GEOMAR REPORT

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Helmholtz-Zentrum für Ozeanforschung Kiel

KIEL276
Time Series Data from Moored Current Meters

Madeira Abyssal Plain

33°N, 22°W, 5285 m water depth

March 1980 – April 2011

Background Information and Data Compilation

Thomas J. Müller[1] and Joanna J. Waniek[2]

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Summary

This report is thought as a user's guide containing back ground information of the 31 years long physical data record from mooring site KIEL276 in the Madeira Abyssal Plain, nominal location 33°N, 022°W at 5285 m water depth. It comprises meta and physical data for all 28 individual moorings deployed from 1980 to 2011, processing methods, and steps for the physical data, namely current speed and direction, and temperature collected at significant depths all over the water column. Spikes are removed, and data are checked for consistency and quality. Some corrections were applied as compared to earlier versions, in particular to instrument depths; however, these corrections do not affect scientific results published earlier in the literature. Nevertheless, for the reason of future consistency we recommend to use the present data and meta data set for further analysis.

By publishing this report, the data set at highest available data rate and the essential meta data along with this report will be submitted to international data centres for open and public access and use, in particular to the new *World Data System*'s (WDS) centre PANGAEA and the *Ocean Sites* data centre (CORIOLIS). In addition, the data set along with further associated meta data like, e.g., log sheets of mooring deployments has been electronically archived at the *GEOMAR Helmholtz Centre for Ocean Research Kiel*, Kiel, Germany, where it can be accessed through the institute's data centre (see www.geomar.de; contact datamanagement@geomar.de).

Zusammenfassung

Mit diesem Bericht wird Hintergrundinformation zu den physikalischen Daten der 31 Jahre langen Zeitreihe von 1980 bis 2011 auf der Verankerungsposition KIEL276 im Madeira Becken auf nominell 33°N, 22°W bei 5285 m Wassertiefe, vorgelegt. Für jede der 28 einzelnen Verankerungen werden die Metadaten sowie Einzelheiten zur Aufbereitung und Archivierung der gemessenen physikalischen Daten (Strömung, Temperatur, Druck, Salzgehalt), gegeben, die durch verankerte Geräte an signifikanten Tiefen der gesamten Wassersäule gewonnen wurden. Die gemessenen Daten wurden in physikalische Einheiten überführt, Fehler beseitigt, und alle Daten auf Konsistenz und Qualität überprüft. Im Vergleich zu früheren Versionen wurden einige Korrekturen angewendet, insbesondere hinsichtlich der Einsatztiefen von Geräten. Jedoch haben diese Korrekturen keinen Einfluß auf früher veröffentlichte wissenschaftliche Ergebnisse. Wir raten allerdings, aus Gründen künftiger Konsistenz diese hier vorliegende Version bei weiteren Analysen zu benutzen.

Mit der Veröffentlichung dieses Berichts wird der Datensatz zusammen mit den wichtigsten Metadaten an internationale Datenzentren gegeben zur freien öffentlichen Nutzung: PANGAEA des neuen *Welt Daten Systems* (WDS) und CORIOLIS für ‚*Ocean Sites*'. Der Datensatz sowie alle relevanten und zusätzlich vorhandenen Metadaten, wie z.B. Protokolle von Verankerungsauslegungen, sind in elektronischer Form (PDF) am *GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel* in Kiel archiviert und über das Datenzentrum des Instituts zugänglich (s. www.geomar.de; Kontakt datamanagement@geomar.de).

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1. Introduction

1.1 Project summary

Background

A mooring site at 33°N, 022°W at 5285 m water depth in the Madeira abyssal plain – later known as KIEL276 (Fig. 1.1) - was first occupied as part of the *North East Atlantic Dynamic Studies* (NEADS, see Dickson et al., 1985) in 1977 for almost one year. The major goal of NEADS was to measure and compare the ocean's meso-scale activity in several regions of the North East Atlantic far away from coasts and at key depth levels of the water column (see Dickson et al., 1985). After some mooring losses in these early years of long-term moorings at this and other sites, the site was re-occupied 2 1/2 years later in March 1980 and operated as part and later as adjoined project of the German long-term research programme *Warm-water-sphere* (SFB133) dealing with the thermocline circulation and associated processes in the North Atlantic (see Krauß, 1996a, 1986b) funded by the *German Research Foundation* (DFG). Away from direct surface influences, current meters were distributed over the water column to cover the cores of the major water masses: North Atlantic Central Water between nominal 200 m and 700 m; Mediterranean outflow water around 1000 m; upper North Atlantic Deep Water around 1500 m; North Atlantic Deep Water around 3000 m; near bottom water about 50 m above the bottom. Some early publications deal with the regional mean circulation and its variability in the deep (> 2000 m) ocean and on scales up to two years (Dickson et al., 1985), within the whole water column on scales up to ten years (Müller and Siedler, 1992), with the variability in the Mediterranean water tongue (Zenk and Müller, 1988; Siedler et al., 2005), and with the variability in the main thermocline on time scales up to almost 30 years (Fründt et al., 2013).

After completion of the SFB133 programme, the mooring was maintained as part of the German contribution to the then new international *Joint Global Ocean Flux Study (JGOFS)* and funded by the *German ministry for science*, BMBF. Particle traps (Kremling et al., 1996) were added from 1993 on, and thus the mooring became interdisciplinary. The main aim was to measure and to understand vertical fluxes of biogenic material of oceanic origin and its variability on annual and longer time scales (e.g. Waniek et al., 2005). However, not only particles that origin from oceanic processes, but also lithogenic material was detected at depths of 2000 m, and despite the large distance fro the African coast its origin was determined within the Sahara desert (Chavanac et al., 2007; Brust and Waniek, 2010; Brust et al., 2011).

The combined physical and bio-geo-chemical measurements at KIEL276 are now on-going as part of the long-term measurements within the international and multidisciplinary *Ocean Sites* programme. It presently is funded by the *German Research Foundation* (DFG) and operated under the responsibility of the *Leibniz-Institut für Ostseeforschung in Rostock-Warnemünde, (IOW)*, Germany. Table 1.1 overviews past and present responsibilities.

***Table 1.1**: Overview on KIEL276 major time periods, principal investigators, and responsible institute for mooring techniques and data; for abbreviations see glossary.*

Mooring ID	Time period	Responsible for	
from / to	from / to	Science (PI)	Mooring & Data
V264-01	1980 1980	T.J. Müller	IfM
V276-01 **V276-13**	1980 1993	T.J. Müller	IfM
V276-14 **V276-20**	1993 2000	J.J. Waniek & T.J. Müller	IfM
V276-21 **V276-24**	2001 2005	J.J. Waniek & T.J. Müller	IOW
V276-25 **V276-27**	2005 2011 & on-going	J.J. Waniek	IOW

Goal of this report

After 31 years of sampling and analyzing data from KIEL276, we feel it worth to summarize the available 31 year physical data set. This report therefore is designed as a user's source of information and guide to the measurement and processing of the physical data obtained between 1980 and 2011 at site KIEL276, 33°N, 022°W, 5285 m water depth, and to the processed data itself. In particular, we summarize the

- **key meta data** for all moorings and hydrographic casts taken close to mooring sites during mooring deployment and / or recovery cruises
- **physical data** from moored current meters at highest data rate available
- **hydrographic data** close to mooring locations during deployment / recovery cruises interpolated to same vertical scales

Methods and processing of particle trap (Kremling et al., 1996) data are dealt with in the scientific literature (e.g. Waniek et al., 2005; Brust et al., 2011).

As a result of consistency checks, some information as given in earlier papers, is slightly improved. In particular, instrumental depths were reviewed taking into account that future analysis may need best estimates of absolute temperature depth relations (see Sec. 2.4). Improvements of instrument depths, however, do not affect earlier scientific results as all of those were related to currents and to temperature variability, and these do not rely significantly on vertical scale changes of less than 50 m.

1.2 Data summary

Overview

This section aims at providing the user a quick overview of

- what kind of data do exist
- where can data be accessed
- which kind of original meta data like handwritten logs do exist in electronic form (PDF), and where can they be accessed
- which are the relevant reports, and where can they be accessed

Data Sets

The data set stems from

- Moored current meter data, 1980 – 2011
- CTD casts, one Nansen cast, and two XBT drops close to mooring site during deployment / recovery cruises
- Moored particle trap data, 1993 – 2011

In this report, the physical data from current meters and hydrographic casts at the mooring site during mooring deployment / recovery cruises are described (Tab. 1.2). Particle trap data were dealt with in a number of publications (e.g., Waniek et al., 2005; Brust et al., 2011) and are available at the World Data System's centre PANGAEA (www.pangaea.de)

Moored current meter data, Aanderaa RCM (1980 – 2011)

The following current meter sets are the basic input data (Fig 1.2; Tab. 1.2) for checking and re-processing as described in section 4 of this report; delivery of result to data centres as ASCII data files for each current meter:

- V264-01, V276-01 through V276-09: for these moorings, raw data are lost; processed data at sampling interval in MK4 ASCII format are available (MK4 level); data sets checked and re-processed as described in section 4;
- V276-13, V276-14: only processed low pass filtered (36 h half power period) daily averages are available in MK4 ASCII format (MK4 level); data checked and re-processed as described in section 4.
- V276-10 to V276-12 and from V276-15 on: for these moorings raw data are available; converted and processed as described section 4.
- V276-20: mooring deployment failed; no data

Moored 50 m thermistor cable data (1980-1994)

The cables were 50 m long and equipped with 11 thermistors at equal distances. Cable and recorder were attached to the mooring line within the main thermocline. Data recording often completely failed, and in many other cases data quality is poor. After conversion of raw data to physical units and de-spiking, these data are stored only at the GEOMAR data centre and available there on request.

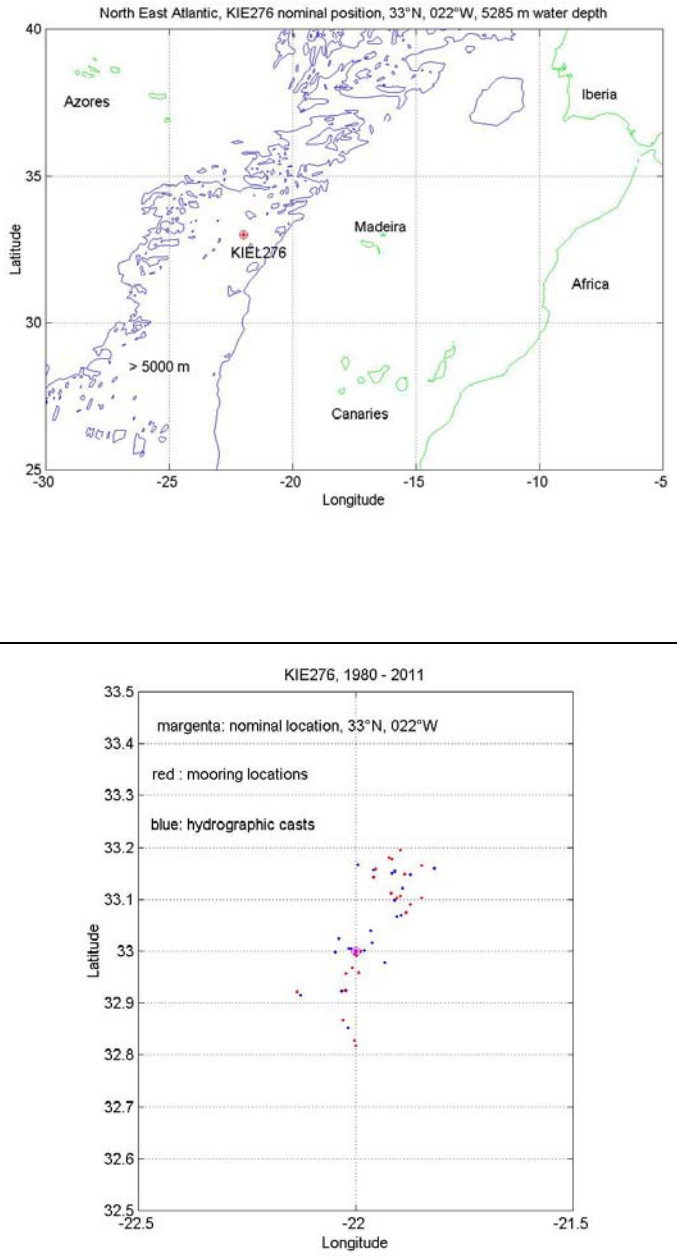


Fig. 1.1: *Upper panel: North East Atlantic with the KIEL276 mooring site location, 1980 – 2011, in the Madeira Abyssal Plain 240 nm west of Madeira Island; nominal location is 33°N, 022°W (red star) at nominal water depth 5285 m (corrected for depth averaged sound velocity); coast lines (green) and 5000 m depth contour (purple) after GEBCO included); Lower panel: detailed locations of 28 mooring (red) and CTD casts during mooring cruises (blue).*

Moored Acoustic Doppler Profiling Current meter (ADCP, 2001/2002)

On a single occasion (mooring V276-21, 2001-2002) an RDI 150 kHz upward looking ADCP was moored in the top buoy at designed 163 m depth. Deployment file and raw data are available the GEOMAR data centre.

Hydrographic casts (1980 – 2011)

CTD casts were taken whenever possible during deployment cruises close to deployment / recovery of moorings. In some few early cases, no reliable CTD data is available or data are lost; in one of these cases, a *Nansen bottle* cast and in two other cases XBT drops replace the CTD data. All data are part of the K276 data set and as such delivered to data centres; they are also part of complete hydrographic cruise data sets and as such also available at data centres along with other casts from the cruise.

Particle trap data (1993 – 2011)

All data available will be delivered in 2014 to the *World Data System*'s centre PANGAEA (www.pangaea.de).

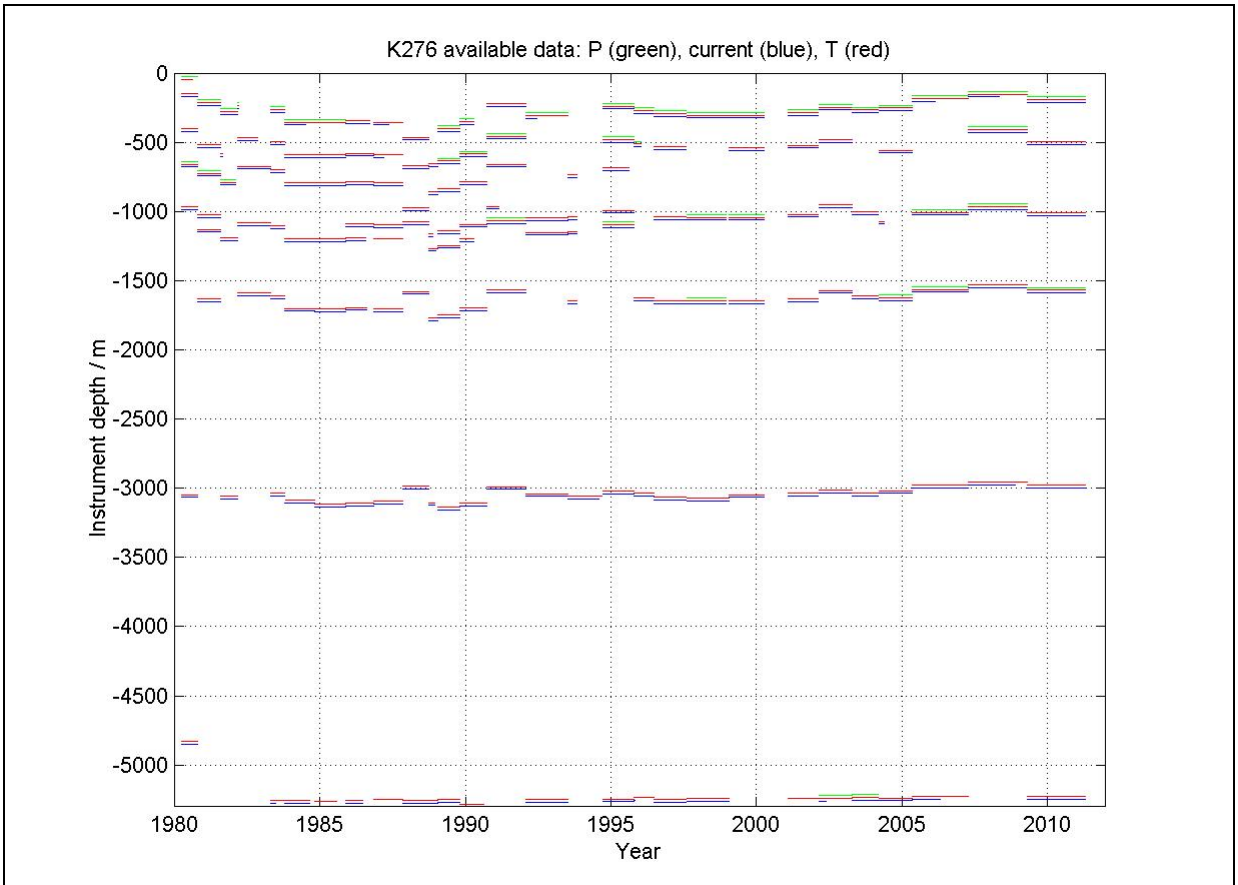


***Fig. 1.2**: KIEL276, overview of current meter data, 1980-2011; pressure (green), current vector (blue), temperature (red).*

Table 1.2: *Overview of K276 moored Aanderaa current meter (RCM4/5/7/8),Aanderaa thermistor cable TR4/5/7/8), and trap data; all physical data are re-processed from highest available resolution and lowest available pre-processing level, and then delivered to data centres (trap data in 2014).*

KIEL276					
Mooring ID	**Aanderaa RCM4/5/7/8 and TR4/5/7/8 data**				**Particle traps**
	Available input for checking & processing			**Dissemination to data centres**	
V264-01 V276-01 to V276-09		processed at sampling interval		checked, sampling interval	n/a
V276-10 to V276-12	raw			processed, sampling interval	n/a
V276-13			processed low-pass filtered daily averages	checked, low-pass filtered daily averages	n/a
V276-14			processed low-pass filtered daily averages	checked, low-pass filtered daily averages	yes, separate mooring L1
V276-15 to V276-17	raw			processed, sampling interval	yes
V276-18	raw			processed, sampling interval	n/a
V276-19	raw			processed, sampling interval	yes
V276-20	Mooring deployment failure, no data				
V276-21 to V276-27	raw			processed, sampling interval	yes

Data access

After processing, consistency and quality check of physical data from moored current meters, and on completion of this report, the physical data set along with hydrographic casts taken close to the mooring site during mooring cruises, and along with this report will be submitted to international data centres (Tab. 1.2).

The above processed physical data set along with additional meta information (Tab. 1.2, Appendix A1, Appendix A2) from the moorings is also archived at

- **GEOMAR Physical Oceanography Research Unit**: All meta data in digitized form (PDF); all measured data, both, raw and processed; access through the institute's data centre (datamanagement@geomar.de). The set consists of:
  - relevant data and cruise reports
  - mooring design input and design sketches corrected for deployment & recovery logs
  - mooring sketch with nominal depths, re-drawn as from logs and static mooring model
  - instrumental start and stop logs
  - bridge logs
  - calibration information
  - raw data as copied from tapes or data storage units (DSU)
  - calibrated and processed data sets, at sampling rate if available
  - this report

Table 1.2: *KIEL276 data as submitted to international data centres after publishing this report; physical and trap data as from moored instruments; CTD casts close to the mooring site during mooring cruises; electronic versions (PDF) of deployment / recovery logs and of and RCM start / stop logs also at Geomar Physical Oceanography data bank.*

	World Data System PANGAEA	**Ocean Sites**	**GEOMAR Physical Oceanography data bank**
This report	Yes	Yes	Yes
Mooring cruise reports	No	No	Yes
Mooring design information	No	No	Yes
Aanderaa Recording Current Meter (RCM) data	Yes	Yes	Yes
ADCP data (solely V276-21, raw data)	No	No	Yes
Aanderaa 50 m Thermistor cable data	No	No	Yes
Particle trap data	Yes (complete 2014)	No	No
CTD Mooring site data	Yes	Yes	Yes
Mooring deployment logs	No	No	Yes
RCM start/stop logs	No	No	Yes

Cruise reports (Appendix 3)

All cruise reports associated with KIEL276 mooring deployment and / or recovery are available either on-line at the publishing institute or on request at the GEOMAR Physical Oceanography data bank.

2 KIEL276 moorings

2.1 Overview

Mooring information (Appendix A01)
All basic information for individual moorings is summarized in Appendix A01; it contains information from cruise logs on

- Mooring codes
- Position (decimal, positive to North and East); early deployments used transit satellites with a single fix every 3 to 4 hours at that latitude (33°N); later GPS, once the codes were free for non-military use
- Water depth measured by single beam echo sounder (RVs METEOR II, POSEIDON) or central beam of multi-beam systems (RVs METEOR III, MARIA S. MERIAN); depths corrected for by vertically integrated sound velocity as determined from CTD (Fig. 2.1)
- Magnetic anomaly at the mooring position for deployment time as from sea charts
- Date, ship and cruise of deployment / recovery
- Existence and electronic (PDF) availability of bridge and deck logs during launching / recovery
- CTD cast files taken close to the mooring site during the mooring cruises

Data information from moored instruments (Appendix A02)
All sources for archived physical data from moored Aanderaa current meters RCM4/5 and RCM7/8, are listed in Appendix A02; it contains information on

- Existence and status of each mooring's meta information in a text file
- Existence of static mooring model results, in particular a final sketch with *nominal depths*, taking into account information from deployment and recovery logs, and from static mooring model; note, instrument nominal depths need further checks to get instrument depth (Sec. 2.4)
- Existence and electronic availability (PDF) of start & stop logs of instruments
- Existence of raw data as mirrored from recording media (tape or data storage unit) to processing computers
- Status of processed data (see Sec. 4).

Also, Appendix A02 shows a column with the number of particle traps within each mooring.

Moored instruments & sensors (Appendix A05)
Current meters: Initially, the basic instrumentation consisted of Aanderaa RCM4/5 current meters which nominally were placed in the upper thermocline at about 250 m and 500 m depth, the Mediterranean water tongue around 1000 m, upper North Atlantic Deep water (1500 m), North Atlantic Deep Water (3000 m) and 50 m above the bottom (from V276-01 on). From 1989 on, RCM4/5 were replaced by RCM7/8, completing this process in 1993. These current meters measured a *quasi-vector-average* of current speed and direction.

Only in 2001/2002, V276-21, carried an upward looking ADCP which was implemented to the upper buoyancy.

Temperature sensors were standard for all current meters. Until 1994, up to two Aanderaa 50 m thermistor cables (TR4/5 and TR7/8) were attached to the mooring line within the thermocline.

Conductivity sensors were attached to some RCM within the Mediterranean Water level during the initial phase adding information on salinity.

Pressure sensors on the top instruments were implemented whenever sensors were available; they helped estimating actual instrument depths (see sec. 2.4) and vertical mooring motion.

Particle traps were added from 1993 on; up to four particle traps were added with changing number and depths depending on resources and scientific objectives being addressed.

Relevant cruise and data reports (Appendix A03)

All relevant reports from mooring cruises, both, internal und public is given in Appendix A03; they can be accessed through the addresses listed in A03. Some of them also present first results from recovered KIEL276 instrumentation.

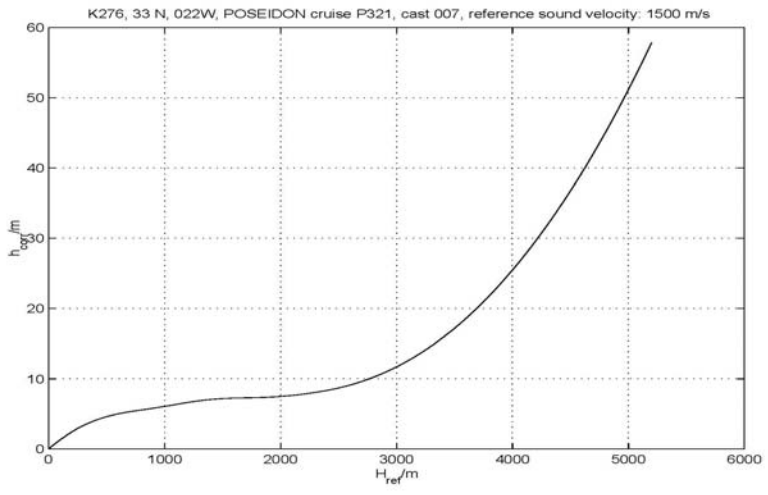


Fig 2.1: *KIEL276 corrections to sounding depths with 1500 m/s assumed average sound velocity based on a POSEIDON cruise POS321 CTD cast.*

2.2 Mooring design

Mooring components

Mooring components used in KIEL276 changed only slightly over the years. The major buoyancy, wire and rope components are

- Top buoyancy, pressure rated up to 300 dbar; at the end of this range, it starts loosing buoyancy due to non-elastic compression.
- Deep sea buoyancy made of two half spheres of glass balls, sheltered by plastic caps (Benthos, later also Nautilus); this type of buoyancy is stable until rated pressure (6000 dbar); may implode by shock.
- Steel wire, 8 mm, coated, upper thermocline, withstands fish-biting.
- Stainless low torsion steel wire, 8 mm, coated, upper thermocline, can be re-used; withstands fish-biting.
- Kevlar low torsion rope, 11 mm, coated, deeper parts of the thermocline, can be re-used.
- Nylon ropes, 11mm diameter, 2700 kp breaking load, jacket, low weight, also known as *METEOR rope*, for depths larger than about 1500 m (low risk of fish-biting); about 10% stretching under forces given by KIEL276 mooring design, re-use not recommended.

Shackles and rings are made of zinced steel with high (3200 kp) breaking load; thus they function as an anode to protect other metal ends of connected components from corrosion without becoming too weak themselves over a 2-year period.

For all components, their form, dimensions and weight in water is known and used to design the mooring. The effect of stretching of steel wire and Kevlar rope is small (although not zero) and neglected when compared to the much larger effect on nylon ropes, the latter being about 10% of length under given forces of more than 300 kp (Zenk, 1981; Schröder, 1982).

Mooring design basics

Mooring design is static, although since 1982 the computer programme also allows to estimate the effect of horizontal non-zero current profiles on depths, elongations and horizontal displacements of mooring components. The design uses the *Physical Oceanography Research Unit's* computer programme *Integrated Mooring Package (IMP)* which was developed over many years and in several steps, starting with the transfer of the original *Woods Hole Oceanographic Buoy Groups* programme package for static single point moorings (Moller, 1976) to metric units and to non-zero current profiles (Schröder, 1982). Kiel mooring components were implemented, e.g. the above mentioned *METEOR* nylon rope and its elongation under stretching forces (Engelmann, 1972; Zenk, 1981; Schröder, 1982). Finke and Siedler (1986) estimated drag coefficients of some Kiel mooring components. The programme package was transferred for the use with MATLAB® by Helmbrecht (2001). It

also allows for simulating a mooring's motions under the time series of measured currents (Helmbrecht, 2002).

In the 1980's and 1990's, the FORTRAN® model results (Schröder, 1982) were transferred to mooring sketches manually. With the invention of the MATLAB® based version (Helmbrecht, 2001), the mooring sketch is created by the computer programme.

2.3 Logs

Formatted logs with handwritten notes were kept while preparing and switching the RCM on and off, and during mooring deployment and recovery. These logs are digitized (PDF copies) and are available as noted in Appendices A01 and A02 in at the GEOMAR data base.

RCM

These logs contain information on

- Type of instrument
- Sensors attached and their settings, e.g. temperature and pressure range chosen
- Battery type and voltage (under 100 Ω resistance) before deployment and after recovery
- Recording interval set
- Date and (external) time (UTC) of switching on, begin of first and last record taken; this information is used to correct for clock drifts, usually of the order of some minutes over a year
- Times of deployment (into water) and recovery (on deck)

Mooring launch & recovery

A bridge log was kept by the watch officer, and a detailed mooring log on deck on the mooring design sketch. Any design changes were noted and together with the actual corrected water depth transferred to the input for the mooring design programme to result in the final design sketch showing '*nominal depths as from logs and static mooring programme'*.

2.4 Instrument depths

Terminology

Instrument depths are estimated in several steps. When using pressure records, these are converted to depths and *vice versa* (UNESCO, 1983) for consistent comparison. The following terminology is used:

- *Designed* depths are the depths in mooring designs before deployment and before corrections for actual water depths and finally used mooring components.
- *Nominal* depths are estimated from the mooring design including relevant information from the mooring's deployment and recovery logs, in particular changes during the deployment process. They are predicted by the static mooring programme IMP (see sec. 2.2)
    - using corrected best estimated water depth at the estimated mooring location
    - assuming zero currents throughout the water column, i.e. no tilt and stretching of the mooring line due to currents ,
    - using mooring components as logged in the deck launch and recovery logs.

  To keep track, *nominal depths* are kept and are denoted as such in meta files and comment lines of data files.
- *Instrument depths*, after further statistical and heuristic inspection from initial temperature and pressure differences to deployment CTD casts, are finally determined (see Sec. 2.4 below); they reflect best estimates at the start of a record, they are filed and recommended for scientific use with the data. They do not reflect any changes of instrument depths during the mission period, be it temporal diving of the mooring due to strong current events or permanent non-elastic elongation of nylon ropes after strong stretching forces or buoyancy loss on top of the mooring (see below). Such changes need special treatment, may include subjective aspects, and therefore are left to the user.

Error sources in estimating depths

Systematic errors in depth estimates mostly result from errors in lengths of ropes and wires, and in buoyancy other than assumed or logged. Such errors are singular for a certain mooring, and only they are dealt with here.

Stretching of wires and ropes: Within a KIEL276 mooring, typically about 3500 m of nylon rope were used between the bottom and about 1500 m depth (low risk of fish-biting), and steel wire or Kevlar above (higher risk of fish-biting). Although not zero, the elongation of steel wires and Kevlar ropes under stretching forces is low as compared to that of nylon ropes, and so is the error in stretching. Therefore, under the given stretching forces and overall lengths any stretching of steel wires and Kevlar ropes is (ca. 1300 m total) neglected as compared to that of the nylon ropes (ca. 3000 m total). For the type of nylon rope used in KIEL276 moorings (METEOR rope), the elongations under stretching forces were measured ashore experimentally with a short and dry length by Engelmann (1972, see Schröder, 1982) and later with a 100 m wet length by Zenk (1981, see Schröder, 1982). They both used a

power law which gave similar coefficients at forces larger than 200 kp, with Engelmann's coefficients leading to about 1% higher stretch (35 m) less depths in the thermocline for typical KIEL276 lengths (Fig. 2.2). It was not noted in the designs which coefficients of the two models were used. We therefore re-calculated all mooring designs using Zenk's (1981) more reasonable coefficients for wet ropes and added a linear interpolation to zero below 200 kp stretching force to end up with consistent *nominal instrument depths* according to design, deployment logs and modelling. However, a systematic error of 1% in the elongation estimate of used nylon (METEOR) rope may remain. Note also, that stretching may be non-elastic under strong forces, leading to permanently higher elongations, e.g. after strong current events.

Lengths of wires and ropes: Steel wires and Kevlar ropes were used at individual lengths up to 200 m. Lengths of steel wires and Kevlar ropes are metered once they are configured, either by the manufacturer or in the institute. They are coiled individually in portion lengths of 10 m, 20 m, 30 m, 50 m, 100 m and 200 m. From individual length differences and individual coiling, it is rather unlikely that large errors in lengths of up to 200 m will not be detected by the handling personnel, either in the laboratory while preparing a mooring or at sea during deployment. The situation is similar for short nylon ropes, but different for long nylon lengths (300 m, 500 m, 1000 m). Such long lengths are not metered but configured and delivered by the manufacturer based on a weight to length relation for dry rope. A 1% error in this relation corresponds to 35 m length error plus roughly 10% stretching under given forces, i.e. nominal depths maybe estimated 30 m too low or 40 m too high.

Buoyancy: Glass ball buoyancy is rated to 6000 m depth. Except by implosion, its buoyancy is stable over time once it is determined. However, the major buoyancy on top of the mooring which is rated to depths of 300 m only, may loose buoyancy by non-elastic compression, e.g. through a mooring's diving during strong current events. Each buoy's buoyancy was calibrated before it's first deployment. Any later buoyancy loss is unknown and may lead to systematic and unknown errors, i.e. stretching forces being too low as compared to the assumed in the design programme. The most significant effect of this error will be too high estimates of the elongation of the nylon rope. For KIEL276 moorings, the top buoyancy force ranges between 300 kp and 800 kp. In this range we estimate about 0.008% less elongation by kp less buoyancy on top (Figure 2.2). A 10% (35 kp) loss of buoyancy on top and 3500 m long nylon rope would then result to 10 m larger instrument depths above the nylon rope, decreasing to 0 m at its lower end.

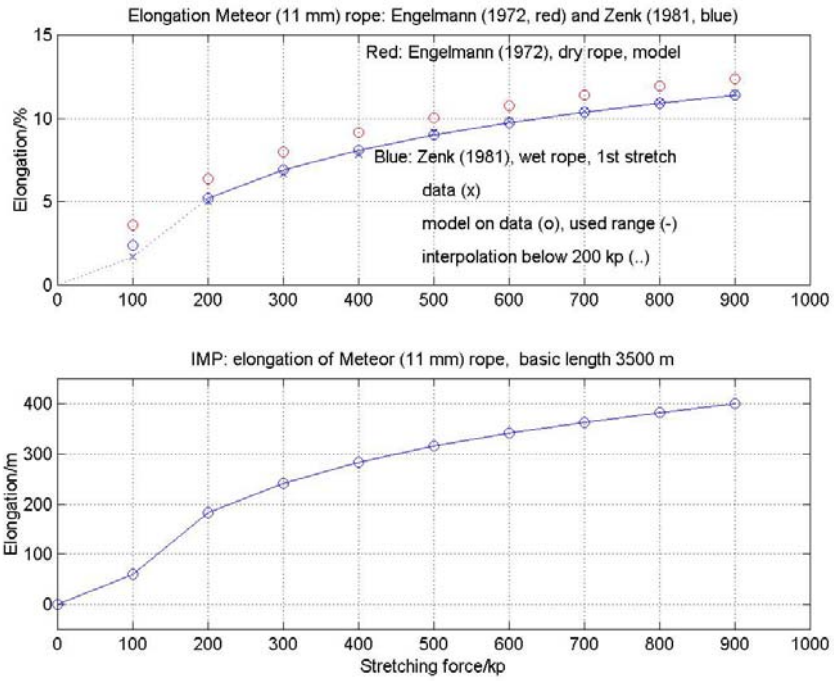


Fig. 2.2, *Elongation of 11 mm nylon (METEOR) rope under stretching force: 100 m wet rope (Zenk, 1981) with linear Interpolation below 200 kp load (upper panel, blue); Engelmann (1972) model for dry rope at Zenk's (1981) data points (upper panel, red); elongation of typical 3500 m length in KIEL276 mooring lines after Zenk's (1981) model with interpolation below 200 kp load (lower panel).*

Estimating instrument depths

As noted above, significant systematic errors in depth estimates of order 10 m and more may most likely result from length errors in long (>300 m) pieces of nylon rope, and / or from loss of buoyancy of the top buoyancy element. Long nylon ropes in KIEL276 moorings usually (with few exceptions) are used at nominal depths larger than a depth z_n, where z_n=2000 m is typical (low risk of fish biting at larger depths) at the KIEL276 mooring site. The method to *best estimate instrument depths*, assumes:

- RCM temperature and pressure records at depths less z_n *a-priori* do not have an offset error as wire and Kevlar have almost zero elongation, pieces are short (less 200 m) and therefore large errors in lengths can easily be detected by eye-inspection during cruise preparation and mooring deployment. Therefore the risk of systematic errors is expected to be small.
- Current meters at depths less z_n are arranged *a-priori* as logged during deployment with depth differences between them fixed (wire and Kevlar pieces less 200 m).
- RCM temperature and pressure record median values of the first 25 hours characterize the ocean's internal state on a time scale (< 3 days) close to the date and time of deployment.

- From the above, RCM pressure and temperature first 25 h median values at depths less z_n maybe compared with the CTD deployment cast, thereby also enabling to detect singular offset errors in RCM records or in logged lengths of wires above z_n.
- Temperature and pressure differences between RCM first 25 h median and CTD maybe be combined to a single average through normalization based on the RCM sensor's measurement range.
- Starting close to the surface, the minimum of the sum of normalized absolute differences (after ignoring outliers in a 2nd run) at depths less z_n defines the optimal instrument depths. Instrument depths larger than z_n are adjusted by linear interpolation between the bottom and the uppermost depth of nylon rope larger z_n.
- Reasonable results were achieved with he following parameters:
    - 2000 m upper ocean depth z_n, which is the maximum depth to assume sufficient accurate RCM temperature measurements in sufficient large vertical temperature gradients
    - According to the mooring design and logs, a deep (long nylon rope) array with linear stretch correction between the bottom and the upper nylon end, and an upper fixed array with non-stretchable mooring components where depth correction is constant.
    - half range temperature (12°C) and full range pressure (6000 dbar) values for normalization
    - 0.45°C and 50 dbar error bounds to flag (and ignore) outliers in temperature and pressure differences for the 2nd run.

For each mooring, the result is output in figures and tables. Nominal depths, corrections and (best estimates of) instrument depths are tabulated in Appendix A04 for each mooring and instrument. Overall statistics for the upper ocean based on (27 individual) mooring statistics are summarized in Figure 2.3 and in Table 2.1.

The final temperature differences of pre-deployment CTD to the first 25 h RCM median (mean) is 0.01 °C, i.e. less than resolution (0.02 °C) on average (Tab. 2.1, Fig. 2.3) with standard deviation less 0.1 °C and absolute differences less 0.5 °C. There are 6 outliers of which three (mooring numbers 19, 21, 22) are due to a single RCM (S/N 10550); the other three stem from different instruments. These corresponding six temperature records were offset corrected to match the record start to the pre-deployment CTD cast.

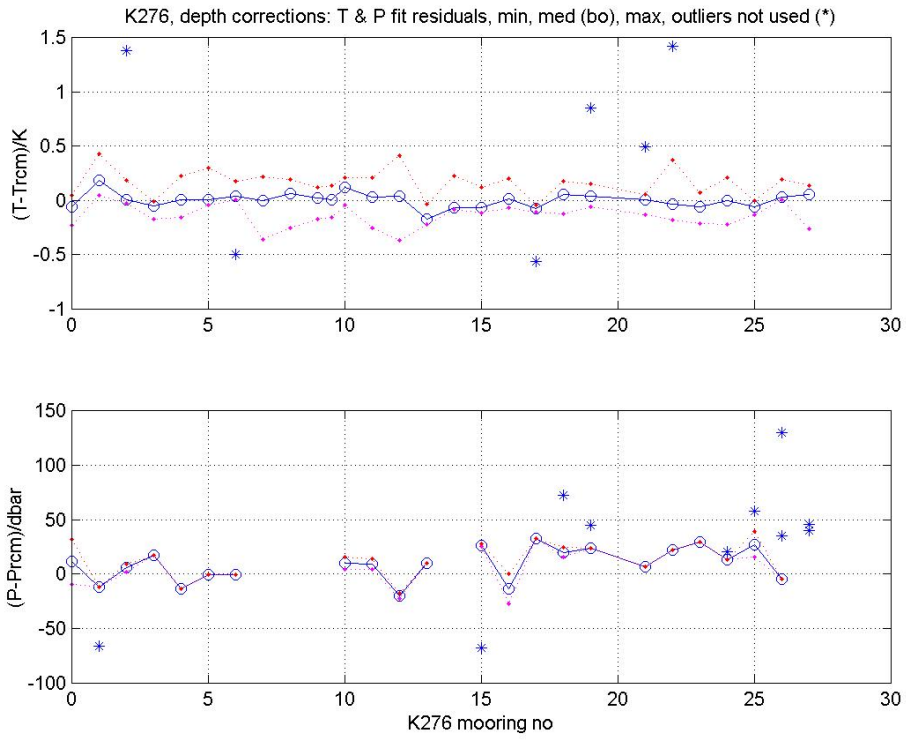


Fig. 2.3: *For each mooring's depth adjustments, the upper ocean (<2000 m) residuals of pre-deployment CTD cast values v/s RCM first 25 h temperature (upper panel) and pressure (lower panel) medians: medians (blue circles), maxima (red dots), minima (margenta dots), blue stars are outliers identified in the first run and not used for the fit in the second (final) run.*

For pressure, the median (mean) is close to zero for moorings number 0 (V264-01) to 6 (V276-06) and from 10 to 13 (V276-10 to V276-13). Moorings V276-07 and V276-08 had no pressure sensor. For mooring V276-09, the record of the uppermost RCM is lost with the top buoy and the top RCM. From mooring V276-18 on, the median increases to an overall value of ~10 dbar, probably due to uncertain linear range calibrations of sensors from mooring number V276-18 on. However, the low corresponding residuals in temperature provide confidence in the result of depth corrections for these moorings. The pressure sensor outlier in mooring V276-01 is due to (non-linear) adaption of the sensor in (nominal) 700 m to in-situ pressure within the first 600 records (25 d). These first 600 pressure records are set dummy. All pressure records were offset corrected to match the record start to the best estimate of instrument depth.

The basic depth correction parameter now is a stretch correction factor applied to nominal bottom distances; this results in zero correction at the bottom and maximum correction at the upper (long) nylon rope end. This maximum correction is then applied as constant towards the surface (Fig. 2.4; App. A04). The maximum – and exceptional large - RCM depth corrections of more than 200 m towards the surface were applied to mooring V264-01, the reason being errors in nylon rope lengths due to a failure of the length meter used (see App.

05, V264-01 for details). Note, that nearly all corrections are positive towards the surface, i.e. less instrument depths, and only two are slightly negative, indicating a systematic problem in the exact determination of nominal lengths of the nylon rope.

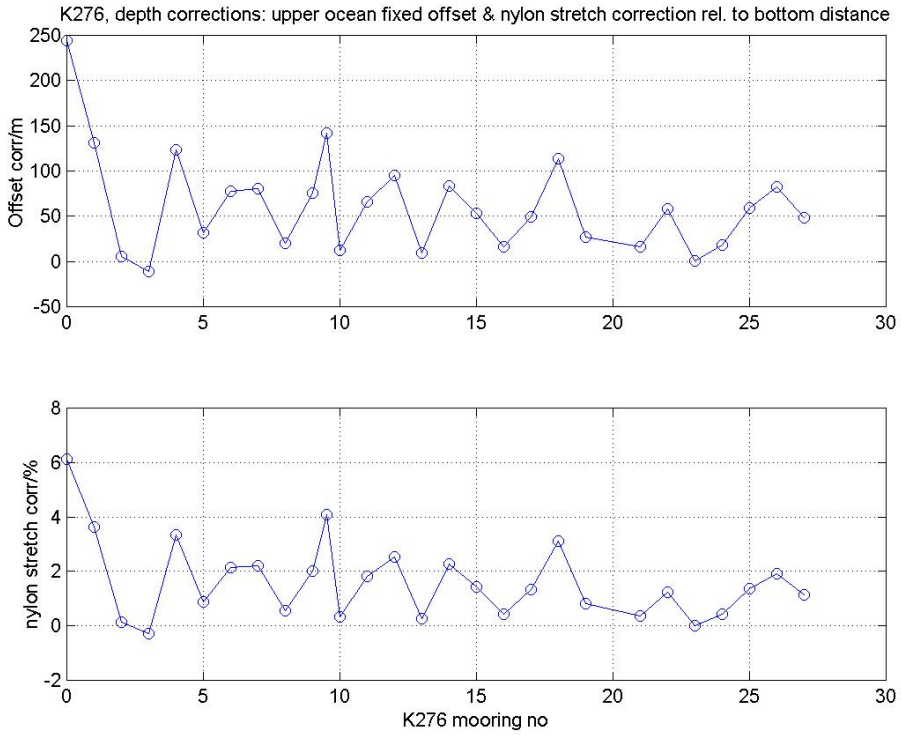


Fig. 2.4: *For each mooring's depth adjustments, the upper ocean fixed array correction constant (upper panel) and (long) nylon rope stretch correction/(%), both relative to the bottom.*

Note

- **All depth corrections to achieve *best estimate of instrument depth as from log sheets and from static mooring model, and from RCM first day statistics against deployment CTD*. All pressure and temperature corrections made are noted in comment lines of data header lines.**

Comparison with instrument depths published earlier

Re-investigation of mooring design and deployment logs and the method described above to estimate actual initial instrument depths coherently throughout all moorings, results in differences to depth estimates published earlier. However, as discussed below these differences are sufficient small not to change the scientific results published so far.

Barotropic tides: A single paper (Siedler and Paul, 1991) deals with high frequency variability in the subtropical North East Atlantic, namely barotropic tides. As barotropic tides do not depend on depth, changes (or errors) in instrument depth estimates will not change the results.

Tab. 2.1: *RCM best depth estimates; overall upper ocean z<=2000 m statistics as derived from individual mooring statistics.*

```
P, T    : best pressure estimate for RCM; CTD pre deployment cast temperatuere at P
PRCM    : RCM first 25 h median pressure
TRCM    : RCM first 25 h median temperature measurement
Corr_off: offset/m correction applied to (nominal) bottom distance of RCM
Corr_str: stretch factor coefficient applied to (nominal) bottom distance of RCM
```

	(T-TRCM)/K	(P-PRCM)/dbar	Corr_off	Corr_str
median	0.01	10.0	56	1.013
mean	0.01	9.2	62	1.016
std	0.07	15.3	55	0.015
std*2	0.14	30.5	110	0.029
min	-0.37	-27.0	-11	0.997
max	0.43	39.0	244	1.061

Low-frequency variability: All other papers published so far treat low-frequency (<1/2 d^{-1}) variability, i.e. on quasi-geostrophic time-scales in the region.

Published instrument depths: Siedler et al. (2005) listed instrument depths (their Tab. 1). Their list encompasses moorings V264-01 to V276-19 and RCMs at all depth levels that provided data. For an analysis of upper thermocline fluctuations, Fründt et al. (2013) used one to two RCM records from the upper thermocline from each mooring until mooring V276-26 and tabled instrument depths from this level (their Tab. 1). Their depths are identical to the respective ones of Siedler et al. (2005) until V276-19. The combined set of instrument depths used by Siedler at al. (2005) and by Fründt et al. (2013) is the most complete one published so far. These depths therefore are treated as being typical and representative. They are listed along with instrument depths as recommended in this report in Appendix A04, and for each mooring, differences of recommended instrument depths (this report) to those published by Siedler et al. (2005) and Fründt et al. (2013) are displayed in Figure 2.5.

Overall, instrument depth differences are less +/- 70 m (Fig. 2.5), and only deep ocean differences (stars, >2900 m) exceed +/- 45 m. Inspection of logs shows, that the major reason for the observed differences is subjective adjustment of instrument depths. Neither a systematic nor a coherent method of adjustment covering all moorings has been used so far. However as discussed below, the depth differences are sufficient small to not affect the scientific results in earlier papers with respect to both, temperature and current records.

Temperature records: No temperature records from the deep (>2900 m) ocean have been analyzed scientifically so far. Temperature records from the upper ocean were used in the

papers by Siedler et al. (2005) and Fründt et al. (2013). Here, the authors have adjusted the temperature records directly to depths of investigation by linear corrections to CTD casts taken close to mooring deployment and / or recovery. This individual sensor approach creates coherent links between records in terms of averages, and as variances do not change much with small depth changes of less 70 m, the papers' scientific results do not depend on this adjustment.

Current records: Daily averages of low pass filtered current measurements from all or from part of then available depths of moorings V264-01 through V276-19 were used by Zenk and Müller (1988), by Müller and Siedler (1992), Waniek et al. (2000), Waniek et al. (2005), Siedler et al. (2005) and Fründt et al. (2013). Müller and Siedler (1992) interpolated measured currents to depths of investigation using a 3 mode quasi-geostrophic or a 2 mode Empirical Orthogonal Function (EOF) decomposition into time and depth dependant parts at KIEL276 and other sites of the subtropical eastern North Atlantic. At all sites, such a decomposition explains about 90% of record variances and therefore was accepted to represent each record. The barotropic mode (Fig. 2.6 for KIEL276) is constant with depth and therefore insensitive to changes (or errors) in depths (Fig. 2.6, left panel). The 1st and 2nd baroclinic modes changes over 50 m steps at a given depth sum up to less than 1% amplitude change (Fig. 2.6, right panel) in currents at all depths. We conclude that changes of less than 100 m by depth adjustments would result in a change of current amplitude of less than 2% and therefore would not change the scientific results in the above papers.

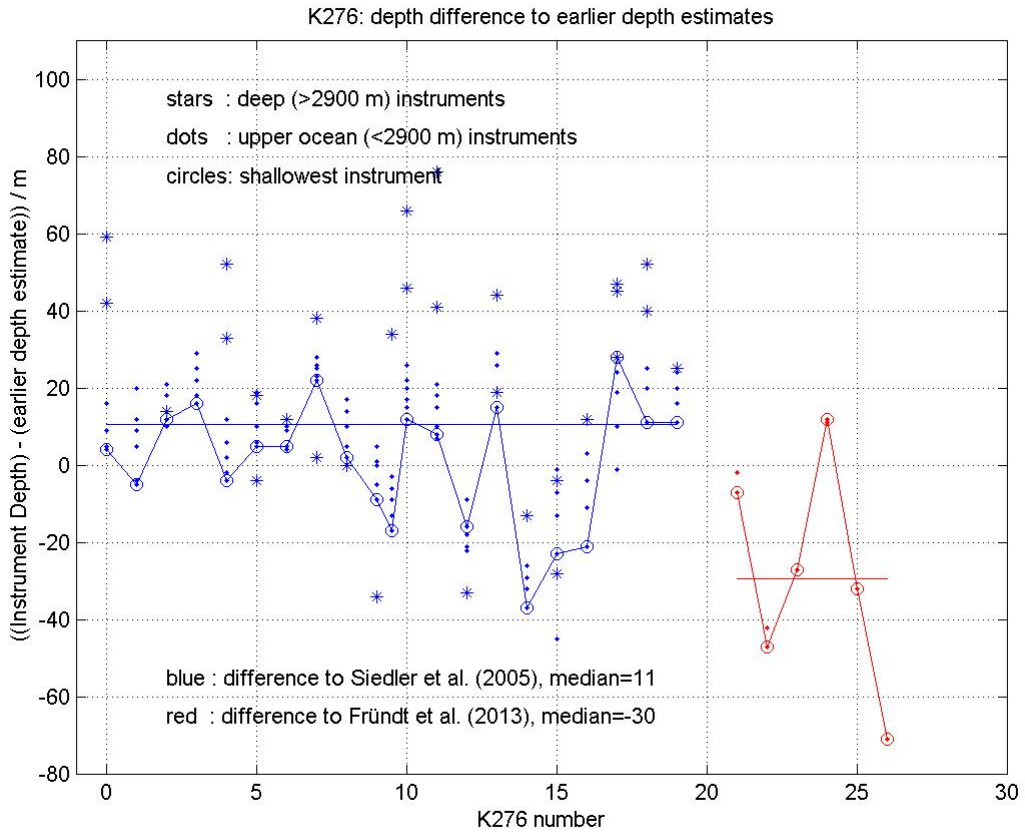


***Fig. 2.5**: KIEL276 instrument depth differences recommended in this report to those used by Siedler et al. (2005) for all RCMs until mooring V276-19 (blue) and Fründt et al. (2013) for upper ocean RCMs in moorings V276-21 to V276-26 (red). Stars for deep (>2900 m), circles for uppermost and dots for all other instruments used.*

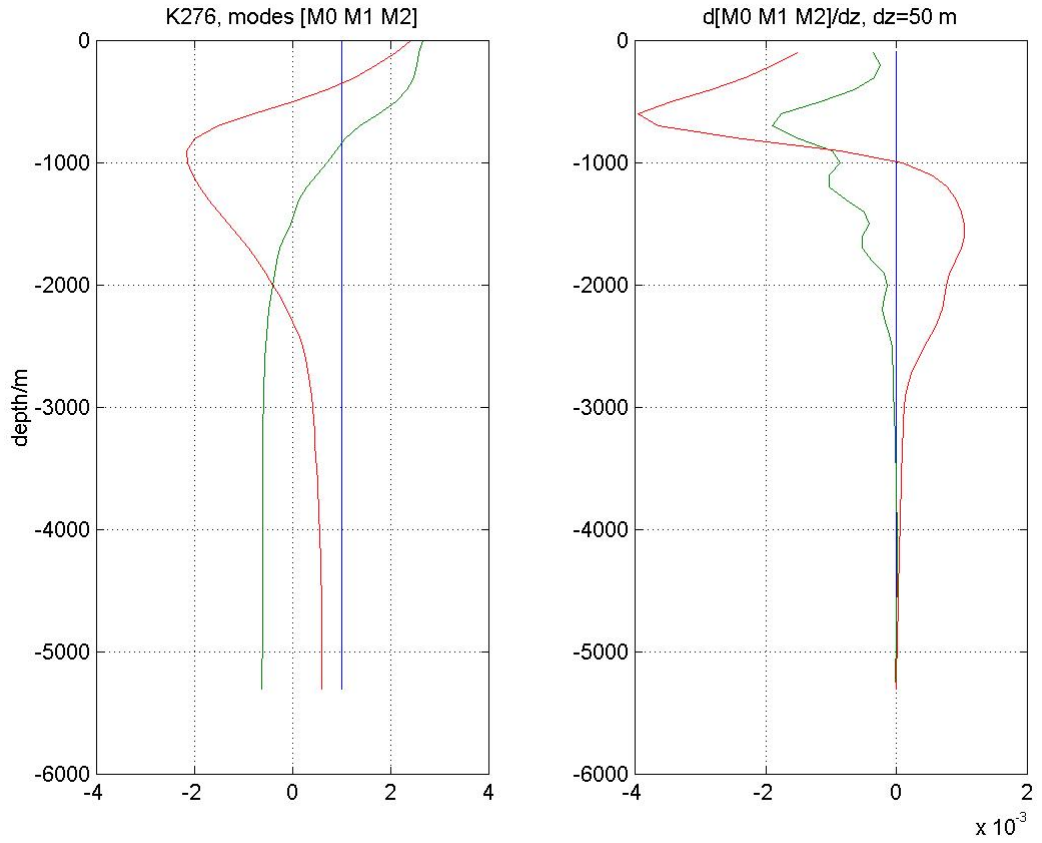


***Fig. 2.6**: KIEL276: vertical normal modes from stratification (left panel) and their vertical gradients in 50 m steps (right); barotropic mode M0 (blue), 1st baroclinic M1 (green) and 2nd baroclinic M2 (red).*

3 KIEL276 CTD data

Casts

During all mooring cruises, hydrographic (mostly CTD) casts were obtained close to the nominal mooring location (see map in Fig. 1.1, summary in Tab. 3.1) in order to acquire vertical profile data for comparison with data from moored instruments. The CTD's used onboard were of type *Kiel Multisonde* until 1981 and in 1985, *Neil Brown's MKIIIB*, *Falmouth Scientific's ICTD*, and Sea Bird's 911.

Table 3.1: *Summary of CTD cast at KIEL276; No corresponds to setting of mooring; M2T is R/V METEOR II, MSM is R/V MARIA S MERIAN.*

K276 No	Remark
00	CTD conductivity bad, no salinity, M2T053
01	CTD conductivity bad, no salinity, M2T056
02	Nansen cast replaced bad CTD during M2T057
03	M2T060 CTD casts lost; replaced at KIEL276 by XBT file 072, drop 067
04 to 28	CTD casts for V276-04 (M2T064) to V276-28 (MSM018) deployments

Calibration

All CTD temperature and pressure sensors were checked and eventually corrected for calibration of temperature and pressure sensors in the laboratory at IfM Kiel (now GEOMAR); for electrical conductivity (salinity) sensors the manufacturer's calibration were used during the cast. Generally, *in-situ* samples were taken, to measure *in-situ* salinity in a *Guildline AUTOSAL* salinometer which was then used for *in-situ* calibration of the CTD's conductivity cell and finally salinity. During some cruises, however, no samples were taken; in these cases, salinity was offset-calibrated against the stable relation of potential temperature and salinity in the deep North East Atlantic Ocean (Saunders, 1986); such adaption is marked in the files.

Processing

In a first step, raw data of all casts from a cruise (usually taken at 16 Hz rate, ca. 16 data cycles / m) were converted from binary code to ASCII applying the basic (manufacturer's) calibration. Next, the following processing steps were performed (see Müller, 1999) using UNESCO (1988) computational formulas:

- spikes were removed
- data were reduced to lowering parts of the cast
- a time constant shift was applied where necessary
- the basic calibration for temperature and pressure sensors was corrected using the laboratory calibration, and for the conductivity cell's using the in-situ calibration with Standard Sea Water (SSW)
- a low pass filter was applied with a ca. 2 dbar response
- low-pass cosine filter over 10 dbar
- interpolation to appropriate pressure scale relative to sampling, nominally 2 dbar
- check of static stability using potential density
- salinity was recalculated

- check of calibration using Saunders (1986) relation of potential temperature and salinity for the deep (< 3°C) North East Atlantic.

For each deployment cruise, the single deep cast which is closest in space and time to the mooring was extracted, processed as above and transferred to MATLAB and ASCII files *K276_hydro_iii.ext*, 000<=iii<=028, with ext=MAT and ext=CTD, respectively. The casts are 'smooth' and statically stable. Only cast 28 is slightly instable in the deep sea. The deep salinity of all casts fit to Saunders (1986) relation better than 0.005 (Fig. 3.1.1). For more details see the cruise reports and comments in the file headers.

We recommend this set of CTD data shall be used for comparison with the current meter data set. Summary plots of casts in Figures 3.1 and relations of potential temperature and salinity in Fig. 3.2. For each cast, note the comments in the files.

Tab. 3.2: *KIEL276 CTD casts during mooring cruises: nominal location 33° 00.0'N, 022° 00.0' W. CTD casts processed. Quality of calibration checked with Saunders' (1986) relation and found acceptable (error less 0.005); for some casts salinity was offset calibrated to meet the relation (see cruise reports). Quality of profiles checked with static stability of potential density anomaly. Casts 0 and 1 have no salinity, cast 3 was replaced by a Nansen cast; cast 4 is lost and replaced by a near-by XBT drop (no 67). Cast 28 processed with manufacturer's (Sea Bird) software to 1 dbar basket averages; cast 28 is slightly statically instable in the deep sea.*

List of CTD-data at KIEL276 during mooring deployment cruises.
Directory: 2_k276_mooring_cruises_hydro_data/3_k276_mooring_cruises_CTD_XBT/k276/
Files: k276_hydro_
File no: 000 to 028
File numbers correspond to mooring deployments V264-01 (000) and V276-01 (001)
to V276-28 (028).
Ship codes: M2T: METEOR II; MET: METEOR III; POS: POSEIDON; MSM: MARIA S MERIAN
Pmax is maximum pressure of cast

File	Stat	Cast	Date			Hour	Min	Latitude	Longitude	Depth	Pmax	Cruise	Remark
			YYYY	MM	DD	hh	mm	North	East	m	dbar		
0	180	3	1980	3	31	12	0	32.1017	-21.8483	5280	500	M2T53-D	no salinity
1	5	1	1980	10	17	17	48	32.1183	-21.8033	5280	3494	M2T56-1	no salinity
2	542	1	1981	7	26	20	42	33.1500	-21.9167	5280	2533	M2T57-1	Nansen cast
3	067	67	1982	3	4	1	5	33.0700	-21.8950	5280	807	M2T60-3	XBT file 72
4	315	1	1983	4	17	2	45	33.1600	-21.8200	5280	5332	M2T64-6	
5	731	1	1983	10	20	12	45	33.1533	-21.9100	5280	5000	POS104-C	
6	229	3	1984	10	26	13	50	33.1217	-21.8917	5280	5368	M2T69-5	
7	529	21	1985	11	16	18	30	33.1567	-21.9600	5280	5269	POS124	
8	296	6	1986	10	31	21	51	33.1435	-21.9587	5280	4998	MET04-2	
9	803	5	1987	11	5	23	26	33.1470	-21.8738	5280	5320	MET06-1	
10	59	50	1989	1	14	3	2	33.0980	-21.9108	5280	5288	MET09-2	
11	911	3	1989	10	27	18	25	33.0667	-21.9050	5280	5360	MET11-2	
12	615	5	1990	9	25	18	5	33.1563	-21.9098	5280	5368	MET14-1	
13	37	14	1992	1	27	21	25	32.9150	-22.1267	5280	5320	POS189-1	
14	501	9	1993	7	12	19	6	32.9983	-22.0467	5280	5352	POS200-8	
15	764	4	1994	9	18	12	50	32.9236	-22.0330	5280	3998	POS202	
16	884	98	1995	10	15	12	23	33.0393	-21.9650	5280	4576	POS212-4	
17	178	3	1996	6	25	2	36	33.0050	-22.0167	5280	5286	MET36-2	
18	482	3	1997	8	7	0	44	33.0167	-21.9633	5280	3980	POS231-3	
19	10	7	1999	1	24	20	25	33.0010	-21.9995	5280	5360	POS247-2	
20	57	15	2000	4	12	16	45	32.9781	-21.9329	5280	5358	POS259-1	
21	66	3	2001	2	1	15	2	32.9983	-22.0000	5280	5352	POS268	
22	17	19	2002	2	19	17	20	32.9247	-22.0219	5280	5372	POS283-2	
23	71	13	2003	4	20	11	56	32.8530	-22.0183	5280	4958	POS297	
24	10	13	2004	3	16	18	19	33.0058	-22.0107	5280	1008	POS308	
25	187	7	2005	5	8	17	49	33.0007	-21.9814	5280	5358	POS321	
26	254	5	2007	4	10	5	28	32.9999	-22.0005	5280	3636	POS349	
27	007	7	2009	4	26	15	54	33.1655	-21.9951	5280	4414	POS383	
28	004	4	2011	4	21	17	8	33.0246	-22.0393	5280	5301	MSM18-1	

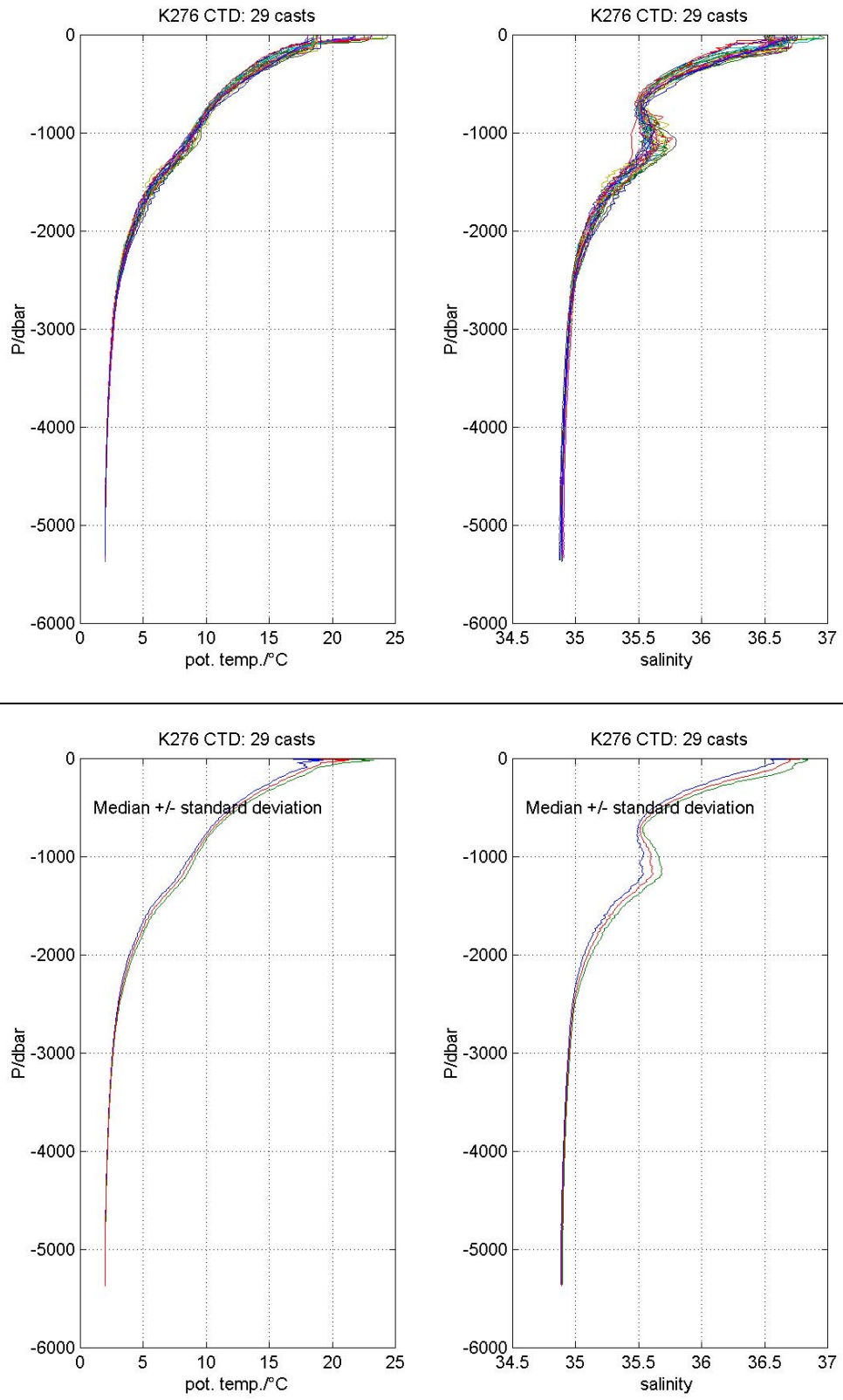
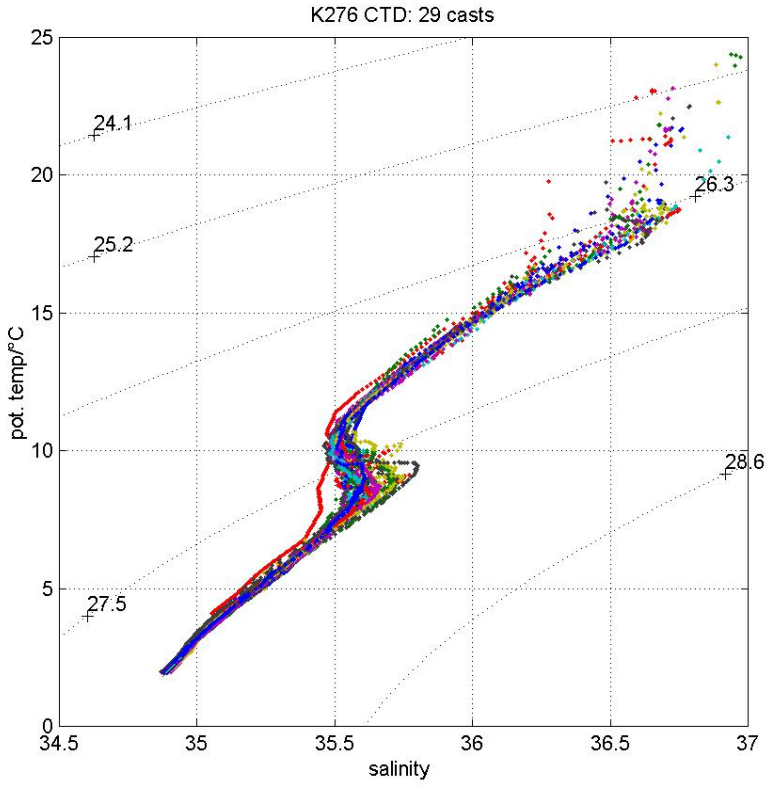


Fig. 3.1: *CTD summary casts (upper panel) and statistics (lower panel) at KIEL276 during deployment cruises; note salinity is missing for casts 0 and 1(bad salinity) and 3 (XBT); here, average salinity was assumed to calculate potential temperature.*



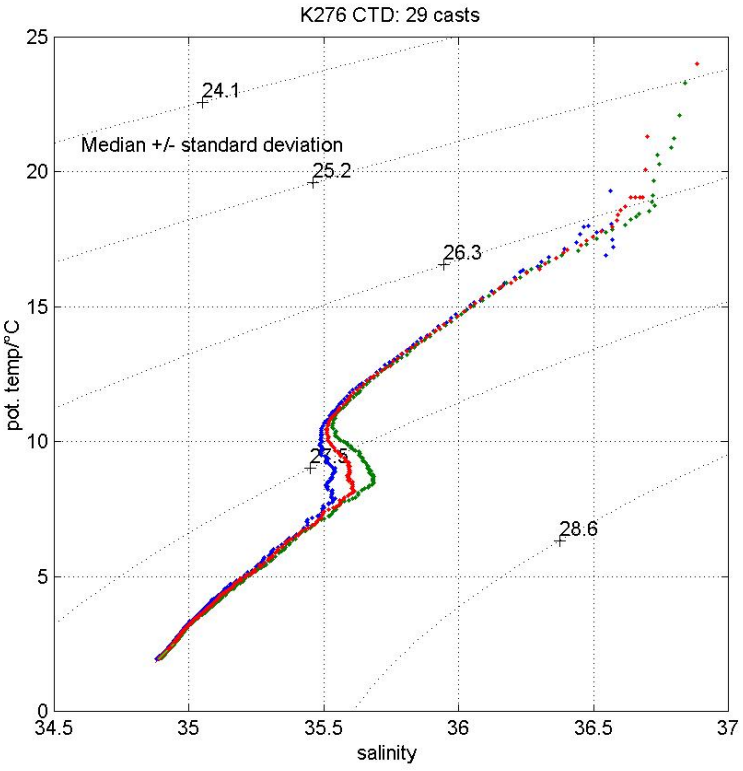


***Fig. 3.2**: As Fig. 3.1, but summary of potential temperature and salinity. Note that in the deep sea the relation of θ and S of all casts merge, and all coincide well with the one given by Saunders (1985) for the deep Northeast Atlantic (red line below 3°C).*

4 KIEL276 moored instruments

4.1 Instrumentation, processing and archiving

Instrumentation of moorings differed for each setting. It depended on availability of instruments and sensors, specific scientific questions, and sometimes on deployment conditions. Also, different instruments need different processing steps, and over 30 years computers and formats and even methods changed. Some earlier processing of physical data is documented in cruise reports (see App. 03) or in data reports (Müller, 1981; Müller and Zenk, 1983; Müller, 1984; Müller et al., 1987; Müller et al. 1990). We here aim at providing a homogenous set of physical data from KIEL276 by harmonizing the meta data information and partly re-processing necessary steps. For a quick overview see data sources, processing and submission to data centres see Table 4.1 and Appendix A05; for details see this section.

In 1980 the series started solely with Aanderaa RCM4/5 current meters (Aanderaa, 1978). In the main thermocline these were supplemented from the second deployment (V276-01) in late 1980 to 1995 (V276-15) by Aanderaa thermistor cables of 50 m length. Replacement of the RCM4/5 by *quasi-vector-averaging* RCM7/8 (Aanderaa, 1987) started in 1989 (V276-10) and was completed in 1993 (V276-15). Only for a single setting (V276-21), a 150 kHz upward looking ADCP was mounted on the top buoy.

From 1994 (V276-14) on, particle traps made by *Howaldt Werke Deutsche Werft* (HDW) and *Salzgitter Elektronik* (SE) were added; first in a separate mooring (L1) close to V276-14, and then implemented into KIEL276 moorings as standard from 1994 (V276-15) on.

Detailed information on instrumentation, instrument depths and data return for each mooring is available in Appendix A02 and on the cover pages for each mooring in Appendix 06.

4.2 Aanderaa current meters RCM4/5 and RCM7/8

Sensors

Standard sensors provide time information, temperature, current direction and speed sensor. Additionally, a conductivity and pressure sensor, both with different ranges can be mounted.

- **Time basis:** for the RCM4/5, the time basis is taken from the recording interval as set by the user and the number of records between the instrument's start and stop; for the RCM7/8 it is taken from the instrument's internal clock which stores date and time once a day before each day's first record, and from the recording interval as set internally.
- **Temperature** is measured at the instrument's housing. Mostly, the *Low Range* option (-2.1°C to 21°C) was chosen. From the 3000 m depth level on and deeper, the *Arctic Range* (-2.1°C to 5.6°C) option was chosen and archived where available; in these cases no pressure sensor could be mounted. For temperature calibration, Aanderaa claims the second and third order coefficients, (*C* and *D* in Tab. 4.2), to be the same

for a chosen range for all sensors while offset and slope define range and resolution. At the institute, early calibrations were tabulated for computational reasons. Range end point calibrations correspond to raw values N=0 and N=1023 and were filed in headers of MK4 data files. With the 2nd and 3rd order coefficients, *C* and *D*, being known and constant, the complete set of coefficients has been recovered and were used where needed. Files created later, have the complete set of coefficients in their header's comment part.

- **Temperature sensor stability:** inspection shows: (i) calibrated temperature records in the deep sea differ by less 0.2 K to all other records in the deep sea, and (ii) te*mperature calibration stability* within a record of up to two years length is better than 2 mK/a for all record lengths available; any drift within a record therefore is much less than the sensor resolution, 20 mK and 7.5 mK, for the low and arctic ranges, respectively; therefore no drift correction with respect to CTD casts is needed and is not applied
- **Conductivity** measurements together with temperature and pressure (or the instrument's depth) provide salinity; some conductivity calibrations are just by *Range* as logged in the respective instrument's start logs. Derived salinity often shows strong and non-linear drift; salinity therefore is archived, but no further processing attempt was made.
- **Pressure** sensors were used in the upper ocean to monitor instrument depth and mooring motion. Lack of funding limited availability of sensors. Lack of time and personnel limited laboratory calibration from about 1999 on, and therefore many conversions of raw data to physical units just could use *linear-range-calibrations* as logged in the respective instrument's start logs; if so, it is noted in the mooring's detailed meta data (Appendix 06), and these records - without further adjustments to offset and range - only give estimates of events in mooring motion. Few pressure records show non-linear adaption to environmental pressure which however is obvious in the pressure record plots
- **Current direction & Speed**: direction is measured by a magnetic compass at the end of each measuring interval while speed is measured as an integral counting revolutions of the rotor over the same measuring interval. For the RCM4/5, the measuring interval is the recording interval as set by the user. For the RCM7/8, each recording interval consists of several measuring intervals to deliver *quasi-vector-averaged* values of direction and speed. In KIEL276 moorings, the recording interval was set to 2 h, and initially (from 1989, V276-10 on) an average of 100 individual measurements (1 in 72 s) was taken over the recording interval (Aanderaa, 1987). Due to problems with battery power, this rate was reduced to 50 individual measurements (one in 144 s) from 1991, V276-12, on. Bio-fouling at KIEL276 is significant only in the ocean's upper 150 m and decreases very quickly downwards; it affects mostly the rotor, but only in few cases bio-fouling led to cut the record. The (average) direction needs correction for earth's horizontal magnetic anomaly component as noted in bridge logs taken from sea charts. In some cases, anomalies

were not noted in the logs; these were interpolated between mooring deployments (Appendx 01).

Data sources for archiving & file formats

For an overview see Table 4.1 below. Data sources for further inspection and processing to files for archiving are:

- **V264-01 and V276-01 through V276-09**: For these first settings, raw data as mirrored from the storage medium to ASCII computer files, are lost; processed data at recording interval on the MK4 level are available as ASCII files (internal MK4 format of the then IfM Kiel). For consistency with later data sets, these were transferred to ASCII files (internal PH3 format) with the following adjustments (Pre1-level):
    - Meta information in header adjusted w/r to position; water depth; nominal depths as from mooring logs and static mooring model (see sec. 2.4). Deviations from older values are small and are not significant for scientific results already published (see discussion in sec. 2.4).
    - East and North components of currents were re-transferred to measured current direction and speed.
    - Any temperature corrections in MK4 reverted in PH3 (Tab. 4.3 below).
- **V276-10 through V276-12, V276-15 through V276-19, V276-21 through V276-27**: raw data are available and processed (re-processed) to create ASCII (internal PH3 format) data files at sampling interval (Pre1-level).
- **V276-13 and V276-14:** For data of these two settings, only low pass (49 h filter length, 36 h half power response) filtered daily averages are available. Data sources are internal MK4 ASCII formatted files which were transferred to PH3 formatted ASCII data for consistency, with adaption of meta information in the header (Pre1-level).

Processing

Processing used *'home-made'* institutional FORTRAN^{R} and MATLAB^{R} software written for data processing of moored Annderaa RCM and TR. The result is stored in computer dependent binary coded files and in ASCII files (Tab. 4.1). Processing steps include

- creation of an ASCII meta information file V276ii.txt where ii is the KIEL276 deployment number. This file contains data on
    - deployment and recovery times, and cruises
    - mooring position and water depth
    - instrumentation with nominal depths as from mooring logs and static model
    - information on eventual problems with the mooring
    - information on problems with data
- MK4 level data: source were raw data which now are lost; detailed steps below
- Pre1-level data: source is either MK4 data or raw data; detailed steps as below; output to PH3 formatted ASCII and MAT files
- Pre2-level data: source is pre1-level data; some additional adaption and corrections are made; *nominal depth* replaced by *best estimate of instrument depth* (Sec. 2.4)

MK4-level

- **Input**: on this level, all raw data are from RCM4/5 as mirrored from data storage tape to ASCII computer files
- **Raw data conversion :** Conversion of raw data to physical units of temperature,, conductivity, pressure, current direction and speed used
    - the calibration instructions of the manufacturer (Aanderaa, 1978, 1987)
    - the calibration sheets accompanying each new instrument (see Tab. 4.2)
    - any re-calibration of sensors at the institute's calibration lab
    - linear range calibrations if no better information is available
- **Time basis**: start time (instrument's switch on) as from log; stop time from start time, sampling interval and number of records; control as from instrument's switch off time if available; time offset correction from start time; time drift correction from start and stop time if controlled externally; final start time, stop time and sampling interval to header information; time basis for records created linearly between start and stop time using number of records.
- **Speed & direction**: replace zero speed readings by 1/2 of the offset calibration coefficient; decompose to East and North components
- **Spikes**: detect spikes using a running median filter over typically 9 records with typically 0.05K, 5 cm/s ; replace spikes by associated median
- **Temperature**: corrections as in Table 4.3
- **Salinity**: replaces conductivity if measured
- **Edit** suspicious data and header information as necessary
- **Dummy** values were set where data are bad or not measured
- **Output** to MK4 binary and ASCII formatted files at sampling interval
    - **Header** information as from logs and processing steps including dates and times of start and stop of the time series along with the time interval of storage
    - **Records** with pressure, current East- and North components, temperature, salinity

Pre1-level

- **Input:** either MK4 or raw data
- **Processing**
  From start and stop time, for each record create decimal day referred to a reference year, i.e. day 0.0 refers to 1st January, 00:00 UTC of the reference year
    - **MK4** input
        - Add missing information for PH3 output
        - Current direction and speed re-calculated from components
        - Revert temperature corrections applied for MK4 (Tab. 4.3)
    - **Raw data input**
        - Create header information from logs; nominal depth as from logs and static mooring model
        - Data processed as for MK4-level
    - **MK4 and raw data input**
        - Choose *arctic range* temperature if available for deep sea records
        - Check correct speed conversion factor within a mooring line for consistency by comparing standard deviations of fluctuations around the M2 tidal signal in band-pass filtered speed data; fluctuations decrease slightly with depth reflecting higher oceanic variability in the thermocline; standard deviations differ less than a factor 2 from depth average standard deviations. The spectral peaks are all within the frequency band of the M2 tide at highest spectral resolution.
- **Output** to PH3 formatted ASCII and MAT files at sampling interval
    - **Header** information as from logs and processing steps
    - **Records** with reference year, decimal day, pressure, current direction, current speed, temperature, salinity

Pre2-level

- **Input:** PH3 formatted pre1-level data files
- **Processing**
  - **Depth**: instrument depth set to '*best estimate*' as from logs, static mooring model and first day's data statistics compared to deployment CTD casts (Sec. 2.4); '*nominal depth*' kept as comment in header
  - **Pressure***:* all records adapted such that first day's median matches instrument '*best- depth-estimates*' (Sec. 2.4, App. 04).
  - **Temperature:** thermocline temperature records which first day's median differ more than +/- 0.45 K from deployment CTD were offset-adapted to match deployment CTD (Sec. 2.4); deep sea temperature records corrected such that first day's median matches pre-deployment CTD casts if available (Sec. 2.4, App. 04); all corrections commented
  - **Speed:** speed values at zero or 1/2 offset calibration value are set to dummy and interpolated in time; interpolation keeps trailing dummies.
- **Output:** PH3 formatted ASCII and MAT files
  - **Header** information as from logs and processing steps with instrument's *'best depth estimate'* in header and *'nominal depth'* in comment
  - **Records** with reference year, decimal day, pressure, current direction, current speed, temperature, salinity

Table 4.1*: RCM4/8 and RCM7/8 data sources, processing steps and data formats; raw data as mirrored from tape or data storage unit (DSU).*

KIEL276 Mooring Data		**Raw data ASCII**	**MK4 level**	**Pre1 level**	**Pre2 level**	**Archived *****
Format		**matrix**	**MK4**	**PH3**	**PH3**	**RODB**
From	**To**					
V264-01	**-**	No	Yes	Yes	Yes	Yes
V276-01	**V276-09**	No	Yes	Yes	Yes	Yes
V276-10	**V276-12**	Yes		Yes	Yes	Yes
V276-13*	**V276-14***	No	Yes	Yes	Yes	Yes
V276-15	**V276-19**	Yes		Yes	Yes	Yes
V276-20**	**-**	-		-	-	-
V276-21	**V276-27**	Yes		Yes	Yes	Yes

(*) for data from moorings V276-13 and V276-14 ,only low pass filtered daily averages available

(**) mooring failed, no data

(***) Data initially are archived at GEOMAR data centre and submitted to the *World Data System*'s centre PANGAEA and to *Ocean Sites'* data centre at CORIOIS. (Appendix A05)

Table 4.2: *RCM4/5 and RCM7/8 polynomial calibration coefficients used in KIEL276 moorings: $P=A+B*N+C*N^2+D*N^3$ with N as the 10-bit recorded raw value, and P the physical value; note that speed calibration of the RCM4/5 depends on the setting of R (rotor revolutions per count) and on the sampling interval, t/s.*

	Unit		**A**	**B**	**C**	**D**
Speed	Cm/s	RCM4/5	1.5	42*R/t	0	0
		RCM7/8	1.1	0.2906	0	0
Direction	°N	RCM4/5	1.5	0.3490	0	0
		RCM7/8	1	0.3500	0	0
Temperature	°C	Arctic range	Sensor dependent	Sensor dependent	-1.601e-007	7.911e-011
		Low range	Sensor dependent	Sensor dependent	-1.344e-006	1.937e-009
Conductivity	mS/cm		Sensor dependent	Sensor dependent	0	0
Pressure	dbar		Sensor dependent	Sensor dependent	Sensor dependent	Sensor dependent

***Table 4.3**: Individual temperature corrections as of 22-SEP-1993 and copied from printed log. Corrections were reverted for this report to create consistent data sets throughout the whole KIEL276 data set, e.g. for estimating instrument depths from temperature and pressure measurements.*

Mooring ID	Instrument ID	Temperature corrections as of 22-SEP-1993	Temperature corrections reverted
V264-01	V264-01_007	0.13	Y
	V264-01_008	0.19	Y
V276-01	V276-01_005	0.14	Y
	V276-01_009	0.43	Y
V276-02	V276-02_003	1.28	Y
	V276-02_004, No. 7	0.09	Y
	V276-02_004, No. 11	-0.04	Y
	V276-02_008	0.23	Y
V276-03	V276-03_005	0.50	Y
V276-04	V276-04_005	-0.11	Y
	V276-04_008	0.45	Y
	V276-04_009	0.11	Y
	V276-04_010	0.20	Y
V276-05	V276-05_006	0.30	Y
	V276-05_008	0.25	Y
	V276-05_009	0.06	Y
	V276-05_010	0.02	Y
V276-06	V276-06_004	-0.30	Y
	V276-06_005, No. 1	0.85	Y
	V276-06_005, No. 2-9	0.80	Y
	V276-06_007	0.15	Y
	V276-06_008	0.15	Y
	V276-06_009	0.10	Y
	V276-06_010	0.03	Y

4.3 Other Aanderaa instruments

Thermistor cables TR4/5, TR7/8

Aandeaa thermistor cables of 50 m length were used from V276-01 until V276-15 in the main thermocline. Data sources, raw data conversion, calibration and processing as for Aanderaa RCM (see sec. 4.2) pre1-level; data kept on pre1-level for archiving at GEOMAR data centre.

Pressure recorders and inclinometers

Some early moorings carried pressure recorders and/or inclinometers on the mooring's top with high sampling rates (30 s) in order to monitor the mooring's deployment phase. These data are not archived and lost.

4.4 Acoustic current meters

Early single beam Acoustic vector averaging current meters

Proto types made by NBIS were implemented in moorings V276-02 and V276-04 to V276-06. Data return was poor. Those data that could be read from storages clearly showed that the internal algorithm that changed current components from instrument coordinates to earth coordinates was wrong. As the instrument did not store the original measurements they could not be reverted from the wrongly transformed data. Data were not used nor archived, and now are lost.

Acoustic Doppler Current Profiler

In a single deployment, V276-21, 2001 to 2002, an upward looking ADCP, 150 kHz, made by RDI was mounted in the top buoy at nominal 163 m depth. ADCP ping data as stored internally by the instrument are available in the archive together with the deployment and recovery log. These data are singular in the whole set and have therefore not been processed yet.

4.5 Particle traps

Particle traps were added in 1993, starting with 4 traps in a separate mooring (L1) close to the existing V276-14 (1993/1994). From 1994 (V276-15) on, traps were merged with the current meter mooring. Lack of funding left a data gap from end of 1997 to early 1999 (V276-18).

All particle trap data were evaluated by the institute's JGOFS group and later at the *Leibniz-Institut für Ostseeforschung, Warnemünde (IOW)*; they are documented and archived at the IOW and available at the *World Data System*'s centre PANGAEA. In this report, we only adjust the estimates of measurement depths to the level *nominal depths as from logs and static mooring model*. These are used in the meta data and in the mooring sketches (Appendix A05). Deviations from trap depth estimates used earlier are small and do not affect scientific results already published (see Section 2.4).

Acknowledgements

The KIEL276 mooring site for more than 30 years could only be run with the support by numerous institutions and persons: The former *Institut für Meereskunde* in Kiel (now GEOMAR) and later the *Leibniz-Institut für Ostseeforschung* in Warnemünde (IOW) provided support through personnel and basic funding sources, the *Deutsche Forschungsgemeinschaft* (DFG) and the *Bundesministerium für Forschung* (BMBF) through project funding and ship time. From 2001 to 2005, part of the scientific analysis and of the planning processes was performed while one of the authors (JJW) was affiliated at the *National Oceanography Centre, Southampton*, UK. We thank Gerold Siedler and Detlef Schulz-Bull for their scientific guidance and advise over many years. In particular, we thank the technicians involved in the two institutes, and the ship crews for their work at sea.

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Glossary

Institutions

- BMBF: *Bundesministerium für Forschung*
- DFG: *Deutsche Forschungsgemeinschaft*
- IfM: *Institut für Meereskunde*, Kiel, Germany, until 2002
- IFM-GEOMAR: *Leibniz-Institut für Meereswissenschaften*, Kiel, Germany, 2003 - 2011
- GEOMAR *Helmholtz-Zentrum für Ozeanforschung*, Kiel, Germany, since 2012
- NOCS: *National Oceanography Centre*, Southampton, UK

Mooring identifications

- V26401 and V27601 through V27627: identification for a mooring; 'V' stands for the German word for 'mooring' (Verankerung); a 3-digit number identifies a mooring site; if a site is occupied several times, a 2-digit running number is attached. In the case of KIEL276, the second setting received a new number (V27601 instead V26402) which was kept against this rule. In texts, for easier reading sometimes, e.g. V27601, is replaced by V276-01.
- K276 instead KIEL276 sometimes is used in graphics.
- KIEL276 numbers, 0, 1, 2, ... 27, sometimes are used in graphics or tables for moorings V264-01, V276-01, V276-02,….V276-27, respectively.

Instrumentation

- RCM: Recording Current Meter, made by Aanderaa, Norway
- ADCP: Acoustic Doppler Profiler, made by RD Instruments, USA .

Physical measures

- SPD: current speed/(cm/s)
- DIR: current direction/degree relative to North, counted clockwise from North
- UC, VC: current components, positive towards East and North
- T: temperature/°C; for CTD casts, the scale, IPTS68 or ITS90 is given in the cast headers; for RCM measurements, accuracy is not sufficient to distinguish the scales
- P: pressure/dbar relative to the sea surface;
- S: practical salinity, IPSS78

KIEL276

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

March 1980 – April 2011

Appendix A01: Mooring Inventory

KIEL276, NE Atlantic current meter moorings**,** 1980 to 2011, with particle traps since 1992; nominal location is 33.0° N, 022.0°W, Madeira Abyssal Plain (240 nm west of Madeira), nominal water depth is 5285 m
Remark 1: All dates and locations after bridge logs. All water depths corrected for sound velocity[(1).]
Remark 2: KPO is *Kiel Physical Oceanography* mooring ID, introduced in 2011and assigned also to earlier moorings
Status: 23-OCT-2012

KIEL276 Mooring information											
Code		Navigation (bridge log)			Launching					Recovery	
Traditional	KPO	Position	Water	Mag.	Date	Ship	Bridge	Deck	CTD	Date	Ship
		(bridge log)	Depth[1]	Dev.		Cruise	log[3]	log[3]	file		Cruise
		Latitude	(m)	°E			(master)	(scientist)			
		Longitude					status	status			
V264-01	629	33° 06.1' N 021° 50.9' W	5280	not logged	31.03.1980	Meteor II M2T053-D	3	3	M2T53_D_180 (no Salinity)	17.10.1980	Meteor II M2T056-1
V276-01	630	33° 09.9'N 021° 50.9'W	5295	-14 MK4 files	17.10.1980	Meteor II M2T056/1	3	3	M2T056_1_005 (no Salinity)	27.07.1981	Meteor II M2T057-1
V276-02	632	33° 04.75'N 021° 53.05'W	5290	-13 MK4 files	27.07.1981	Meteor II M2T057/1	hard to read, no copy	3	M2T057_1_542	02.03.1982	Meteor II M2T060-3
V276-03	633	33° 11.67'N 021° 53.88'W	5288	-12.3	05.03.1982	Meteor II M2T060/3	3	3	M2T060_3_4_072 (XBT T7, 760 m)	17.04.1983	Meteor II M2T064/6
V276-04	635	33° 10.6'N 021 55.0'W	5288	-12.3	19.04.1983	Meteor II M2T064/6	3	3	M2T064_6_7_001	19.10.1983	Poseidon POS104-c
V276-05	636	33° 10.8'N 021° 55.4'W	5285	-13.5	20.10.1983	Poseidon POS104-c	3	3	POS104_731	25.10.1984	Meteor II M2T69-5
V276-06	642	33° 09.5'N 021° 57.3'W	5290 (deck log)	-11.7 MK4 files	26.10.1984	Meteor II M2T69-5	3	3	M2T069_5_6_003	16.11.1985	Poseidon POS124
V276-07	658	33° 08.5'N 021° 57.6'W	5288	-11.7 MK4 files	17.11.1985	Poseidon POS124	3	3	POS124_049	31.10.1986	Meteor III MET004-2
V276-08	660	33° 06.7'N 021° 55.1'W	5276	-11.7	01.11.1986	Meteor III MET004-2	3	3	MET004_006	06.11.1987	Meteor III MET006
V276-09	666	33° 05.4'N 021° 52.5'W	5287	-12	06.11.1987	Meteor III MET006	3	3	MET006_005	14.01.1989	Meteor III MET009-2
V276-10	671	33° 06.4'N 021° 53.8'W	5281 (HS)	-12 (interp.)	14.01.1989	Meteor III MET009-2	3	3	MET009_050	27.10.1989	Meteor III MET011-2

KIEL276 Mooring information											
Code	**Navigation (bridge log)**				**Launching**					**Recovery**	
Traditional	**KPO**	**Position**	**Water**	**Mag.**	**Date**	**Ship**	**Bridge**	**Deck**	**CTD**	**Date**	**Ship**
		(bridge log)	**Depth[1]**	**Dev.**		**Cruise**	**log[3]**	**log[3]**	**file**		**Cruise**
		Latitude	**(m)**	**°E**			**(master)**	**(scientist)**			
		Longitude					**status**	**status**			
V276-11	678	33° 06.2'N 021 54.3'W	5272	-11 (interp.)	27.10.1989	Meteor III MET011-2	3	3	MET011_2_003	25.09.1990	Meteor III MET014-1
V276-12	685	33° 08.95'N 021° 53.25'W	5335 (HS)	-11	25.09.1990	Meteor III MET014-1	3	3	MET014_1_005	27.01.1992	Poseidon POS189-1
V276-13	719	32° 55.30'N 022° 08.17'W	5279	-10.6	28.01.1992	Poseidon POS189-1	3	3	POS189_003	11.07.1993	Poseidon POS200-8
V276-14 & L1	739	32° 59.63'N 022° 00.10'W	5282	-11.7	01.07.1993	Poseidon POS200-8	3	3	POS200_8_009	17.09.1994	Poseidon POS202
V276-15	757	32° 57.41'N 022° 01.30'W	5277	-10.5	18.09.1994	Poseidon POS202	3	3	POS202_004	14.10.1995	Poseidon POS212/4
V276-16	775	33° 00.14'N 021° 57.85'W	5274	-10.3	15.10.1995	Poseidon POS212/4	3	3	POS212_098	24.06.1996	Meteor III MET036-2
V276-17	781	33°00.0'N 022° 00.0'W	5294	-10	28.06.1996	Meteor III MET036-2	3	3	MET036_2_003	06.08.1997	Poseidon POS231-3
V276-18	826	32° 59.5'N 021° 59.9'W	5277	-10	07.08.1997	Poseidon POS231-3	3	3	POS231_002	24.01.1999	Poseidon POS247-2
V276-19	855	32° 58.1'N 022° 00.5'W	5271	-9.5	25.01.1999	Poseidon POS247-2	3	3	POS247_007	13.04.2000	Poseidon POS259-1
V276-20	856	Mooring line broke during launch; lower part lost;not redeployed			14.04.2000	Poseidon POS259-1	0	3	POS259_015	14.04.2000	Poseidon POS259-1
V276-21	912	32° 55.5'N 022° 01.5'W	5272	-10	02.02.2001	Poseidon POS268	3	3	POS268_003	19.02.2002	Poseidon POS283-2

KIEL276 Mooring information											
Code	**Navigation (bridge log)**				**Launching**					**Recovery**	
Traditional	**KPO**	**Position**	**Water**	**Mag.**	**Date**	**Ship**	**Bridge**	**Deck**	**CTD**	**Date**	**Ship**
		(bridge log)	**Depth[1]**	**Dev.**		**Cruise**	**log[3]**	**log[3]**	**file**		**Cruise**
		Latitude	**(m)**	**°E**			**(master)**	**(scientist)**			
		Longitude					**status**	**status**			
V276-22	938	32° 52.10'N 022° 01.75'W	5275	-9 (interp.)	22.02.2002	Poseidon POS283-2	3	3	POS283_019	20.04.2003	Poseidon POS297
V276-23	957	32° 49.65'N 022° 00.20'W	5264	-7.3	22.04.2003	Poseidon POS297	3	3	POS297_013	16.03.2004	Poseidon POS308
V276-24	1083	32° 49.1'N 022° 00.0'W	5270	-9.0	17.03.2004	Poseidon POS308	3	3	POS308_012	06.05.2005	Poseidon POS321
V276-25	1084	33° 00.0'N 021° 59.9'W	5273	-8.6	08.05.2005	Poseidon POS321	3	3	POS321_007	10.04.2007	Poseidon POS349
V276-26	1085	33° 00.01'N 021° 59.98'W	5271	-9.5	17.04.2007	Poseidon POS349	3	3	POS349_005	27.04.2009	Poseidon POS383
V276-27	1086	32°57.55'N 021°59.55'W	5276	-9 (as 2007)	28.04.2009	Poseidon POS383	3	3	POS383_007	21.04.2011	Merian MSM018-1
V276-28		33°05.58'N 021°58.90'W	5244		24.04.2011	Merian MSM018-1			MSM018_1_004		

Remarks

(1) Water depth estimated from measured sounding depth assuming average 1500 m/s sound velocity plus 55 m local correction estimate from Matthew Tables and CTD cast 007 during Poseidon cruise POS321 in 2005. HS is HYDROSWEEP (multibeam) corrected depth on R/V METEOR.
(2) Nominal depths are from static model results, using deployment & recovery log information
(3) Log status index: (0) unknown; (1) GEOMAR buoy group, (2) with TJM; (3) scanned or other digital form

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

March 1980 – April 2011

Appendix A02: KIEL276 data information

Remark: KPO is *Kiel Physical Oceanography* mooring ID, introduced in 2011and assigned also to earlier moorings

Status: 23-OCT-2012

KIEL276 data information					
Mooring Code		**Current meters[1] RCM4/5/7/8/9/11**			**Traps**
Traditional	**KPO**	**start/stop /proc logs[2]**	**raw data from tape/DSU**	**processed data available**	
V264-01	629	3	Lost	at sampling interval	none
V276-01	630	3 partly lost	Lost	at sampling interval	none
V276-02	632	3	Lost	at sampling interval	none
V276-03	633	3	Lost	at sampling interval	none
V276-04	635	3	Lost	at sampling interval	none
V276-05	636	3	Lost	at sampling interval	none
V276-06	642	3	Lost	at sampling interval	none
V276-07	658	3	Lost	at sampling interval	none
V276-08	660	3	Lost	at sampling interval	none
V276-09	666	3	Lost	at sampling interval	none
V276-10	671	3	Y	at sampling interval	none
V276-11	678	3	Y	at sampling interval	none
V276-12	685	3	Y	at sampling interval	none
V276-13	719	3	Lost	daily averages	none
V276-14 & L1	739	3	Lost	daily averages	traps moored separately

KIEL276 data information					
Mooring Code		**Current meters[1] RCM4/5/7/8/9/11**			**Traps**
Traditional	**KPO**	**start/stop /proc logs[2]**	**raw data from tape/DSU**	**processed data available**	
V276-15	757	3	Y	at sampling interval	4 traps
V276-16	775	3	Y	at sampling interval	4 traps
V276-17	781	3 start only	Y	at sampling interval	3 traps
V276-18	826	3	Y	at sampling interval	none
V276-19	855	3	Y	at sampling interval	2 traps
V276-20	856	no data from V276-20, April 2000 to February 2001			
V276-21	912	3	Y	at sampling interval	1x2 traps 1 trap
V276-22	938	3	Y	at sampling interval	1x2 traps 1 trap
V276-23	957	3	Y	at sampling interval	1x2 traps 1 trap
V276-24	1083	3	Y	at sampling interval	2 traps
V276-25	1084	3 start only	Y	at sampling interval	2 traps
V276-26	1085	not logged	Y	at sampling interval	2 traps
V276-27	1086	not logged	Y	at sampling interval	2 traps

1) ADCP: solely V276-21 had an upward looking 150 kHz ADCP on the top buoy; data not processed, but set-up & raw data available

(2) Log status index: (0) unknown; (1) GEOMAR buoy group, (2) with TJM; (3) scanned or other digital form

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

March 1980 – April 2011

Appendix A03: KIEL276 mooring cruise reports

Table A03: KIEL276 deployment cruise reports; internal reports are available through the GEOMAR data centre; public reports are available at the publishing institution and/or on-line at GEOMAR's library (www.geomar.de) or at the Senatskommssion für Ozeanographie der Deutschen Forschungsgemeinschaft (SkfOz, http://www.dfg-ozean.de; PS is the cruise's Principal Scientist.

KIEL276 deployment cruise reports							
No	**Mooring**	**Deployment cruise**			**Internal report at**	**Public report**	
	ID	**Ship**	**ID**	**PS**	**GEOMAR data centre**	**Reference**	**on-line at**
0	V264-01	Meteor II	M2T053-D	Werner	M2T53_C_D_report.pdf		
1	V276-01	Meteor II	M2T056-1	Seiler	M2T56_1_report.pdf		
2	V276-02	Meteor II	M2T057-1	Zenk	M2T57_1_report.pdf		
3	V276-03	Meteor II	M2T060-3	Siedler	M2T60_3_report.pdf		
4	V276-04	Meteor II	M2T064/6	Siedler		Siedler et al. (1983)	GEOMAR
5	V276-05	Poseidon	POS104-c	Zenk	POS104_C_D_report.pdf		
6	V276-06	Meteor II	M2T69-5	Zenk	M2T69_5_report.pdf	Meincke et al. (1985)	
7	V276-07	Poseidon	POS124	Müller	POS124_report.pdf		GEOMAR
8	V276-08	Meteor III	MET004-2	Müller	MET04_report.pdf	Siedler et al. (1987)	SKfOz
9	V276-09	Meteor III	MET006	Siedler	MET06_1_report.pdf	Müller et al. (1988)	SKfOz
10	V276-10	Meteor III	MET009-2	Müller	MET09_2_3_report.pdf	Zenk et al. (1989)	SKfOz
11	V276-11	Meteor III	MET011-2	Müller	MET11_2_report.pdf	Roether et al. (1990)	SKfOz
12	V276-12	Meteor III	MET014-1	Hasse	MET14_1_report.pdf	Hinz et al. (1991)	SKfOz
13	V276-13	Poseidon	POS189-1	Müller	POS189_1_report.pdf		
14	V276-14	Poseidon	POS200-8	Müller	POS200_8_report.pdf		
15	V276-15	Poseidon	POS202	Müller	POS202_report.pdf	Knoll et al. (1998)	GEOMAR
16	V276-16	Poseidon	POS212-4	Müller	POS212_report.pdf	Knoll et al. (1998)	GEOMAR
17	V276-17	Meteor III	MET036-2	Kremling		Mienert et al. (1998)	SKfOz
18	V276-18	Poseidon	POS231-3	Waniek	POS231_3_report.pdf		
19	V276-19	Poseidon	POS247-2	Müller	POS247_2_report.pdf		
20	V276-20	Poseidon	POS259-1	Müller	POS259_1_report.pdf		
21	V276-21	Poseidon	POS268	Schulz-Bull	lost		
22	V276-22	Poseidon	POS283-2	Schuz-Bull	POS283_report.pdf		
23	V276-23	Poseidon	POS297	Blanz	POS297_report.pdf		
24	V276-24	Poseidon	POS308	Schiebel	POS308_report.pdf		
25	V276-25	Poseidon	POS321	Müller	POS321_report.pdf		
26	V276-26	Poseidon	POS349	Waniek	POS349_report.pdf		
27	V276-27	Poseidon	POS383	Waniek	POS383_report.pdf.		
28	V276-28	Merian	MSM018-1	Waniek		Waniek (2011)	SKfOz

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

March 1980 – April 2011

Appendix A04: RCM Instrument depths

Tab. A04.1: RCM best depth estimates result (see section 2.4 for method). Normalization factors used were the pressure approximate maximum range, p_norm= 6000 dbar and the low temperature half range, t_norm=12 °C. For a second run, residuals P-PRCM and T-TRCM between pre-deployment CTD cast and first 25 h RCM records larger 50 dbar and 0.45°C, respectively, were flagged 1 and not used in a second run. Note, residuals after the second run maybe smaller. Dummies are -9999.

```
KIEL276
RCM depth info; all depths rounded and in m
RCM_z   : corrected (best) depth estimate for RCM
RCM_ID  : instrument identification within mooring (from top)
Nom_z   : nominal depths as from design & deployment log
C_z     : depth correction applied (relative to surface)
C_off   : offset/m correction applied to (nominal) bottom distance of RCM
C_str   : stretch factor coefficient applied to (nominal) bottom distance of RCM
P, T    : best pressure estimate for RCM; CTD pre deployment cast temperatuere at P
PRCM    : RCM first 25 h median pressure
TRCM    : RCM first 25 h median temperature measurement
P_flag  =1 if PRCM is not used for RCM best depth estimate (spike or deep sea)
T_flag  =1 if TRCM is not used for RCM best depth estimate (spike or deep sea)
Z_S_F   : instrument depths as in Siedler et al. (2005, V27601 to V27619) and
          Fründt et al. (2013, V27621 to V27626)
```

RCM_z	RCM_ID	S/N	Nom_z	C_z	C_off	C_str	P-PRCM	P_flag	T-TRCM	T_flag	z_S_F
v26401											
24	2640101	1407	266	-242	244	1.000	-9.3	0	0.026	0	-9999
128	2640102	2025	370	-242	244	1.000	-9999	0	-0.064	0	124
381	2640103	1409	623	-242	244	1.000	-9999	0	-0.231	0	376
636	2640104	4030	877	-241	244	1.000	31.8	0	-0.060	0	627
942	2640105	4570	1183	-241	244	1.000	-9999	0	0.044	0	926
3025	2640107	4563	3156	-131	0	1.061	-9999	1	0.167	1	2966
4812	2640108	4564	4839	-27	0	1.061	-9999	1	0.179	1	4770
v27601											
190	2760103	2104	320	-130	132	1.000	-11.8	0	0.049	0	195
495	2760105	2105	625	-130	132	1.000	-9999	0	0.191	0	499
702	2760108	3827	832	-130	132	1.000	-66.1	1	0.293	0	697
1004	2760109	2320	1134	-130	132	1.000	-9999	0	0.426	0	995
1107	2760110	1626	1237	-130	132	1.000	-9999	0	0.150	0	1095
1611	2760111	2712	1740	-129	0	1.036	-9999	0	0.173	0	1591
v27602											
255	2760201	1409	260	-5	5	1.000	9.5	0	0.004	0	243
560	2760203	2527	565	-5	5	1.000	-9999	0	1.382	1	550
766	2760205	2528	771	-5	5	1.000	1.8	0	-0.023	0	748
1170	2760206	673	1175	-5	5	1.000	-9999	0	0.184	0	1149
3034	2760208	4562	3037	-3	0	1.001	-9999	1	-9999	1	3020
v27603											
210	2760301	94	199	11	-11	1.000	17.2	0	-0.048	0	194
446	2760303	1484	435	11	-11	1.000	-9999	0	-0.012	0	428
651	2760304	1485	639	12	-11	1.000	-9999	0	-0.176	0	629
1057	2760305	131	1045	12	-11	1.000	-9999	0	-9999	0	1032
1564	2760306	2317	1552	12	0	0.997	-9999	0	-9999	0	1535
v27604											
239	2760402	776	361	-122	123	1.000	-13.6	0	0.008	0	243
473	2760404	1407	595	-122	123	1.000	-9999	0	0.227	0	475
677	2760405	1409	798	-121	123	1.000	-9999	0	-0.074	0	675
1081	2760406	2025	1202	-121	123	1.000	-9999	0	-0.158	0	1075
1587	2760408	4352	1708	-121	0	1.034	-9999	0	0.159	0	1575
3013	2760409	4565	3087	-74	0	1.034	-9999	1	0.074	1	2980
5237	2760410	5327	5239	-2	0	1.034	-9999	1	-9999	1	5185

RCM_z	RCM_ID	S/N	Nom_z	Corr_z	Corr_off	Corr_str	P-PRCM	P_flag	T-TRCM	T_flag	z_S_F
v27605											
332	2760502	776	364	-32	32	1.000	-0.6	0	0.006	0	327
566	2760504	6051	598	-32	32	1.000	-9999	0	-0.020	0	560
770	2760505	5882	801	-31	32	1.000	-9999	0	-0.044	0	760
1176	2760506	6682	1207	-31	32	1.000	-9999	0	0.280	0	1160
1679	2760508	6161	1710	-31	0	1.009	-9999	0	0.298	0	1660
3068	2760509	5881	3087	-19	0	1.009	-9999	1	-9999	1	3050
5236	2760510	6160	5236	0	0	1.009	-9999	1	-9999	1	5340
v27606											
332	2760602	673	409	-77	77	1.000	-0.3	0	0.013	0	327
566	2760603	2528	642	-76	77	1.000	-9999	0	0.067	0	562
769	2760604	7330	845	-76	77	1.000	-9999	0	-0.494	1	764
1177	2760607	7343	1253	-76	77	1.000	-9999	0	0.003	0	1168
1680	2760608	6681	1756	-76	0	1.021	-9999	0	0.178	0	1670
3092	2760609	6678	3138	-46	0	1.021	-9999	1	0.061	1	3080
5241	2760610	6160	5242	-1	0	1.021	-9999	1	-9999	1	-9999
v27607											
322	2760701	6158	402	-80	80	1.000	-9999	0	-9999	0	300
557	2760702	7656	636	-79	80	1.000	-9999	0	0.218	0	534
761	2760703	7927	840	-79	80	1.000	-9999	0	0.045	0	736
1065	2760705	7654	1144	-79	80	1.000	-9999	0	-0.355	0	1040
1168	2760706	7928	1247	-79	80	1.000	-9999	0	-9999	1	1142
1672	2760707	7929	1751	-79	0	1.022	-9999	0	-0.048	0	1644
3085	2760708	4565	3133	-48	0	1.022	-9999	1	0.863	1	3047
5237	2760709	6161	5238	-1	0	1.022	-9999	1	-9999	1	5235
v27608											
332	2760801	6679	352	-20	20	1.000	-9999	0	-0.256	0	330
565	2760802	131	585	-20	20	1.000	-9999	0	0.195	0	560
770	2760803	7330	789	-19	20	1.000	-9999	0	-0.210	0	760
1074	2760805	4354	1093	-19	20	1.000	-9999	0	0.042	0	1060
1177	2760806	4564	1196	-19	20	1.000	-9999	0	0.083	0	1160
1680	2760807	5881	1699	-19	0	1.005	-9999	0	0.098	0	1670
3070	2760808	6121	3082	-12	0	1.005	-9999	1	0.026	1	3070
5231	2760809	4563	5231	0	0	1.005	-9999	1	-9999	1	-9999
v27609a											
441	2760902	7924	516	-75	75	1.000	-9999	0	-0.173	0	450
645	2760903	7624	719	-74	75	1.000	-9999	0	0.025	0	650
950	2760905	5252	1024	-74	75	1.000	-9999	0	0.089	0	950
1051	2760906	2317	1125	-74	75	1.000	-9999	0	0.119	0	1050
1555	2760907	6159	1629	-74	0	1.020	-9999	0	-0.069	0	1550
2966	2760908	7656	3012	-46	0	1.020	-9999	1	0.022	1	3000
5239	2760909	6160	5240	-1	0	1.020	-9999	1	-9999	1	-9999
v27609b											
633	2760902	7924	773	-140	142	1.000	-9999	0	0.044	0	650
837	2760903	7624	977	-140	142	1.000	-9999	0	-0.036	0	850
1141	2760905	5252	1281	-140	142	1.000	-9999	0	-9999	0	1150
1244	2760906	2317	1384	-140	142	1.000	-9999	0	0.136	0	1250
1747	2760907	6159	1887	-140	0	1.041	-9999	0	-0.159	0	1750
3084	2760908	7656	3171	-87	0	1.041	-9999	1	-9999	1	3050
5238	2760909	6160	5240	-2	0	1.041	-9999	1	-9999	1	-9999
v27610											
379	2761001	8412	391	-12	12	1.000	15.9	0	-0.043	0	367
612	2761002	2528	624	-12	12	1.000	4.1	0	0.010	0	595
815	2761003	7343	827	-12	12	1.000	-9999	0	0.154	0	800
1120	2761005	7928	1132	-12	12	1.000	-9999	0	-9999	0	1100
1222	2761006	8295	1234	-12	12	1.000	-9999	0	0.206	0	1200
1726	2761007	7927	1738	-12	0	1.003	-9999	0	0.117	0	1700
3116	2761008	4570	3123	-7	0	1.003	-9999	1	0.109	1	3050
5231	2761009	9310	5231	0	0	1.003	-9999	1	-9999	1	5185
v27611											
328	2761101	9726	394	-66	66	1.000	4.1	0	-0.039	0	320
562	2761102	7330	627	-65	66	1.000	13.8	0	0.011	0	555
765	2761103	6051	830	-65	66	1.000	-9999	0	0.213	0	755
1070	2761105	7924	1135	-65	66	1.000	-9999	0	0.055	0	1055
1173	2761106	9727	1238	-65	66	1.000	-9999	0	0.206	0	1155
1676	2761107	7925	1741	-65	0	1.018	-9999	0	-0.256	0	1655

RCM_z	RCM_ID	S/N	Nom_z	Corr_z	Corr_off	Corr_str	P-PRCM	P_flag	T-TRCM	T_flag	z_S_F
3086	2761108	6160	3126	-40	0	1.018	-9999	1	0.020	1	3045
5266	2761109	9728	5267	-1	0	1.018	-9999	1	-9999	1	5190
v27612											
199	2761201	9313	294	-95	95	1.000	-9999	0	-0.033	0	215
433	2761202	2528	527	-94	95	1.000	-22.6	0	0.078	0	455
636	2761203	7343	730	-94	95	1.000	-9999	0	0.104	0	645
941	2761205	6681	1035	-94	95	1.000	-9999	0	-0.369	0	-9999
1044	2761206	9323	1138	-94	95	1.000	-17.5	0	-0.001	0	1065
1547	2761207	7927	1641	-94	0	1.025	-9999	0	0.408	0	1565
2967	2761208	4570	3025	-58	0	1.025	-9999	1	0.122	1	3000
v27613											
285	2761301	131	294	-9	9	1.000	10.0	0	-0.035	0	270
1026	2761305	7928	1035	-9	9	1.000	-9999	0	-0.224	0	1000
1129	2761306	9311	1138	-9	9	1.000	-9999	0	-0.168	0	1100
3019	2761308	2317	3025	-6	0	1.003	-9999	1	0.024	1	3000
5229	2761309	9345	5229	0	0	1.003	-9999	1	-9999	1	5185
v27614											
713	2761403	10659	795	-82	83	1.000	-9999	0	0.228	0	750
1018	2761405	9820	1100	-82	83	1.000	-9999	0	-0.064	0	1050
1121	2761406	9727	1203	-82	83	1.000	-9999	0	-0.084	0	1150
1624	2761407	10662	1706	-82	0	1.023	-9999	0	-0.068	0	1650
3037	2761408	10660	3087	-50	0	1.023	-9999	1	-0.002	1	3050
v27615											
217	2761501	9813	270	-53	53	1.000	27.9	0	-0.034	0	240
457	2761503	9816	510	-53	53	1.000	25.1	0	-0.068	0	470
663	2761504	9833	715	-52	53	1.000	-9999	0	-0.115	0	670
969	2761506	9821	1021	-52	53	1.000	-9999	0	0.120	0	970
1075	2761508	10658	1127	-52	53	1.000	-67.9	1	-0.091	0	1120
3002	2761511	9344	3034	-32	0	1.014	-9999	1	0.010	1	3030
5226	2761513	9312	5227	-1	0	1.014	-9999	1	-9999	1	5320
v27616											
249	2761601	10501	265	-16	16	1.000	-27.0	0	-0.051	0	270
489	2761603	9726	505	-16	16	1.000	0.6	0	0.083	0	500
996	2761604	10659	1012	-16	16	1.000	-9999	0	-0.070	0	1000
1603	2761604	10504	1619	-16	0	1.004	-9999	0	0.200	0	1600
3012	2761607	11576	3022	-10	0	1.004	-9999	1	0.008	1	3000
5213	2761709	10502	5213	0	0	1.004	-9999	1	-9999	1	5185
v27617											
269	2761701	11348	318	-49	50	1.000	32.9	0	-0.071	0	270
510	2761703	11442	559	-49	50	1.000	-9999	0	-0.038	0	500
1019	2761705	9833	1068	-49	50	1.000	-9999	0	-0.564	1	1000
1624	2761706	9821	1673	-49	0	1.013	-9999	0	-0.110	0	1600
3045	2761708	9345	3075	-30	0	1.013	-9999	1	0.013	1	3000
5232	2761709	9312	5233	-1	0	1.013	-9999	1	-9999	1	5185
v27618											
281	2761801	10501	393	-112	113	1.000	24.3	0	-0.126	0	270
1020	2761803	10578	1132	-112	113	1.000	15.9	0	0.054	0	1000
1625	2761804	10577	1736	-111	0	1.031	72.4	1	0.179	0	1600
3052	2761805	11576	3120	-68	0	1.031	-9999	1	0.019	1	3000
5225	2761806	10502	5227	-2	0	1.031	-9999	1	-9999	1	5185
v27619											
281	2761901	10551	303	-22	22	1.000	28.0	0	-0.144	0	270
516	2761902	10577	538	-22	22	1.000	-9999	0	0.128	0	500
1020	2761903	10578	1042	-22	22	1.000	48.5	0	0.002	0	1000
1624	2761904	10550	1646	-22	22	1.000	-9999	0	0.853	1	1600
3025	2761906	10555	3040	-15	0	1.007	-9999	1	0.041	1	3000
v27621											
263	2762102	10554	279	-16	16	1.000	6.6	0	0.006	0	270
498	2762103	10577	514	-16	16	1.000	-9999	0	0.051	0	500
999	2762104	10578	1014	-15	0	1.003	-9999	0	-0.135	0	-9999
1608	2762105	10550	1621	-13	0	1.003	-9999	0	0.495	1	-9999
3016	2762107	10555	3024	-8	0	1.003	-9999	1	0.078	1	-9999
5222	2762109	10581	5222	0	0	1.003	-9999	1	0.092	1	-9999
v27622											
223	2762202	10554	281	-58	58	1.000	22.0	0	-0.032	0	270
458	2762203	10577	516	-58	58	1.000	-9999	0	-0.177	0	500

RCM_z	RCM_ID	S/N	Nom_z	Corr_z	Corr_off	Corr_str	P-PRCM	P_flag	T-TRCM	T_flag	z_S_F
930	2762204	10578	984	-54	0	1.013	-9999	0	0.373	0	-9999
1548	2762205	10550	1594	-46	0	1.013	-9999	0	1.419	1	-9999
2992	2762207	10555	3020	-28	0	1.013	-9999	1	0.049	1	-9999
5223	2762209	10558	5224	-1	0	1.013	-26.4	1	0.010	1	-9999
v27623											
243	2762301	10554	244	-1	1	1.000	29.7	0	-0.062	0	270
979	2762303	10578	980	-1	0	1.000	-9999	0	-0.210	0	-9999
1588	2762304	10550	1589	-1	0	1.000	-9999	0	0.075	0	-9999
3013	2762306	10555	3013	0	0	1.000	-9999	1	0.026	1	-9999
5214	2762308	10558	5214	0	0	1.000	-54.6	1	-9999	1	-9999
v27624											
229	2762401	10554	227	2	-2	1.000	40.3	0	-0.100	0	217
534	2762402	10581	532	2	-2	1.000	-9999	0	-0.375	0	523
1049	2762403	10578	1047	2	-2	1.000	-9999	0	-9999	0	-9999
1600	2762404	10558	1598	2	0	0.999	30.5	0	-9999	0	-9999
2996	2762406	10555	2995	1	0	0.999	-9999	1	-9999	1	-9999
5220	2762408	10550	5220	0	0	0.999	-9999	1	-9999	1	-9999
v27625											
162	2762501	10554	220	-58	59	1.000	15.4	0	-0.129	0	194
983	2762503	8411	1041	-58	0	1.014	57.4	1	-0.057	0	-9999
1542	2762504	10558	1592	-50	0	1.014	39.0	0	-0.001	0	-9999
2957	2762506	10555	2988	-31	0	1.014	-9999	1	0.033	1	-9999
5211	2762508	9812	5212	-1	0	1.014	-9999	1	0.002	1	-9999
v27626											
130	2762601	10554	212	-82	83	1.000	-4.3	0	0.011	0	201
385	2762602	10558	467	-82	83	1.000	129.9	1	0.052	0	456
943	2762603	8411	1024	-81	83	1.000	34.7	1	0.191	0	-9999
1506	2762604	9344	1577	-71	0	1.019	-9999	0	0.003	0	-9999
2933	2762606	10555	2977	-44	0	1.019	-9999	1	0.044	1	-9999
v27627											
168	2762701	9349	216	-48	49	1.000	39.7	1	0.138	0	-9999
474	2762702	5881	522	-48	49	1.000	-9999	0	-0.263	0	-9999
989	2762703	4562	1037	-48	0	1.011	-9999	0	0.129	0	-9999
1546	2762704	9932	1588	-42	0	1.011	45.8	1	-0.013	0	-9999
2958	2762706	9832	2984	-26	0	1.011	-9999	1	-0.034	1	-9999
5209	2762708	10578	5210	-1	0	1.011	-9999	1	-9999	1	-9999

A-priori corrections of instrument depths Z_S_F according to Siedler et al. (2005):
V26401, 2640108: 4770 from 4707 (typo in Siedler et al., 2005))
V27615, 2761513: 5230 corrected from 5275 (water depth)

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

March 1980 – April 2011

Appendix A05: RCM processing, archiving &data submission

Raw data:

- sampling on magnetic tape (RCM4/5) or data storage units (RCM7/8) as 10- bit integers valued from 0 to 1023
- mirrored to computer ASCII files for further processing using reading units.

Processed data

- create and up-date meta file in ASCII with general information on mooring: V276ii.txt, where ii denotes K276 mooring number
- transfer raw data to physical units using calibrations as provided either by the manufacturer or by the institute or by an instrument's log
- compare and adapt instrument start and stop times to external times by linear interpolation
- apply running median filter over typical 9 records allowing for deviations from the median of 5 dbar, 0.05 K, 5 cm/s.
- edit any suspicious data like remaining spikes and early sensor malfunctions like stops (rotor)
- include meta information to files:
    - deployment & recovery dates, times, cruises
    - mooring position, water depth, earth's local magnetic anomaly at deployment time
    - record start & stop date / time, recording interval
    - sensors & and their calibrations and physical units
    - instrument's best depth estimate from logs, static mooring model and first day's data statistics against deployment CTD cast; keep nominal depth as from logs and static mooring model in comment line
- store / copy results as ASCII files *.dat and MATLAB file *.mat by mooring and instrument in files under /pre1/, /pre2/ and /final/ level subdirectories.

Data archiving & submission

- archive data and any relevant meta information at the GEOMAR data centre datamanegement@geomar.de
- submit best estimate data and meta data to international data centres for free use in basic science
    - World Data System's centre PANGAEA, www.pangaea.de
    - Ocean Sites' data centre at CORIOLIS, www.oceansites.org

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

March 1980 – April 2011

Appendix A06: KIEL276 meta data and data presentation

The following presentations for each by moorings shows on 5 pages:

- General information on:
  - Mooring ID
  - Dates and cruises of deployment & recovery;
  - Mooring location, water depth, earth's local magnetic anomaly at deployment time
  - Project and Principal Investigator (PI)
  - Depths used in this part and in mooring sketch
  - Remarks on mooring
  - Remarks on data
- Mooring sketch
  - all components and depths nominal as from logs and static mooring model
- Instrument and sensor information
  - Nominal depths as from logs and static mooring model
  - Serial numbers
  - File Identification
  - Sampling rate
  - Sensor quality
- Low pass (49 h filter length, 36 h half power response) daily averages
  - Time series plots of
    - Pressure
    - Upper ocean and deep ocean temperature
    - Current vector
  - Statistics

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V264-01

31-MAR-1980 - 17-OCT-1980

Mooring information
****

General

```
Mooring ID   : V264-01/KPO 0629
Deployed     : Date: 31-MAR-1980    Ship / Cruise: Meteor II, M53/D
Recovered    : Date: 17-OCT-1980    Ship / Cruise: Meteor II, M56/1
Latitude N   :   33.102
Longitude E  : -021.848
Water depth  : 5280 m (sounding 5225 m at 1500 m/s + 55 m correction)
Magn. Anom.  : -14 (as Oct 1980 for V27601); MK4 files were not corrected
               for.
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

Mooring:

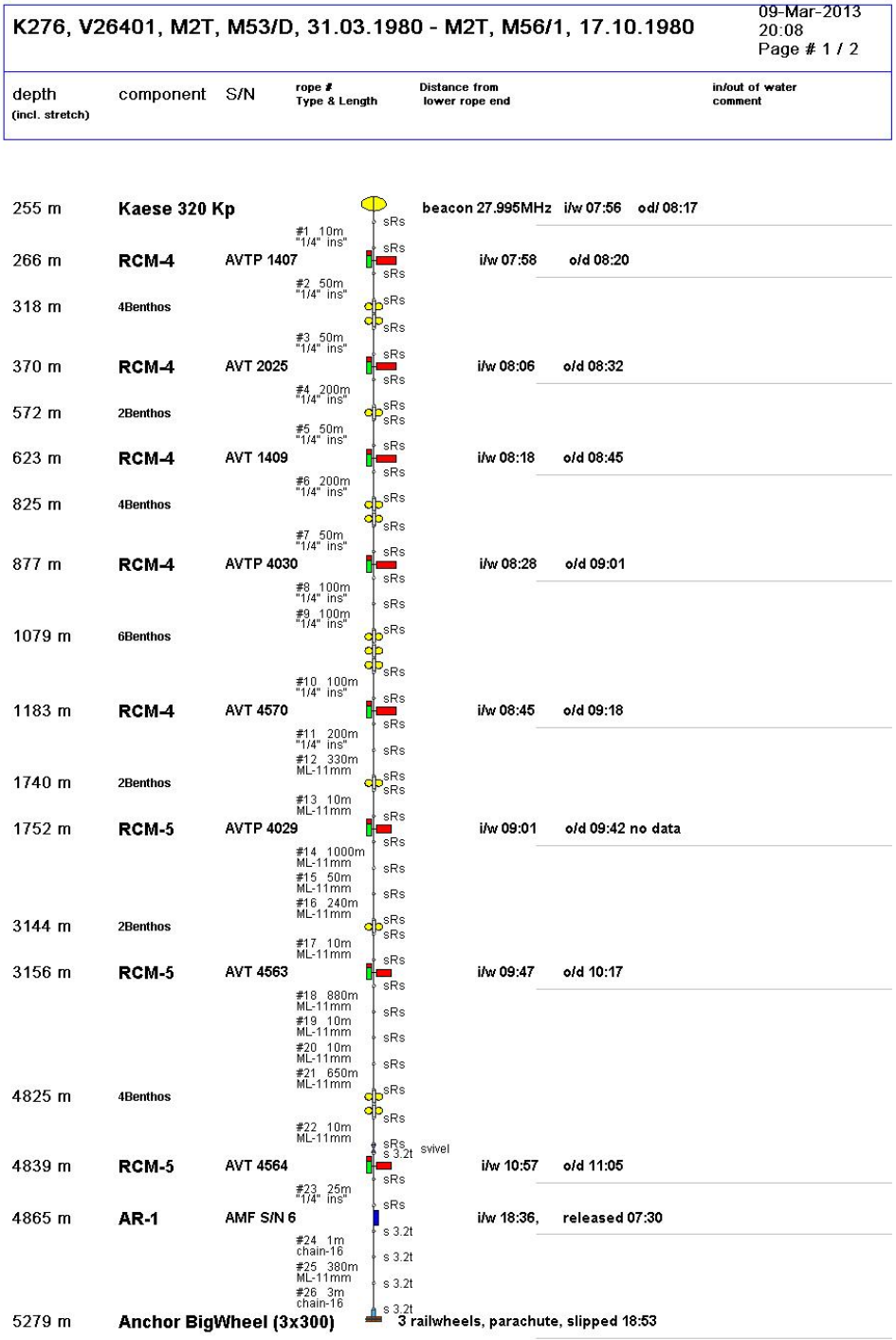
Immediately after deployment, the top of the mooring surfaced, with the radio transmitter on the top buoy in air. As the mooring could not be sighted, it was released. The radio transmitter became clearer, the mooring was sighted and recovery started from the bottom part until RCM5 04563 (3000 m designed depth). It was re-deployed the same day with 155 m less nylon rope according to the deck log (145 m according to the master's log). The stretch for the nylon part is estimated in the model from buoyancy forces and averages to 9.66% of (un-stretched) length.

Instrumental nominal depths as modelled from logged mooring components (deck log with 155 m less nylon for the 2nd deployment) and (corrected) water depth, disagree with two pressure records of ca. 24 dbar at 228 m nominal depth and 633 dbar at 839 m nominal depth. The difference is 204 m for the upper and 211 m for the other instrument with only steel components between both. With all components as logged, a strecth of 15.34% for the nylon part is needed to match pressure and temperature records in the upper ocean, much too high or an extra nylon length of ca 175 m (unstretched) would be needed. It was reported after recovery (see Schröder, 1982, p. 50), that length the meter that was used to determine rope lengths before deployment showed slip, which may explain the observed too large lengths. As also the two deep ocean temperature records are too low by more than 0.15 K as compared to the CTD they give no hint where to implement such an extra (not logged) length. Therefore, an extra stretch of 6.1% was accepted and distributed equally over all long nylon lengths to match the RCM upper ocean records (see Müller & Waniek, 2013, sec. 2.4).

Data:

Raw data are lost. Data sources are MK4 ASCII files with pre1-level processed data at sampling rate with 'Magnetic Anomaly as in mooring V184' (position as KIEL276) noted a handwritten processing log. However, from instrument v264102, three handwritten raw data with calculated DIR are available for a check of the calibration formula for the direction measurement. Comparison with MK4 files shows that direction is indeed not compensated for magnetic anomaly in 264102. Comparision of directions of all records at sampling rate, shows high vertical directional coherence top to bottom between day 150 and 200 during a strong current event. It is therefore concluded that in all MK4 files direction is not yet corrected for magnetic anomaly (which is supported by some inconsistent comment lines throughout these files concerning rotation of the coordinate system). Taking -14° as local magnetic anomaly from October 1980 (V276-01), correction of +14° was applied to the input from MK4 files when transferring data to PH3.

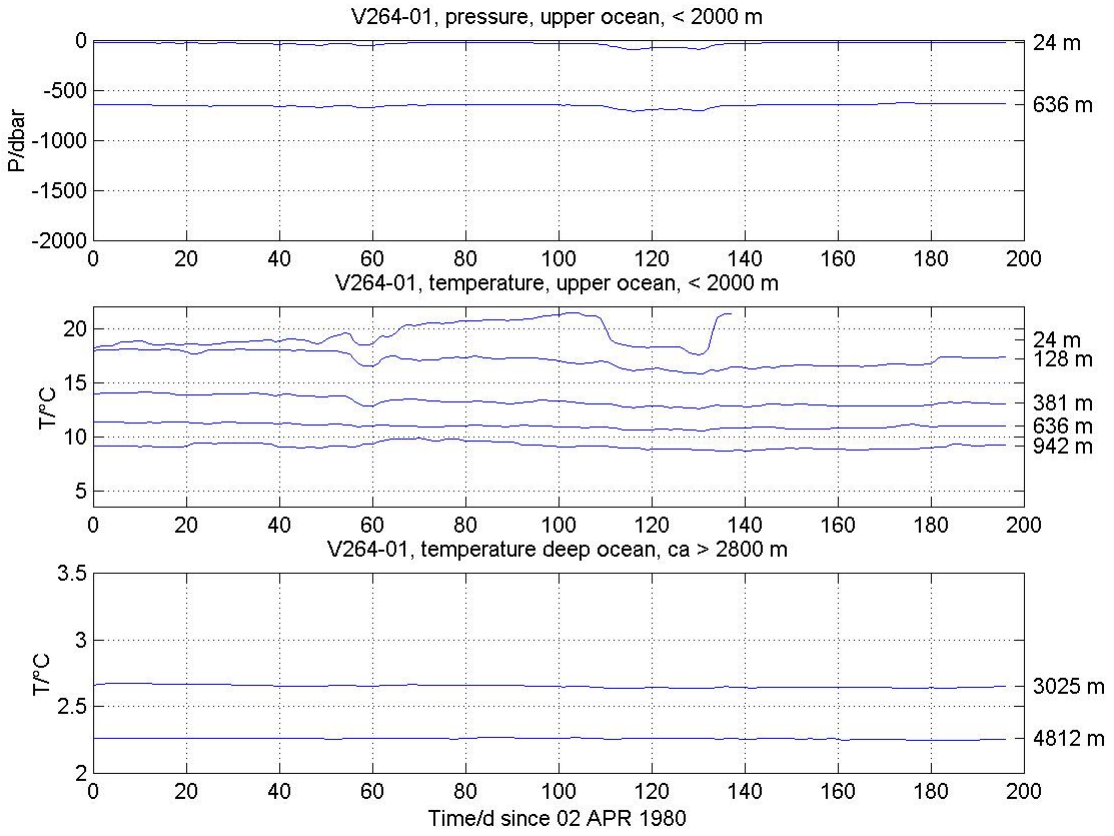
Compiled by: T.J. Mueller Date: 08-FEB-2013

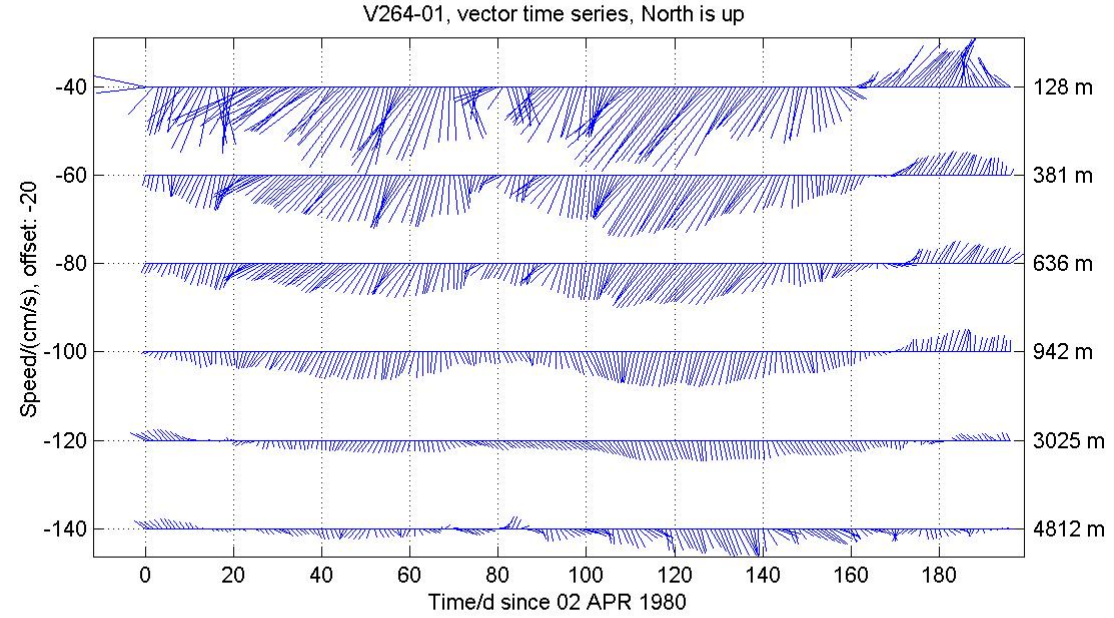


***V264-01**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments
All depths are nominal as from logs and mooring model (see sec. 2.4.)

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
266	2640101	RCM4	01407	3600 s	strong bio-fouling, vane broken	
					REF	
					T_LR	ok, after record 3200 partly out of range (T > 21.47 °C)
					PRES	ok, median 34 dbar, minimum 24 dbar
					DIR	no data
					SPD	no data
370	2640102	RCM4	02025	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
623	2640103	RCM4	01409	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
877	2640104	RCM4	04030	3600 s	REF	
					T_LR	ok
					COND	ok
					PRES	ok, median 633 dbar, minimum 613 dabr
					DIR	ok
					SPD	ok
1183	2640105	RCM4	04570	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
1752	2640106	RCM5	04029	3600 s	no data	
3156	2640107	RCM5	04563	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
4839	2640108	RCM5	04564	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	rotor stuck after 90 d, ok else





V264-01: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V264-01: statistics from low pass filtered daily averages

v26401

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
24	138	NaN	NaN	NaN	NaN	NaN	19.4	NaN	NaN	NaN	NaN	NaN	NaN	NaN
					NaN	NaN	1.1							
128	197	9.5	212	0.72	-5.0	-8.0	17.1	13	17	28	34	38	-0.4	0.3
					6.7	7.9	0.7							
381	197	6.7	209	0.80	-3.2	-5.9	13.3	14	17	31	14	34	-0.2	-0.1
					3.8	5.1	0.4							
636	197	5.0	212	0.78	-2.7	-4.2	11.0	14	18	28	9	40	0.1	0.2
					3.2	3.7	0.2							
942	197	3.4	186	0.75	-0.3	-3.4	9.1	11	17	19	2	13	0.1	0.1
					1.4	3.3	0.3							
3025	197	2.0	167	0.69	0.4	-1.9	2.8	17	16	31	-2	-38	-0.0	0.0
					1.5	1.8	0.0							
4812	197	2.1	144	0.75	1.2	-1.7	2.4	12	14	20	-1	-30	0.0	0.0
					1.5	1.9	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-01

17-OCT-1980 - 27-JUL-1981

Mooring information
****

General
Mooring information
****

```
General
-------
Mooring ID   : V276-01/KPO 630
Deployed     : Date: 17-OCT-1980    Ship / Cruise: Meteor II, M56/1
Recovered    : Date: 27-JUL-1981    Ship / Cruise: Meteor II, M57/1
Latitude N   :   33.165
Longitude E  : -021.848
Water depth  : 5292 m (corrected)
Magn. Anom.  : -14 (according to MK4 files)
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  :IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring

Release failed during recovery trial on 27-JUL-1981 during Meteor II, cruise M57/1. Uppermost part recovered with steel buoy imploded and uppermost RCM damaged. Middle part with 8 instruments from 200 m designed depth down to 1100 m dredged and recovered the same day. Lower part with RCM 2712 at 1600 m with data until December 1981 dredged in March 1982 (MT2, M60/3); this later part of data (part B) is double to those from the follow-up mooring V276-02. Three Instruments at larger depths (3000 m, 4700 m, 5250 m) and the release are lost.

As the two pressure records both show no sudden increase and also less depth than designed or nominal, it is most likely that the steel buoy imploded during the first dredging exercise.

Recovery deck log is missing; only recovery information from reports of cruises Meteor II, M57/1 and Meteor II, M60/3.

All depths are nominal as from logs and static mooring model.

2) Data

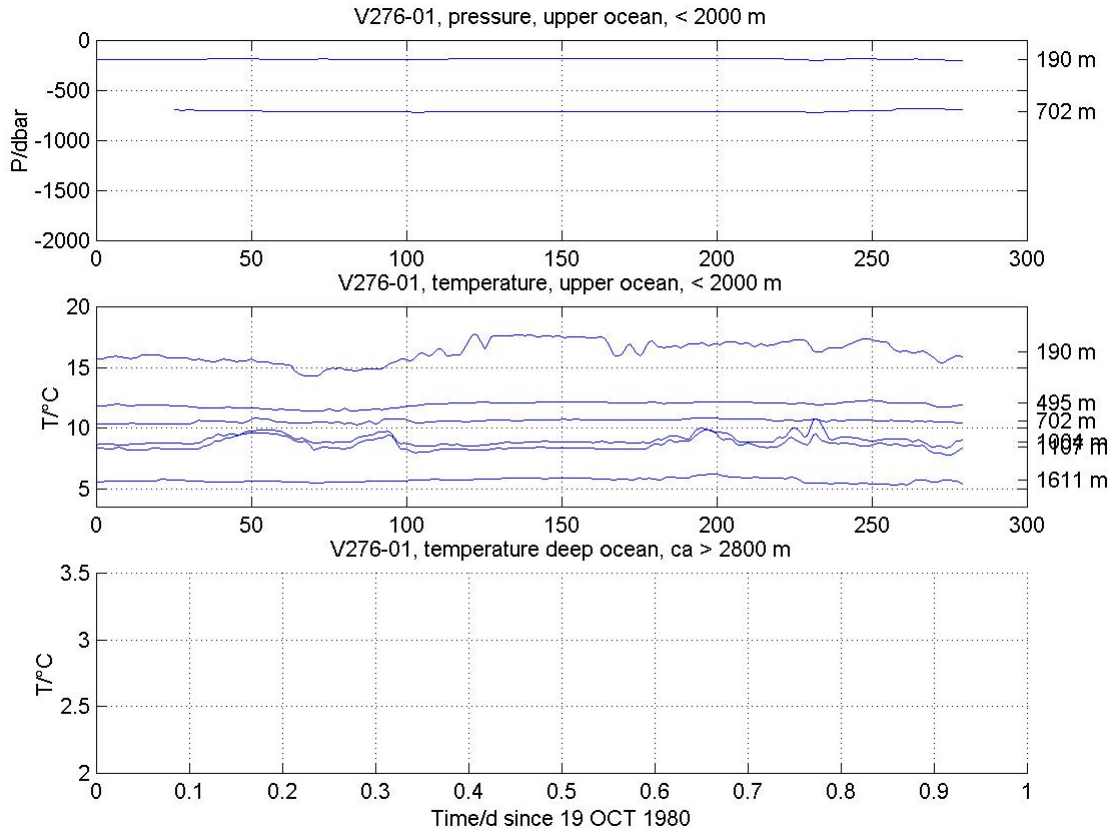
Raw data and data at sampling rate are lost. Data sources are MK4 ASCII files
at sampling rate and pre1-level processed data.
RCM data, both at pre1-level and pre2-level processed and at sampling rates in V27601_iii.dat.

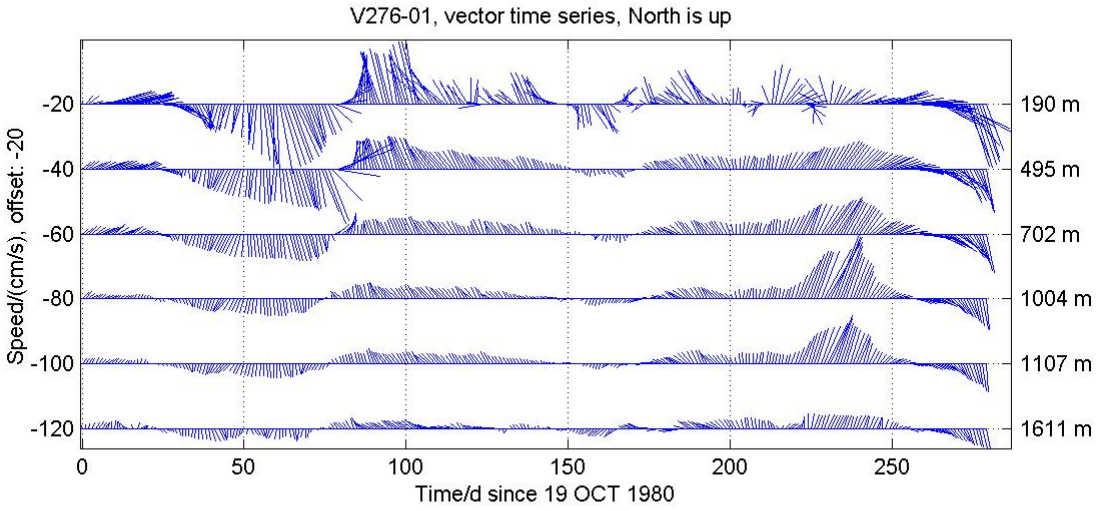
Compiled by: T.J. Mueller Date: 27-FEB-2012

***V276-01**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments
All depths are nominal as from logs and mooring model (see sec. 2.4.)

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
215	2760101	RCM4	01627	3600 s		lost due to implosion of steel buoy
319	2760102	DLI	61	3600 s		inclinometer, data lost
320	2760103	RCM4	02104	3600 s	REF	
					T_LR	ok
					COND	ok
					PRES	ok, [med max min]=[197 194 210] dbar
					DIR	ok
					SPD	ok
322	2760104	TK50	181&174	7200 s		recorder with 11 thermistors equally distributed 50 m downwards
					REF	
					11xT_LR	ok
625	2760105	RCM4	02105	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
627	2760106	TK50	441&528	7200 s		recorder with 11 thermistors equally distributed 50 m downwards
					REF	
					11xT_LR	
830	2760107	DLI	62	3600 s		inclinometer data lost
832	2760108	RCM4	03827	3600 s	REF	
					T_LR	ok
					PRES	ok, 600 records (25 d) adaption time
					DIR	ok
					SPD	ok
1134	2760109	RCM4	02320	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
1237	2760110	RCM5	01626	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
1740	2760111	RCM5	02712	3600 s		instrument dredged in March 1982; data until Dec 1981; data used until 1st dredge in July 1981
					REF	
					T_LR	ok
					DIR	ok
					SPD	ok
3075	2760112	RCM5	02318	3600 s		instrument lost
4727	2760113	RCM5	03801	3600 s		instrument lost
5242	2760114	RCM5	03802	3600 s		instrument lost





V276-01: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-01: statistics from low pass filtered daily averages

v27601

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
190	280	2.2	77	0.23	2.2	0.5	16.3	18	13	29	-19	-24	-1.0	1.8
					6.4	8.6	0.9							
495	280	1.5	60	0.23	1.3	0.7	11.9	16	15	33	-5	-14	-0.1	0.6
					4.2	6.0	0.2							
702	280	1.3	48	0.26	1.0	0.9	10.6	24	17	25	-0	-1	-0.1	0.2
					3.2	4.6	0.1							
1004	280	1.4	7	0.33	0.2	1.3	9.0	24	15	9	4	14	0.2	0.6
					2.6	4.7	0.4							
1107	280	1.2	357	0.34	-0.1	1.2	8.6	24	15	10	2	9	-0.0	0.2
					2.0	3.7	0.4							
1611	280	0.6	299	0.23	-0.6	0.3	5.7	21	14	20	-1	-23	-0.2	0.1
					1.9	2.3	0.2							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-02

27-JUL-1981 - 02-MAR-1982

Mooring information
****

General

```
Mooring ID   : V276-02/KPO 632
Deployed     : Date: 27-JUL-1981    Ship / Cruise: Meteor II, M57/1
Recovered    : Date: 02-MAR-1982    Ship / Cruise: Meteor II, M60/3
Latitude N   :   33.075
Longitude E  : -021.884
Water depth  : 5290 m (corrected)
Magn. Anom.  : -12.3 (bridge log, hard to identify, -13 according to MK4 files)
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring

All depths are nominal as from logs and static mooring model.

2) Data

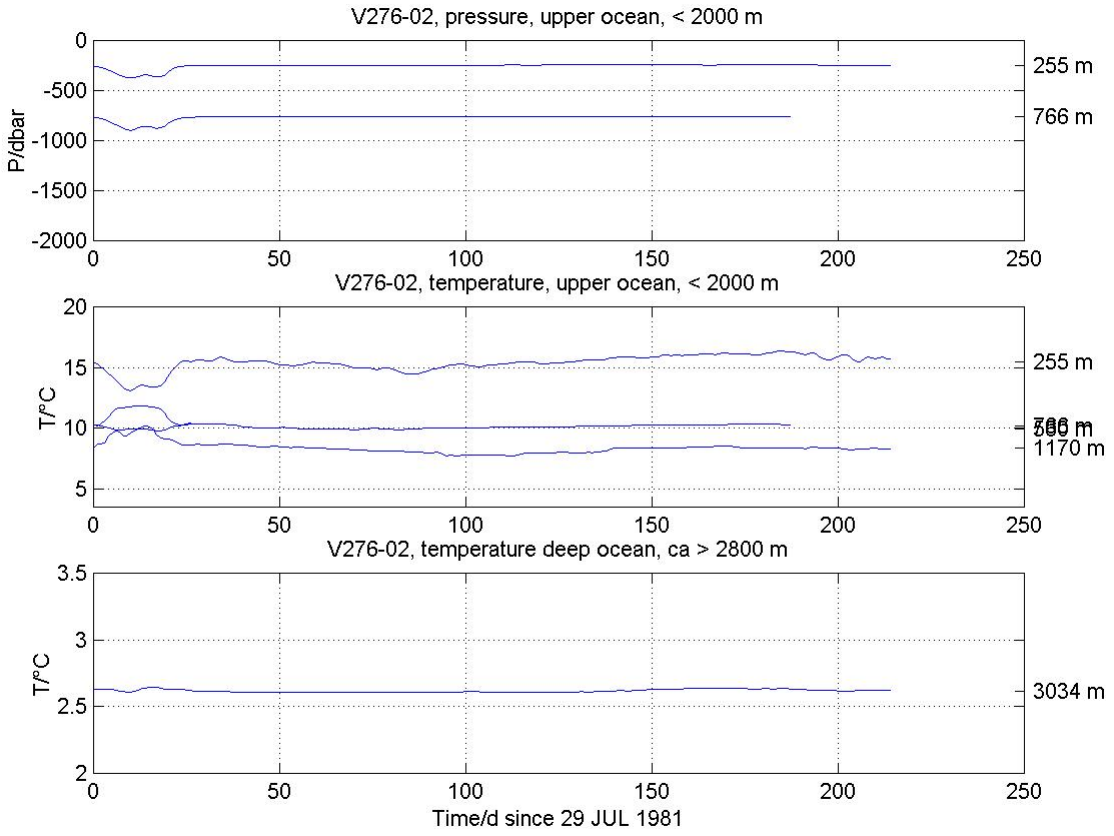
Raw data are lost. Data sources are MK4 ASCII files at pre1-processing level and at sampling rate. RCM data, both at pre1-level and pre2-level, processed and at sampling rates in V27602_iii.dat.

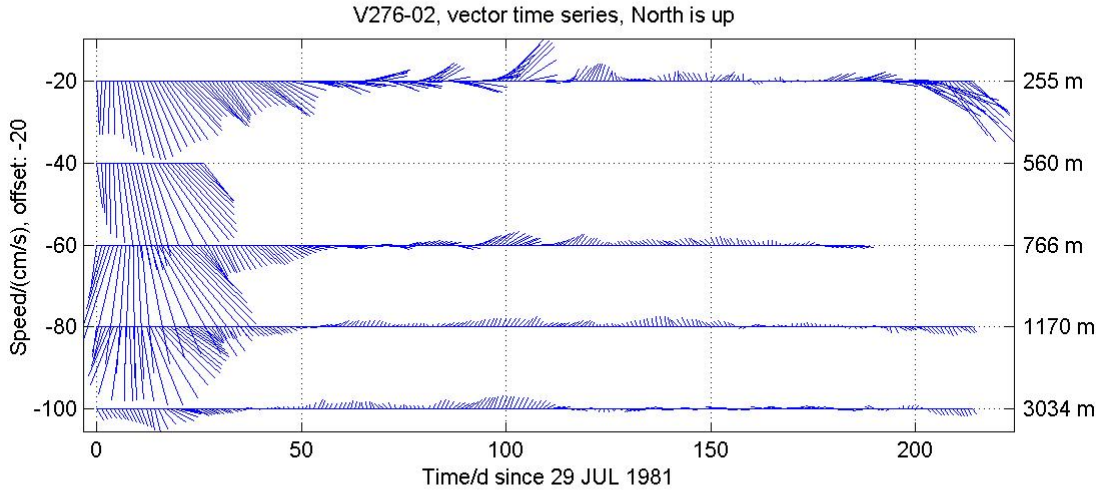
Compiled by: T.J. Mueller Date: 27-FEB-2012

***V276-02**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments
All depths are nominal as from logs and mooring model (see sec. 2.4.)

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
260	2760201	RCM4	01409	3600 s	REF	
					T_LR	ok
					COND	ok
					PRES	ok
					DIR	ok
					SPD	ok
262	2760202	TK50	485&647	7200 s	recorder with 11 thermistors equally distributed 50 m downwards	
					REF	
					11xT_LR	ok
565	2760203	RCM4	02527	3600 s	REF	stop after 1600 cycles
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
567	2760204	TK50	486&648	7200 s	recorder with 11 thermistors equally distributed 50 m downwards	
					REF	
					11xT_LR	ok
771	2760205	RCM4	02528	3600 s	REF	stop after 4785 cycles
					T_LR	ok
					COND	bad, replaced by dummies
					PRES	ok
					DIR	ok
					SPD	ok
1175	2760206	RCM4	00673	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
1678	2760247	ACM	18	-9999 s	FSI Acoustic Current Meter, S/N NB18; data not usable due to systematic hardware error in rotating instrumental orientation to earth coordinates; current rotated by additional 26 degree, but not consistent with Aanderaa RCM	
3037	2760208	RCM5	04562	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok





V276-02: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-02: statistics from low pass filtered daily averages

v27602

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
255	215	6.0	113	0.75	5.5	-2.3	15.4	17	20	20	-8	-22	-0.7	2.0
					4.4	6.0	0.7							
560	27	18.9	157	0.96	7.5	-17.4	11.4	6	5	4	4	25	-0.3	0.8
					5.0	5.6	0.2							
766	188	4.2	141	0.67	2.6	-3.3	10.3	8	18	13	-12	-12	0.5	-3.4
					4.2	8.5	0.5							
1170	215	1.7	135	0.50	1.2	-1.2	8.4	8	17	20	-5	-17	0.5	-1.9
					2.7	4.7	0.5							
3034	215	0.1	46	0.05	0.1	0.1	2.6	19	16	20	-1	-68	-0.0	-0.0
					1.9	1.5	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-03

05-MAR-1982- 17-APR-1983

Mooring information
****
General

```
Mooring ID   : V276-03/KPO 633
Deployed     : Date: 05-MAR-1982     Ship / Cruise: Meteor II, M60/3
Recovered    : Date: 17-APR-1983     Ship / Cruise: Meteor II, M64/6
Latitude N   :   33.195
Longitude E  : -021.898
Water depth  : 5288 m (corrected)
Magn. Anom.  : -12.3
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring

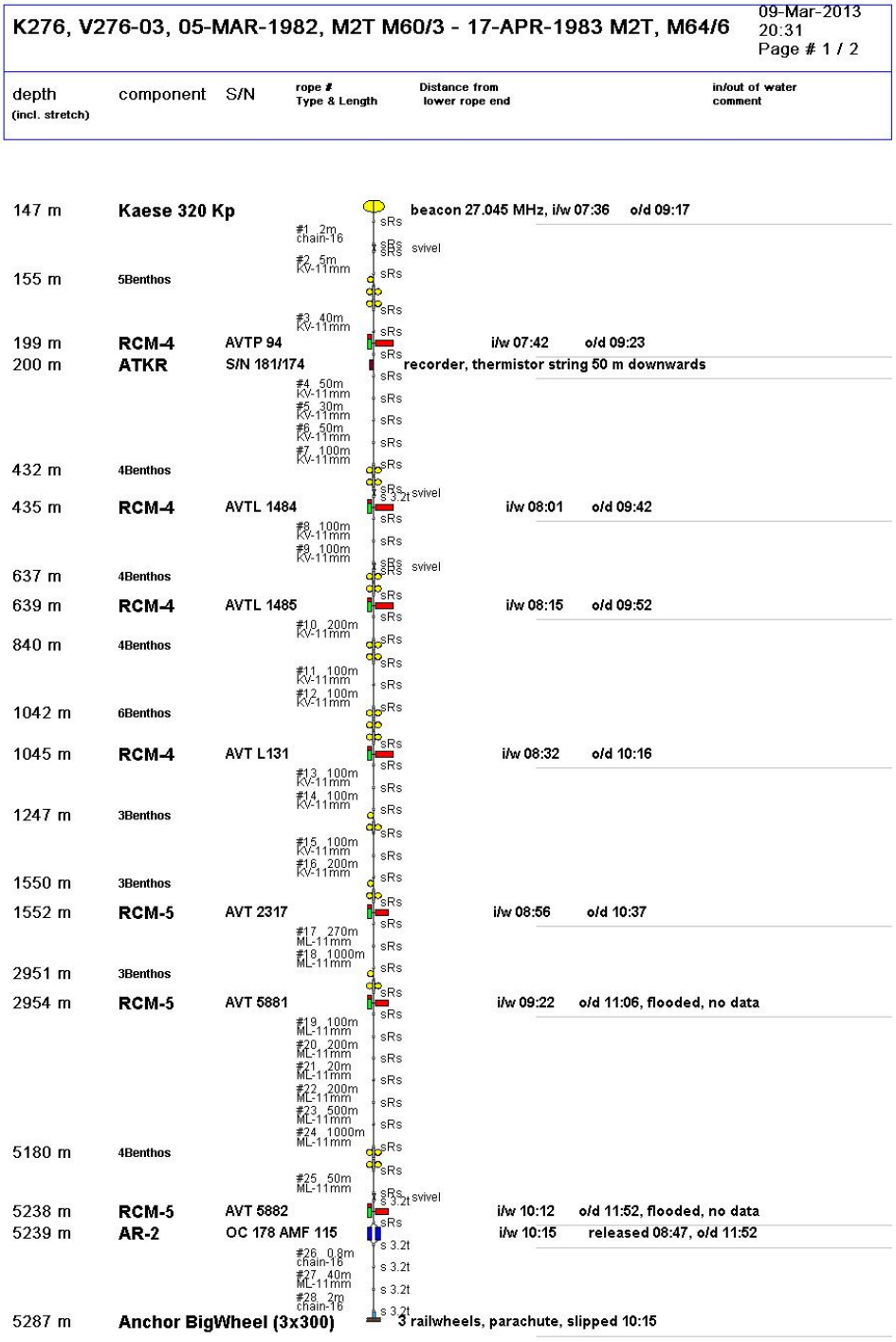
After a first deployment on 04-MAR-1982, the release was called for testing; it failed and released the mooring which was recovered immediately. On 05-MAR-1982, the mooring was launched a second time.

All depths are nominal as from logs and static mooring model.

2) Data

Raw data are lost. Data sources are MK4 ASCII files at sampling rate and pre1-processing level. RCM data, both at pre1-level and pre2-level, processed and at sampling rates in V27603_iii.dat.

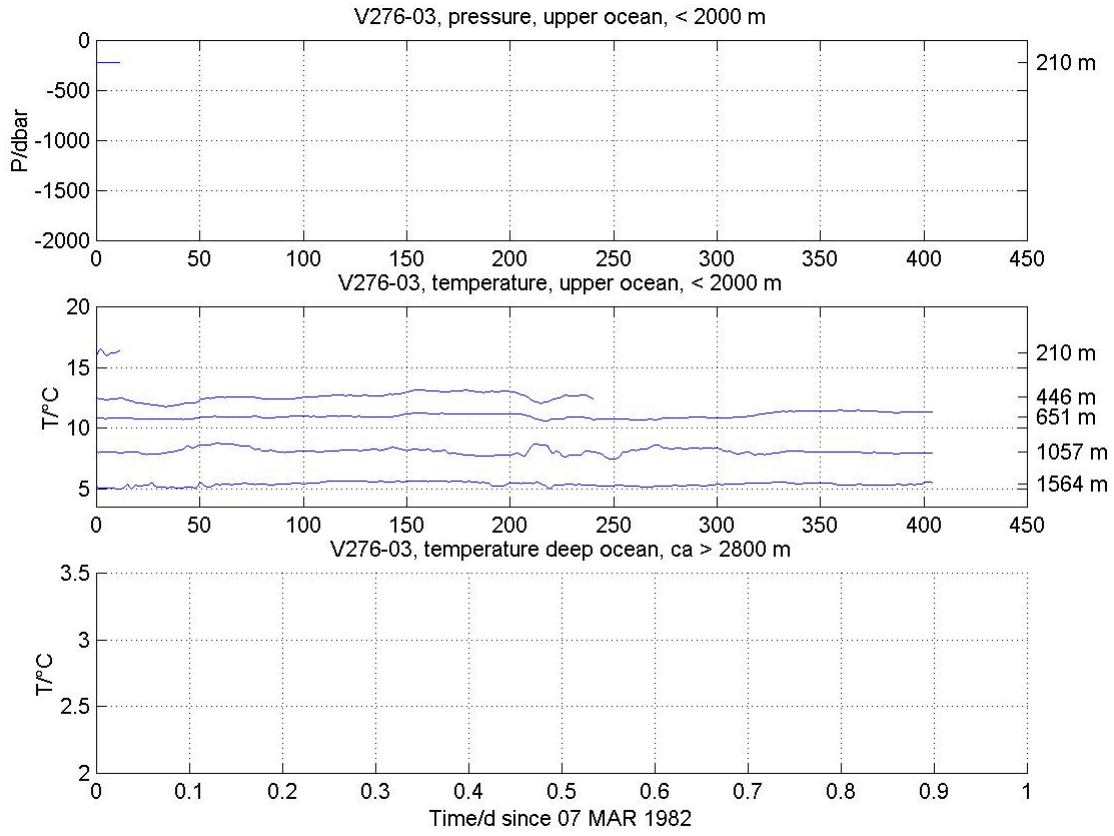
Compiled by: T.J. Mueller Date: 08-MAR-2012

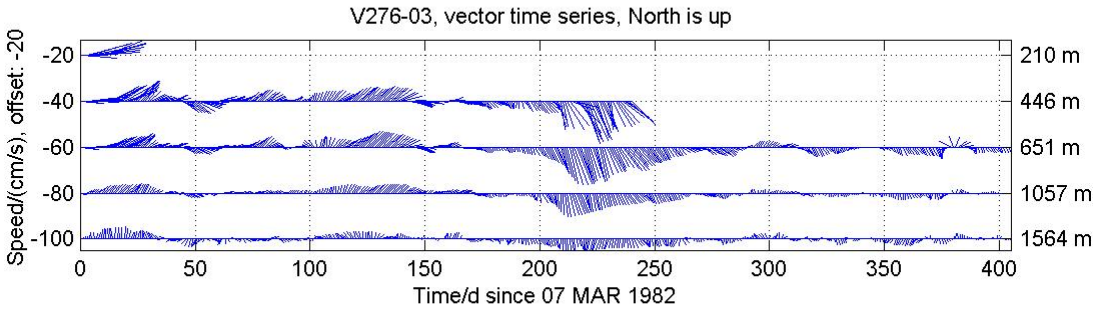


***V276-03**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments
All depths are nominal as from logs and mooring model (see sec. 2.4.)

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
199	2760301	RCM4	0094	3600 s	REF	
					T_LR	ok
					PRES	700 dbar range, ok
					DIR	ok
					SPD	rotor lost after 10 d
200	2760302	TK50	181 & 174	7200 s		recorder with 11 thermistors equally distributed 50 m downwards
					REF	
					11xT_LR	ok
435	2760303	RCM4	01484	3600 s		last good record 30-OCT-1982
					REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
639	2760304	RCM4	01485	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
1045	2760305	RCM4	00131	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
1552	2760306	RCM5	02317	3600 s	REF	
					T_LR	many spikes, ok
					DIR	ok
					SPD	ok
2954	2760307	RCM5	05881	3600 s		housing flooded, no data
5238	2760308	RCM5	05882	3600 s		housing flooded, no data





V276-03: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-03: statistics from low pass filtered daily averages

v27603

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
210	12	17.8	80	0.99	17.6	3.0	16.2	2	2	2	3	45	-0.1	-0.0
					2.4	2.4	0.2							
446	241	5.7	98	0.75	5.6	-0.7	12.6	13	24	26	1	2	-0.5	-0.3
					2.7	5.7	0.3							
651	405	3.5	113	0.68	3.3	-1.4	11.0	15	28	32	0	2	-0.3	0.1
					2.3	4.5	0.2							
1057	405	1.6	112	0.57	1.5	-0.6	8.1	27	28	12	1	5	0.1	0.1
					1.2	2.8	0.2							
1564	405	0.4	150	0.18	0.2	-0.4	5.4	7	20	27	0	0	0.0	0.0
					1.4	2.2	0.2							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-04

19-APR-1983 - 19-OCT-1983

Mooring information
****

General

```
Mooring ID   : V276-04/KPO 635
Deployed     : Date: 19-APR-1983     Ship / Cruise: Meteor II, M64/6
Recovered    : Date: 19-OCT-1983     Ship / Cruise: Poseidon, POS104
Latitude N   :   33.177
Longitude E  : -021.917
Water depth  : 5288 m (corrected)
Magn. Anom.  : -12.3
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

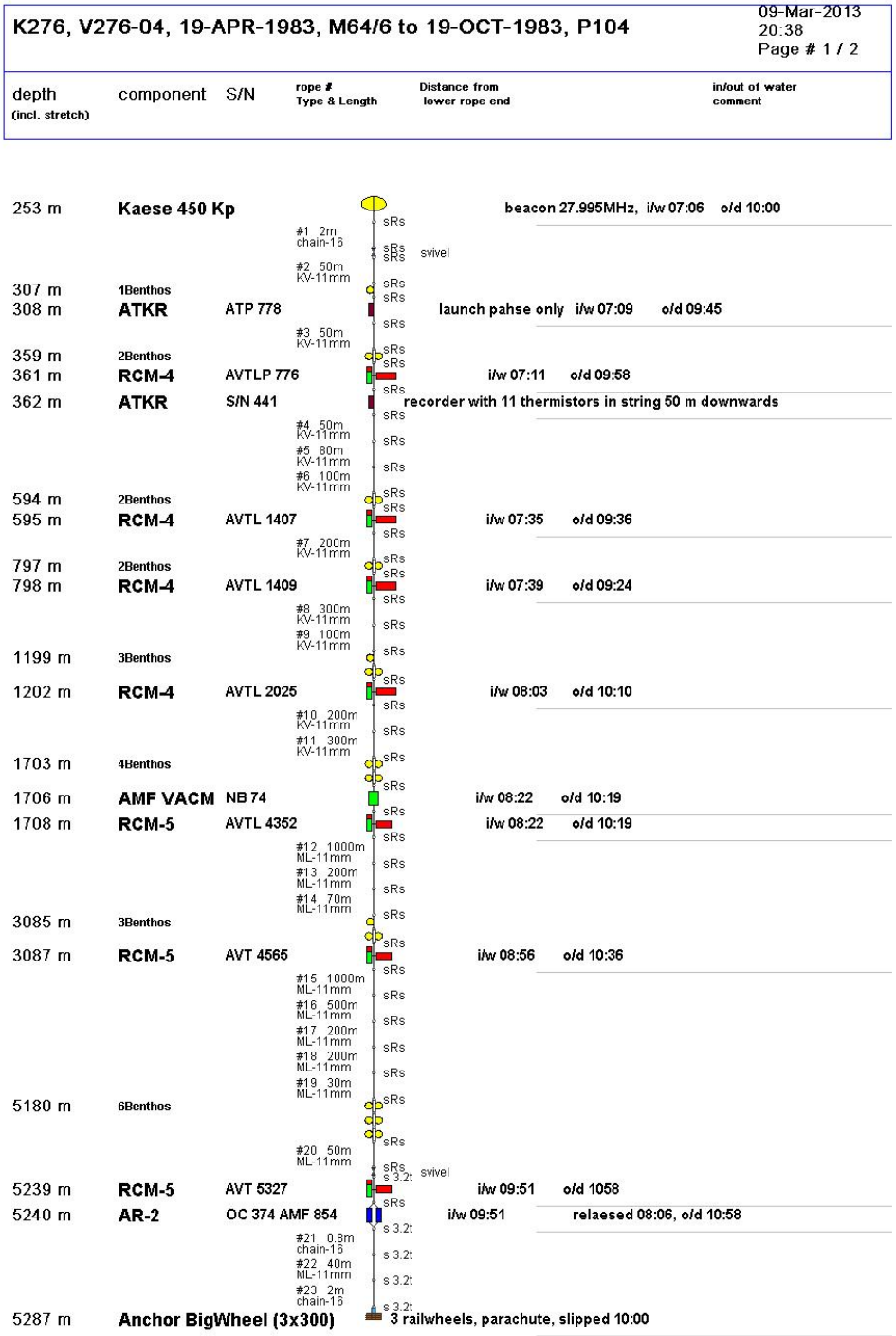
1) Mooring

Buoyancy of top element not noted in launch log. Topb buoys with 450 kp buoyancy had the maximum buoyancy available at that time in the mooring group. With such buoy and mooring components according to log of launch, all instrument nominal depths in static model from top to 1721 m are ca. 80 m deeper than in MK4 files and 50 m deeper than designed.

2) Data

Raw data are lost. Data sources are MK4 ASCII files at sampling rate and pre1-processing level. Data of uppermost T/P recorder S/N 778 were high resolution in time (300 s) to measure the mooring's adjustment to depth after the launch phase; data are lost.
RCM data, both at pre1-level and pre2-level, processed and at sampling rates in V27604_iii.dat.

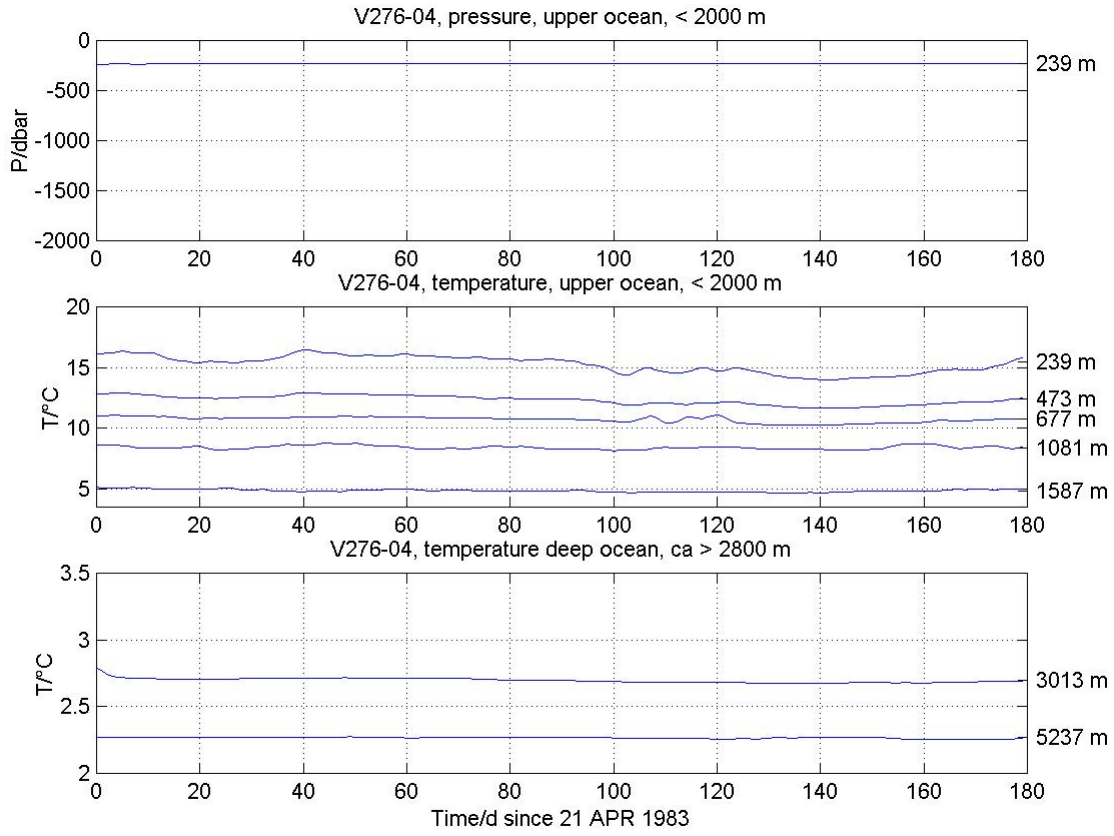
Compiled by: T.J. Mueller Date: 11-MAR-2012

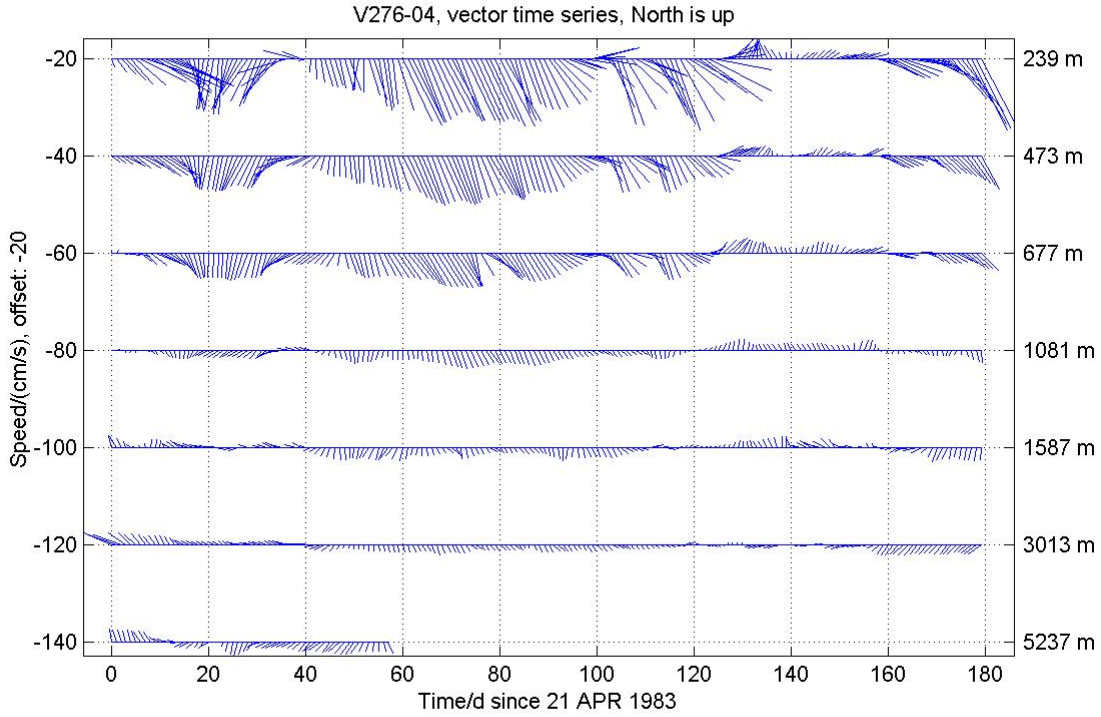


***V276-04**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments
All depths are nominal as from logs and mooring model (see sec. 2.4.)

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
308	2760401	DLTP	0778	300 s		TP recorder; high resolution in time; used for launch phase only; data lost
361	2760402	RCM4	00776	3600 s	REF	
					T_LR	ok
					COND	ok
					PRES	ok
					DIR	ok
					SPD	ok
362	2760403	TK50	441&528	7200 s		recorder with 11 thermistors equally distributed 50 m downwards
					REF	
					11xT_LR	ok
595	2760404	RCM4	01407	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
798	2760405	RCM4	01409	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
1202	2760406	RCM4	02025	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
1706	2760407	ACM	74			instrument with wrong conversion of instrument's to earth's coordinates; data not used and lost
1708	2760408	RCM5	04352	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
3087	2760409	RCM5	04565	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
5239	2760410	RCM5	05327	3600 s	REF	
					T_LR	ok
					DIR	bad, not used
					SPD	bad, not used





V276-04: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-04: statistics from low pass filtered daily averages

v27604

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
239	180	7.1	146	0.78	4.0	-5.8	15.3	9	11	28	-3	-18	-0.2	-2.0
					4.5	5.3	0.7							
473	180	4.6	152	0.79	2.2	-4.0	12.3	12	17	30	0	2	-0.3	-0.7
					2.7	3.3	0.4							
677	180	3.1	140	0.72	2.0	-2.4	10.7	12	20	22	-1	-13	0.0	-0.4
					2.2	2.7	0.2							
1081	180	0.8	179	0.47	0.0	-0.8	8.4	14	18	8	-0	-24	-0.0	-0.0
					1.1	1.4	0.2							
1587	180	0.7	233	0.36	-0.5	-0.4	4.9	16	13	16	-0	-33	-0.0	-0.0
					1.2	1.3	0.1							
3013	180	0.8	236	0.44	-0.6	-0.4	2.8	18	15	27	-1	-62	-0.0	0.0
					1.4	1.1	0.0							
5237	58	1.5	242	0.68	-1.3	-0.7	2.3	4	8	4	0	4	-0.0	0.0
					0.7	1.6	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-05

20-OCT-1983 - 25-OCT-1984

Mooring information
****

General

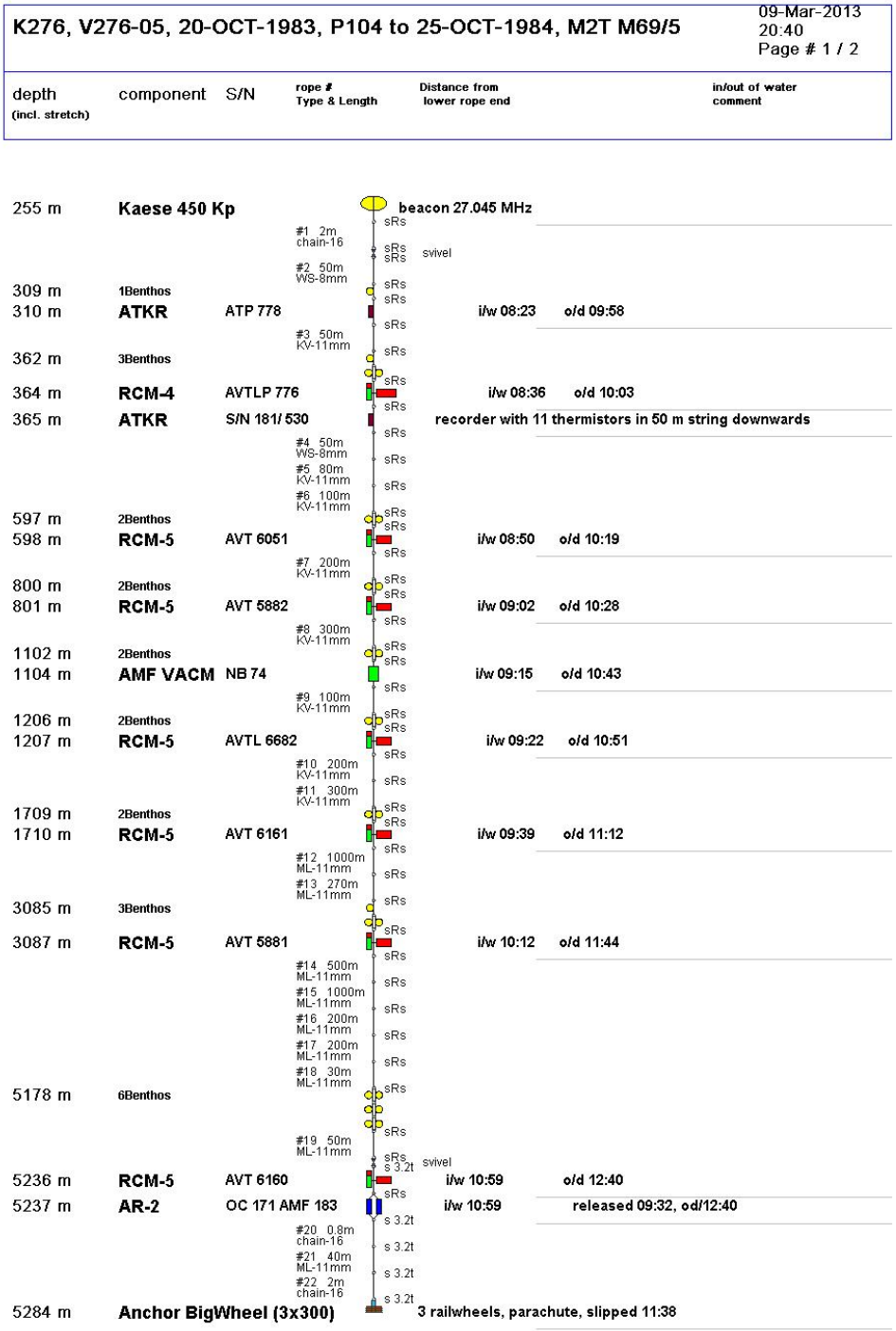
```
Mooring ID   : V276-05/ KPO 636
Deployed     : Date: 20-OCT-1983     Ship / Cruise: Poseidon, POS104
Recovered    : Date: 25-OCT-1984     Ship / Cruise: Meteor II, M69/5
Latitude N   :   33.180
Longitude E  : -021.923
Water depth  : 5285 m (corrected)
Magn. Anom.  : -13.5
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks
General remarks
---

1) Mooring
All mooring components according to log of launch; all instrument depths nominal as from logs and static model.

2) Data
Raw data are lost. Data sources are MK4 ASCII files at sampling rate and pre1-processing level.
Data of uppermost T/P recorder S/N 778 were high resolution in time (300 s) to measure launch phase.
RCM data, both at pre1-level and pre2-level, processed and at sampling rates in V27605_iii.dat.

Compiled by: T.J. Mueller Date: 11-MAR-2012

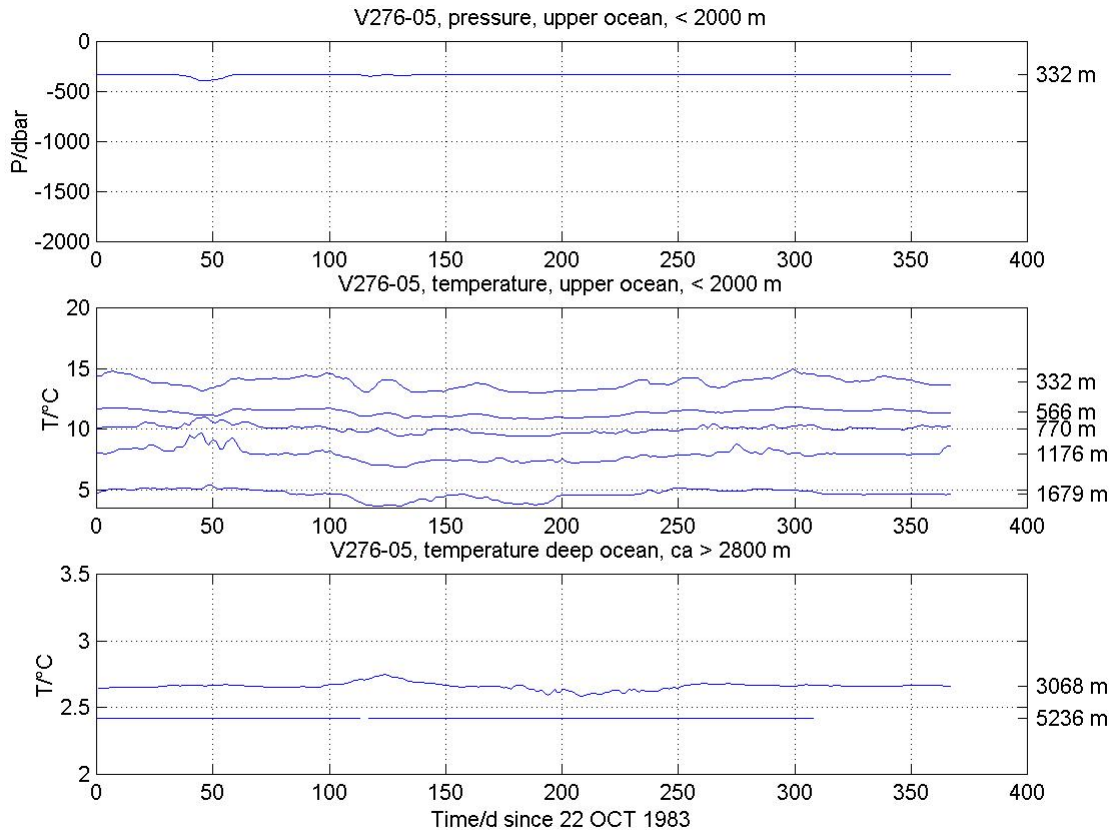


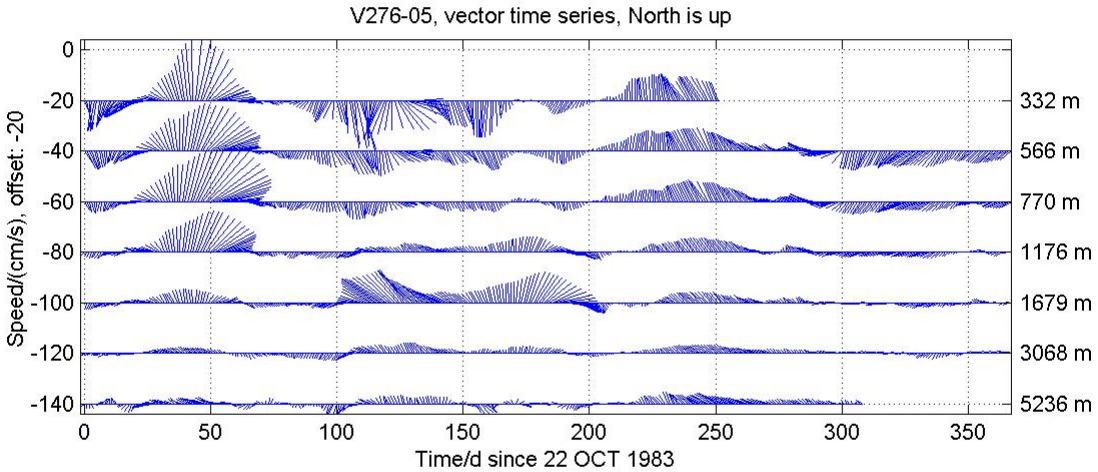
***V276-05**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments

All depths are nominal as from logs and mooring model (see sec. 2.4.)

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
310	2760501	DLTP	0778	30 s	TP	recorder; high resolution in time; used for launch phase only
364	2760502	RCM4	00776	3600 s	REF	
					T_LR	ok
					COND	ok
					PRES	ok
					DIR	ok
					SPD	ok, rotor bad after 30-JUN-1984
365	2760503	TK50	181&530	7200 s		recorder with 11 thermistors equally distributed 50 m downwards
					REF	
					11xT_LR	ok
598	2760504	RCM4	06051	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
801	2760505	RCM4	05882	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
1104	2760507	ACM	74			position in line changed before launching; instrument with wrong conversion of instrument's to earth's coordinates; data not used and lost
1207	2760506	RCM4	06682	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
1710	2760508	RCM5	06161	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
3087	2760509	RCM5	05881	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
5236	2760510	RCM5	06160	3600 s		record stops 23-AUG-1984
					REF	
					T_LR	ok
					DIR	ok
					SPD	ok





V276-05: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-05: statistics from low pass filtered daily averages

v27605

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
332	252	1.6	185	0.19	-0.2	-1.6	13.7	10	17	17	-2	-2	-0.3	-0.8
					4.9	8.6	0.5							
566	368	0.9	219	0.13	-0.5	-0.7	11.4	37	19	31	3	13	-0.4	-0.3
					4.8	5.8	0.3							
770	368	0.7	302	0.12	-0.6	0.4	10.0	25	16	33	8	37	0.3	0.5
					4.8	5.3	0.3							
1176	368	1.8	324	0.41	-1.0	1.4	7.9	16	13	31	4	44	0.4	0.5
					3.5	3.5	0.5							
1679	367	2.5	314	0.51	-1.8	1.8	4.7	20	14	30	-5	-62	0.2	-0.8
					4.6	3.7	0.4							
3068	368	1.5	298	0.63	-1.3	0.7	NaN	17	14	NaN	-1	-45	NaN	NaN
					1.6	1.5	NaN							
5236	309	2.0	290	0.64	-1.9	0.7	NaN	13	11	NaN	-1	-51	NaN	NaN
					2.1	1.9	NaN							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-06

26-OCT-1984 - 16-NOV-1985

Mooring information
****

General

```
Mooring ID   : V276-06/KPO 642
Deployed     : Date: 26-OCT-1984     Ship / Cruise: Meteor II, M69/5
Recovered    : Date: 16-NOV-1985     Ship / Cruise: Poseidon, P124
Latitude N   :   33.158
Longitude E  : -021.955
Water depth  : 5290 m (corrected, deck log)
Magn. Anom.  : -11.7 (Mk4 files)
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Compiled by: T.J. Mueller Date: 12-MAR-2012

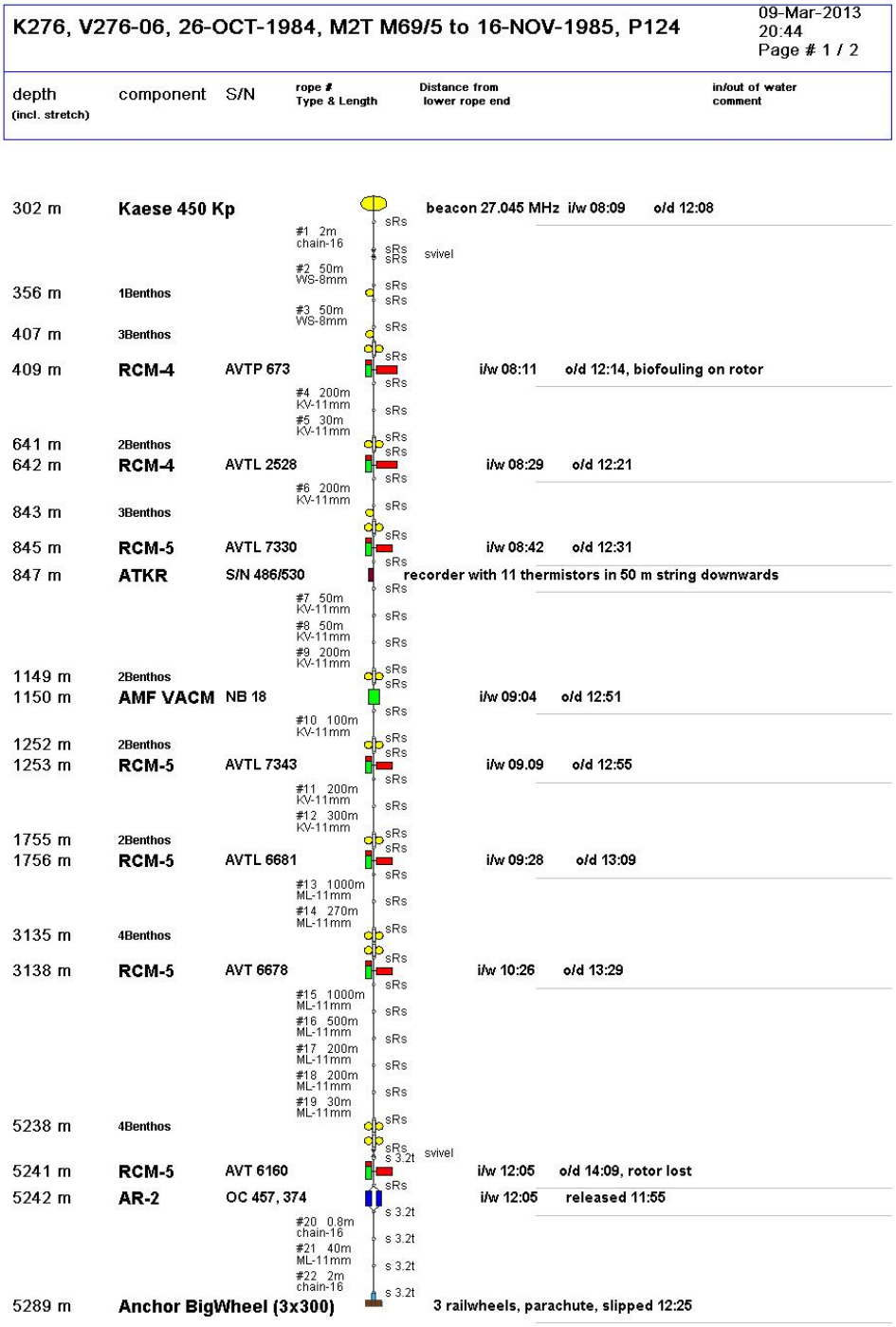
Remarks

1) Mooring

Uppermost T/P recorder was cancelled before deployment. All mooring components according to log of launch; all instrument depths nominal as from logs and static model.

2) Data

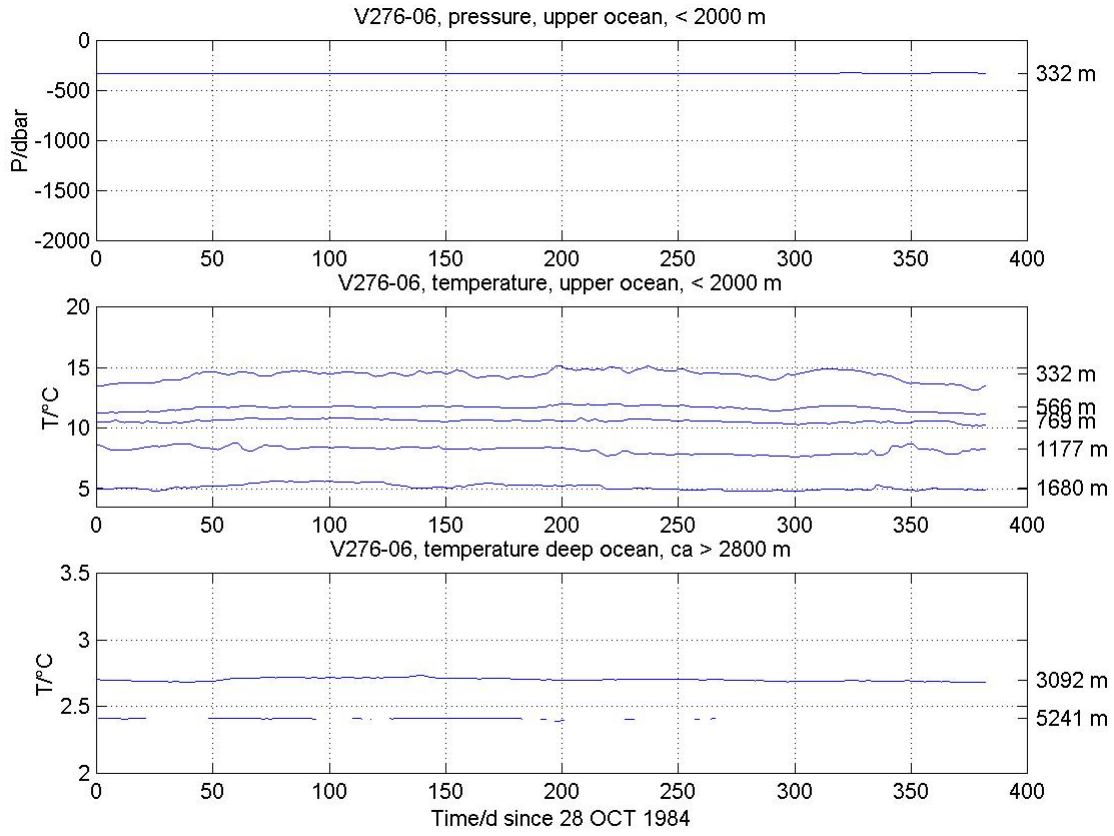
Raw data are lost. Data sources are MK4 ASCII files at sampling rate and pre1-processing level. RCM data, both at pre1-level and pre2-level, processed and at sampling rates in V27606_iii.dat.

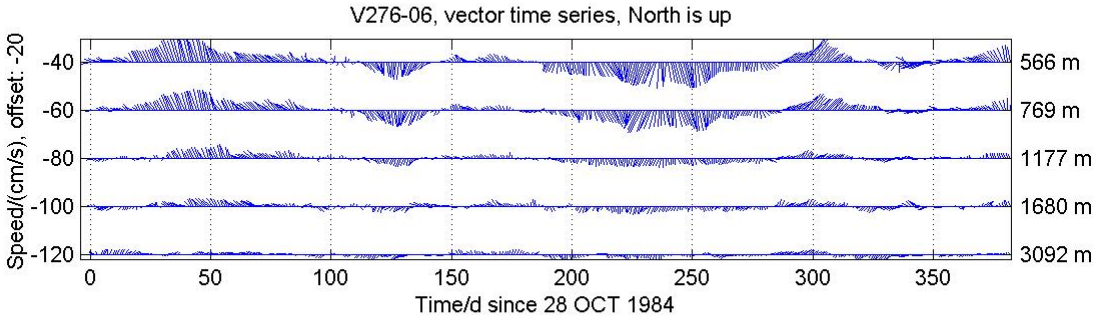


***V276-06**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments
All depths are nominal as from logs and mooring model (see sec. 2.4.)

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
409	2760602	RCM4	00673	3600 s	REF	
					T_LR	ok
					PRES	ok
					DIR	ok,
					SPD	blocked by bio-fouling
642	2760603	RCM4	02528	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
845	2760604	RCM4	07330	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
847	2760605	TK50	486&530	7200 s	recorder with 11 thermistors equally distributed 50 m downwards	
					stop 03-SEP-1985	
					REF	
					10xT_LR ok,	
					sensor 11 bad; to be set to dummy	
1150	2760606	ACM	18		data not used and lost	
					due to instrument with wrong conversion of instrument's	
					to earth's coordinates;	
1253	2760607	RCM4	07343	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
1756	2760608	RCM5	06681	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
3138	2760609	RCM5	06678	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
5242	2760610	RCM5	06160	3600 s	stop 19-JUL-1985	
					REF	
					T_LR	ok, spikes wth T<2.38 °c set to NaN
					DIR	bad, not used
					SPD	bad, not used





V276-06: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-06: *statistics from low pass filtered daily averages*

v27606

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
332	383	NaN	NaN	NaN	NaN	NaN	14.4	NaN	NaN	NaN	NaN	NaN	NaN	NaN
					NaN	NaN	0.4							
566	383	1.1	254	0.21	-1.0	-0.3	11.7	17	24	20	-2	-8	0.2	-0.5
					2.8	4.8	0.2							
769	383	0.6	249	0.16	-0.6	-0.2	10.1	16	25	28	-1	-8	-0.1	-0.2
					2.3	3.9	0.1							
1177	383	0.4	269	0.20	-0.4	-0.0	8.2	12	21	43	-0	-14	-0.2	0.2
					1.4	1.9	0.3							
1680	383	0.9	272	0.41	-0.9	0.0	5.1	11	15	40	-0	-66	-0.1	0.0
					1.6	1.5	0.2							
3092	383	0.5	274	0.31	-0.5	0.0	2.8	17	11	37	0	72	-0.0	-0.0
					1.4	1.0	0.0							
5241	151	NaN	NaN	NaN	NaN	NaN	2.4	NaN	NaN	NaN	NaN	NaN	NaN	NaN
					NaN	NaN	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-07

17-NOV-1985 - 31-OCT-1986

Mooring information
****

General

```
Mooring ID   : V276-07/KPO 658
Deployed     : Date: 17-NOV-1985      Ship / Cruise: Poseidon, P124
Recovered    : Date: 31-OCT-1986      Ship / Cruise: Meteor, M04/2
Latitude N   :   33.142
Longitude E  : -021.960
Water depth  : 5288 m (corrected)
Magn. Anom.  : -11.7 (Mk4 files)
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks
1) Mooring
All mooring components according to log of launch; all instrument depths nominal as from static model;
S/N 4665 at 3000 m designed depth changed to S/N 4565 (probably a misprint in the edited deck log)

2) Data
Raw data are lost. Data sources are MK4 ASCII files at sampling rate and at pre1-processing level. RCM data, both at pre1-level and pre2-level, processed and at sampling rates in V27607_iii.dat.

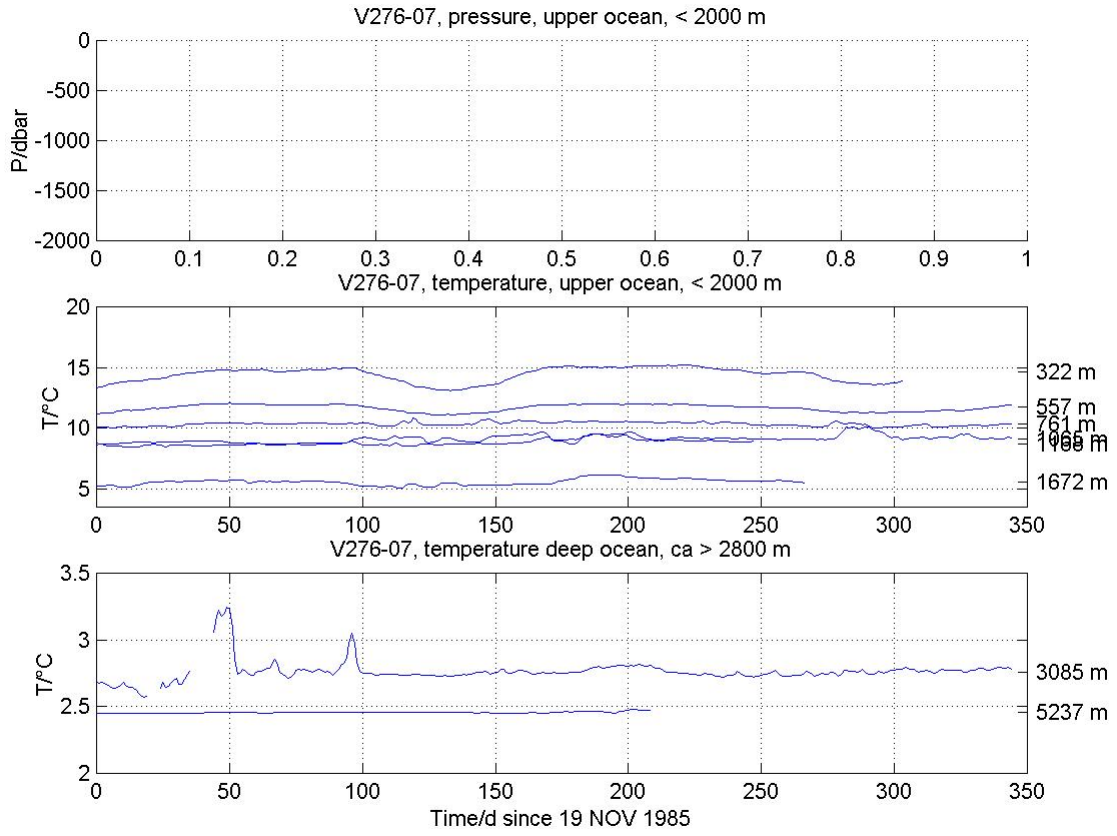
Compiled by: T.J. Mueller Date: 12-MAR-2012

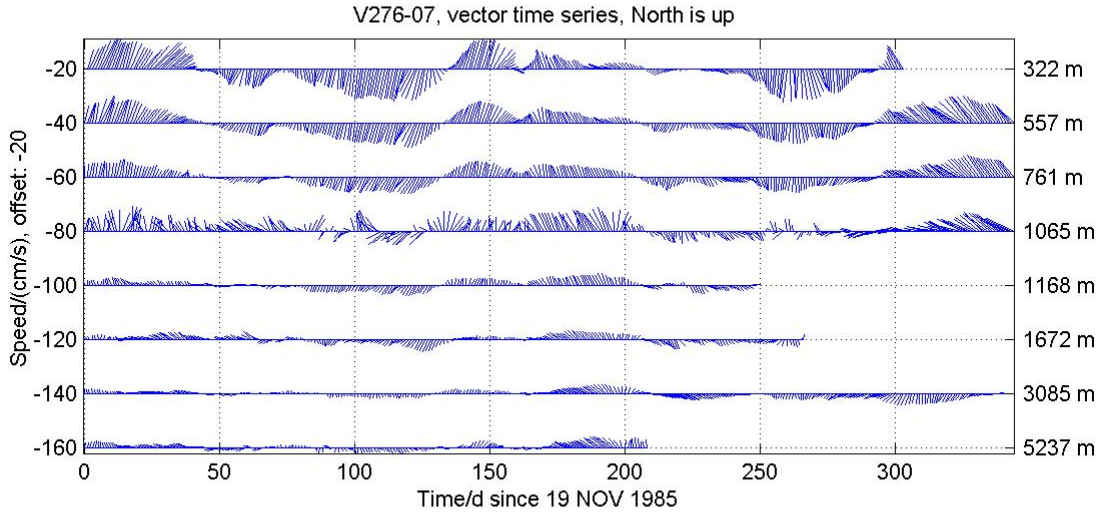
***V276-07**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments

All depths are nominal as from logs and mooring model (see sec. 2.4.)

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
402	2760701	RCM5	06158	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
636	2760702	RCM5	07656	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
840	2760703	RCM4	07927	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
841	2760704	TK50	181&648	7200 s	recorder with 11 thermistors equally distributed 50 m downwards	
					stop 03-SEP-1986	
					REF	
					T_LR: 01 and 02 bad; 03-11 ok	
1144	2760705	RCM4	07654	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
1247	2760706	RCM4	07928	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
1751	2760707	RCM5	07929	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
3133	2760708	RCM5	04565	3600 s	REF	
					T_LR	few days bad, all other ok
					DIR	ok
					SPD	ok
5238	2760709	RCM5	06161	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok





V276-07: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-07: statistics from low pass filtered daily averages

v27607

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
322	303	1.0	161	0.16	0.3	-0.9	14.4	14	17	20	8	14	-0.5	-0.6
					2.9	6.2	0.6							
557	345	0.9	299	0.18	-0.8	0.4	11.7	19	20	21	-1	-5	0.0	-0.2
					3.0	5.0	0.3							
761	345	1.2	296	0.30	-1.1	0.5	10.3	20	20	22	-1	-6	0.1	-0.1
					2.2	3.8	0.2							
1065	345	3.2	319	0.61	-2.1	2.4	9.1	17	15	27	-1	-33	-0.2	-0.2
					3.3	3.4	0.3							
1168	248	0.8	306	0.35	-0.7	0.5	8.8	15	18	28	-0	-5	0.1	0.1
					1.3	2.0	0.2							
1672	267	1.0	279	0.40	-1.0	0.2	5.6	14	15	21	-1	-49	0.1	0.1
					1.8	1.7	0.3							
3085	345	0.6	252	0.28	-0.6	-0.2	NaN	17	23	NaN	-1	-73	NaN	NaN
					2.0	1.5	NaN							
5237	209	1.2	308	0.50	-0.9	0.7	2.5	17	16	12	-1	-65	-0.0	0.0
					2.0	1.4	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-08

01-NOV-1986 - 06-NOV-1987

Mooring information
****

General

```
Mooring ID   : V276-08/KPO 660
Deployed     : Date: 01-NOV-1986      Ship / Cruise: Meteor, M04/2
Recovered    : Date: 06-NOV-1987      Ship / Cruise: Meteor, M06/1
Latitude N   :   33.112
Longitude E  : -021.918
Water depth  : 5281 m (corrected)
Magn. Anom.  : -11.7 (bridge log)
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring

All mooring components according to log of launch; all instrument depths nominal as from static model;

2) Data

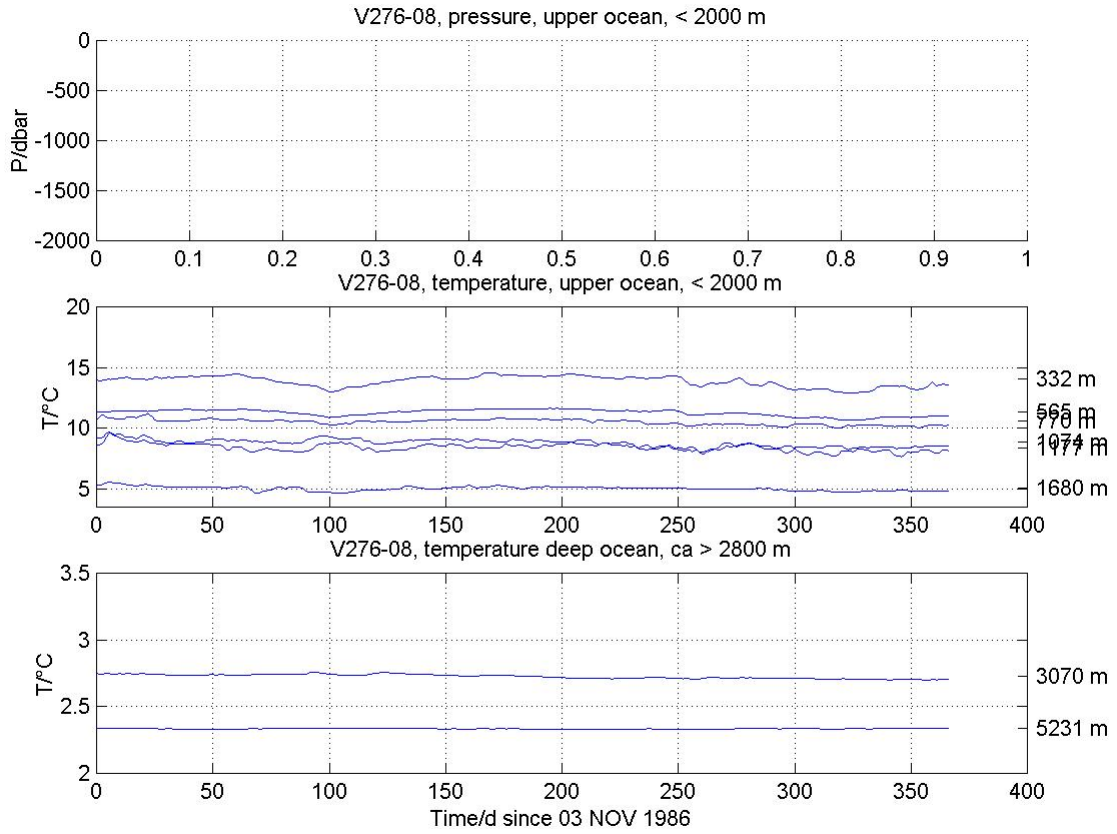
Raw data are lost. Data sources are MK4 ASCII files at sampling rate and at pre1-processing level.
S/N 4564 showed bad direction measurements.
S/N 4563 had the instrumental revolutions/count set wrongly.
RCM data, both at pre1-level and pre2-level, processed and at sampling rates in V27608_iii.dat.

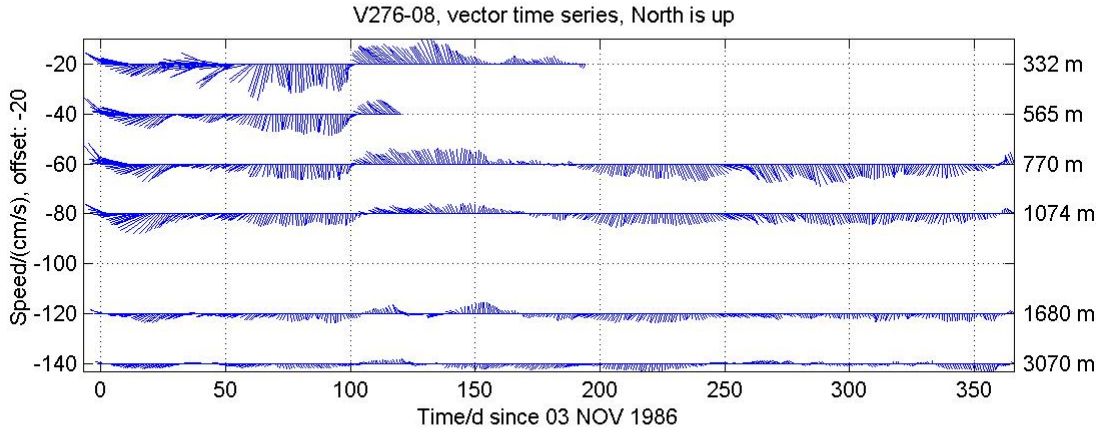
Compiled by: T.J. Mueller Date: 12-MAR-2012

***V276-08**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
352	2760801	RCM5	06679	3600 s	REF	
					PRES	no data (sensor bad)
					T_LR	ok
					DIR	ok until 11-MAY-1987
					SPD	ok until 11-MAY-1987
585	2760802	RCM4	00131	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok until 27-APR-1987
789	2760803	RCM4	07330	3600 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
790	2760804	TK50	441 & 464	7200 s	recorder with 11 thermistors equally distributed 50 m downwards	
					REF	
					T_LR, 11x	ok
1093	2760805	RCM4	04354	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
1196	2760806	RCM4	04564	3600 s	REF	
					T_LR	ok
					DIR	bad
					SPD	no data
1699	2760807	RCM5	05881	3600 s	REF	
					T_LR	ok
					DIR	ok
					SPD	ok
3082	2760808	RCM5	06121	3600 s	REF	
					T_AR	ok
					DIR	ok
					SPD	ok
5231	2760809	RCM5	04563	3600 s	REF	
					T_AR	ok
					DIR	ok
					SPD	bad (setting of rev/count wrong)





V276-08: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-08: statistics from low pass filtered daily averages

v27608

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
332	195	4.7	263	0.60	-4.7	-0.6	14.0	15	18	19	-5	-20	-0.3	0.1
					4.7	5.9	0.4							
565	121	4.8	239	0.71	-4.1	-2.5	11.3	16	9	18	-8	-36	-0.1	-0.1
					3.4	4.0	0.2							
770	367	2.4	201	0.46	-0.9	-2.2	10.5	35	25	37	-6	-40	-0.5	0.3
					3.6	3.8	0.2							
1074	367	2.4	213	0.58	-1.3	-2.0	8.8	33	22	45	-1	-72	-0.6	0.2
					3.0	2.5	0.3							
1177	367	NaN	NaN	NaN	NaN	NaN	8.4	NaN	NaN	NaN	NaN	NaN	NaN	NaN
					NaN	NaN	0.3							
1680	367	1.6	225	0.57	-1.1	-1.1	5.0	28	16	23	-0	-77	-0.2	0.0
					2.0	1.6	0.2							
3070	366	0.9	215	0.45	-0.5	-0.8	2.8	24	12	62	0	85	-0.0	0.0
					1.8	1.1	0.0							
5231	367	NaN	NaN	NaN	NaN	NaN	2.3	NaN	NaN	NaN	NaN	NaN	NaN	NaN
					NaN	NaN	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-09a and V276-09b

06-NOV-1987 - 14-JAN-1989

Mooring information
****

General

```
Mooring ID   : V276-09/ KPO 666
Deployed     : Date: 06-NOV-1987      Ship / Cruise: Meteor, M06/1
top buoy lost: DATE: ca. 24-SEP-1988
Recovered    : Date: 14-JAN-1989      Ship / Cruise: Meteor, M09/2
Latitude N   :   33.090
Longitude E  : -021.875
Water depth  : 5287 m (corrected)
Magn. Anom.  : -12 (bridge log)
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring
Mooring lost top buoy and top instrument on 24-SEP-1988, probably due to fish biting in KEVLAR rope. Because now stretching of nylon rope was much less, remaining mooring components dropped to larger depths from then on: 326 m above S/N 6159 and less below.

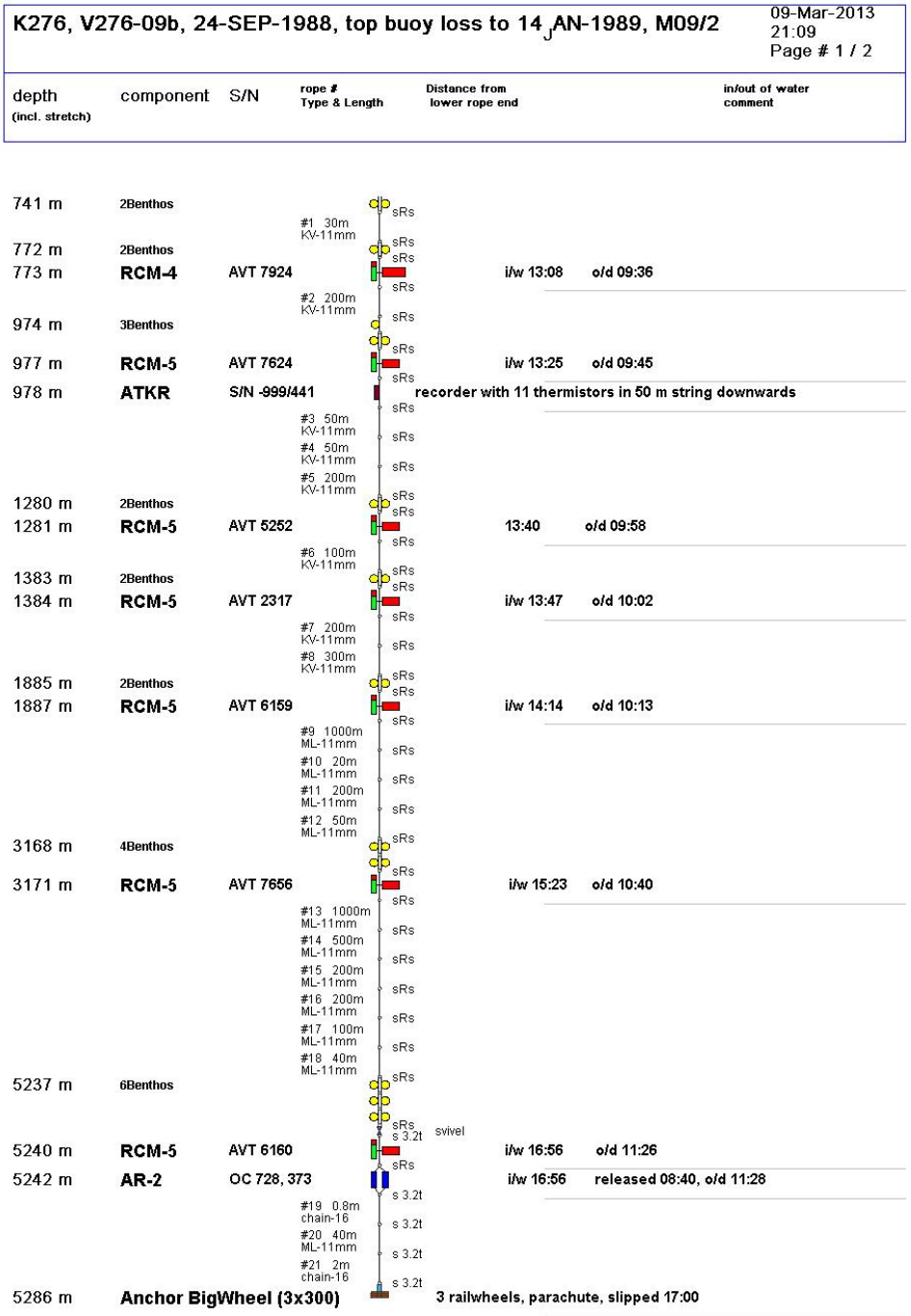
Periods before loss of buoyancy: V276-09a, after loss V276-09b.

All mooring components according to log of launch; all instrument depths nominal as from logs and static model for both periods, before and after loss of the top buoy;

2) Data
Raw data are lost. Data sources are MK4 ASCII files at sampling rate and at pre1-processing level.
RCM data, both at pre1-level and pre2-level, processed and at sampling rates in V27609a_iii.dat and V27609b_iii.dat.

Compiled by: T.J. Mueller Date: 12-MAR-2012

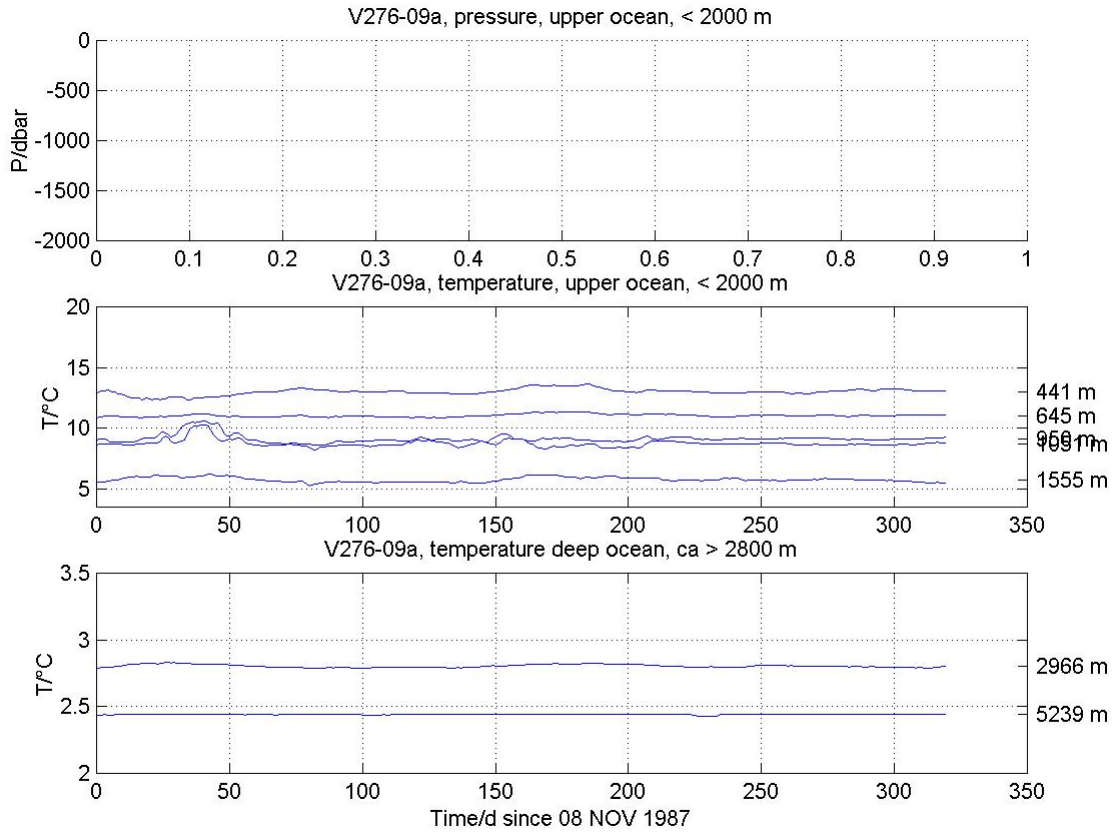
***V276-09a**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

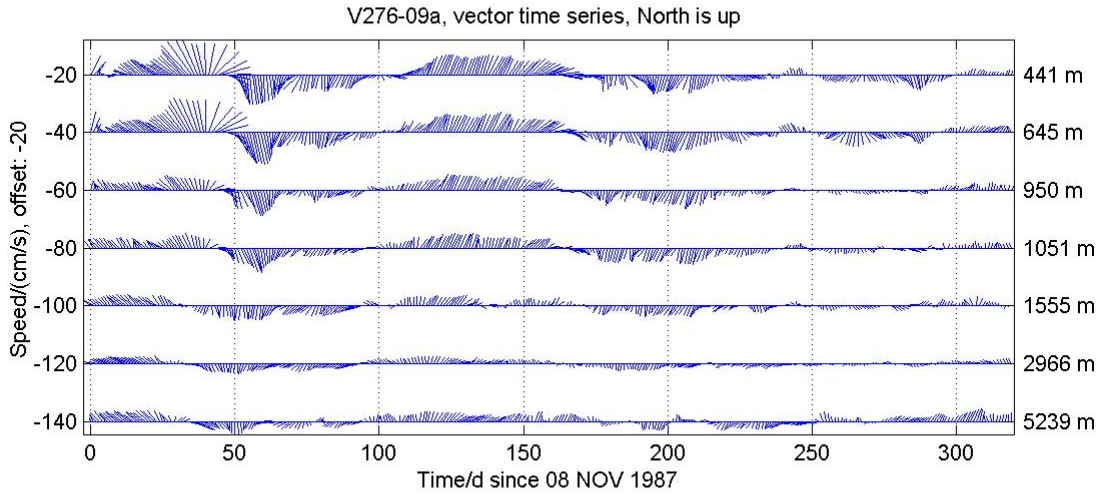


***V276-09b**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

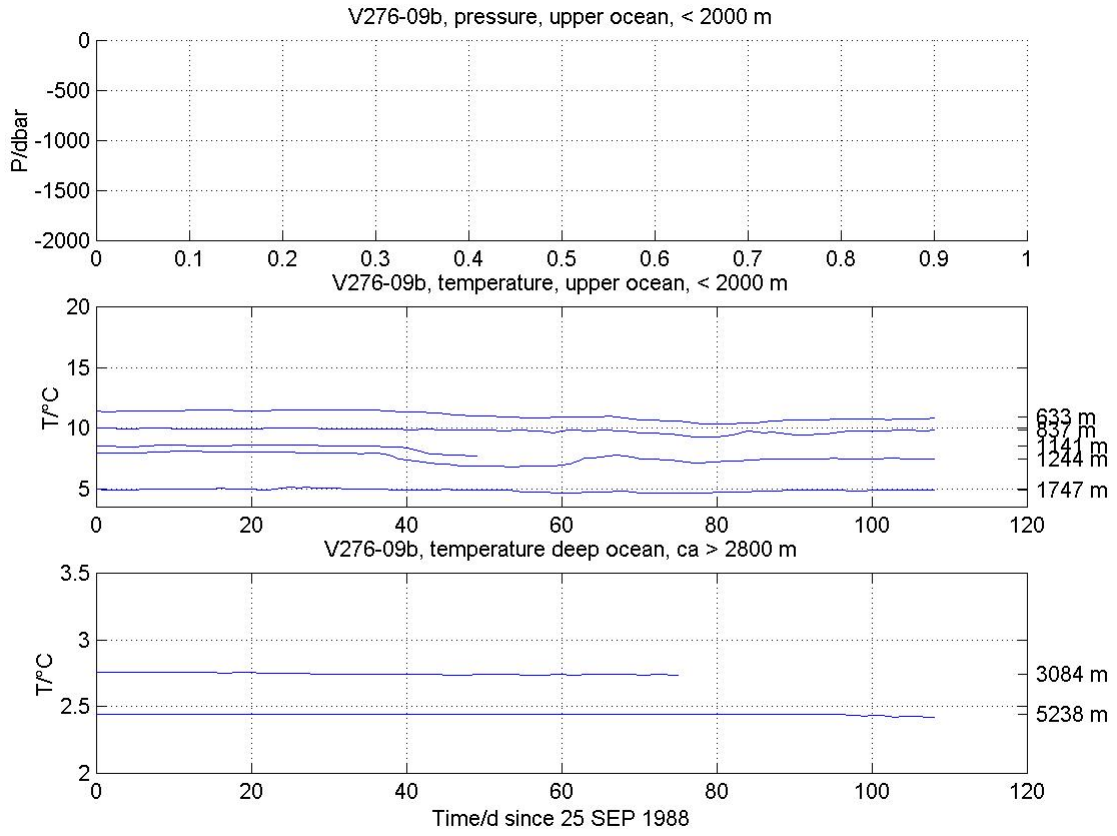
Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

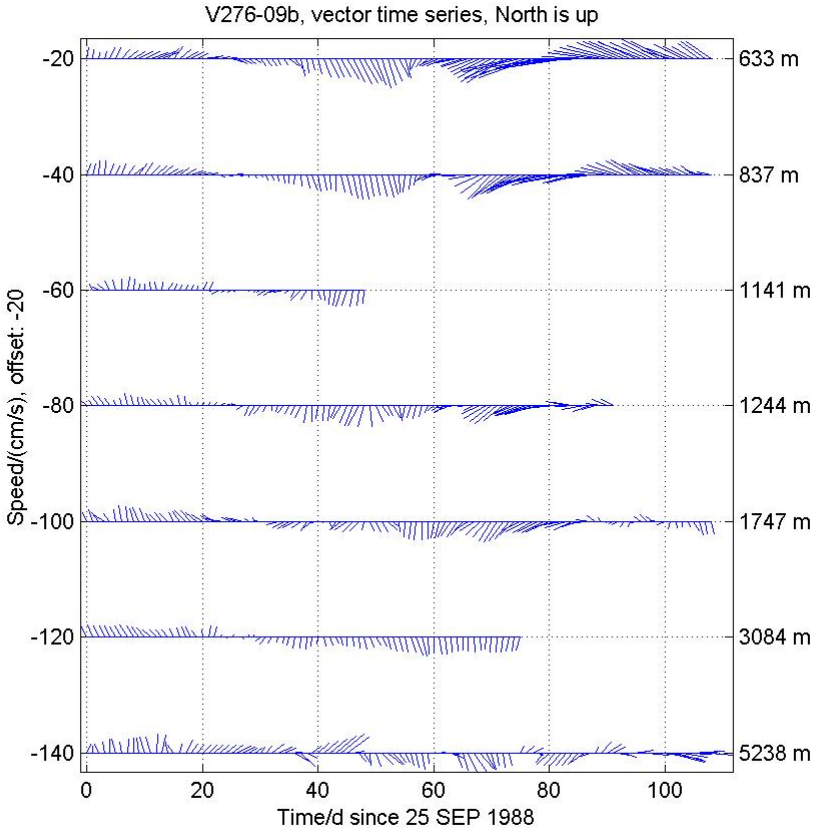
Depth a / b	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
283	2760901	RCM5	06074	7200 s		lost with top buoy
516 / 773	2760902	RCM4	07924	7200 s	REF T_LR DIR SPD	 ok ok ok
719 / 977	2760903	RCM4	07624	7200 s	REF T_LR DIR SPD	 ok ok ok
721 / 978	2760904	TK50	441&464	7200 s	REF T_LR	recorder with 11 thermistors equally distributed 50 m downwards 11x ok until 08-JAN-1989
1024 / 1281	2760905	RCM4	05252	7200 s	stop 15-NOV-1988 REF T_LR DIR SPD	 ok ok ok
1125 / 1384	2760906	RCM4	02317	7200 s	REF T_LR DIR SPD	 ok, ok ok until 28-NOV-1988
1629 / 1887	2760907	RCM5	06159	7200 s	REF T_LR DIR SPD	 ok ok ok
3012 / 3171	2760908	RCM5	07656	7200 s	stop 11-DEC-1988 (water, tape readable) REF T_LR DIR SPD	 ok ok with DIR=DIR+180 ok
5240	2760909	RCM5	06160	7200 s	REF T_AR DIR SPD	 ok ok ok





V276-09a: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*





V276-09b: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-09a: statistics from low pass filtered daily averages

v27609a

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
441	320	0.6	130	0.13	0.5	-0.4	13.0	10	15	19	1	4	0.3	-0.5
					3.3	4.6	0.3							
645	320	0.5	101	0.10	0.5	-0.1	11.0	10	15	20	0	2	0.0	-0.1
					3.0	4.5	0.1							
950	320	0.2	111	0.06	0.2	-0.1	9.1	13	17	12	1	10	0.1	0.2
					2.0	3.0	0.3							
1051	320	0.3	196	0.09	-0.1	-0.3	8.7	11	18	10	1	5	0.1	0.2
					1.9	3.0	0.3							
1555	320	0.6	246	0.24	-0.6	-0.3	5.8	15	16	18	1	14	-0.0	-0.1
					1.7	2.2	0.2							
2966	320	0.9	259	0.42	-0.8	-0.2	2.8	12	16	19	-0	-79	0.0	-0.0
					1.5	1.4	0.0							
5239	320	0.6	338	0.22	-0.2	0.5	2.4	12	15	6	1	39	0.0	0.0
					2.0	2.0	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

Mooring V276-09b: statistics from low pass filtered daily averages

v27609b

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
633	109	2.3	257	0.50	-2.2	-0.5	11.0	19	12	21	-1	-85	1.5	0.1
					4.3	2.2	0.4							
837	109	1.8	249	0.53	-1.7	-0.7	9.8	19	10	15	0	86	0.5	0.1
					2.9	1.9	0.2							
1141	48	0.4	249	0.26	-0.4	-0.1	8.4	4	9	6	0	12	0.0	0.3
					0.7	1.5	0.3							
1244	92	1.6	244	0.67	-1.5	-0.7	7.6	12	11	12	0	73	0.2	0.4
					1.7	1.5	0.4							
1747	109	1.4	245	0.64	-1.3	-0.6	4.9	7	13	15	0	4	0.0	0.1
					1.2	1.6	0.1							
3084	76	0.7	194	0.37	-0.2	-0.7	2.7	8	15	14	-1	-14	-0.0	0.0
					0.7	1.8	0.0							
5238	109	1.4	90	0.53	1.4	0.0	2.4	7	11	6	0	35	-0.0	0.0
					1.8	1.8	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-10

14-JAN-1989 - 27-OCT-1989

Mooring information
****

General

```
Mooring ID   : V276-10/ KPO 671
Deployed     : Date: 14-JAN-1989     Ship / Cruise: Meteor, M09/2
Recovered    : Date: 27-OCT-1989     Ship / Cruise: Meteor, M11/2
Latitude N   :   33.107
Longitude E  : -021.897
Water depth  : 5281 m (HS corrected)
Magn. Anom.  : -12 (interpolated)
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring

Top buoy was shrunk at recovery, i.e. had less buoyancy than when launched. Pressure records of top two RCM both slowly increased from 334 dbar to 354 dbar (600 dbar to 618 dbar). No sudden event.

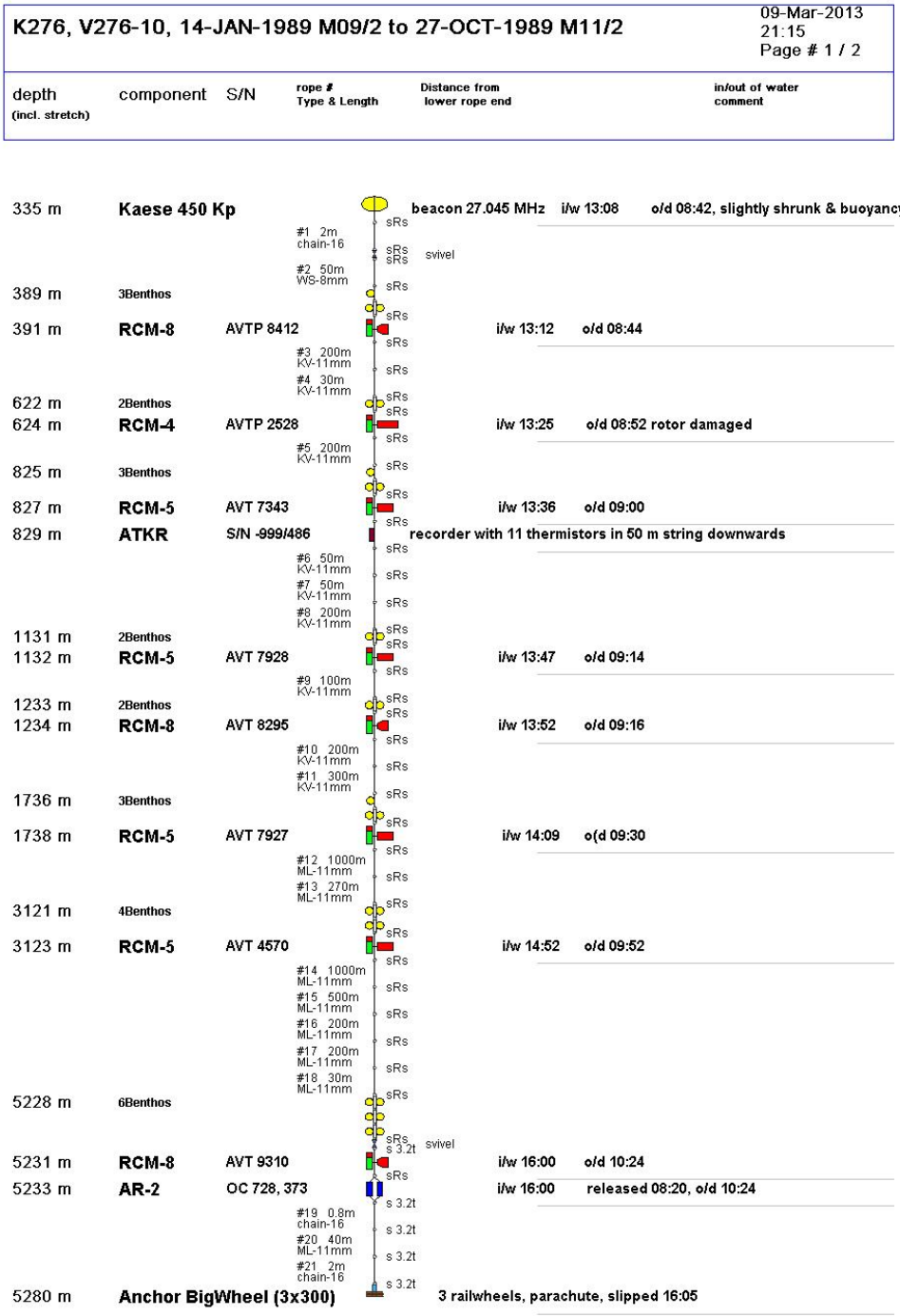
All mooring components according to log of launch; all instrument depths nominal as from logs and static model.

Note: this mooring had 90 m less nylon rope than V276-09; therefore, instrument S/N 07927 at 1705 and all others at less depths are 100 m deeper than the comparable in V27609.

2) Data

Raw data in 27610ii.RAW, 1<=i<=9, files restored from 5 1/4 '' disk, March 2012. Files 27610ii.RAW edited and stored to RCM*.EDT. Data re-processed in May 2012.
CALAAN.M, ok
CHECK_ROTOR_CAL.M applied for M2 tide, ok.
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processed and at sampling rate in V27610_iii.dat.

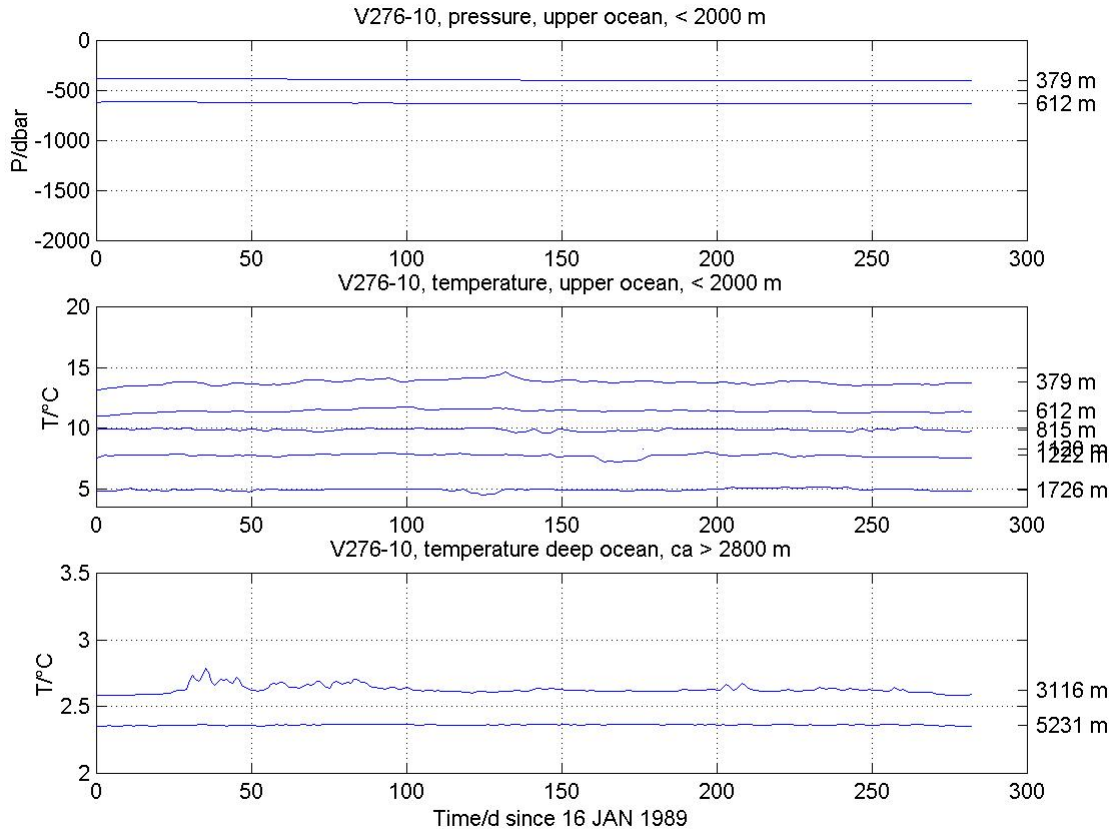
Compiled by: T.J. Mueller Date: 31-MAY-2012

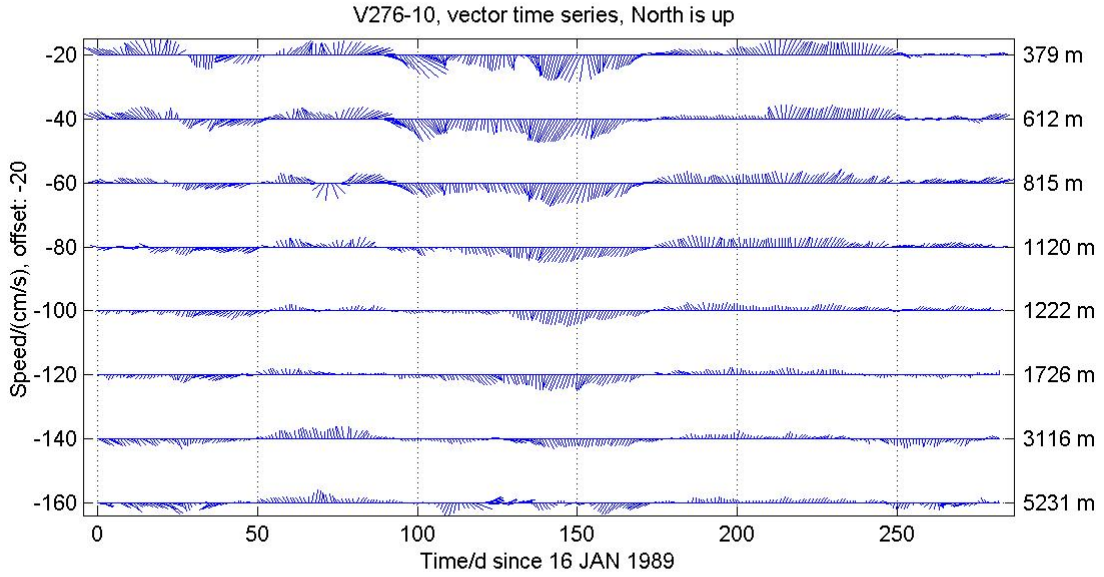


***V276-10**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
391	2761001	RCM8	08412	7200 s	REF	ok, 164
					T_LR	ok
					COND	ok, last 6 values set to NaN,
					PRES	ok, see remark below
					DIR	ok
					SPD	ok
624	2761002	RCM4	02528	7200 s	REF	ok, 371
					T_LR	ok
					COND	ok, few spikes replaced by dummy
					PRES	ok, see remark below
					DIR	ok
					SPD	ok, rotor 'slow' by factor ca. 0.5 between day 165 and day 212
						to be edited: multiply with factor 2
827	2761003	RCM4	07343	7200 s	REF	ok, 292
					T_LR	ok
					COND	ok, S with strong nonlinear trend;
					DIR	ok
					SPD	ok
829	2761004	TK50	486	7200 s	no data, raw values all 512	
1132	2761005	RCM5	07928	7200 s	REF	596 (nominal), median 512 read
					T_LR	often reads T_raw=0; set to dummy
					COND	often reads C_raw=0; set to dummy
					DIR	ok
					SPD	ok
1234	2761006	RCM8	08295	7200 s	REF	ok, 149, at the end often half range
					T_LR	ok
					C_WR	no data
					DIR	ok
					SPD	ok
1738	2761007	RCM5	07927	7200 s	REF	ok, 606
					T_LR	ok
					DIR	ok
					SPD	ok
3123	2761008	RCM5	04570	7200 s	REF	
					T_LR	ok, not stored
					T_AR	ok, stored
					DIR	ok
					SPD	ok
5231	2761009	RCM8	09310	7200 s	REF	
					T_LR	ok, not stored
					T_AR	ok, stored
					DIR	ok
					SPD	ok





V276-10: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-10: statistics from low pass filtered daily averages

v27610

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
379	283	0.3	135	0.07	0.2	-0.2	13.8	13	19	23	0	5	0.1	-0.3
					2.6	3.4	0.2							
612	283	0.5	202	0.15	-0.2	-0.5	11.4	16	22	24	1	16	0.1	-0.2
					2.4	3.2	0.1							
815	283	0.4	161	0.11	0.1	-0.3	9.9	18	22	9	2	29	0.0	0.1
					2.3	2.8	0.1							
1120	283	0.3	248	0.12	-0.3	-0.1	NaN	22	22	NaN	2	32	NaN	NaN
					1.7	2.1	NaN							
1222	283	0.2	236	0.13	-0.2	-0.1	7.7	20	20	11	1	24	0.0	0.0
					1.0	1.6	0.1							
1726	283	0.6	221	0.36	-0.4	-0.5	4.9	14	21	11	0	2	-0.0	0.0
					1.2	1.6	0.1							
3116	283	0.5	130	0.25	0.3	-0.3	2.7	13	16	11	-0	-15	-0.0	0.0
					1.2	1.6	0.0							
5231	283	0.1	118	0.08	0.1	-0.1	2.4	10	11	11	0	80	-0.0	0.0
					1.7	1.4	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-11

27-OCT-1989 - 25-SEP-1990

Mooring information
****
General

```
Mooring ID   : V276-11/ KPO 678
Deployed     : Date: 27-OCT-1989    Ship / Cruise: Meteor M11/2
Recovered    : Date: 25-SEP-1990    Ship / Cruise: Meteor M14/1
Latitude N   :   33.103
Longitude E  : -021.905
Water depth  : 5317 m (PN, corrected)
Magn. Anom.  : -11 (interpolated)
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring
All mooring components according to log of launch and all depths nominal as from logs and from static model.

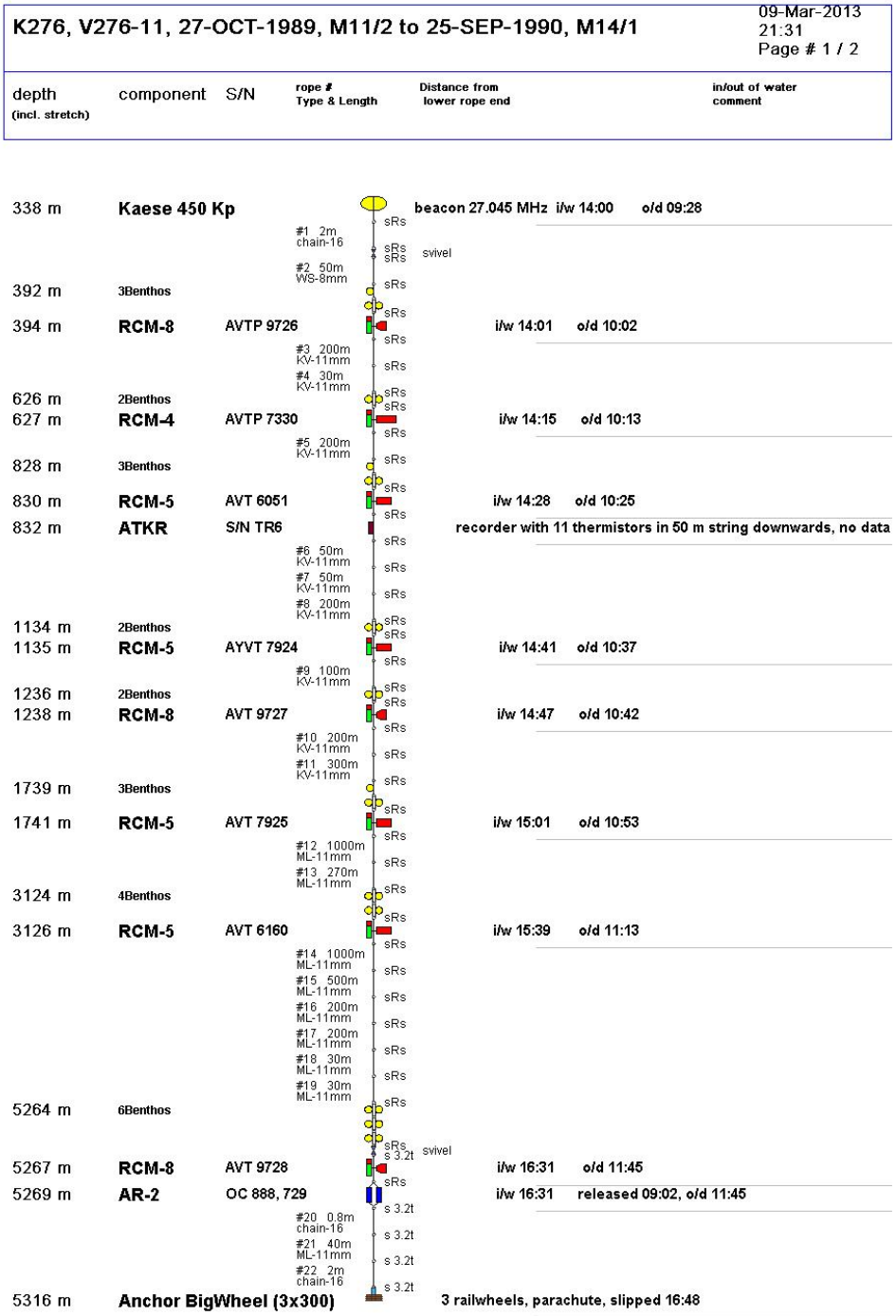
Note: this mooring had (designed) 90 m less nylon rope than V27609; 30 m were added during launch because of larger water depth.

2) Data
Raw data available as V27611*.RAW with * as instrument counter top to bottom in mooring line; copied to corresponding RCM*.RAW and edited to get RCM*.EDT with * as S/N of RCM. CALAAN.M applied

RCM 06160 has corrupted raw data file: nominal 6 columns, but also 774 rows with 12 columns and one row with more than 18 (23) columns. When sorted to 6 column array, the time basis gets ok as compared to the instrument's start/stop log. Data in the beginning are ok until ca. record 1000; later noisy; arctic TEMP graphically edited and interpolated; SPD is noisy and partly somewhat too low; standard deviation in band pass SPD around M2 tide lower (<=40%) than in all other instruments. Data however kept finally.

CHECK_ROTOR_CA ok with vertically averaged standard deviation of SPD around M2 tide 0.4 cm/s +/- 0.08 cm/s (including RCM06160).
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processd and at sampling rate in V27611_iii.dat.

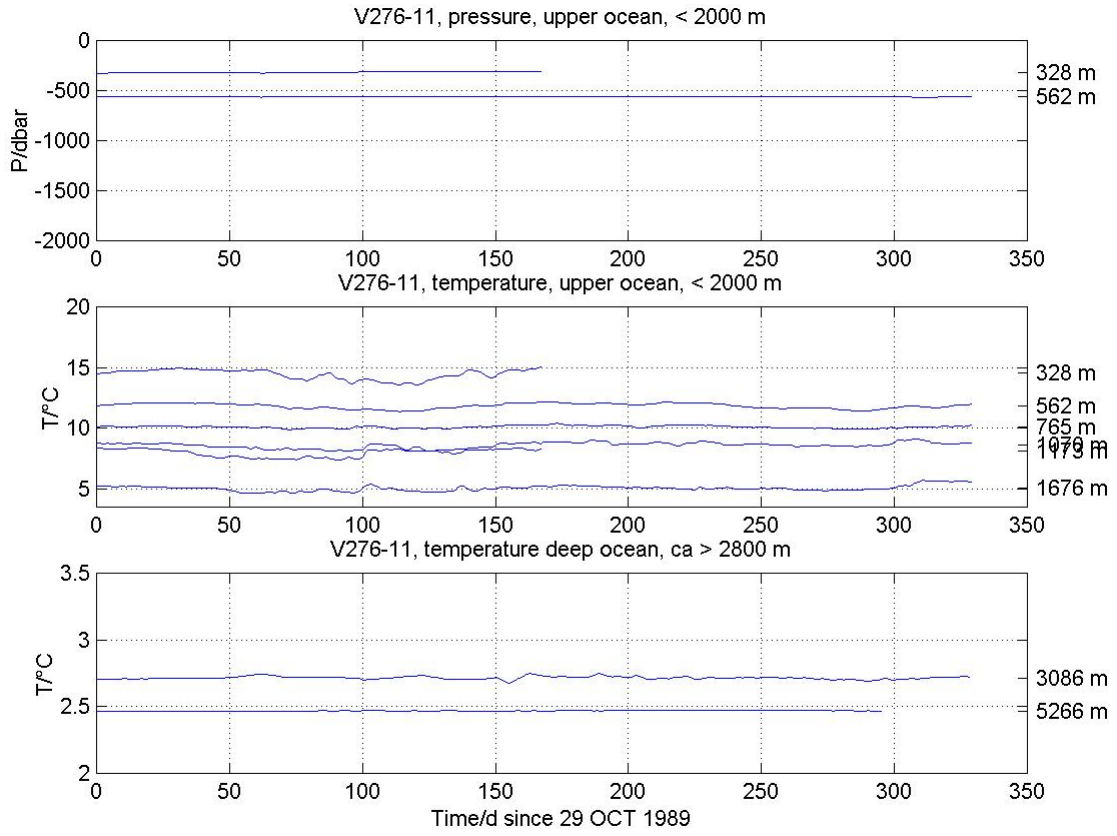
Compiled by: T.J. Mueller Date: 13-FEB-2011

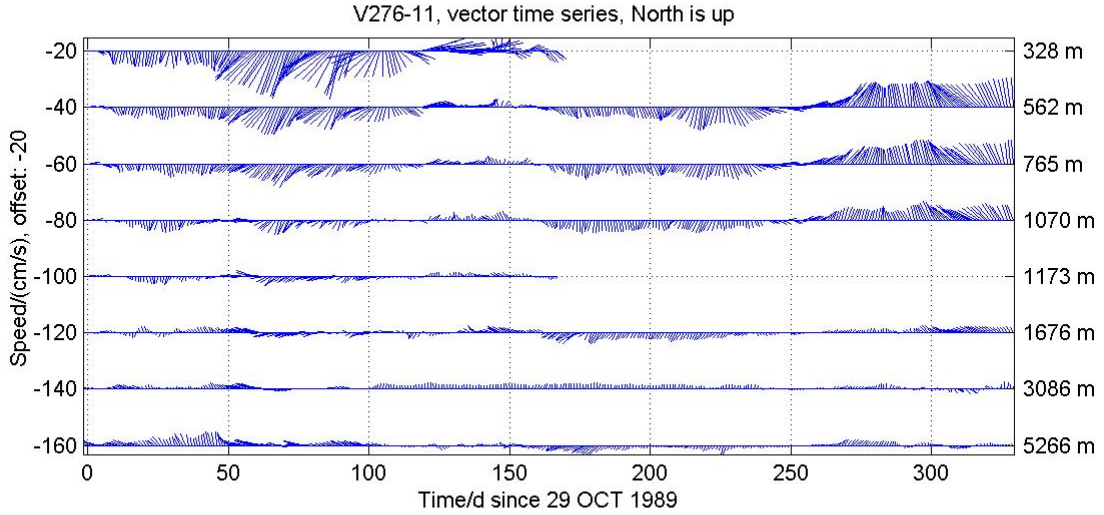


***V276-11**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
394	2761101	RCM8	09726	7200 s		e-board S/N 1107, DSU S/N 2215; short record, stops 16-APR-1990, due to data overflow in early DSU's
					REF	232
					T_LR	ok
					PRES	ok, initially 327 dbar, median 314 dbar
					DIR	ok
					SPD	ok
627	2761102	RCM4	07330	7200 s	REF	ok, 235
					T_LR	ok
					COND	ok
					PRES	ok, initially 554 dbar, median 544 dbar
					DIR	ok
					SPD	ok, 8 rev/count
with rev=8 revolutions/count						
830	2761103	RCM4	06051	7200 s	REF	ok, 381
					T_LR	ok
					DIR	ok
					SPD	ok, 8 rev/count
832	2761104	TK50	006	7200 s	no data	
						recorder with 11 thermistors equally distributed 50 m downwards
1135	2761105	RCM5	07924	7200 s	REF	646
					T_LR	
					COND	ok, SAL too low, 0-77 mS/cm
					DIR	ok
					SPD	8 rev/count
1238	2761106	RCM8	09727	7200 s	stop 22-APR-1990, low voltage on main battery	
					REF	700
					T_LR	ok
					COND	ok, SAL too low
					DIR	ok
					SPD	ok
1741	2761107	RCM5	07925	7200 s	REF	285
					T_LR	ok
					DIR	ok
					SPD	ok, 4 rev/count
3126	2761108	RCM5	06160	7200 s	stop 02-FEB-1990	
					REF	160
					T_AR	ok
					DIR	ok
					SPD	ok, 4 rev/count
5267	2761109	RCM8	09728	7200 s	REF	470, jump to REF=512 at record ca. 2250
					T_AR	ok until record ca. 3500, 30-AUG-1990
					DIR	ok
					SPD	ok





V276-11: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-11: statistics from low pass filtered daily averages

v27611

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
328	168	4.7	178	0.54	0.1	-4.7	14.4	17	19	19	26	58	-0.4	-0.0
					7.2	5.0	0.4							
562	330	0.5	162	0.08	0.2	-0.5	11.8	18	31	24	2	12	-0.0	-0.4
					4.3	5.1	0.2							
765	330	0.6	209	0.12	-0.3	-0.5	10.1	18	31	19	0	2	0.0	-0.1
					3.2	3.9	0.1							
1070	330	0.9	251	0.28	-0.8	-0.3	8.6	16	27	22	-1	-19	0.0	0.0
					2.1	2.9	0.2							
1173	168	1.2	250	0.66	-1.2	-0.4	8.0	14	9	18	0	85	0.4	0.1
					1.6	1.1	0.3							
1676	330	1.6	268	0.70	-1.6	-0.1	5.0	16	19	15	-0	-74	-0.0	0.0
					1.6	1.4	0.2							
3086	330	1.0	333	0.65	-0.5	0.9	NaN	27	16	NaN	0	90	NaN	NaN
					1.3	0.8	NaN							
5266	330	1.3	282	0.60	-1.2	0.3	NaN	17	28	NaN	-0	-83	NaN	NaN
					1.8	1.4	NaN							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-12

25-SEP-1990 - 27-JAN-1992

Mooring information
****
General

```
Mooring ID   : V276-12/ KPO 685
Deployed     : Date: 25-SEP-1990    Ship / Cruise: Meteor M14/1
Recovered    : Date: 27-JAN-1992     Ship / Cruise: Poseidon P189/1
Latitude N   :   33.149
Longitude E  : -021.888
Water depth  : 5335 m (HS corrected, during recovery 5250+55=5305 m)
Magn. Anom.  : -11 (bridge)
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

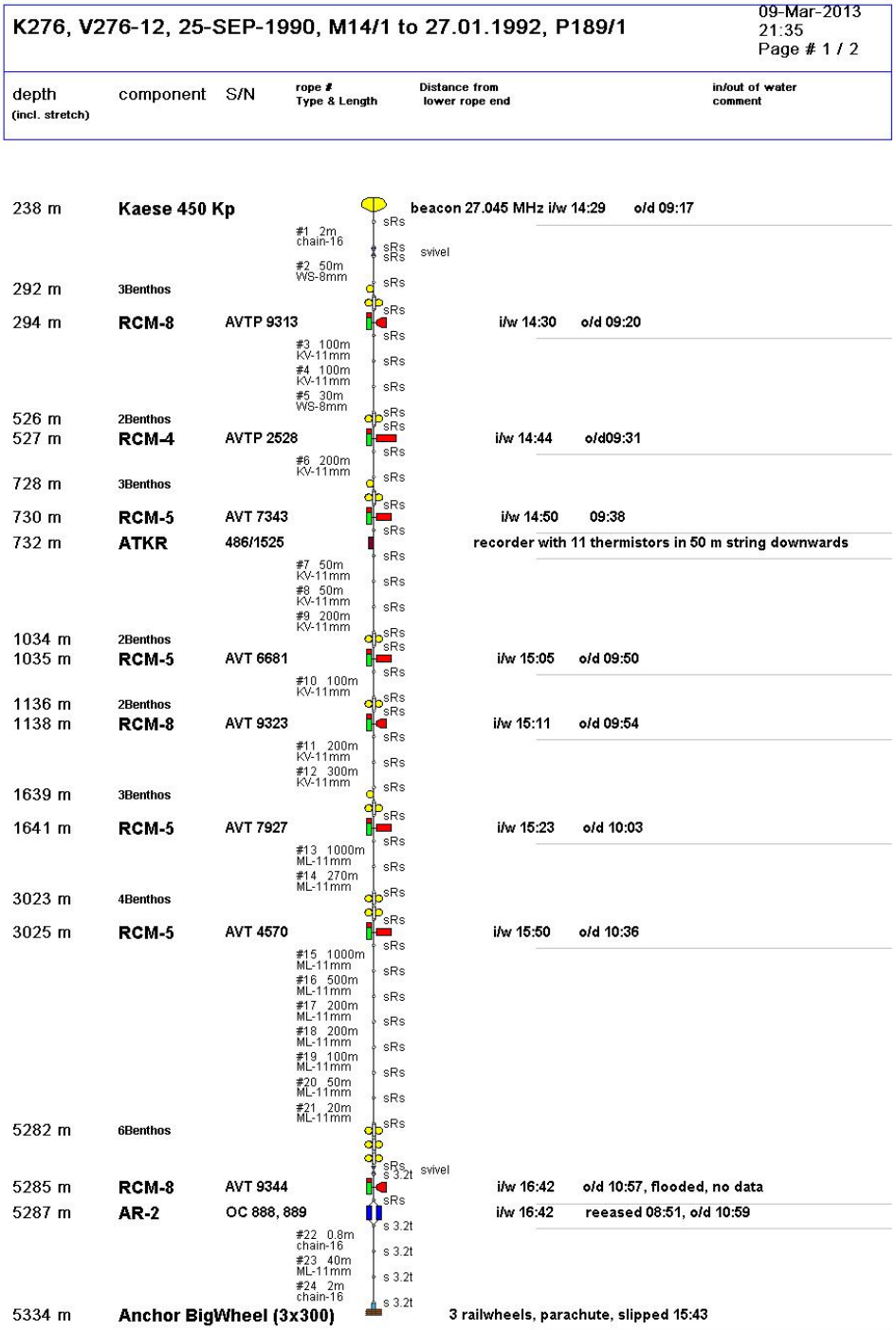
1) Mooring
All mooring components and all instrument depths nominal as from logs and static model.

2) Data
Raw data available.
Raw data copied from V27612*.raw => RCMiiiii.raw; Reference checked against nominal reference.
RCMiiiii.raw edited to RCMiiiii.edt, then processed with CALAAN.M to get pre1_ph3/RCMiiiii.dat.

Result checked for rotor calibration with CECK_ROTOR_CAL.M; ok within error bounds, i.e. all standard deviations of band pass filtered (around M2) SPD are within 15% limits averaged standard deviation. Systematic decrease with depth probably due to other variability around M2 which could not be filtered out due to too coarse resolution in time.

RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processed and at sampling rate in V27612_iii.dat.

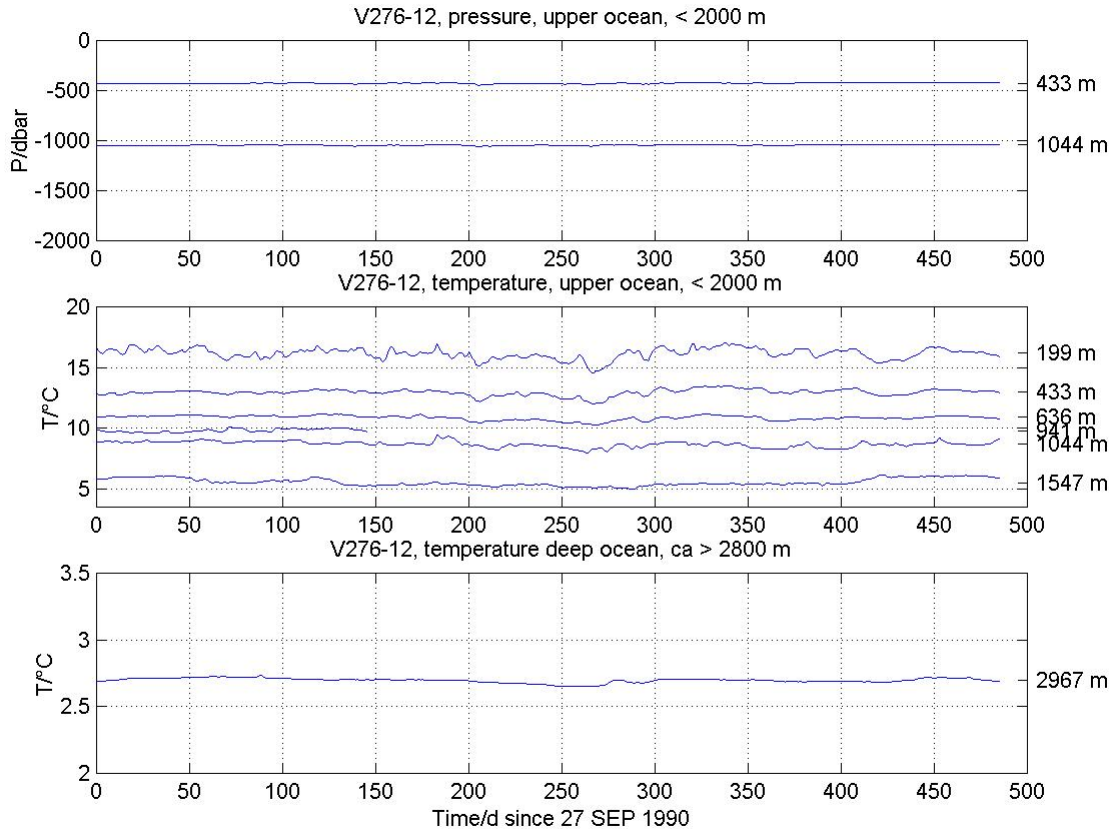
Compiled by: T.J. Mueller Date: 25-MAR-2012

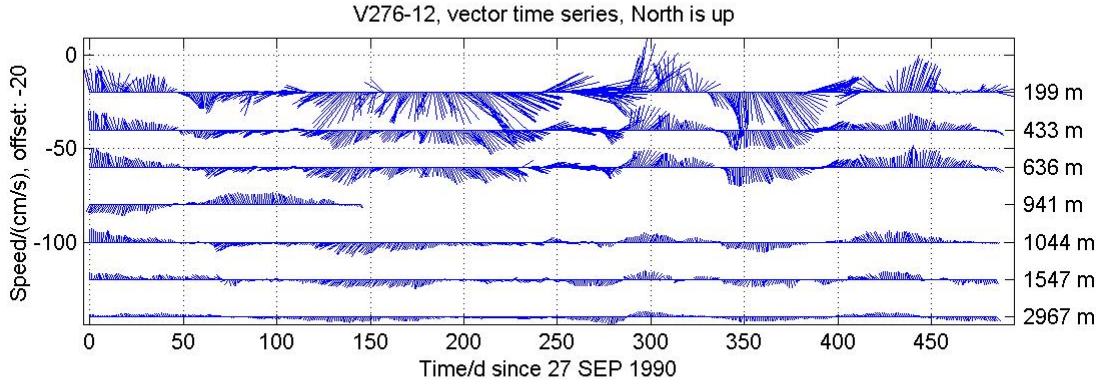


***V276-12**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
294	2761201	RCM8	09313	7200 s		clock 2 h ahead; clock corrected
					REF	ok, 452
					T_LR	ok
					C_WR	ok, offset in SAL
					PRES	constant N=1023 reading, not converted
					DIR	ok
					SPD	ok
527	2761202	RCM4	02528	7200 s	REF	ok, 370
					T_LR	ok
					PRES	ok, initially 455 dbar
					DIR	ok
					SPD	ok
730	2761203	RCM4	07343	7200 s	REF	ok, 292 (except first few records)
					T_LR	ok
					COND	ok, nonlinear drift in SAL
					DIR	ok
					SPD	ok, 8 rev/count
732	2761204	TK50	01525	7200 s	bad data, not processed;	
1035	2761205	RCM5	06681	7200 s	Short record; tape stopped after 1785 records and restarted by shock at release of mooring; confirmed by launch & release records, and pronounced peak in spectrum of SPD at M2 tide. => processed data stored for further use.	
					REF	ok, with errors
					T_LR	ok
					C_HR	ok, but offset in SAL
					DIR	ok
					SPD	ok
1138	2761206	RCM8	09323	7200 s	Date set too late by 304 d, corrected	
					REF	ok, 839
					T_LR	ok
					COND	ok
					PRES	ok, initially 107, median 1062 dbar
					DIR	ok
					SPD	ok
1641	2761207	RCM5	07927	7200 s	REF	ok
					T_LR	ok
					DIR	ok
					SPD	ok, 4 rev/count
3025	2761208	RCM5	04570	7200 s	REF	bad, nominally 545
					T_LR	ok, not stored
					T_AR	ok
					DIR	ok
					SPD	ok, 4 rev/count
5287	2761209	RCM8	09344	7200 s	flooded, bottom cap lost, no data	





V276-12: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-12: statistics from low pass filtered daily averages

v27612

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
199	486	4.5	117	0.31	4.0	-2.0	16.1	32	18	13	-6	-63	-1.8	0.3
					11.1	10.7	0.4							
433	486	1.9	119	0.25	1.6	-0.9	12.9	37	20	20	-1	-80	-0.7	0.1
					5.8	5.5	0.3							
636	486	1.3	102	0.20	1.2	-0.3	10.9	39	22	30	2	22	-0.7	0.1
					4.6	5.0	0.2							
941	146	1.2	335	0.33	-0.5	1.1	9.8	10	23	16	0	2	-0.0	0.3
					1.5	3.7	0.1							
1044	486	0.6	252	0.20	-0.6	-0.2	8.7	35	24	32	2	24	-0.3	0.1
					2.3	2.8	0.2							
1547	486	0.7	235	0.29	-0.6	-0.4	5.5	18	18	43	0	4	-0.1	0.3
					1.6	2.2	0.3							
2967	486	0.2	167	0.13	0.1	-0.2	2.8	23	18	34	-0	-39	-0.0	0.0
					1.3	1.4	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-13

28-JAN-1992 - 11-JUL-1993

Mooring information
****

General

```
Mooring ID   : V276-13/KPO 719
Deployed     : Date: 28-JAN-1992    Ship / Cruise: Poseidon P189/1
Recovered    : Date: 11-JUL-1993    Ship / Cruise: Poseidon, P200/8
Latitude N   :   32.922
Longitude E  : -022.136
Water depth  : 5279 m (corrected)
Magn. Anom.  : -10.6 (bridge & MK4 files)
Project      : KIEL276 time series station
PI           : T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring

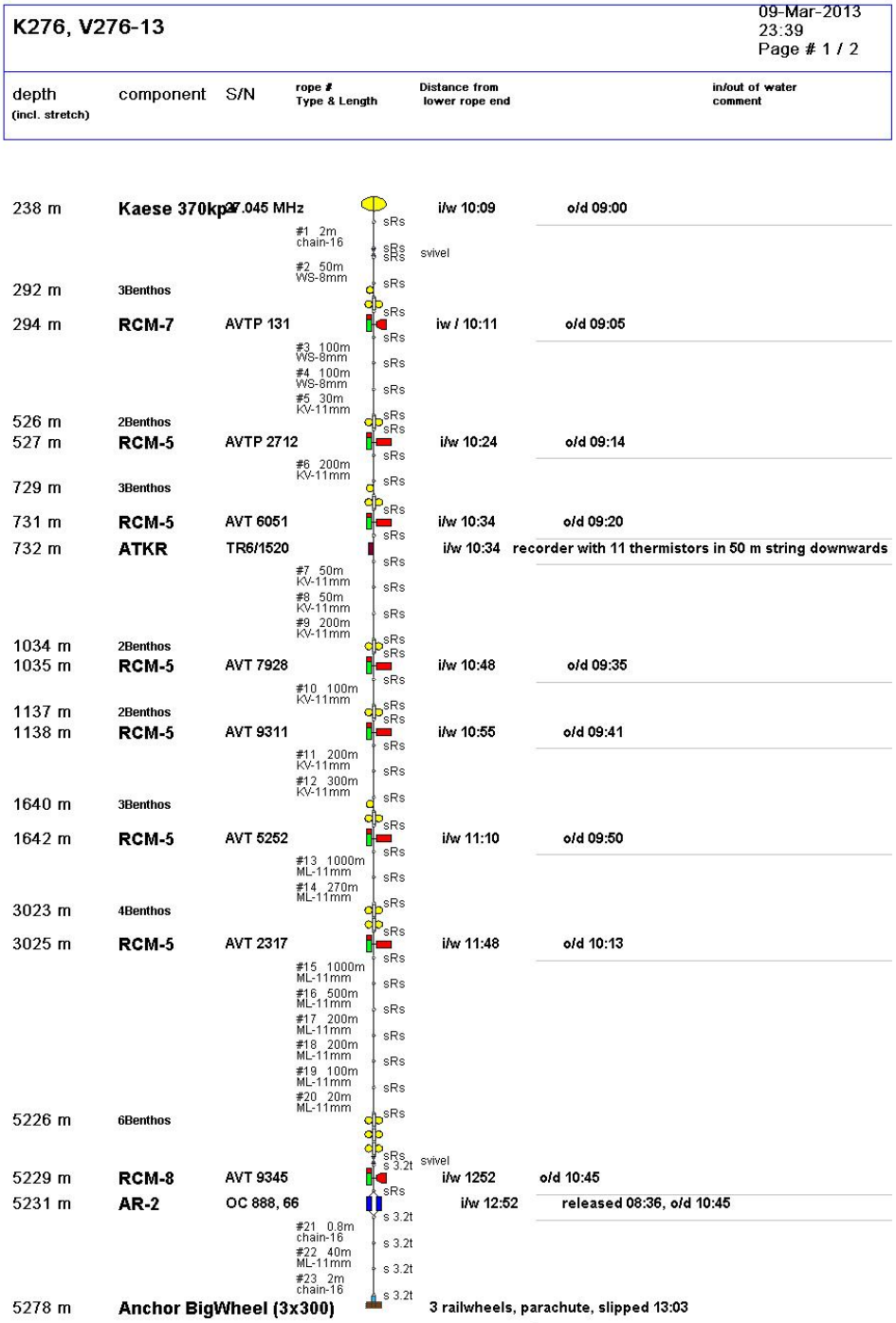
All mooring components as from logs and all depths nominal as from logs and static model.

2) Data

Raw data lost. Processed data sources (without TC 50 m data) are MK4 ASCII files with low pass filtered daily averages at pre1-processing level.

RCM data pre1-level and at pre2-level processed and at low pass filtered daily averages in V27613_iii.dat.

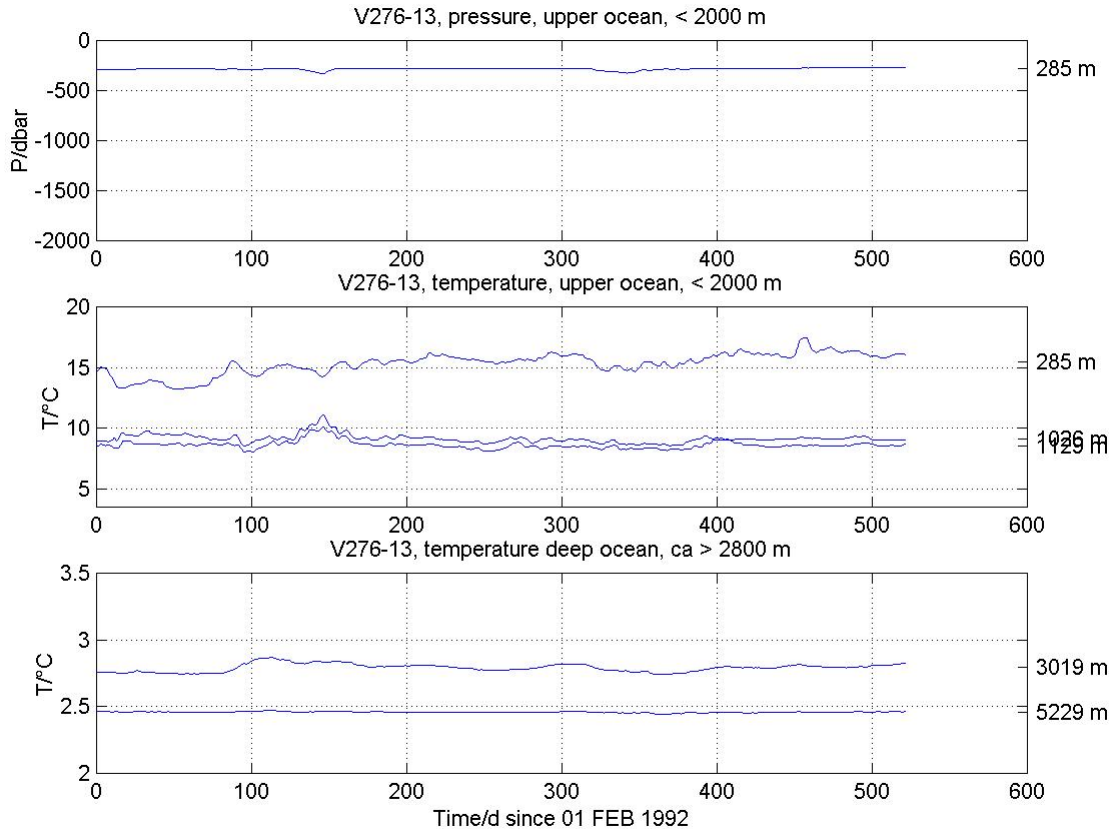
Compiled by: T.J. Mueller Date: 25-MAR-2012

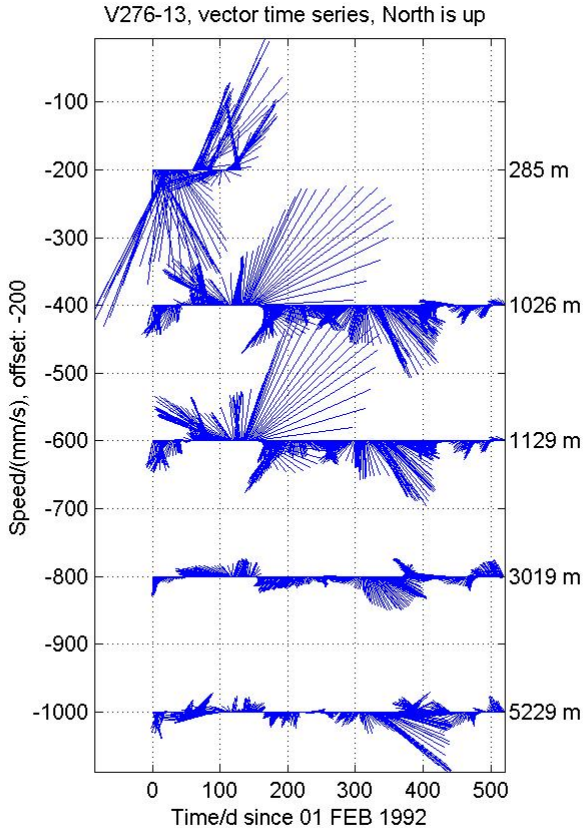


***V276-13**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4).*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
294	2761301	RCM7	00131	7200 s	REF	
					T_LR	ok
					COND	ok
					PRES	ok, starts with 282 dbar, after first event 270 dbar after second event 265 dbar
					DIR	ok
					SPD	ok until first current event, 16-JUN-1992
527	2761302	RCM5	02712	7200 s	no MK4 data	
731	2761303	RCM5	06051	7200 s	no MK4 data	
732	2761304	TK50	6 & 1520	7200 s		stop 13-MAR-1993; thermistors no. 7 & 8 ok until then
1035	2761305	RCM5	07928	7200 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok, 8 rev/count
1138	2761306	RCM8	09311	7200 s	REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
1642	2761307	RCM5	05252	7200 s	flooded, no data	
3025	2761308	RCM5	02317	7200 s	REF	
					T_AR	ok
					DIR	ok
					SPD	ok, 4 rev/count
5229	2761309	RCM8	09345	7200 s	REF	
					T_AR	ok
					DIR	ok
					SPD	ok, 4 rev/count





V276-13: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4).*

Mooring V276-13: statistics from low pass filtered daily averages

v27613

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
285	131	1.9	115	0.17	1.7	-0.8	14.2	6	17	16	29	17	0.5	2.2
					5.6	10.9	0.7							
1026	522	1.3	174	0.26	0.1	-1.3	9.1	16	31	27	2	24	0.4	0.9
					4.2	4.6	0.4							
1129	522	1.0	171	0.22	0.2	-1.0	8.6	16	26	17	1	26	0.5	0.8
					4.1	4.4	0.3							
3019	522	0.9	247	0.35	-0.8	-0.4	2.8	19	20	26	-2	-64	-0.0	0.0
					2.3	1.7	0.0							
5229	522	0.5	166	0.19	0.1	-0.5	2.5	21	16	27	-2	-75	-0.0	0.0
					3.4	1.8	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-14

11-JUL-1993 - 17-SEP-1994

Mooring information
****
General

```
Mooring ID   : V276-14/KPO 739
Deployed     : Date: 11-JUL-1993     Ship / Cruise: Poseidon, P200/8
Recovered    : Date: 17-SEP-1994     Ship / Cruise: Poseidon, P202
Latitude N   :   32.994
Longitude E  : -022.002
Water depth  : 5282 m (corrected)
Magn. Anom.  : -11.7 (bridge & MK4 files)
Project      : KIEL276 time series station
PI           : J.J. Waniek & T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

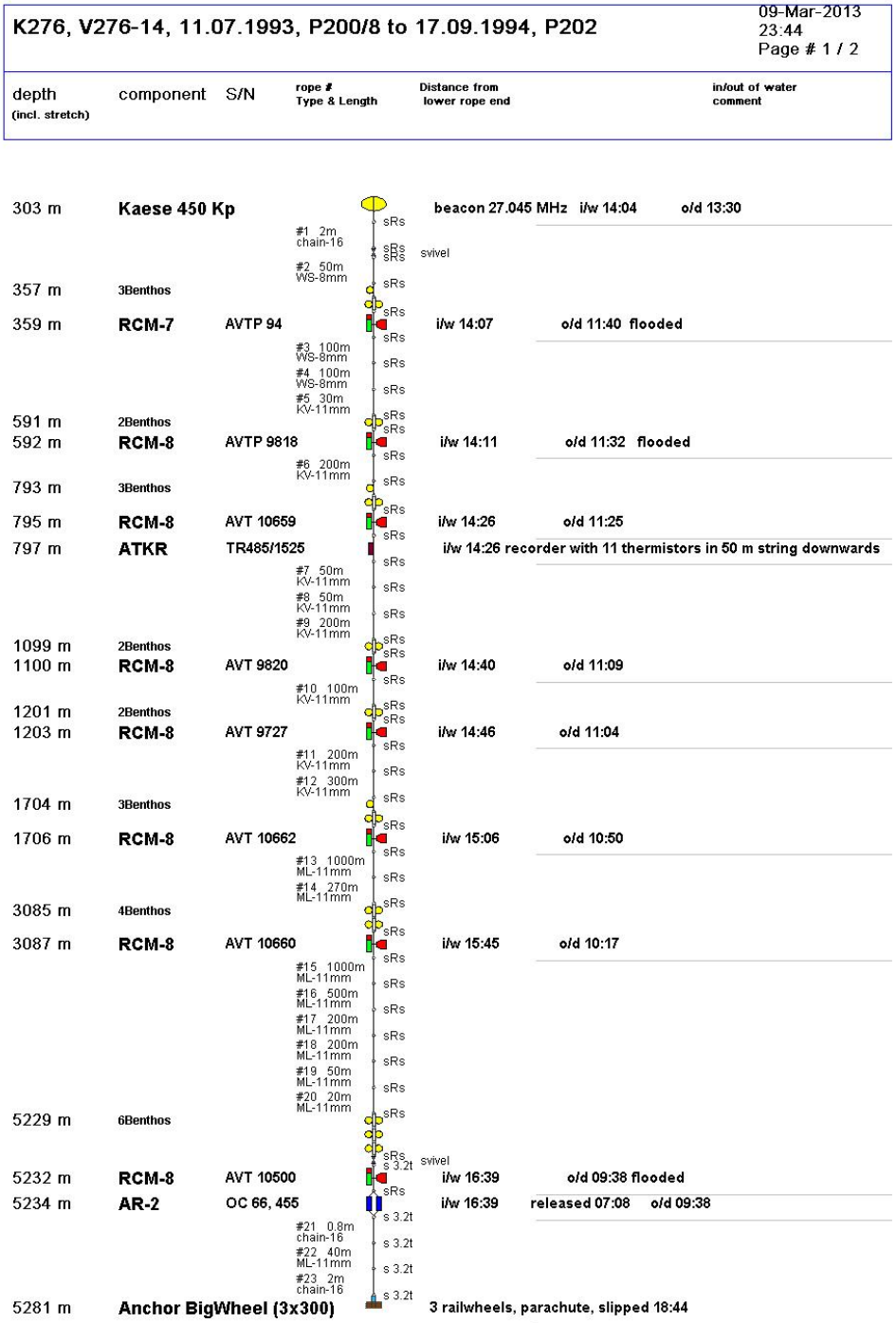
1) Mooring
On recovery, the top buoy turned out to be squeezed; it had no buoyancy at all, but weight in the mooring line as it did not surface on its own. The reason probably was a strong current event in the Mediterranean water level, a 'super MEDDY' which forced the top buoy to much larger depth than its rating (400 dbar), damaged it and then forced the mooring's top down to the bottom due to lack of buoyancy. As the two top instruments had pressure sensors which were rated to 2000 dbar only, these two instruments were flooded. The deepest instrument (5200 m designed) was flooded, now known due to bad bottom caps in early RCM8s. Only the 3000 m designed instrument was not affected.

All mooring components and all instrument depths nominal as from logs and from static model until loss of top buoyancy.

2) Data
Raw data lost. Processed data sources are MK4 ASCII files with low pass filtered daily averages at pe1-processing level in V27614_iii.dat. After the event, the instruments from deeper than 700 m were turned top down and gave no reasonable current data although they were 6000 dbar depth rated; the MK4 data processing cut these data. Only the instrument at 3000 m designed depth with almost full record.

RCM data pre1-level and at pre2-level processed and at low pass filtered daily averages in V27613_iii.dat.

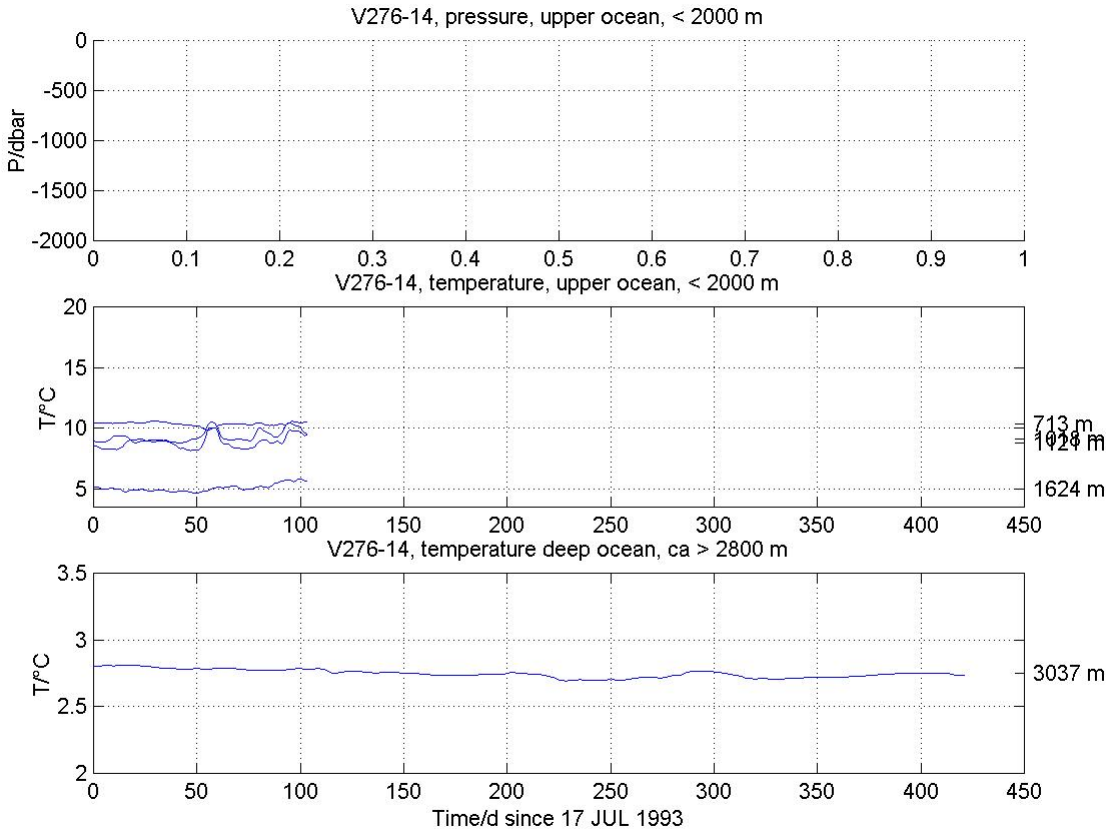
Compiled by: T.J. Mueller Date: 26-MAR-2012

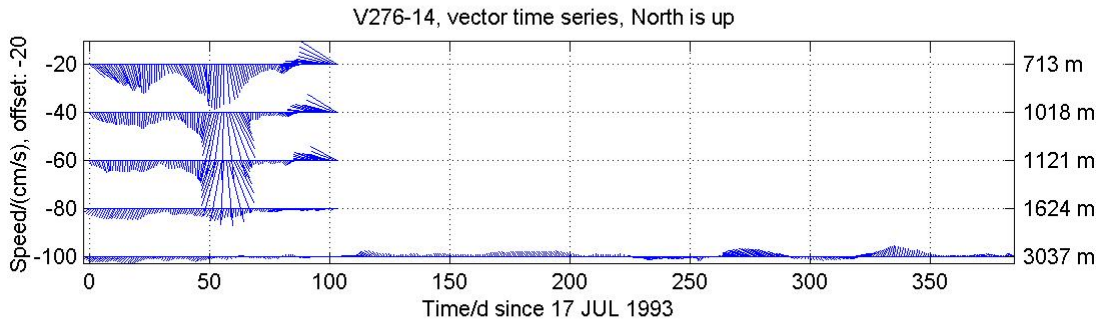


***V276-14**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
324	2761401	RCM8	00094	7200 s		flooded, no data
592	2761402	RCM8	09818	7200 s		flooded, no data
795	2761403	RCM8	10659	7200 s		data (daily averaged) as MK4 until 29-OCT-1993
					REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
797	2761404	TK50	1525	7200 s		recorder with 11 thermistors equally distributed 50 m downwards
						data (daily averaged) as MK4 until 29-OCT-1993; 8 out of 11 thermistors.
1100	2761405	RCM8	09820	7200 s		data (daily averaged) as MK4 until 29-OCT-1993
					REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
1203	2761406	RCM8	09727	7200 s		data (daily averaged) as MK4 until 29-OCT-1993
					REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
1706	2761407	RCM8	10662	7200 s		data (daily averaged) as MK4 until 29-OCT-1993
					REF	
					T_LR	ok
					COND	ok
					DIR	ok
					SPD	ok
3087	2761408	RCM8	10660	7200 s	REF	
					T_AR	ok
					DIR	ok until 05-AUG-1994
					SPD	ok until 05-AUG-1994
5232	2761409	RCM8	10500	7200 s		flooded, no data





V276-14: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-14: statistics from low pass filtered daily averages

v27614

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
713	104	6.7	184	0.71	-0.5	-6.7	10.3	12	10	8	-19	-45	-0.0	0.5
					5.6	5.6	0.2							
1018	104	5.5	193	0.74	-1.3	-5.3	9.3	8	9	7	-13	-20	-0.8	-0.6
					4.1	7.0	0.5							
1121	104	4.7	195	0.75	-1.2	-4.6	8.8	7	8	6	-9	-16	-0.4	-0.7
					3.5	6.5	0.5							
1624	104	2.9	214	0.93	-1.6	-2.4	5.1	7	11	14	-0	-5	-0.1	0.3
					1.0	1.4	0.3							
3037	386	0.8	292	0.35	-0.7	0.3	2.7	14	14	54	-1	-75	-0.0	-0.0
					2.1	1.4	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-15

18-Sep-1994 - 14-Oct-1995

Mooring information
****
General

```
Mooring ID   : V276-15/KPO 757
Deployed     : Date: 18-Sep-1994     Ship / Cruise: POSEIDON 202
Recovered    : Date: 14-Oct-1995     Ship / Cruise: POSEIDON 212/4
Latitude N   :   32.957
Longitude E  : -022.022
Water depth  : 5277 (corrected)
Magn. Anom.  : -10.5° (bridge)
Project      : KIEL276 time series
PI           : J.J. Waniek & T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring
All mooring components and all instrument depths nominal as from logs and static model.

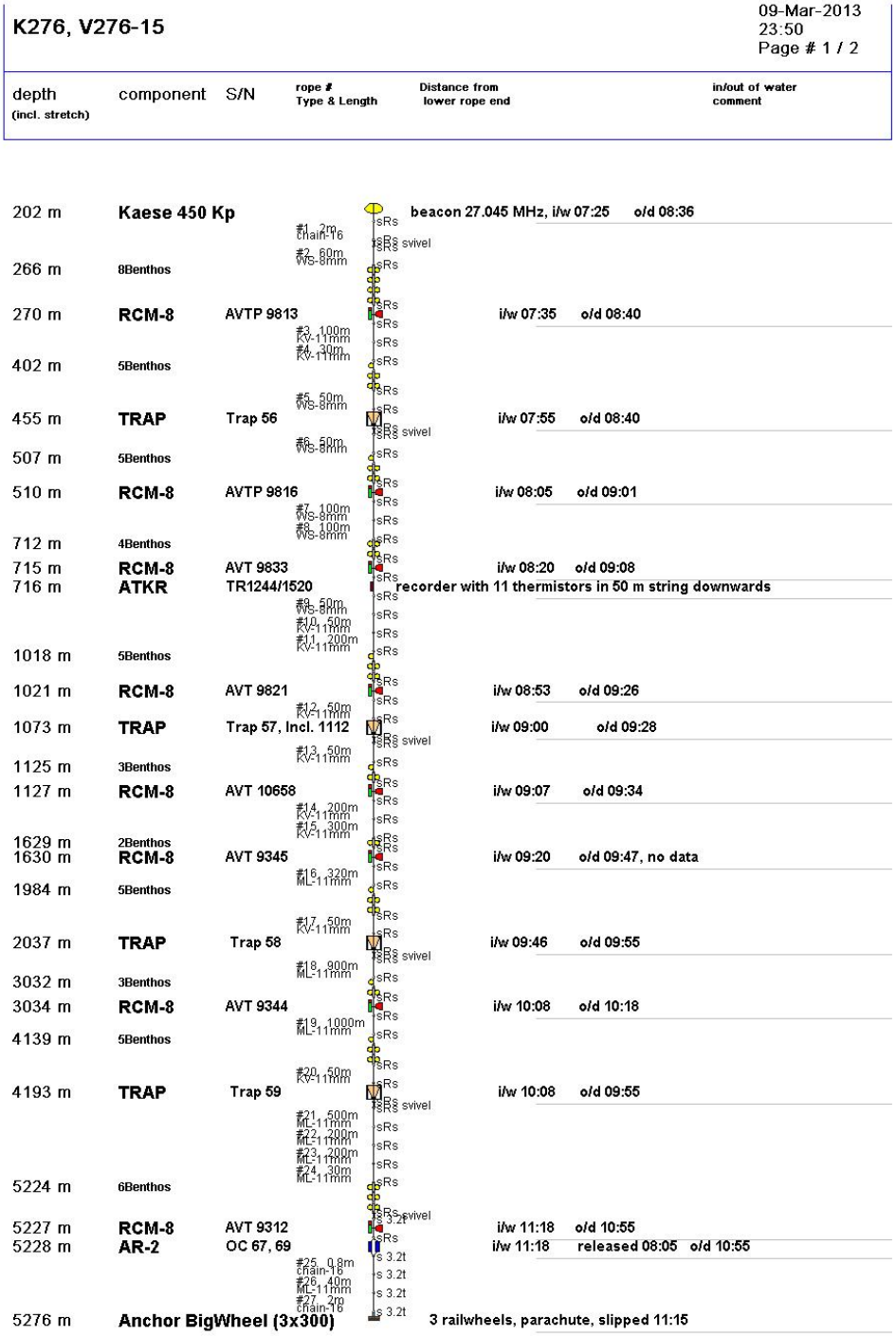
2) RCM data
All current meters are Aanderaa RCM7/8.
All records at 7200 s sampling interval.
All RCM logs: stop is noted with wrong date (16.10.1995); correct stop date is 15.10.1995

- Processed data available (J. Reppin) in specially formatted files (RCM) at sampling interval; there, non-existing pressure and conductivity data are at offset value or zero.

- Re-processing by TJM
V27615i.raw copied to RCMiiiii.raw checking reference where IIIII is the instrument's S/N.
RCMiiiii.raw edited with launch/recovery comments => RCMiiiii.edt.
RCMiiiii.edt processed with CALAAN.M => RCMiiiii.dat; see RCMiiiii.log for details.
Check rotor cal is ok, mean standard deviation 0.5 cm/s +/- 0.02 cm/s
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processd and at sampling rate in V27615_iii.dat.

3) TRAP data at IOW

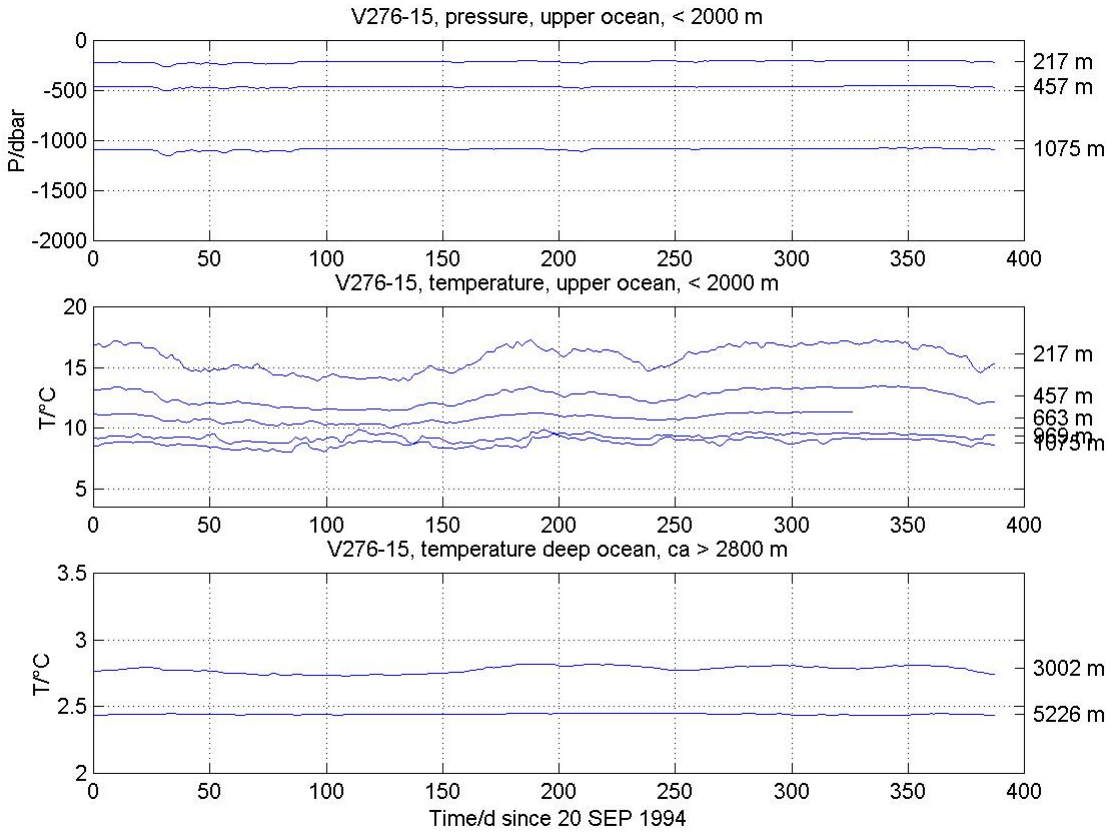
Compiled by: T.J. Mueller, IFMK Date: 24-JUN-2012

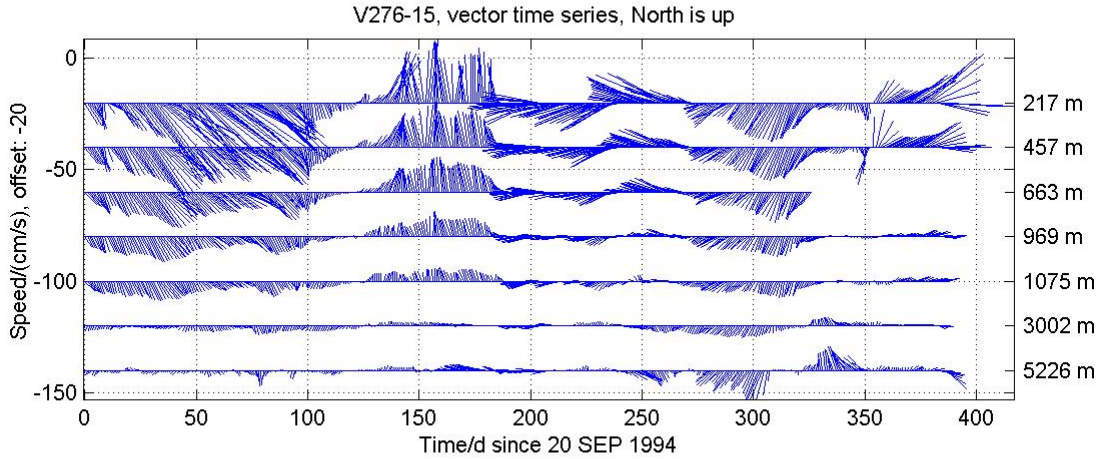


***V276-15**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sensors	Remarks
270	2761501	RCM8	09813	REF	ok, 318
				T_LR	ok
				C_HR	ok; S with offset
				PRES	ok, initially 190 dbar, median 180 dbar
				DIR	ok
				SPD	ok
455	2761502	TRAP	56		data at IOW
510	2761503	RCM8	09816	REF	ok, 303
				T_LR	ok
				COND	ok, S ok; maybe offset
				PRES	ok, initially 435 dbar, median 434 dbar
				DIR	ok
				SPD	ok
715	2761504	RCM8	09833	short record: 329 d (26430 words, nominally 30804); records bad & cut at the end; no time end mark; check M2 tide ok;	
				REF	ok, 452
				T_LR	ok
				COND	ok, S maybe offset; S interpolated
				DIR	ok
				SPD	ok
716	2761505	TK50	01294	raw data bad with large jumps and not processed; 50 m thermistor cable; no cal info;	
1021	2761506	RCM8	09821	REF	ok, 355
				T_LR	ok
				COND	S ok; maybe offset
				DIR	ok
				SPD	ok
1073	2761507	TRAP	57		with inclinometer, data at IOW
1127	2761508	RCM8	10658	T_LR	ok
				COND	ok, S maybe offset
				PRES	ok, initially 1042 dbar, median 1147 dbar
				DIR	ok
				SPD	ok
1630	2761509	RCM8	09345		no data (DSU bad)
2037	2761510	TRAP	58		data at IOW
3034	2761511	RCM8	09344	REF	ok, 235
				T_LR	ok, low resolution; not stored
				T_AR	ok
				DIR	ok
				SPD	ok
4193	2761512	TRAP	59		data at IOW
5227	2761513	RCM8	09312	REF	ok, 239
				T_LR	ok
				T_AR	ok
				DIR	ok
				SPD	ok





V276-15: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-15: statistics from low pass filtered daily averages

v27615

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
217	388	3.3	170	0.18	0.5	-3.2	15.8	44	27	33	-61	-60	-6.1	-0.1
					15.5	13.1	1.1							
457	388	2.5	192	0.19	-0.5	-2.4	12.6	45	27	36	-28	-55	-2.6	-0.3
					10.6	9.6	0.6							
663	327	2.8	213	0.26	-1.5	-2.3	10.8	52	30	31	-23	-52	-1.4	-0.3
					8.2	7.4	0.4							
969	388	1.9	214	0.29	-1.0	-1.5	9.3	41	28	15	-5	-54	-0.5	-0.2
					4.9	4.5	0.3							
1075	388	1.8	204	0.39	-0.7	-1.6	8.8	39	27	33	-2	-52	-0.6	-0.1
					3.4	3.3	0.3							
3002	388	1.1	229	0.43	-0.9	-0.7	2.8	14	19	37	0	83	-0.0	0.0
					2.0	1.8	0.0							
5226	388	1.2	243	0.33	-1.1	-0.5	2.4	12	13	25	-1	-58	-0.0	-0.0
					3.5	3.3	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-16

15-Oct-1995- 24-Jun-1996

Mooring information
****
General

```
Mooring ID   : V276_16/KPO 775
Deployed     : Date: 15-Oct-1995     Ship / Cruise: POSEIDON 212/4
Recovered    : Date: 24-Jun-1996     Ship / Cruise: METEOR 36/2
Latitude N   :   33.002
Longitude E  : -021.964
Water depth  : 5274 (corrected)
Magn. Anom.  : -10.3
Project      : KIEL276 time series
PI           : J.J. Waniek & T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

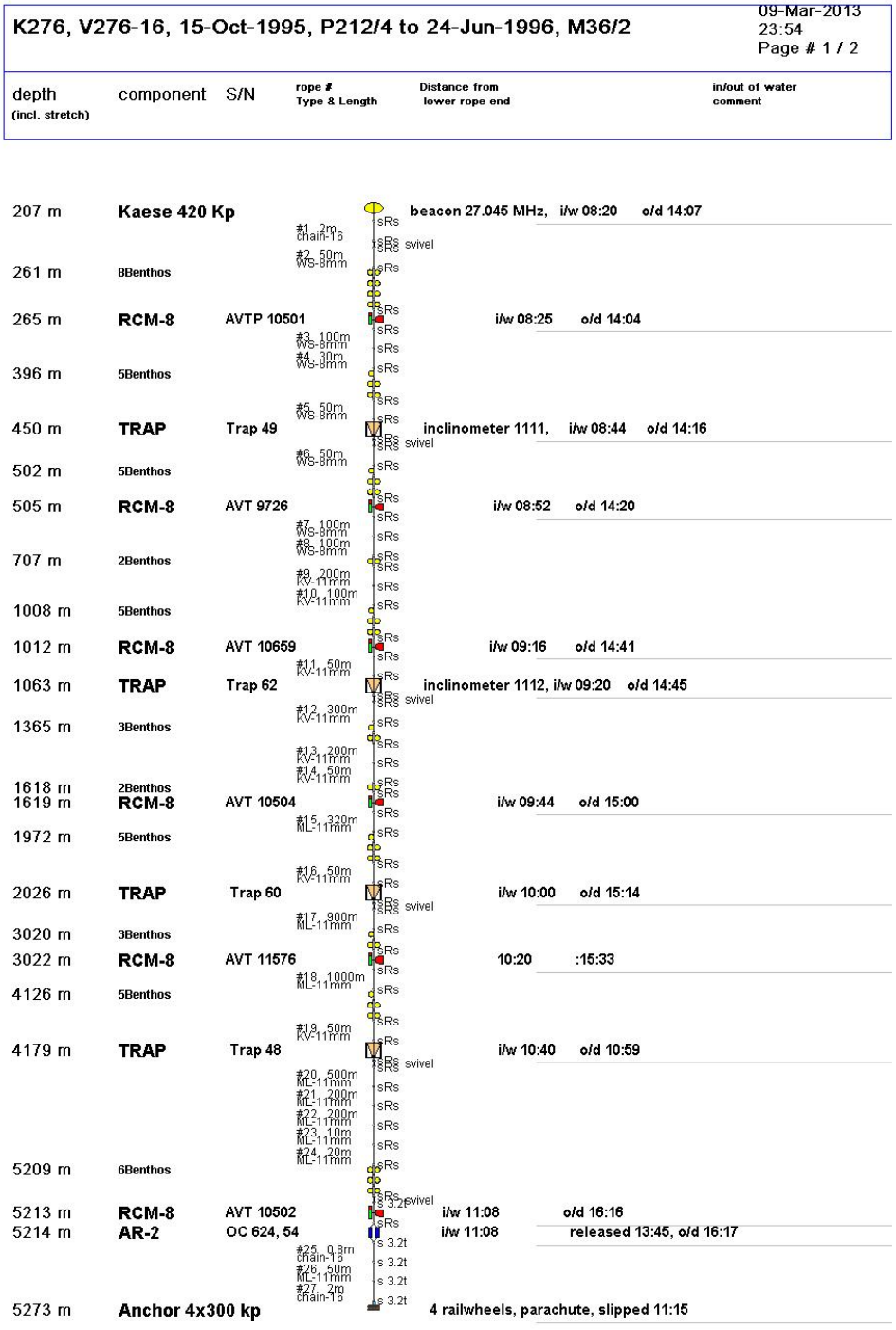
1) Mooring
All mooring components according to log of launch; top buoyancy with nominal 450 kp assumed 30 kp less for design, namely 420 kp.
All instrument depths nominal as from static model.

2) RCM data
All current meters are Aanderaa RCM7/8.
All records at 7200 s sampling interval.
- Processed data available (J. Reppin) in specially formatted files (RCM) at sampling interval; there, non-existing pressure and conductivity data are at offset value or zero.

- Re-processing by TJM
RCMiiiii copied to RCMiiiii.raw checking reference where IIIII is the instrument's S/N.
RCMiiiii.raw edited with launch/recovery comments => RCMiiiii.edt.
RCMiiiii.edt processed with CALAAN.M => RCMiiiii.dat; see RCMiiiii.log for details.
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processed and at sampling rate in V27616_iii.dat.

3) TRAP data:
info at IOW.

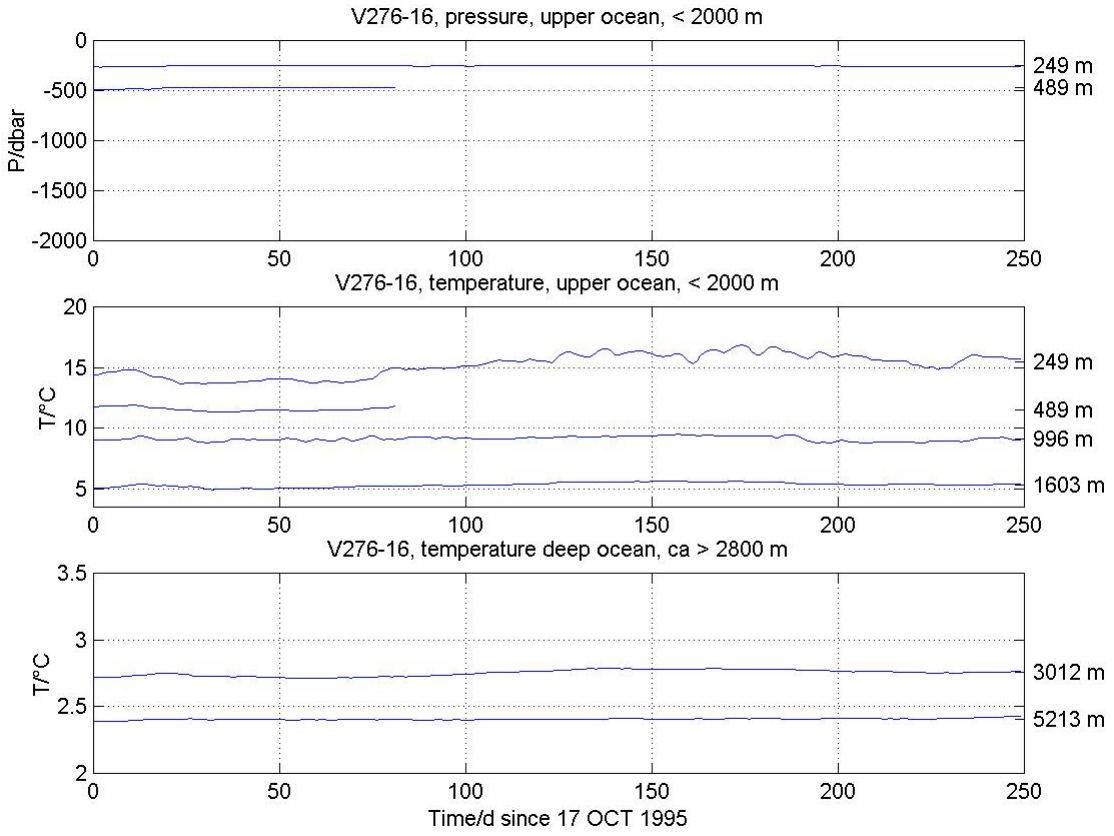
Compiled by: T.J. Mueller, IFMK Date: 17-Oct-2003

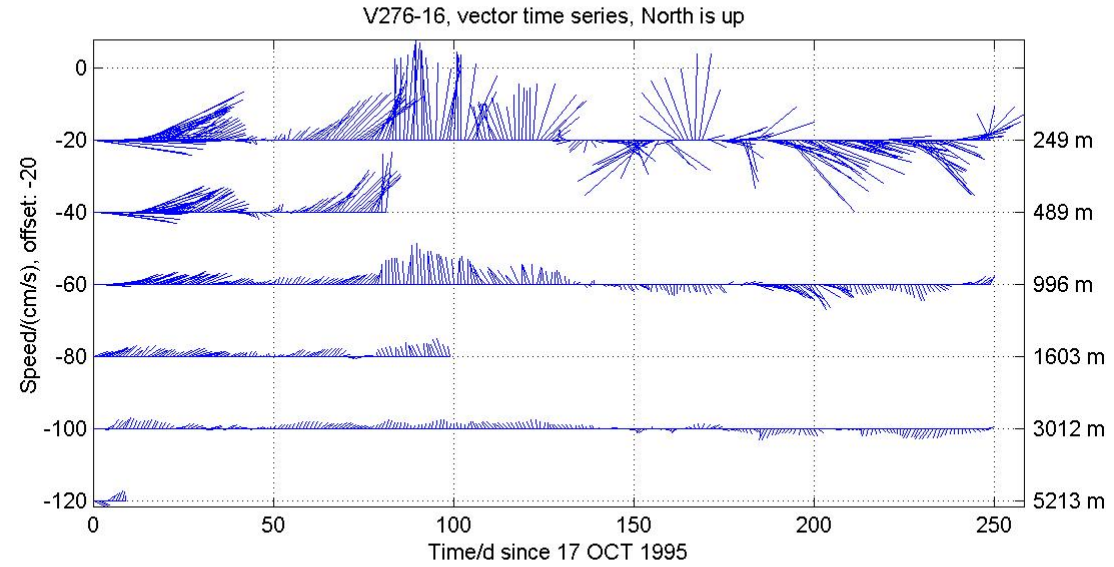


***V276-16**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sensors	Remarks
265	2761601	RCM8	10501	T_LR	ok,
				PRES	initially 295 dbar, median 277 dbar
				DIR	ok
				SPD	ok, spectrum at inert. period ok, at M2 tide much less pronounced than usual
450	2761602	TRAP	49		inclinometer 1111, data at IOW
505	2761603	RCM8	09726	record only until 08-JAN-1996, then stop; record restart on day of recovery; clock ok	
				REF	ok, 323
				T_LR	ok
				PRES	ok, linar range calibration, intially 490 dbar, median 471 dbar
				DIR	ok
				SPD	ok
1012	2761604	RCM8	10659	REF	ok, 312
				T_LR	ok
				COND	ok, SAL at starts nonlinearly
				DIR	ok
				SPD	ok
1063	2761605	TRAP	62		inclinometer 1112, data info at IOW
1619	2761606	RCM8	10504	REF	ok, 579
				T_LR	ok
				DIR	ok
				SPD	ok until record 1225 (day 91)
2026	2761607	TRAP	60		data info at IOW
3022	2761608	RCM8	11576	T_AR	ok
				DIR	ok
				SPD	ok
4179	2761609	TRAP	48		data info at IOW
5213	2761610	RCM8	10502	T_AR	ok
				DIR	ok
				SPD	rotor ok until record 123 (day 10); imploding glass buoyancy destroyed rotor counter





V276-16: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-16: statistics from low pass filtered daily averages

v27616

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
249	250	8.8	64	0.62	7.9	3.9	15.2	14	19	39	-22	-33	-1.3	-2.5
					8.9	9.9	0.9							
489	82	9.9	65	0.91	9.0	4.2	11.6	12	8	10	-1	-88	0.7	0.0
					6.0	4.5	0.2							
996	250	2.6	61	0.59	2.2	1.2	9.1	19	27	18	-3	-33	-0.2	0.1
					2.9	3.3	0.2							
1603	100	2.5	43	0.83	1.7	1.8	5.2	10	7	10	-0	-78	-0.1	0.1
					1.8	1.1	0.1							
3012	250	0.6	47	0.37	0.5	0.4	2.8	15	30	38	0	24	-0.0	-0.0
					1.1	1.4	0.0							
5213	10	2.0	62	0.73	1.7	0.9	2.4	3	3	2	-1	-28	-0.0	0.0
					1.1	1.7	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-17

28-FEB-1996 - 06-AUG-1997

Mooring information
****
General

```
Mooring ID   : V276_17/KPO 781
Deployed     : Date: 28-FEB-1996     Ship / Cruise: METEOR 36/2
Recovered    : Date: 06-AUG-1997     Ship / Cruise: POSEIDON 231
Latitude N   :   33.000
Longitude E  : -022.000
Water depth  : 5294 m (HYDROSWEEP+55 m)
Magn. Anom.  : -10
Project      : KIEL276 time series
PI           : J.J. Waniek & T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring
All mooring components according to log of launch; top buoyancy with nominal 450 kp assumed 30 kp less for design, namely 420 kp.

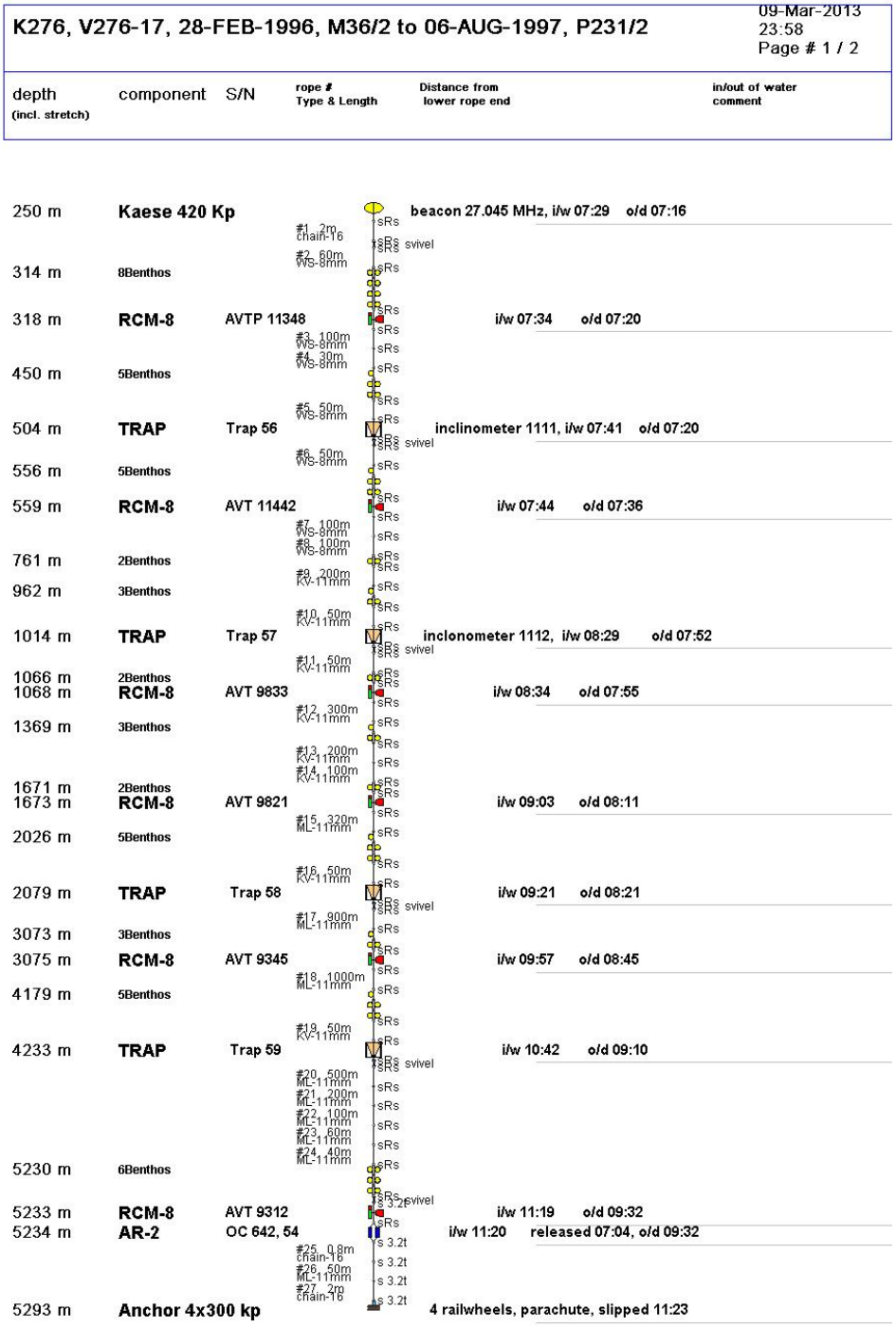
All instrument depths nominal as from logs and static model.

2) RCM data
Raw data available.
All current meters are Aanderaa RCM7/8.
All records at 7200 s sampling interval.
- Processed data available (J. Reppin) in specially formatted files (RCM) at sampling interval; there, non-existing pressure and conductivity data are at offset value or zero.

- Re-processing by TJM
RCMiiiii renamed to RCMiiiii.raw checking reference where IIIII is the instrument's S/N.
RCMiiiii.raw edited with launch/recovery comments => RCMiiiii.edt.
RCMiiiii.edt processed with CALAAN.M => RCMiiiii.dat; see RCMiiiii.log for details.
No stop times taken => just offset clock correction from start time & no correction for drift,
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processed and at sampling rate in V27617_iii.dat.

3) TRAP data
Info at IOW.

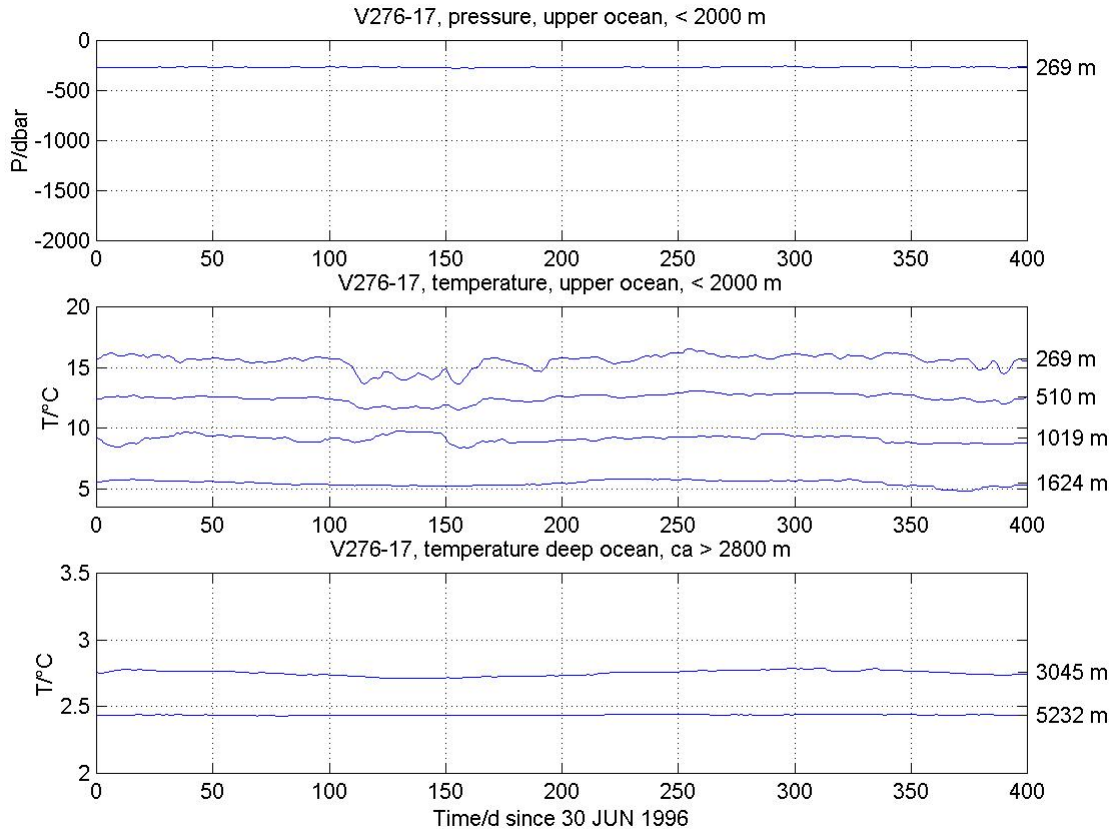
Compiled by: T.J. Mueller, IFMK Date: 17-Oct-2003; revised August 2013

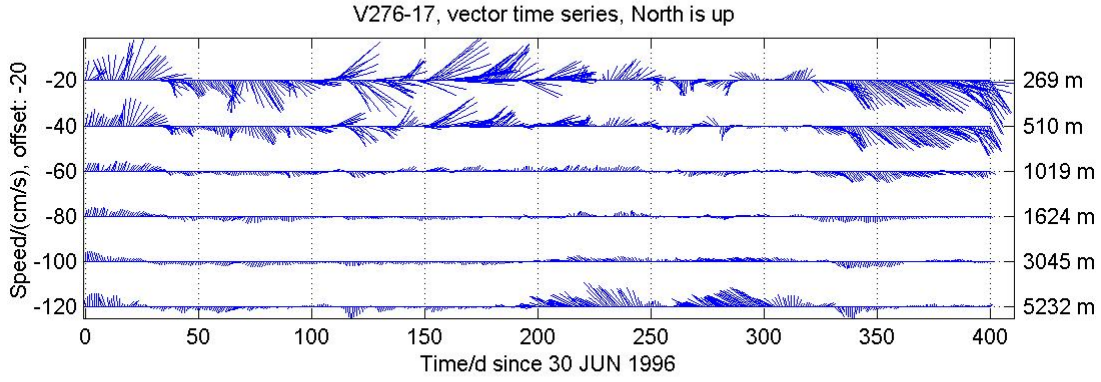


***V276-17**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sensors	Remarks
318	2761701	RCM8	11348	REF	ok, 398
				T_HR	ok
				PRES	ok, initially 238 dbar, median 233 dbar
				DIR	ok
				SPD	ok
504	2761702	TRAP	56		inclinometer 1111; data info at IOW
559	2761703	RCM8	11442	REF	ok, 251
				T_LR	ok
				COND	ok, S maybe offset
				PRES	sensor faied, data not stored
				DIR	ok
				SPD	ok
1014	2761704	TRAP	57		inclinometer 1112; data info at IOW
1068	2761705	RCM8	09833	REF	ok, 452
				T_LR	ok
				COND	ok, S maybe offset
				DIR	ok
				SPD	ok
1673	2761706	RCM8	09821	REF	ok, 355
				T_LR	ok
				C_HR	ok, S maybe offset
				DIR	ok
				SPD	ok
2079	2761707	TRAP	58		data info at IOW
3075	2761708	RCM8	09345	from deck log, time correction of -360 s estimated & applied	
				REF	ok, 952
				T_LR	ok, not stored
				T_AR	ok, overwrites T_LR
				DIR	ok
				SPD	ok
5233	2761709	RCM8	09312	REF	ok, 323 (corr., wrongly 239 in RCM log)
				T_LR	ok, not stored
				T_AR	ok, overwrites T_LR
				DIR	ok
				SPD	ok





V276-17: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-17: statistics from low pass filtered daily averages

v27617

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
269	401	9.0	98	0.71	8.9	-1.3	15.5	25	18	27	-3	-26	-2.1	-0.1
					7.9	8.1	0.6							
510	401	5.7	104	0.72	5.5	-1.4	12.5	24	23	34	-2	-65	-0.9	-0.2
					5.3	4.9	0.4							
1019	401	1.4	105	0.55	1.4	-0.4	8.5	22	22	14	-1	-40	-0.2	-0.0
					1.8	1.9	0.3							
1624	401	0.3	187	0.22	-0.0	-0.3	5.5	24	16	29	0	18	-0.1	0.1
					1.1	1.2	0.2							
3045	401	0.6	274	0.34	-0.6	0.0	2.8	21	18	44	-1	-40	-0.0	0.0
					1.3	1.4	0.0							
5232	401	2.2	305	0.67	-1.8	1.3	2.4	18	23	35	-6	-51	-0.0	0.0
					3.2	2.8	0.0							

Legend:
Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-18

07-AUG-1997 - 24-JAN-1999

Mooring information
****
General

```
Mooring ID   : V276_18/KPO 826
Deployed     : Date: 07-AUG-1997     Ship / Cruise: POSEIDON 231/3
Recovered    : Date: 24-JAN-1999     Ship / Cruise: POSEIDON 247/2
Latitude N   :   32.992
Longitude E  : -021.998
Water depth  : 5277 m (corrected)
Magn. Anom.  : -10
Project      : KIEL276 time series
PI           : J.J. Waniek & T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

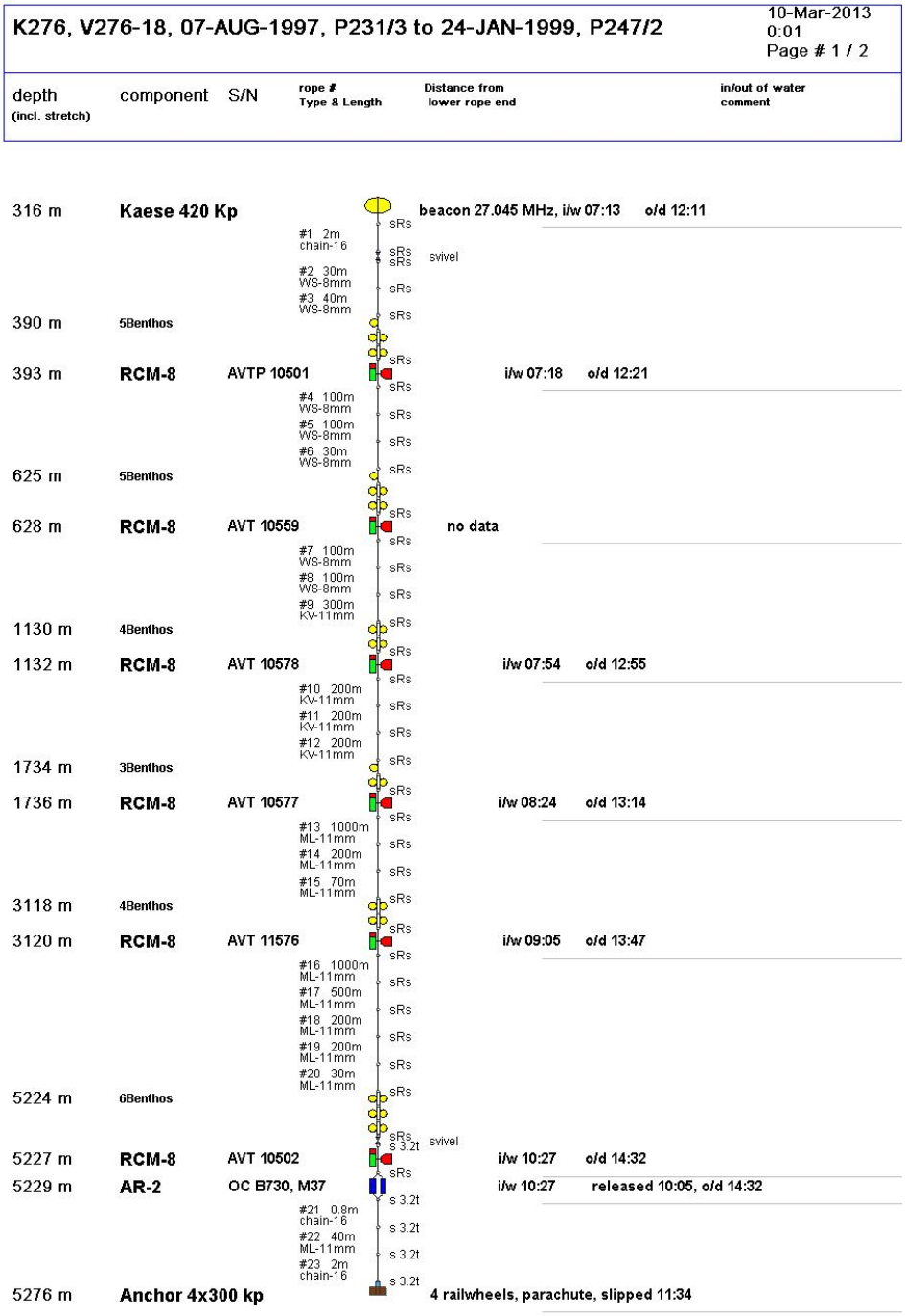
1) Mooring
All mooring components according to log of launch. According to the original draft, there maybe two mistakes in the deployment log:
- 100 m instead of 70 m above RCM11576 (3000 m level)
- 100 m instead of 30 m above RCM10502 (5185 m level)
But all depths are nominal as from logs & static model.

2) Data
All RCM records at 7200 s sampling interval.
Processed data sources are PH3 formatted files at sampling interval;
RCM10578: P sensor, with corrected coefficients recalibrated;
Meteor lengths 30 m corrected to 100 m; length 70 m corrected to 100 m as in original draft to meet best pressure measurements at RCM 10501, RCM 10578 and RCM 10577.
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processed and at sampling rate in V27618_iii.dat.

3) Trap data
No traps deployed; info at IOW.

Compiled by: T.J. Mueller, IFMK Date: 07-Jan-2001, revised Oct 2012

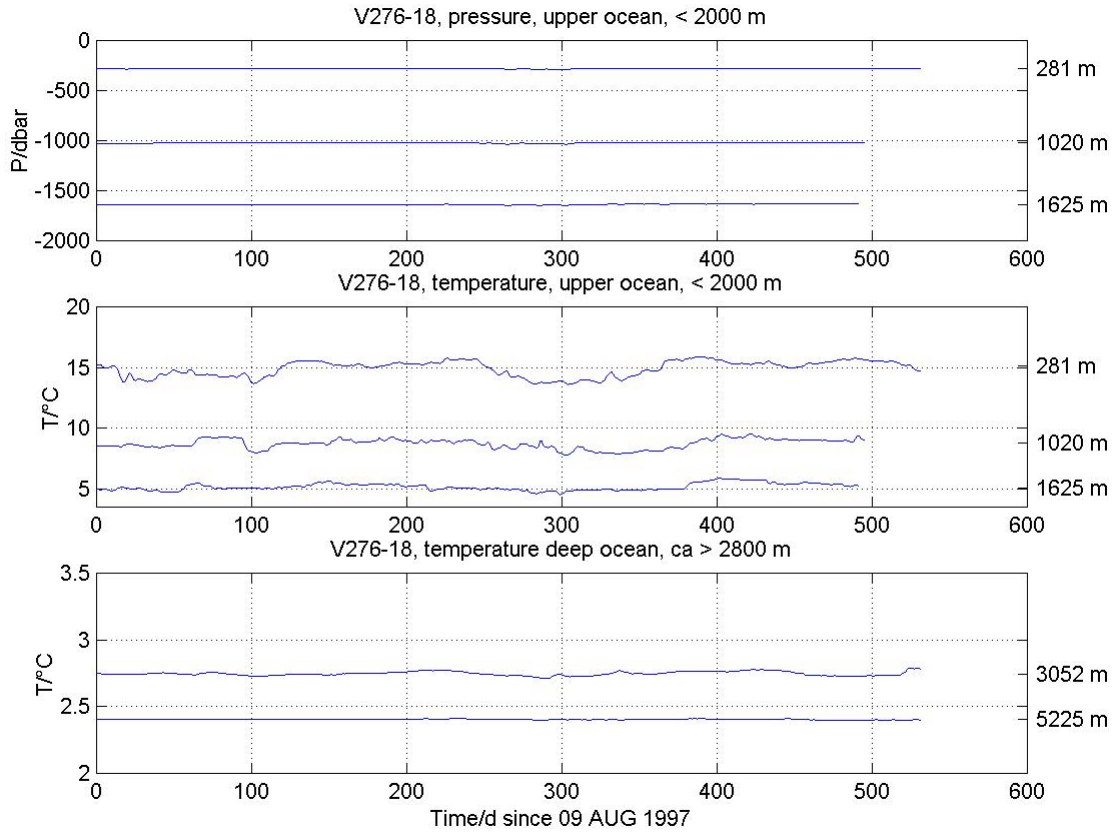
TJM 07.05.2008

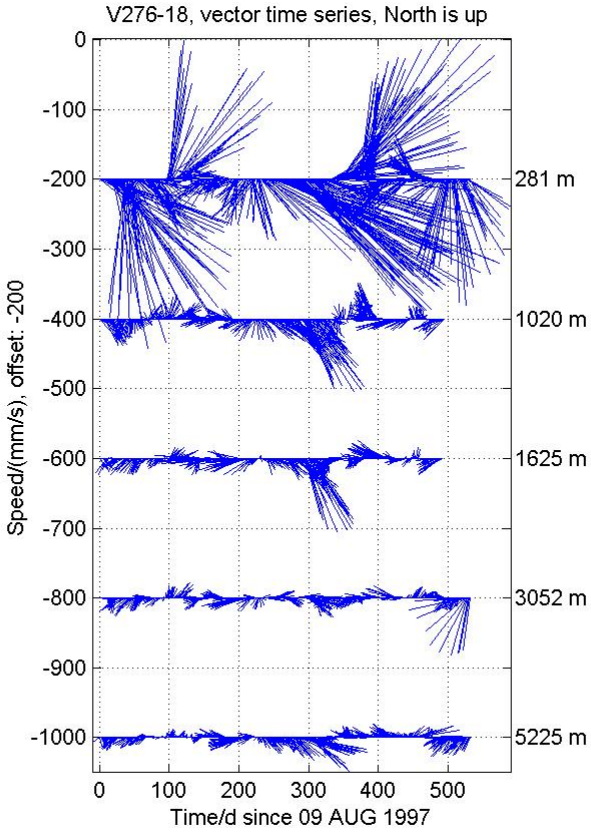


***V276-18**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sensors	Remarks
393	2761801	RCM8	10501	T_LR	ok
				PRES	ok, linear range calibration, initially 258 dbar, median 259 dbar
				DIR	ok
				SPD	ok
628	2761802	RCM8	10559	no data (bad battery)	
1132	2761803	RCM8	10578		last good record 18-Dec-1998
				T_LR	ok
				PRES	ok, linear range calibration initially 1012 dbar, median 1005 dbar
				DIR	ok
				SPD	ok
1736	2761804	RCM8	10577	last good record 14-Dec-1998	
				T_LR	ok
				PRES	ok, linear range calibration, initially 1568 dbar , median 1563 dbar
				DIR	ok
				SPD	ok
3120	2761805	RCM8	11576	T_AR	ok
				DIR	ok
				SPD	ok
5227	2761806	RCM8	10502	T_AR	ok
				DIR	ok
				SPD	ok





V276-18: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-18: statistics from low pass filtered daily averages

v27618

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
281	532	5.8	124	0.51	4.8	-3.2	14.9	37	24	30	-16	-47	-3.4	1.7
					8.7	8.6	0.6							
1020	496	1.0	163	0.31	0.3	-1.0	8.7	32	28	27	-4	-48	-0.7	0.3
					2.7	2.6	0.4							
1625	492	1.2	214	0.50	-0.7	-1.0	5.2	21	22	33	-2	-57	-0.3	0.3
					2.3	1.8	0.3							
3052	532	0.7	231	0.36	-0.6	-0.5	2.8	20	12	21	0	79	-0.0	-0.0
					1.9	1.2	0.0							
5225	532	0.5	217	0.26	-0.3	-0.4	2.4	19	27	21	-1	-78	-0.0	0.0
					2.1	1.1	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-19

25-Jan-1999 - 13-Apr-2000

Mooring information
****
General

```
Mooring ID   : V276-19/KPO 855
Deployed     : Date: 25-Jan-1999    Ship / Cruise: Poseidon 247/2
Recovered    : Date: 13-Apr-2000    Ship / Cruise: Poseidon 259/1
Latitude N   :   32.9683
Longitude E  : -022.0083
Water depth  : 5271 m (corrected)
Magn. Anom.  : - 9.5 deg
Project      : KIEL276 time series station
PI           : J.J. Waniek & T.J. Mueller
Data origin  : IfM Kiel
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring
All mooring components according to log of launch; top buoyancy with nominal 450 kp assumed 30kp less for design, namely 420 kp.

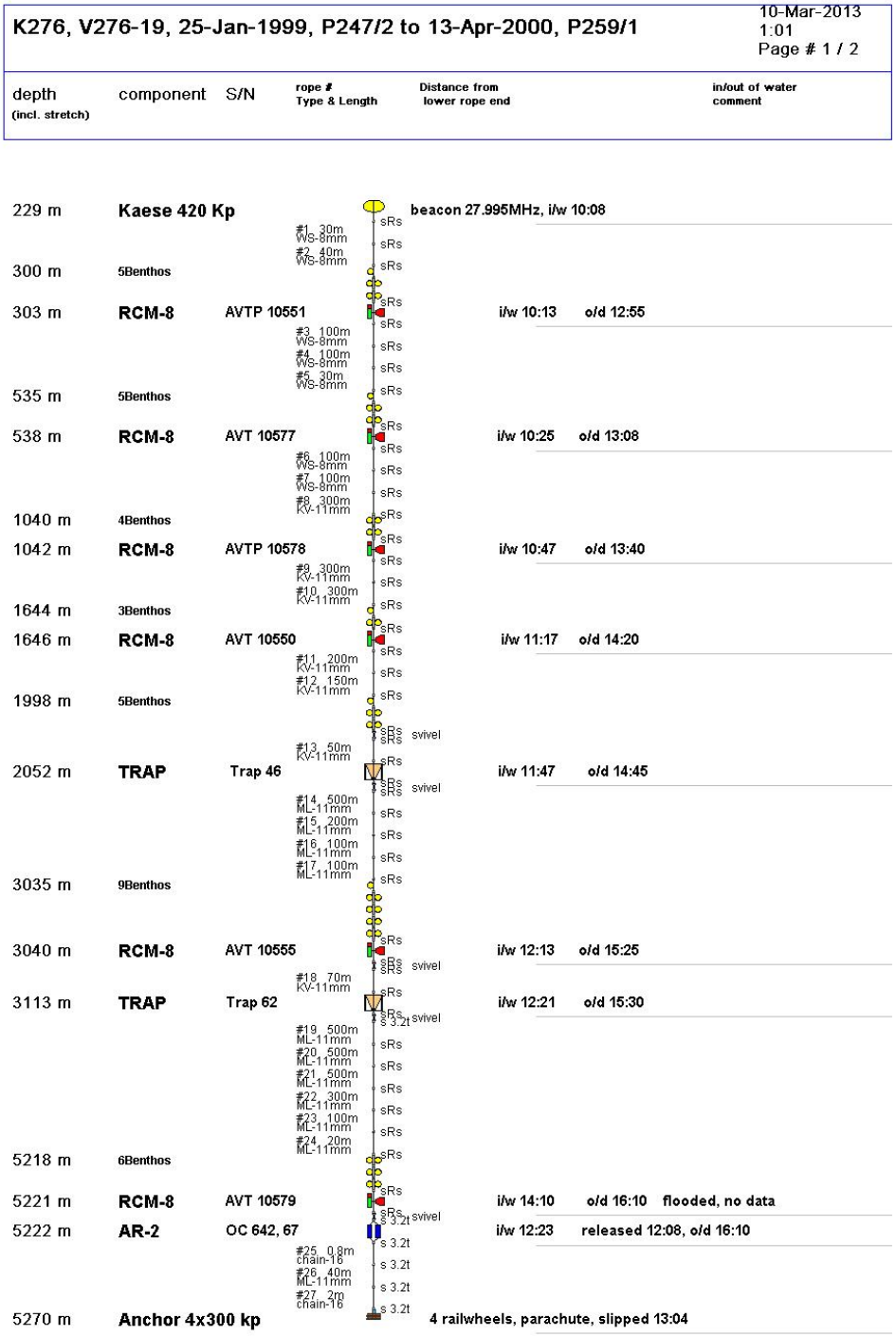
All instrument depths nominal as from logs and static model.

2) RCM data
All RCM records at 7200 s sampling interval.
Processed data sources are PH3 formatted files at sampling interval;
RCM10578: P sensor, with corrected coefficients recalibrated;

RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processed and at sampling rate in V27619_iii.dat.

3) TRAP data
Info at IOW.

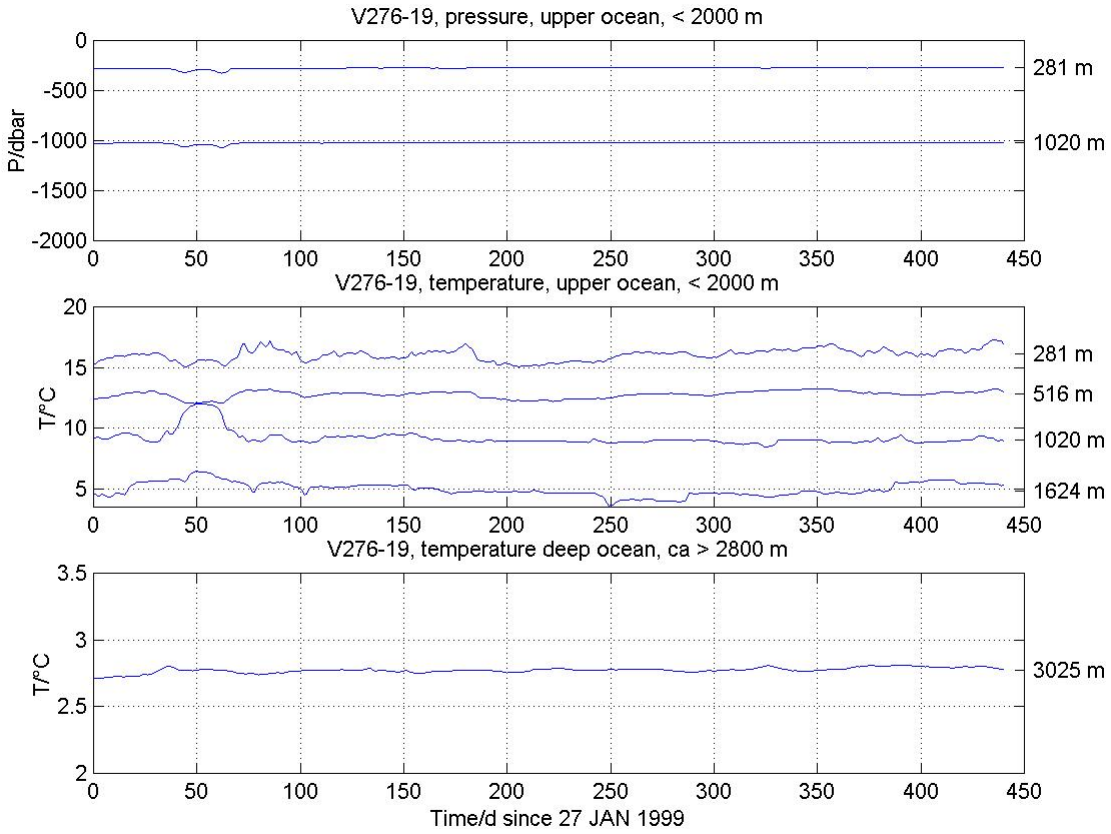
Compiled by: T.J. Mueller Date: 07-Jan-2001, revised 16.10.2003 and Feb. 2012:

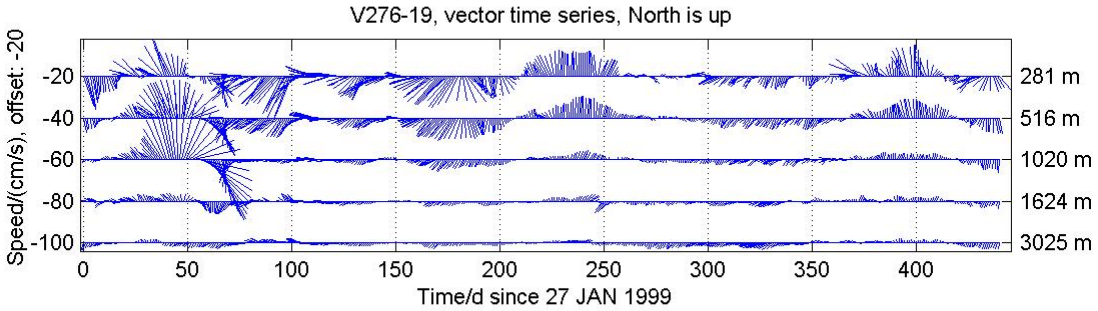


***V276-19**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
303	2761901	RCM8	10551	7200 s	T_LR	ok
					PRES	ok, initially 250 dbar, median 246 dbar
					DIR	ok
					SPD	ok
538	2761902	RCM8	10577	7200 s	T_LR	ok
					PRES	no record
					DIR	ok
					SPD	ok
1042	2761903	RCM8	10578	7200 s	T_LR	ok
					PRES	ok, initially 980 dbar, median 973 dbar
					DIR	ok
					SPD	ok
1646	2761904	RCM8	10550	7200 s	T_LR	ok
					DIR	ok
					SPD	ok
2052	2761905	TRAP	46	1 month	data info at IOW	
3040	2761906	RCM8	10555	7200 s	T_LR	ok
					DIR	ok
					SPD	ok
3113	2761907	TRAP	62	1 month	data info at IOW	
5221	2761908	RCM8	10579	7200 s	flooded, no data	





V276-19: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-19: statistics from low pass filtered daily averages

v27619

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
281	441	3.6	246	0.42	-3.3	-1.5	16.0	23	14	21	6	18	-0.7	-0.9
					5.7	7.1	0.5							
516	441	2.2	247	0.35	-2.0	-0.9	12.8	11	13	19	0	1	-0.5	-0.5
					4.1	6.0	0.3							
1020	441	1.0	260	0.20	-0.9	-0.2	9.2	9	9	24	-7	-17	1.9	0.7
					4.5	6.4	0.6							
1624	441	1.5	257	0.58	-1.4	-0.3	5.8	13	10	38	0	63	0.1	0.2
					2.0	1.8	0.5							
3025	441	1.5	250	0.69	-1.4	-0.5	2.8	23	12	34	0	75	0.0	0.0
					1.7	1.2	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-20

14-Apr-2000 - 14-Apr-2000

Mooring information
****

General

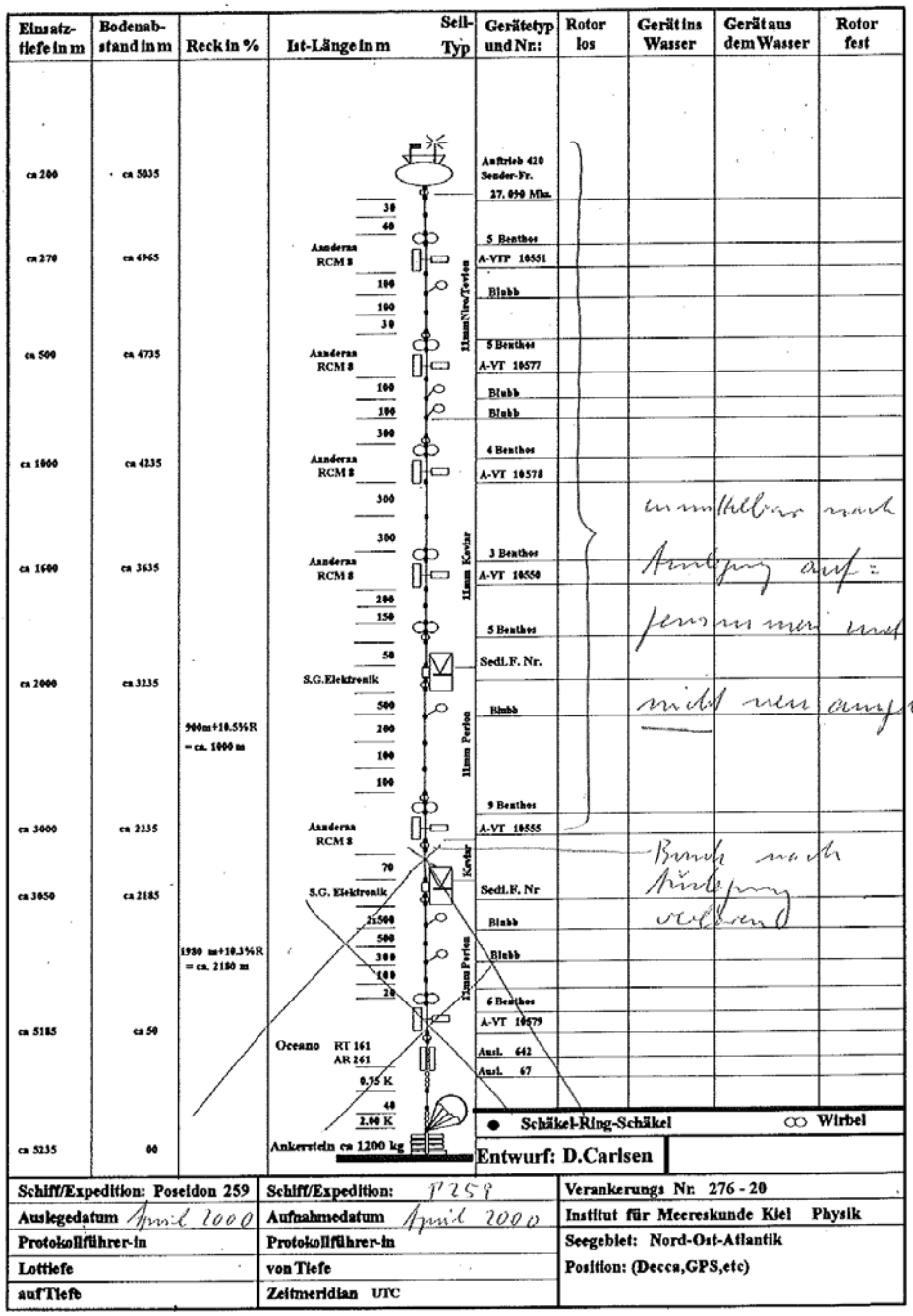
```
Mooring ID   : V276-20/KPO 856
Deployed     : Date: 14-Apr-2000    Ship / Cruise: Poseidon 259/1
Recovered    : Date: 14-Apr-2000    Ship / Cruise: Poseidon 259/1
Latitude N   :   32.9683
Longitude E  : -021.986
Water depth  : 5266 m (corrected)
Magn. Anom.  : - 9.5 deg
Project      : KIEL276 time series station
PI           : J.J. Waniek & T.J. Mueller
Data origin  :: IfM Kiel
```

Remarks

Mooring line broke during launching in Kevlar termination above TRAP at 3050 m designed depth. Upper part recovered including RCM10555 at 3000 m designed depth, lower part of mooring including TRAP 52, RCM10551 and two releases lost because of lack of backup buoyancy (ca. -60 kp at TRAP 52).

Data no data

Compiled by: T.J. Mueller Date: 29-Jun-2002



V276-20: *mooring line broke while launching; bottom part lost; mooring not re-deployed; no data*

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-21

02-Feb-2001 - 19-Feb-2002

Mooring information
****
General

```
Mooring ID   : V276-21/KPO 912
Deployed     : Date: 02-Feb-2001    Ship / Cruise: Poseidon 268
Recovered    : Date: 19-Feb-2002    Ship / Cruise: Poseidon 283/2
Latitude N   :   32.9250
Longitude E  : -022.0250
Water depth  : 5272 m (corrected)
Magn. Anom.  : -10 deg
Project      : KIEL276 time series station
PI           : J.J. Waniek & T.J. Mueller
Data origin  : IOW
Depths       : nominal as of logs and IMP static model
```

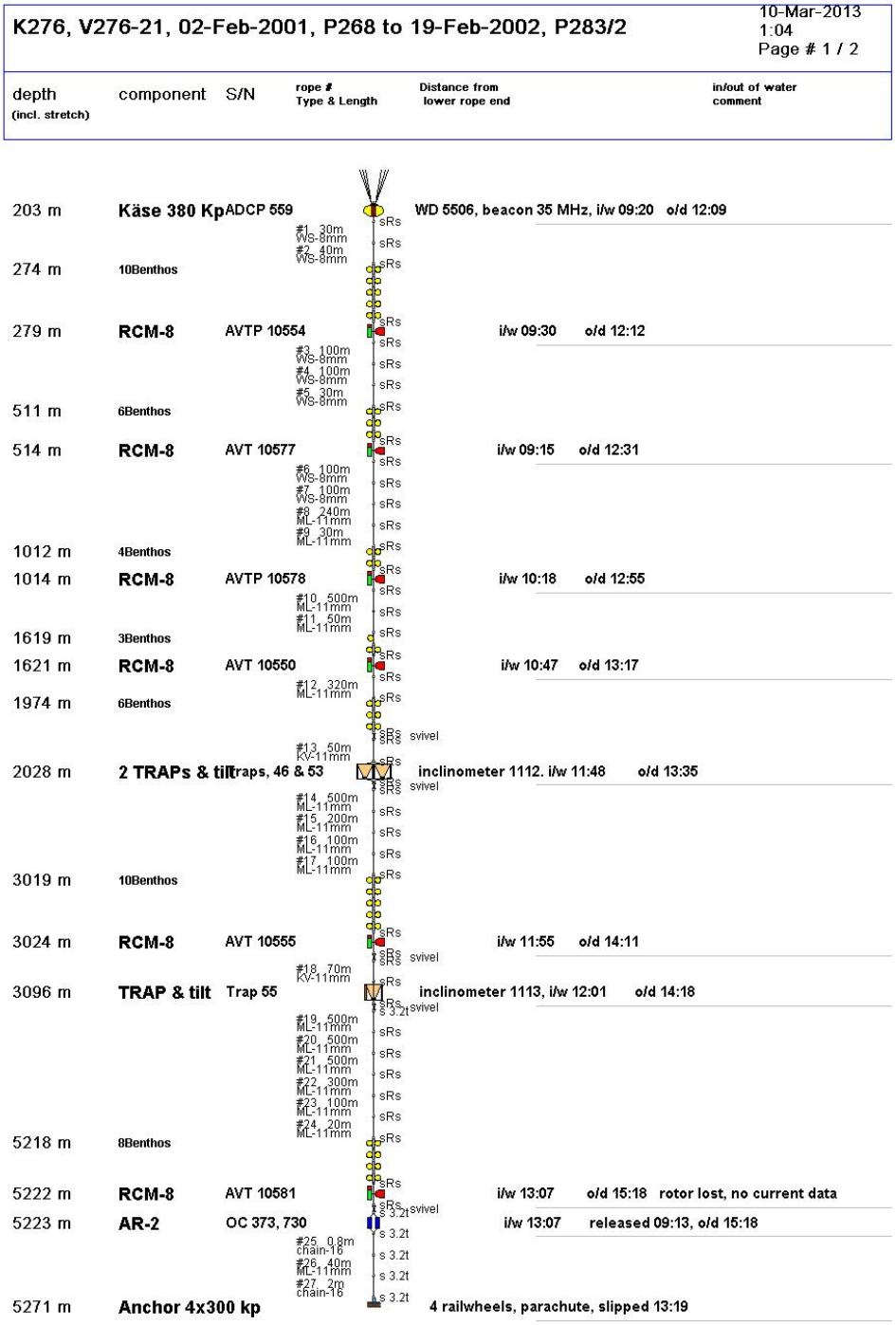
Remarks

1) Mooring
Upward 150 kHz ADCP on top buoy.
Pair of sediment TRAPs designed at 2000 m.
Single TRAP at 3050 m.
All instrument depths as from static mooring model with components as in deck log.

2) RCM & ADCP data
ADCP data still to be processed.
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processd and at sampling rate in V27621_iii.dat.

3) TRAP data
Info at IOW.

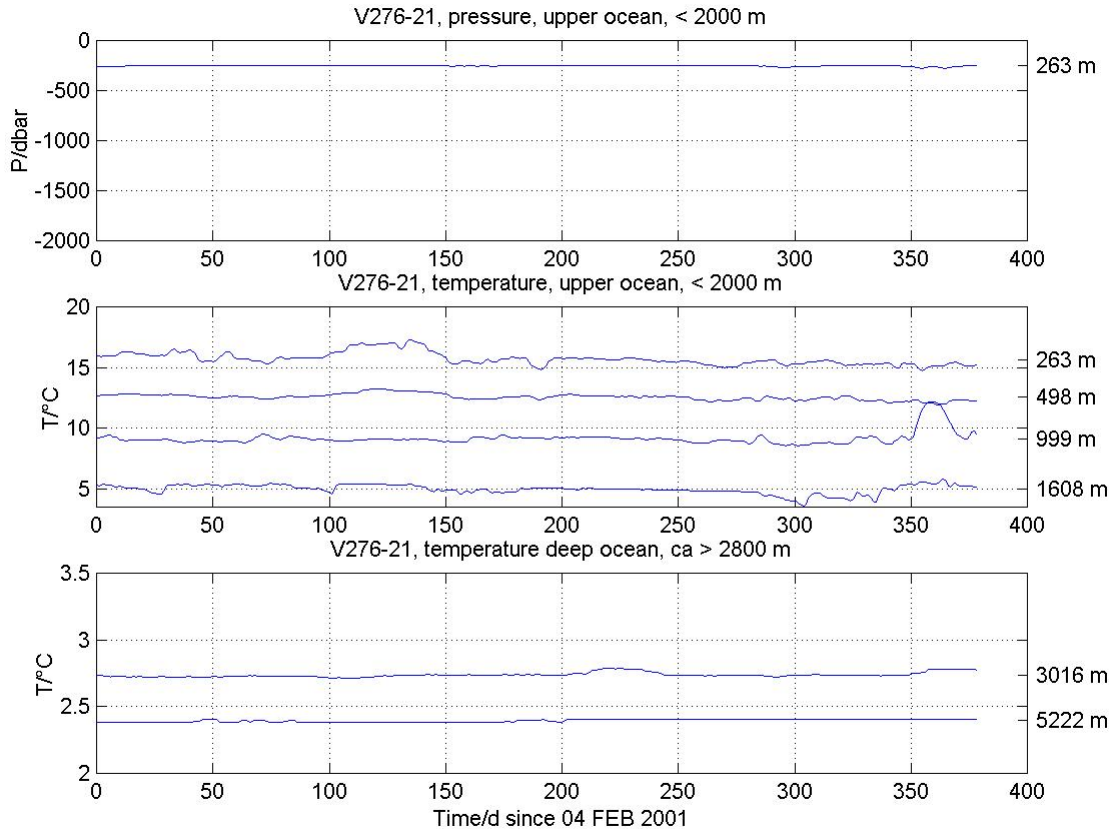
Compiled by: T.J. Mueller Date: 12-Aug-2002, revised Oct 2013

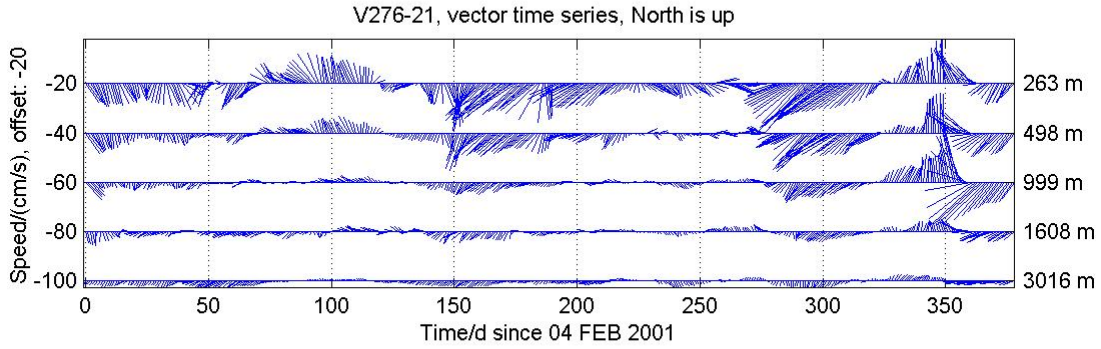


***V276-21**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
203	2762101	ADCP	559	3200		60 pings, 30 bins, 20 bins available, 16 m each
279	2762102	RCM8	10554	7200 s	T_LR	ok
					PRES	ok, linear range calibration initially 255 dbar, median 246 dbar
					DIR	ok
					SPD	ok
514	2762103	RCM8	10577	7200 s		Raw data file partially corrupt from 03-SEP-2001 on. Bad parts are of order of some days. Bad parts eliminated from raw data. Result stored in RCM10577.EDT for processing. Missing parts interpolated linearly in time.
					T_LR	ok
					PRES	sensor encapsulated; slow adjustment to environmental pressure; no reliable data.
					DIR	ok
					SPD	ok
1014	2762104	RCM8	10578	7200 s	T_LR	ok
					DIR	ok
					SPD	ok
1621	2762105	RCM8	10550	7200 s	T_LR	ok
					DIR	ok
					SPD	ok
2028	2762106	TRAP	47 53			two TRAPs, 2X12 bottles inclinometer 1112 data info at IOW
3024	2762107	RCM8	10555	7200 s	T_LR	ok
					DIR	ok
					SPD	ok
3090	2762108	TRAP	55			data info at IOW
5222	2762109	RCM8	10581	7200 s	T_LR	ok, no arctic range avaiable
					DIR	ok
					SPD	rotor lost during deployment; data set to dummy.





V276-21: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-21: statistics from low pass filtered daily averages

v27621

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
263	379	5.5	227	0.52	-4.0	-3.7	15.7	14	17	36	18	40	0.8	0.1
					7.2	7.7	0.5							
498	379	3.9	234	0.59	-3.2	-2.3	12.6	14	14	22	10	38	0.4	-0.1
					4.8	5.3	0.3							
999	379	2.4	250	0.51	-2.2	-0.8	9.2	11	9	11	7	24	-1.1	0.3
					3.6	5.0	0.5							
1608	379	2.3	250	0.72	-2.2	-0.8	5.5	11	11	20	1	46	-0.2	0.1
					2.0	2.0	0.4							
3016	379	1.7	237	0.70	-1.4	-0.9	2.8	14	13	19	1	68	-0.0	0.0
					1.9	1.2	0.0							
5222	379	NaN	NaN	NaN	NaN	NaN	2.5	NaN	NaN	NaN	NaN	NaN	NaN	NaN
					NaN	NaN	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-22

22-Feb-2002 - 20-APR-2003

Mooring information
****
General

```
Mooring ID   : V276-22/KPO 938
Deployed     : Date: 22-Feb-2002    Ship / Cruise: Poseidon 283-2
Recovered    : Date: 20-APR-2003    Ship / Cruise: Poseidon 297
Latitude N   :   32.868
Longitude E  : -022.029
Water depth  : 5275 m (corrected)
Magn. Anom.  : -9 (interpolated between V276-21 and V276-23)
Project      : KIEL276 time series station
PI           : J.J. Waniek & T.J. Mueller
Data origin  : IOW
Depths       : nominal as of logs and IMP static model
```

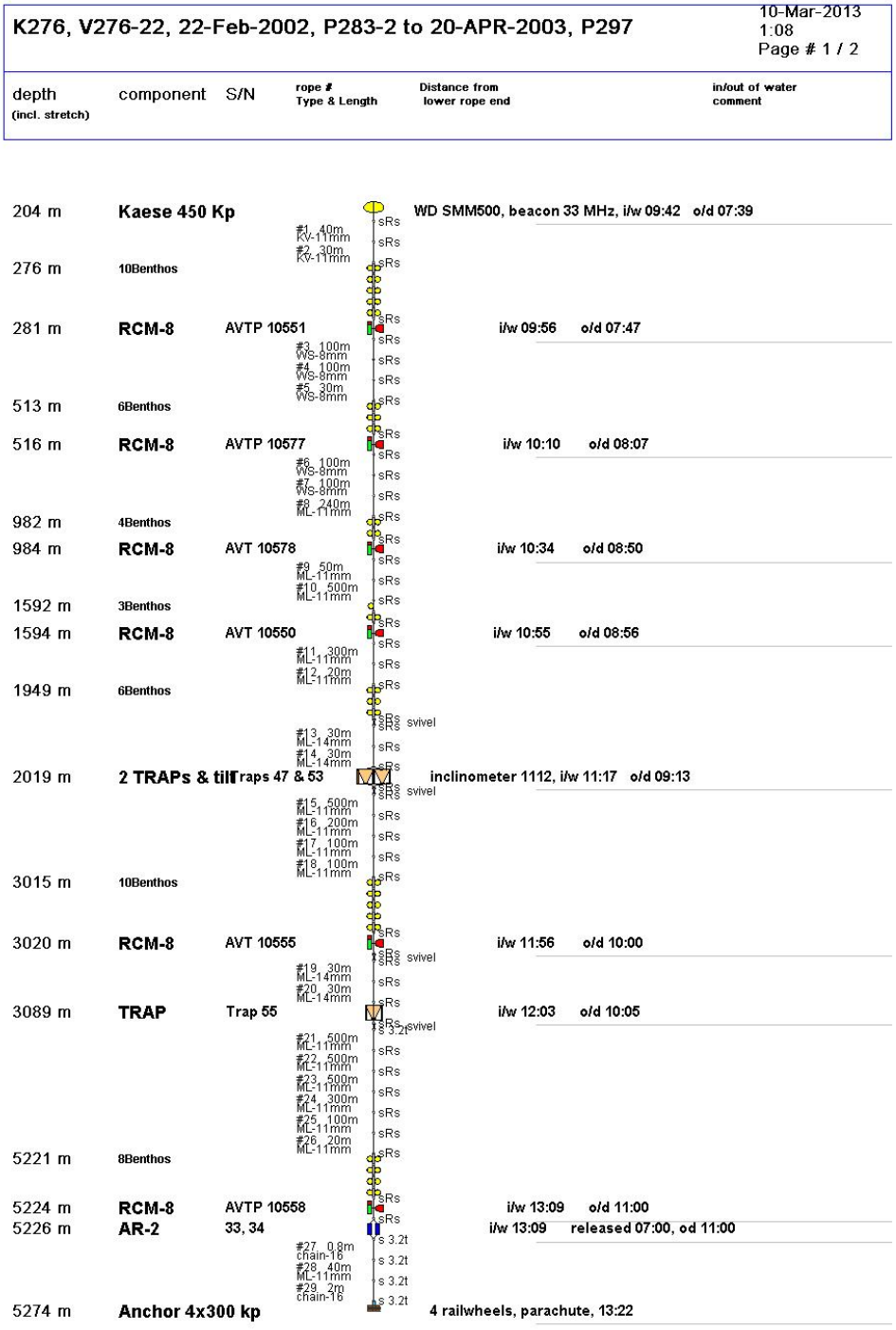
Compiled by: T.J. Mueller Date: 22-Aug-2004

Remarks

1) Mooring
Upward 150 kHz ADCP on top buoy not deployed (P283 cruise report, Ch. 5, Tab. 1).
ADCP Buoy without ADCP has 450 kp
buoyancy; replaced by 'normal' buoy with 450 kp for static model.
Pair of parallel sediment TRAPs at 2000 m designed depth.
Single TRAP at 3050 m designed depth.
All instrument depths nominal from static mooring model with components as in deck log.

2) RCM data
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processed and at sampling rate in V27622_iii.dat.

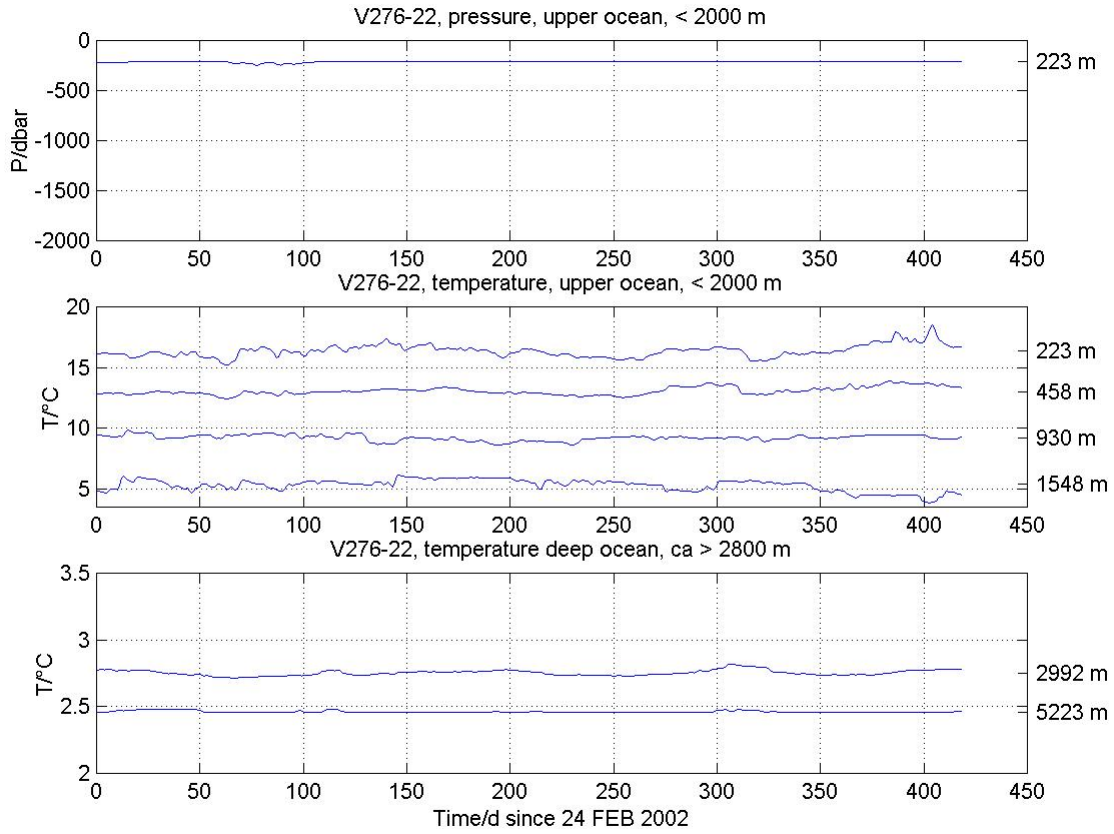
3) TRAP data
Info at IOW.

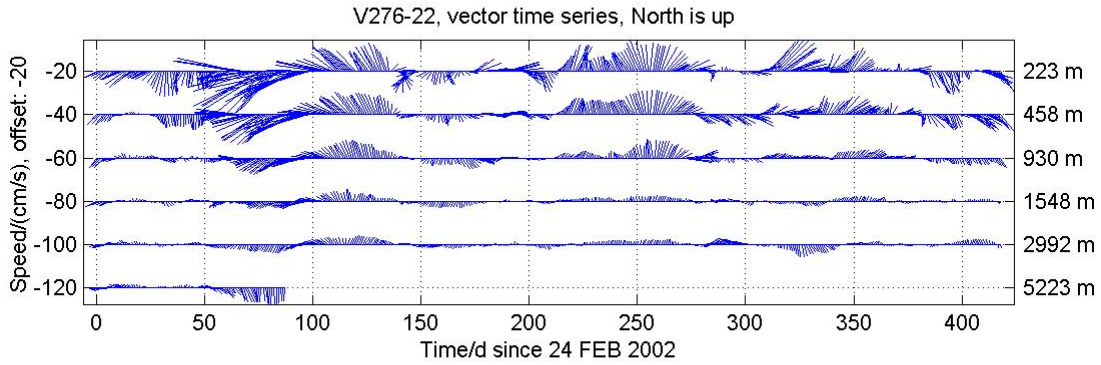


***V276-22**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
204	2762201	ADCP	-9999		ADCP not deployed, See cruise reports POS283 and POS297	
281	2762202	RCM8	10554	7200 s	REF	344, e-board 2595, DSU 3690 time base correction by 20 h
					T_LR	ok
					PRES	ok, 6300 dbar linear range calibration, initially 200 dbar, median 188 dbar
					DIR	ok
					SPD	ok
516	2762203	RCM8	10577	7200 s	Raw data file corrupt from 28-Nov-2002 on, file hand edited in RCM10577.EDT to keep good parts.	
					REF	342, e-board 2626, DSU 6717
					T_LR	ok
					PRES	nonlinear trend from initially 400 dbar to 300 dbar at day 200, then stable; sensor probably encapsulated; data not taken.
					DIR	ok
					SPD	ok
984	2762204	RCM8	10578	7200 s	REF	318, e-board 2624, DSU 3644
					T_LR	ok
					DIR	ok
					SPD	ok
1594	2762205	RCM8	10550	7200 s	REF	271, e-board 2590, DSU 5937
					T_LR	ok
					DIR	ok
					SPD	ok
2019	2762206	TRAP	47 & 53			two particle TRAPs parallel, inclination meter 1112. Info at IOW.
3020	2762207	RCM8	10555	7200 s	REF	414, e-board 2601, DSU 3392
					T_LR	ok, no arctic range
					DIR	ok
					SPD	ok
3089	2762208	TRAP	55			particle TRAP
5224	2762209	RCM8	10558	7200 s		clock has 18 h offset
					REF	258, e-board 2589, DSU 3689
					T_LR	ok, no arctic range
					PRES	ok, 6300 dbar range calibration; initially & median 5352 dbar (5249 m)
					DIR	ok
					SPD	ok until 24-MAY-2002 rotor stuck and set to dummy thereafter





V276-22: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-22: statistics from low pass filtered daily averages

v27622

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
223	419	1.2	269	0.12	-1.2	-0.0	16.4	34	17	19	22	72	0.5	-1.0
					10.5	7.0	0.5							
458	419	0.2	9	0.03	0.0	0.2	13.1	36	15	21	7	78	1.1	-0.5
					7.7	5.2	0.3							
930	419	0.2	360	0.06	-0.0	0.2	9.2	30	14	23	3	73	-0.4	-0.1
					4.1	3.0	0.2							
1548	419	0.5	271	0.24	-0.5	0.0	6.7	15	12	29	1	66	0.0	-0.0
					2.0	1.6	0.5							
2992	419	0.6	274	0.26	-0.6	0.0	2.8	12	13	17	-0	-83	-0.0	0.0
					2.0	1.7	0.0							
5223	88	1.8	168	0.49	0.4	-1.7	2.5	12	15	12	-2	-26	0.0	0.0
					2.5	3.0	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-23

22-APR-2003 - 16-MAR-2004

Mooring information
****
General

```
Mooring ID   : V276-23/KPO 1083
Deployed     : Date: 22-APR-2003    Ship / Cruise: Poseidon 297
Recovered    : Date: 16-MAR-2004    Ship / Cruise: Poseidon 308
Latitude N   :   32.828
Longitude E  : -022.003
Water depth  : 5264 m (corrected)
Magn. Anom.  : -7.3 deg (W)
Project      : KIEL276 time series station
PI           : J.J. Waniek & T.J. Mueller
Data origin  : IOW
Depths       : nominal as of logs and IMP static model
```

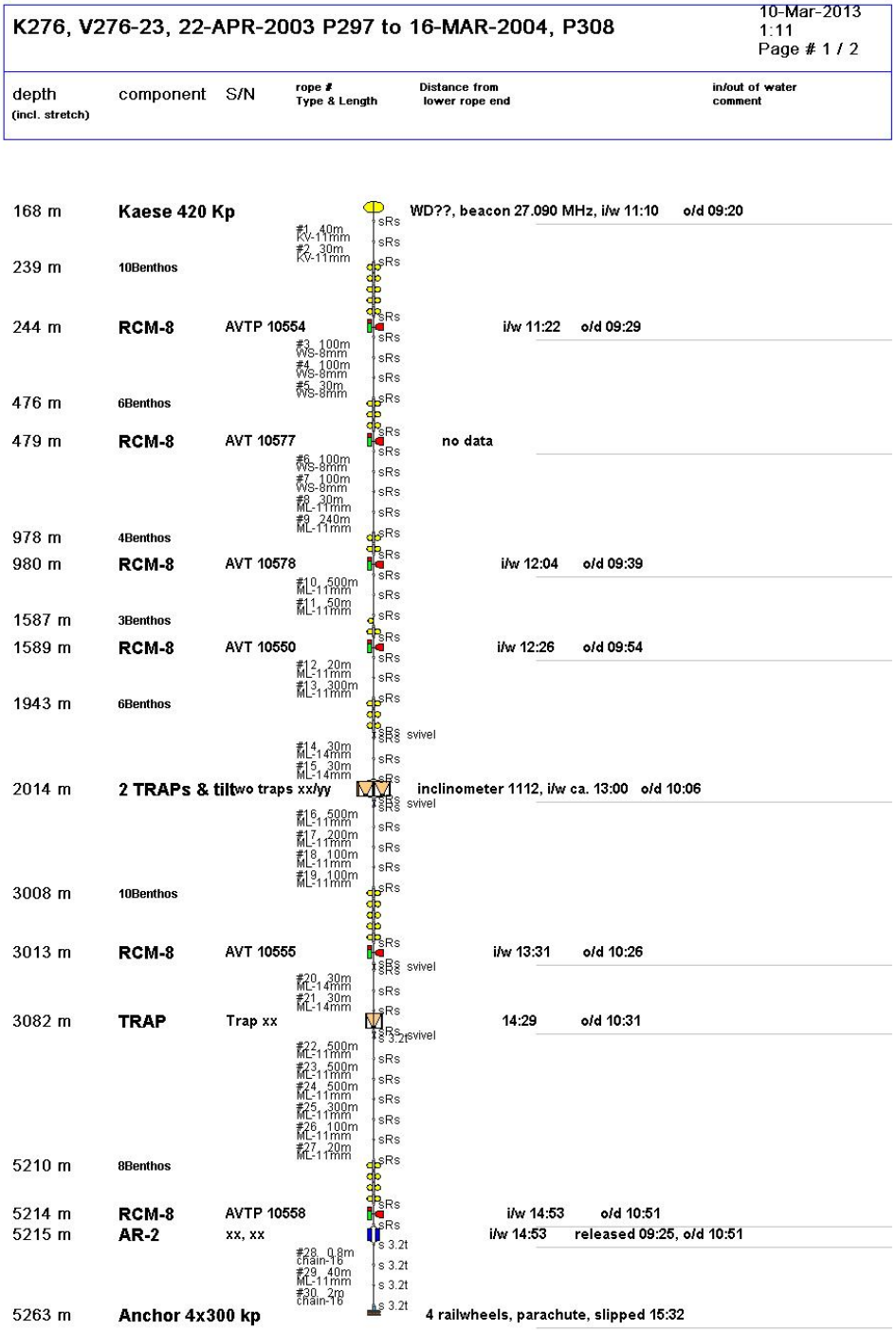
Remarks

1) Mooring
ADCP Buoy designed on top replaced by 'normal' buoy with 450 kp.
Pair of parallel sediment TRAPs at 2000 m designed depth.
Single TRAP at 3050 m designed depth.
All instrument depths nominal from static mooring model with components as in deck log.

2) RCM data
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processd and at sampling rate in V27623_iii.dat.

3)TRAP data
Info at IOW.

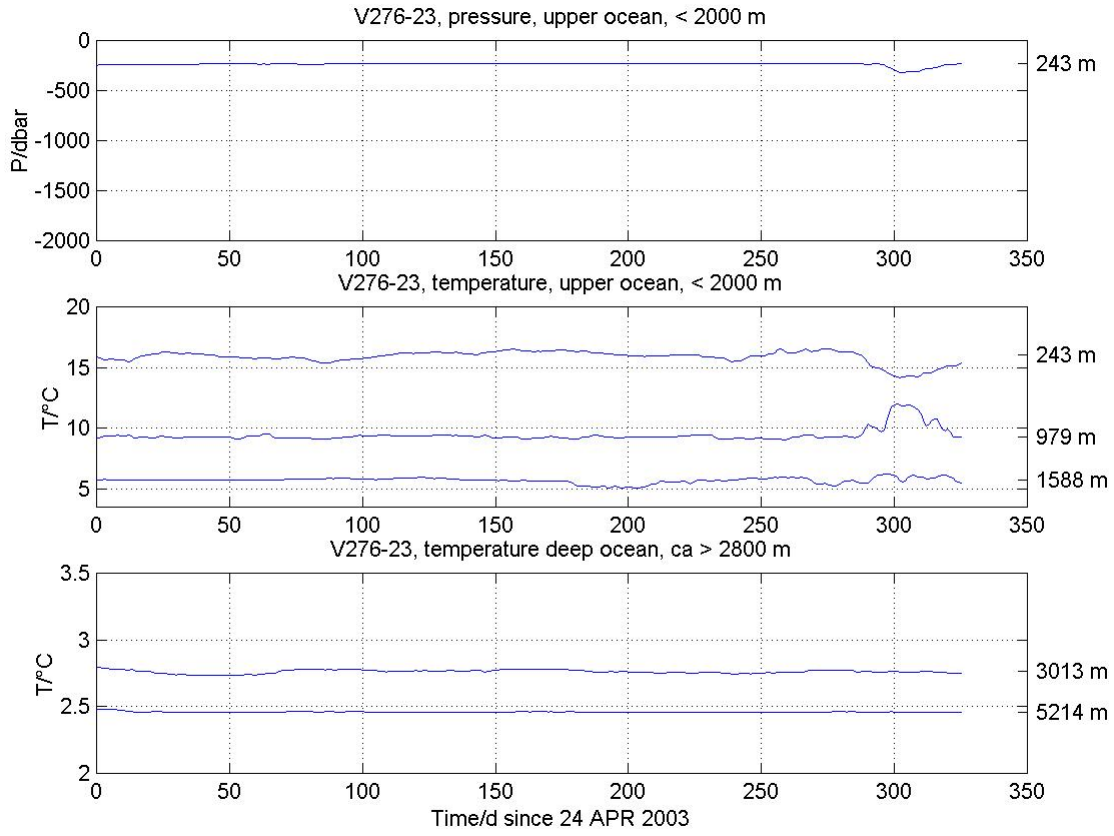
Compiled by: T.J. Mueller Date: 22-Aug-2004, rev. Sep 2013

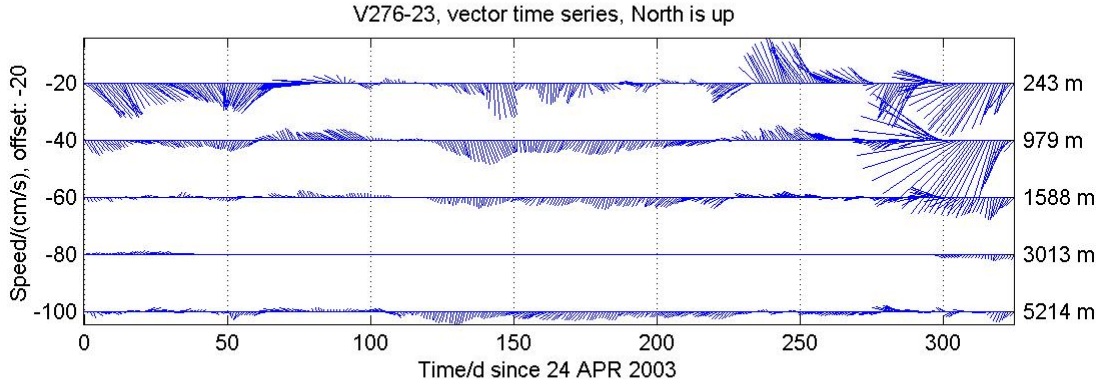


***V276-23**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
244	2762301	RCM8	10554	7200 s	REF	344, e-board 2595, DSU 3690
					T_LR	ok
					PRES	ok, 6300 dbar linear range calibration, initially 215 dbar, median 203 dbar
					DIR	ok
					SPD	ok
479	2762302	RCM8	10577	7200 s		battery leakage, no record
980	2762303	RCM8	10578	7200 s	REF	318, e-board 2624, DSU 3644
					T_LR	ok
					DIR	ok
					SPD	ok
1589	2762304	RCM8	10550	7200 s	REF	271, e-board 2590, DSU 5937
					T_LR	ok
					DIR	ok
					SPD	ok
2014	2762305	TRAP	-9999	-9999		two particle TRAPs, inclinometer 1112 data info at IOW
3013	2762306	RCM8	10555	7200 s	REF	414, e-board 2601, DSU 3392
					T_LR	ok, no arctic range
					DIR	ok
					SPD	stuck between day 40 and 300, set to dummy there
						ok elsewhere
3082	2762307	TRAP	-9999			particle TRAP data info at IOW
5214	2762308	RCM8	10558	7200 s	REF	258, e-board 2589, DSU 3689
					T_LR	ok, no arctic range
					PRES	ok, 6300 dbar range calibration, median 5383 dbar (5279 m at 33°N)
					DIR	ok
					SPD	ok





V276-23: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-23: statistics from low pass filtered daily averages

v27623

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
243	326	4.1	220	0.47	-2.6	-3.1	15.9	19	15	16	-9	-47	1.7	0.8
					6.7	6.6	0.5							
979	326	3.7	236	0.60	-3.1	-2.1	9.4	19	9	14	6	49	-2.8	-1.3
					6.1	6.0	0.5							
1588	326	2.0	242	0.71	-1.8	-1.0	5.7	36	16	16	0	69	0.0	0.1
					2.1	1.9	0.2							
3013	68	0.3	102	0.14	0.3	-0.1	2.8	10	13	8	1	64	-0.0	0.0
					1.7	1.0	0.0							
5214	326	1.4	238	0.53	-1.2	-0.8	2.5	18	19	8	0	82	0.0	0.0
					2.3	1.3	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-24

17-MAR-2004 - 06-MAY-2005

Mooring information
****
General

```
Mooring ID   : V276-24/KPO 1084
Deployed     : Date: 17-MAR-2004    Ship / Cruise: Poseidon 308
Recovered    : Date: 06-MAY-2005    Ship / Cruise: Poseidon 321
Latitude N   :   32.818
Longitude E  : -022.000
Water depth  : 5270 m (corrected)
Magn. Anom.  : -09 deg (W)
Project      : KIEL276 time series station
PI           : J.J. Waniek & T.J. Mueller
Data origin  : IOW
Depths       : nominal as of logs and IMP static model
```

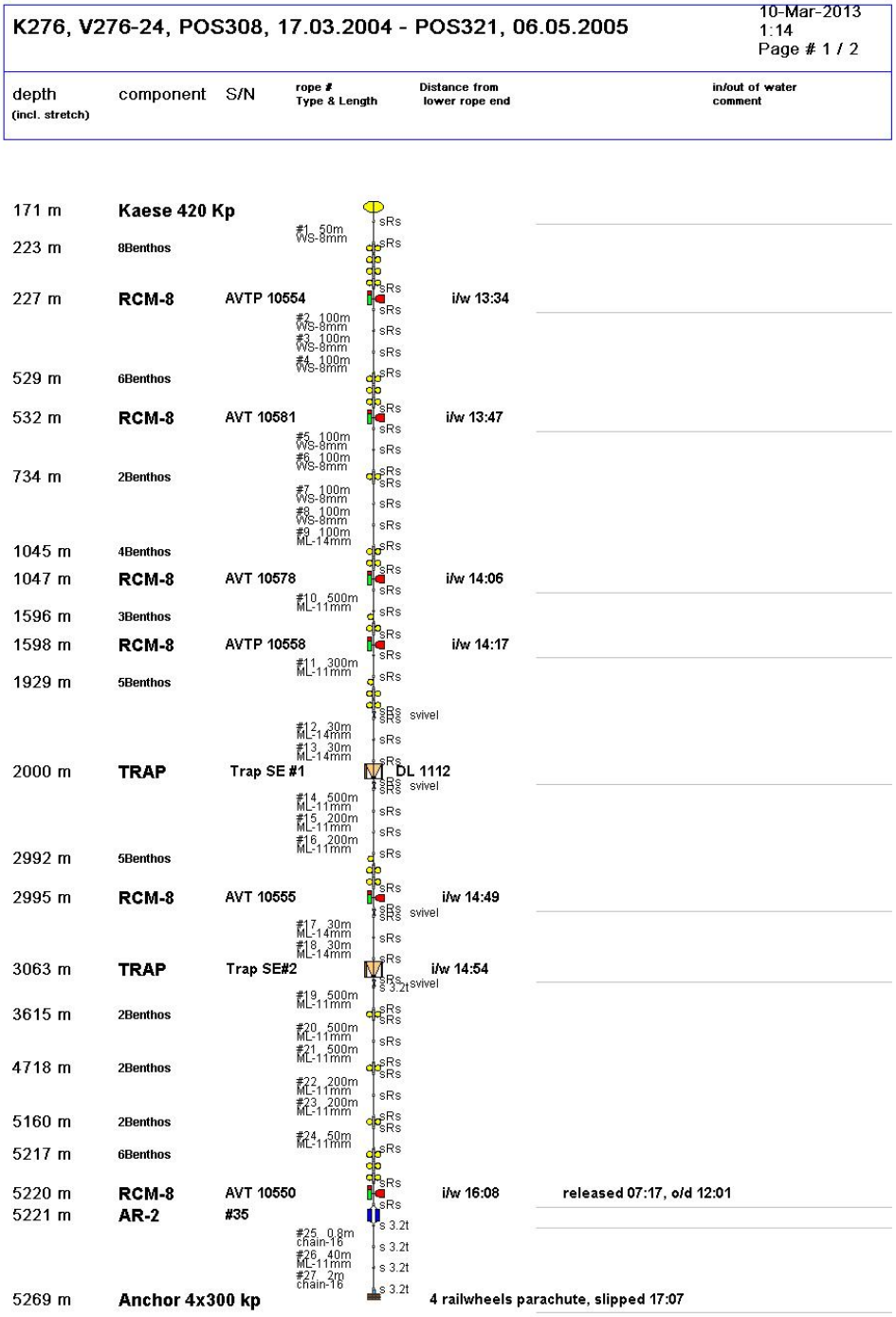
Remarks

1) Mooring
Top buoy with with reduced buoyancy, 420 kp.
TRAPs at 2000 m and at 3050 m designed depth.
All instrument depths nominal as from static mooring model with components as in deck log.

2) RCM data
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processed and at sampling rate in V27624_iii.dat.

3) TRAP data
Info at IOW.

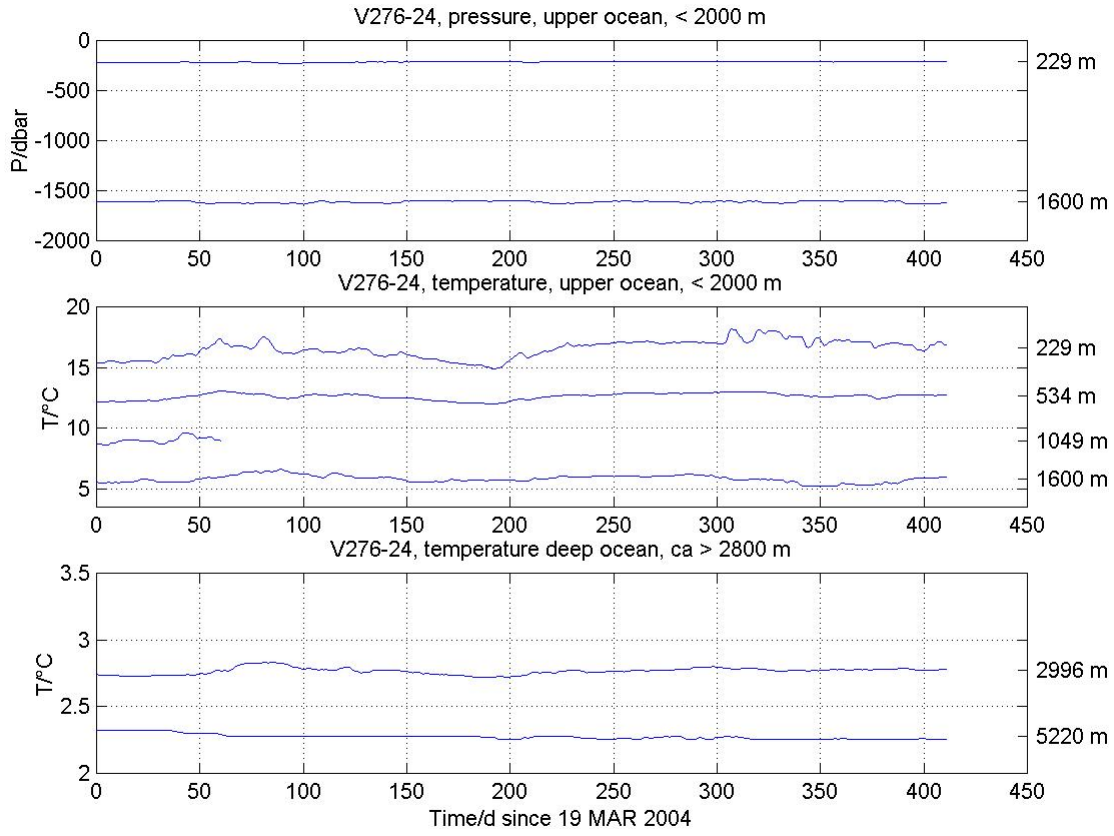
Compiled by: T.J. Mueller Date: 12-SEP-2005

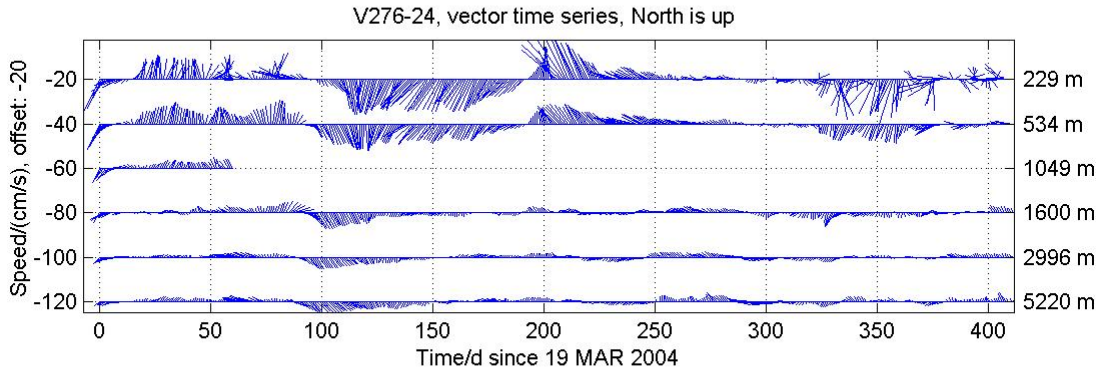


***V276-24**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
227	2762401	RCM8	10554	7200 s	REF	344, e-board 2595, DSU 3690
					T_LR	ok
					PRES	ok, 6300 dbar linear range calibration initially 185 dbar, median 172 dbar
					DIR	ok
					SPD	ok
532	2762402	RCM8	10581	7200 s	REF	301, e-board 2592, DSU 7097
					T_LR	ok
					DIR	ok
					SPD	ok
1047	2762403	RCM8	10578	7200 s	short record of 61 d only; self check DSU ok	
					REF	342, e-board 2624, DSU 3644
					T_LR	ok
					DIR	ok
					SPD	ok
1598	2762404	RCM8	10558	7200 s	REF	257, e-board 2589, DSU 3689
					T_LR	ok
					PRES	ok 6300 dbar linear range calibration initially 1580, median 1581 dbar
					DIR	ok
					SPD	ok
2000	2762405	TRAP	001		SE particle TRAP with DL 1112 inclination meter	
					REF	711
					ch 2	inclination (no calibration sheet accessable)
					ch 3	constant
2995	2762406	RCM8	10555	7200 s	REF	414, e-board 2601, DSU 3392
					T_LR	ok, no arctic range
					DIR	ok
					SPD	ok
3063	2762407	TRAP	002			particle TRAP
5220	2762408	RCM8	10550	7200 s	REF	258, e-board 2590, DSU 5937
					T_LR	ok, no arctic range
					DIR	ok
					SPD	ok





V276-24: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-24: statistics from low pass filtered daily averages

v27624

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
229	412	3.3	248	0.38	-3.1	-1.2	16.5	9	21	35	6	7	0.5	0.1
					5.0	8.3	0.7							
534	412	2.5	255	0.40	-2.4	-0.6	12.6	16	24	25	0	1	0.2	0.1
					3.1	5.5	0.3							
1049	61	2.0	317	0.54	-1.3	1.5	9.0	9	8	7	3	38	0.0	0.4
					2.2	2.6	0.3							
1600	412	1.0	255	0.36	-1.0	-0.3	5.8	14	13	25	-1	-51	0.2	0.1
					2.3	2.1	0.3							
2996	412	0.8	272	0.33	-0.8	0.0	2.8	15	15	23	-1	-63	-0.0	-0.0
					2.0	1.6	0.0							
5220	412	0.6	289	0.24	-0.6	0.2	2.3	15	16	48	-1	-72	0.0	0.0
					2.4	1.7	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-25

08-MAY-2005 - 10-APR-2007

Mooring information
****
General

```
Mooring ID   : V276-25/KPO 1084
Deployed     : Date: 08-MAY-2005    Ship / Cruise: Poseidon 321
Recovered    : Date: 10-APR-2007    Ship / Cruise: Poseidon 349
Latitude N   :   33.000
Longitude E  : -021.998
Water depth  : 5273 m (corrected)
Magn. Anom.  : -8.6 deg (W)
Project      : KIEL276 time series station
PI           : J.J. Waniek
Data origin  : IOW
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring
Sounding depth at 1500 m/s is 5218 m.
Longlines - destroying coating of stainless steel wire - in mooring parts on recovery.
Top buoy modelled with reduced buoyancy, 420 kp.
TRAPs at 2000 m and at 3050 m designed depth.
All instrument depths nominal as from static mooring model with components as in deck log.

2) RCM data
All raw data in RCM*.ASC; non-relevant records skipped in *.ASC.
RCM clocks in DSUs were set prior to launching.
No stop logs for RCMs => drift correction in time estimated from deck log and final recorded times.
RCM pressure sensors have no in-situ calibration (bad weather).
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processed and at sampling rate in V27625_iii.dat.

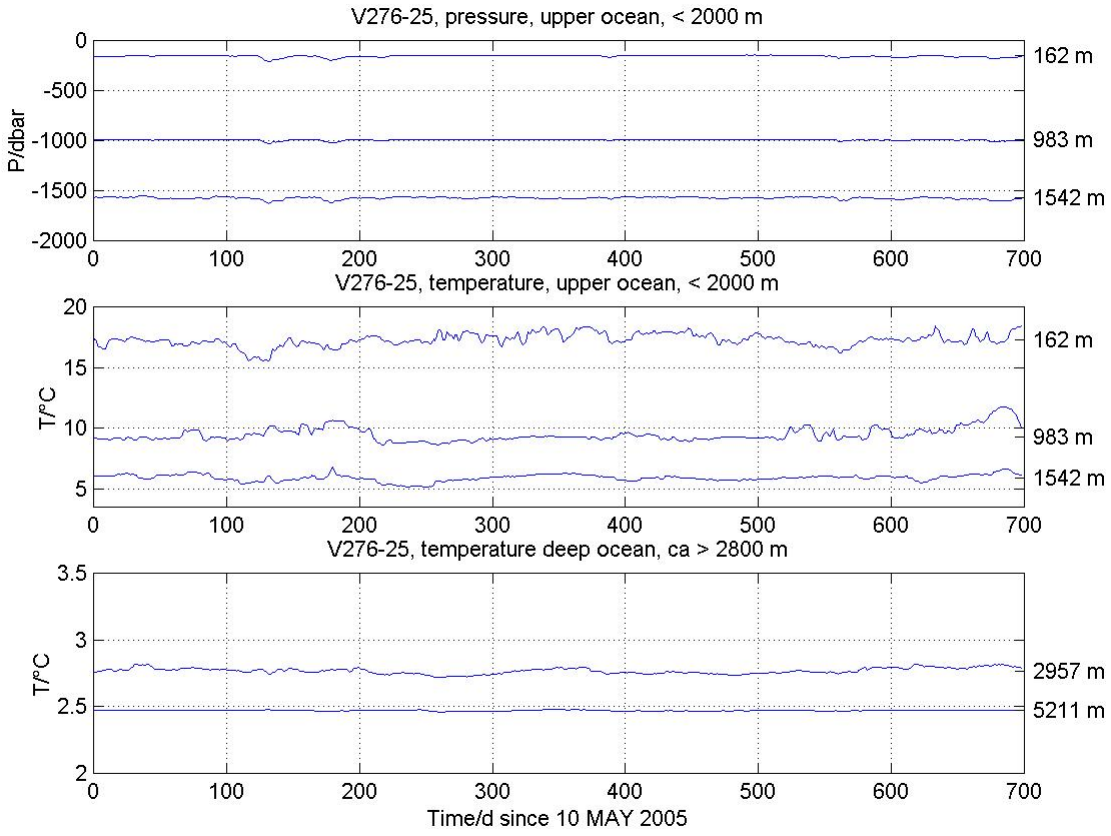
3) TRAP data
Info at IOW.

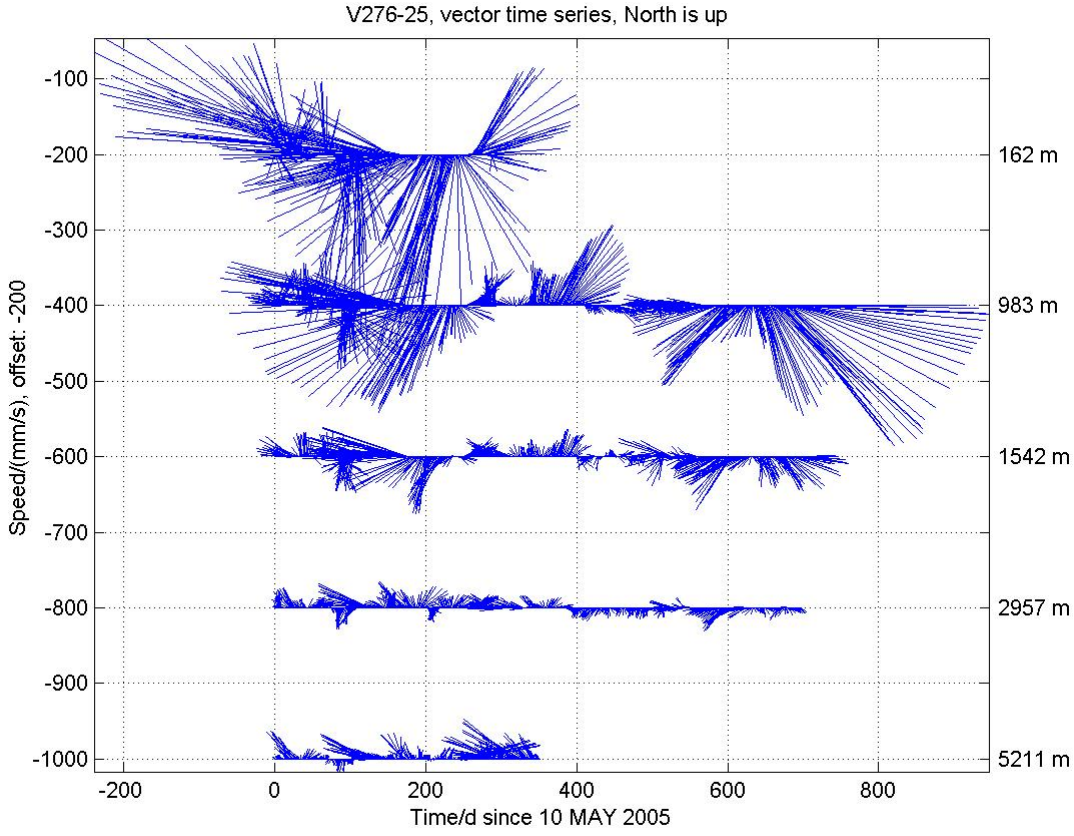
Compiled by: T.J. Mueller Date: 01-MAR-2009

***V276-25**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
220	2762501	RCM8	10554	7200 s	REF	344, e-board 2595, DSU 3690, from V2762401
					T_LR	ok
					PRES	ok, 6300 dbar linear range calibration initially 140 dbar, median 135 dbar
					DIR	ok
					SPD	ok until day 254, rotor off then and data set to dummy
526	2762502	RCM8	10581	7200 s	REF	no data; RCM failed
1041	2762503	RCM8	08411	7200 s	REF	325, e-board 6030, DSU 4831
					T_LR	ok
					PRES	ok, 6300 dbar linear range calibration, initially 935 dbar, median 935 dbar
					DIR	ok
					SPD	ok
1592	2762504	RCM8	10558	7200 s	REF	257, e-board 2589, DSU 3689, from V2762404
					T_LR	ok
					PRES	ok, 6300 dbar linear range calibration, initially 1528 dbar, median 1531 dbar
					DIR	ok
					SPD	ok
1993	2762505	TRAP	001			SE particle TRAP with DL 1112, inclination meter
					REF	711,
					ch 2	ok, inclination, raw data stored
					ch 3	constant, not stored
2988	2762506	RCM8	10555	7200 s	REF	414, e-board 2601, DSU 3392, from V2762406
					T_LR	ok, no arctic range
					DIR	ok
					SPD	ok
3056	2762507	TRAP	002		SE particle TRAP	
5212	2762508	RCM8	09812	7200 s	REF	686
					T_LR	ok, not stored
					T_AR	ok, stored
					DIR	ok
					SPD	ok, rotor stuck from day 400 on, data set to dummy





V276-25: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-25: statistics from low pass filtered daily averages

v27625

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
162	289	6.3	241	0.47	-5.5	-3.0	17.0	15	16	14	-11	-51	2.5	0.3
					10.2	10.0	0.5							
983	699	1.8	219	0.26	-1.1	-1.4	9.5	28	29	27	-2	-85	0.6	-1.3
					7.4	5.3	0.6							
1542	699	1.3	251	0.41	-1.2	-0.4	5.9	24	19	22	0	90	0.1	0.0
					3.0	2.1	0.3							
2957	699	0.7	274	0.38	-0.7	0.1	2.8	15	44	36	-0	-90	-0.0	-0.0
					1.7	1.2	0.0							
5211	352	1.3	318	0.55	-0.9	0.9	2.5	16	11	16	-1	-83	-0.0	-0.0
					2.8	1.1	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-26

17-APR-2007 - 27-APR-2009

Mooring information
****
General

```
Mooring ID   : V276-26/KPO 1085
Deployed     : Date: 17-APR-2007    Ship / Cruise: Poseidon 349
Recovered    : Date: 27-APR-2009    Ship / Cruise: Poseidon 383
Latitude N   :   33.000
Longitude E  : -022.000
Water depth  : 5270 m (corrected)
Magn. Anom.  : -9.5 deg (W)
Project      : KIEL276 time series station
PI           : J.J. Waniek
Data origin  : IOW
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring
Sounding depth at 1500 m/s is 5215 m.
Long-lines destroyed coating of some stainless steel wire.
Top buoy modelled with reduced buoyancy, 420 kp.
TRAPs at 2000 m and at 3050 m designed depth.
All instrument depths nominal as from static mooring model with components as in deck log.

2) RCM data
In-situ RCM pressure calibration was cancelled due to bad weather before deployment.
All raw data in RCM*.RAW with leading columns for [record DD.MM.YYYY hh:mm:ss];
separators '.' and ':' removed by editing; non-relevant rows skipped; result inn *.EDT.
RCM clocks were not set before deployment. Last setting of re-used RCM in May 2005
prior to deployment of V27625.
No start and no stop logs for RCMs => no drift correction in time.
Times in data compare with launch & release times of deck & bridge logs.
RCM pressure sensors have no in-situ calibration (no calibration cast due to bad weather).
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processd and at sampling rate in V27626_iii.dat.

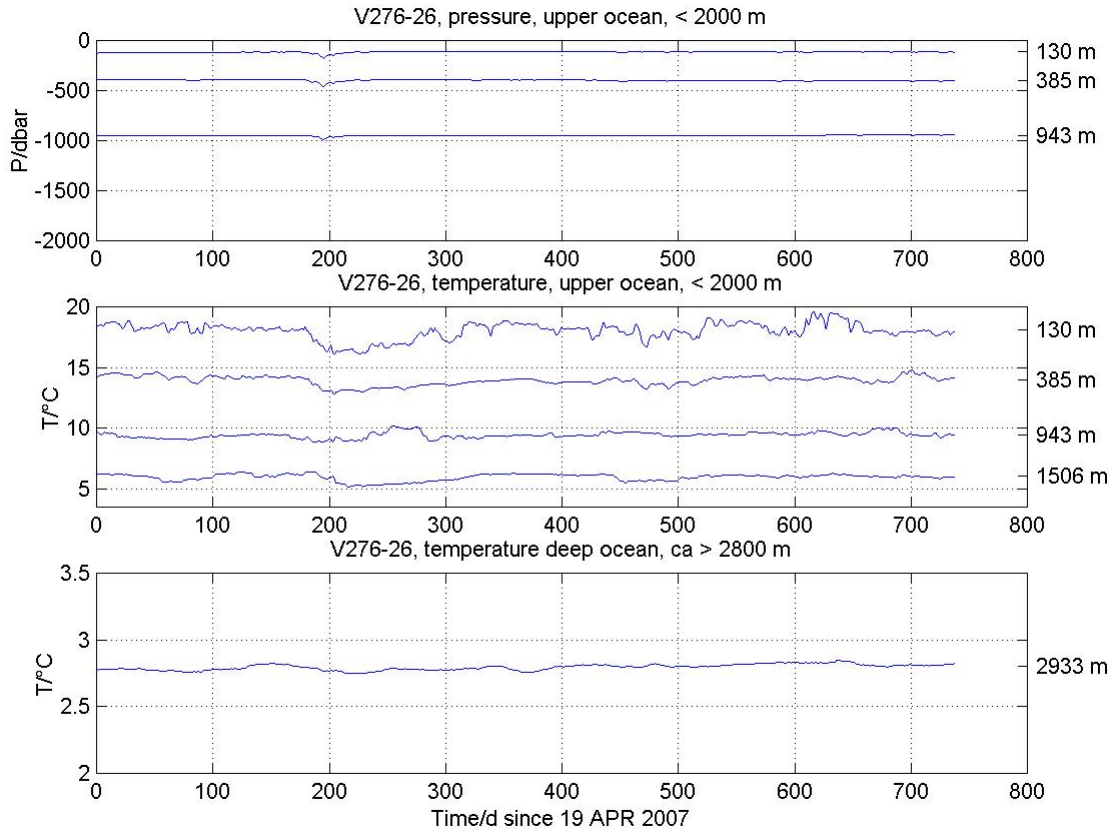
3) TRAP data
Info at IOW.

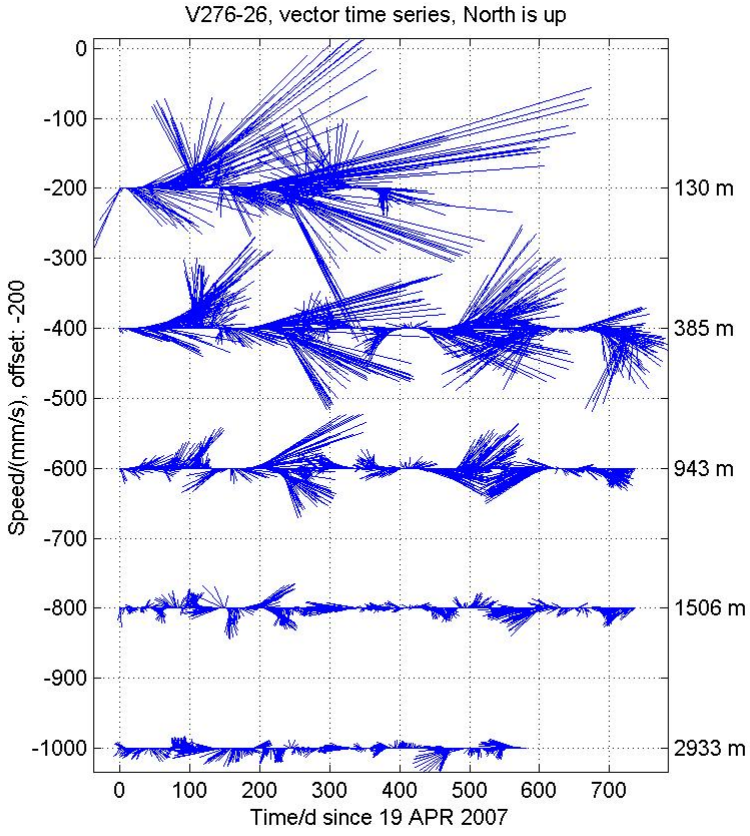
Compiled by: T.J. Mueller Date: 01-MAR-2009

***V276-26**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
212	2762601	RCM8	10554	7200 s		clock change +2*60 s over 2 years compared to recording interval
					REF	344
					T_LR	ok
					PRES	ok, 6300 dbar linear range calibration initially 125 dbar, median 117 dbar
					DIR	ok
					SPD	ok until 07-MAY-2008; thereafter, rotor probably damaged by long-lines
467	2762602	RCM8	10558	7200 s		clock change -18*60 s over 2 years compared to recording interval
					REF	257
					T_LR	ok
					PRES	much too low under 6300 dbar linear range calibration; initially 265 dbar, median 265 dbar
					DIR	ok
					SPD	ok
1024	2762603	RCM8	08411	7200 s		clock change -6*60 s over 2 years compared to recording interval
					REF	325
					T_LR	ok
					PRES	ok, 6300 dbar linear range calibration, initially 915 dbar, median 910 dbar
					DIR	ok
					SPD	ok
1577	2762604	RCM8	09344	7200 s		clock change 6*60 s over 2 years compared to recording interval
					REF	257
					T_LR	ok
					DIR	ok
					SPD	ok
1979	2762605	TRAP	001			SE particle TRAP wih DL 1112, inclination meter
					REF	711,
					ch 2	ok, inclination, raw data stored
					ch 3	constant, not stored
2977	2762606	RCM8	10555	7200 s		clock change 5*60 s over 2 years compared to recording interval
					REF	411
					T_LR	ok
					DIR	ok
					SPD	ok until 21-NOV-2008, rotor stuck later
3046	2762607	TRAP	002			SE particle TRAP
5208	2762608	RCM8	09812	7200 s		flooded, no data





V276-26: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-26: statistics from low pass filtered daily averages

v27626

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
130	384	6.9	81	0.67	6.8	1.0	17.9	20	15	36	10	83	-3.3	1.2
					10.8	6.5	0.8							
385	738	3.8	89	0.53	3.8	0.0	13.9	28	18	38	8	76	-0.8	0.0
					7.1	4.5	0.4							
943	738	1.2	94	0.31	1.2	-0.1	9.4	27	16	18	3	76	-0.2	-0.2
					4.0	2.3	0.3							
1506	738	0.6	235	0.28	-0.5	-0.3	6.0	22	11	28	0	83	-0.1	0.1
					2.1	1.2	0.3							
2933	582	0.9	247	0.47	-0.8	-0.3	2.8	13	13	28	0	86	-0.0	-0.0
					1.8	0.9	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

KIEL276 Time Series Data

Madeira Abyssal Plain

33°N, 022°W, 5280 m water depth

V276-27

28-APR-2009 - 21-APR-2011

Mooring information
****
General

```
Mooring ID   : V276-27/KPO 1086
Deployed     : Date: 28-APR-2009    Ship / Cruise: Poseidon 383
Recovered    : Date: 21-APR-2011    Ship / Cruise: Merian MSM018/1
Latitude N   :   32.959
Longitude E  : -021.993
Water depth  : 5276 m (corrected)
Magn. Anom.  : -9 deg (W, from 2007)
Project      : KIEL276 time series station
PI           : J.J. Waniek
Data origin  : IOW
Depths       : nominal as of logs and IMP static model
```

Remarks

1) Mooring
On recovery, mooring broke at 3000 m; second part found and also recovered.
Top buoy modelled with reduced buoyancy, 420 kp.
TRAPs at 2000 m and at 3050 m designed depth.

All instrument depths nominal as from static mooring model with components as in deck log.

2) RCM data
No in-situ or lab RCM pressure calibration available.
Standard calibrations for temperature and linear range calibration for pressure sensors used.
All raw data in RCM*.ASC; non-relevant rows skipped in *.EDT.
No setting of RCM clocks prior to launching logged. All times of launching and
of release fit with times of associated temperature and pressure changes in data.
No start and no stop logs for RCMs => no drift correction in time.
RCM data pre1-level processed and at sampling rates in RCM*.dat.
RCM data at pre2-level processd and at sampling rate in V27627_iii.dat.

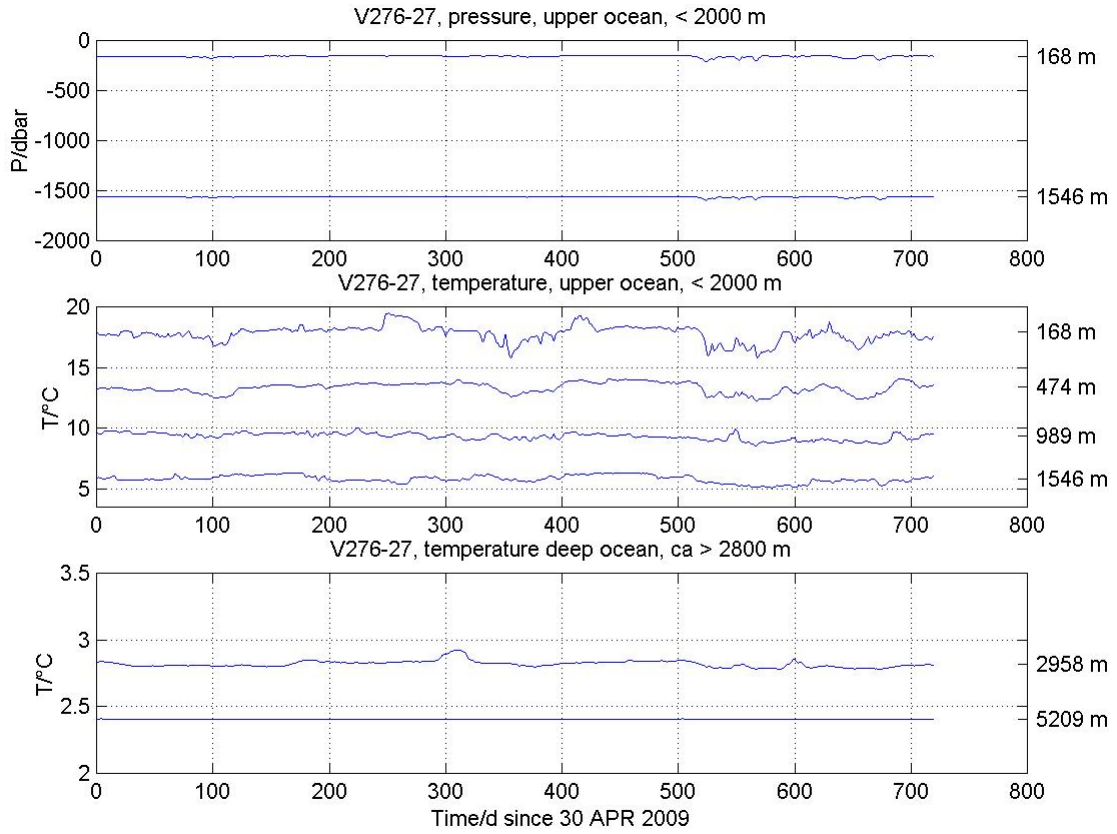
3) TRAP data
Info at IOW.

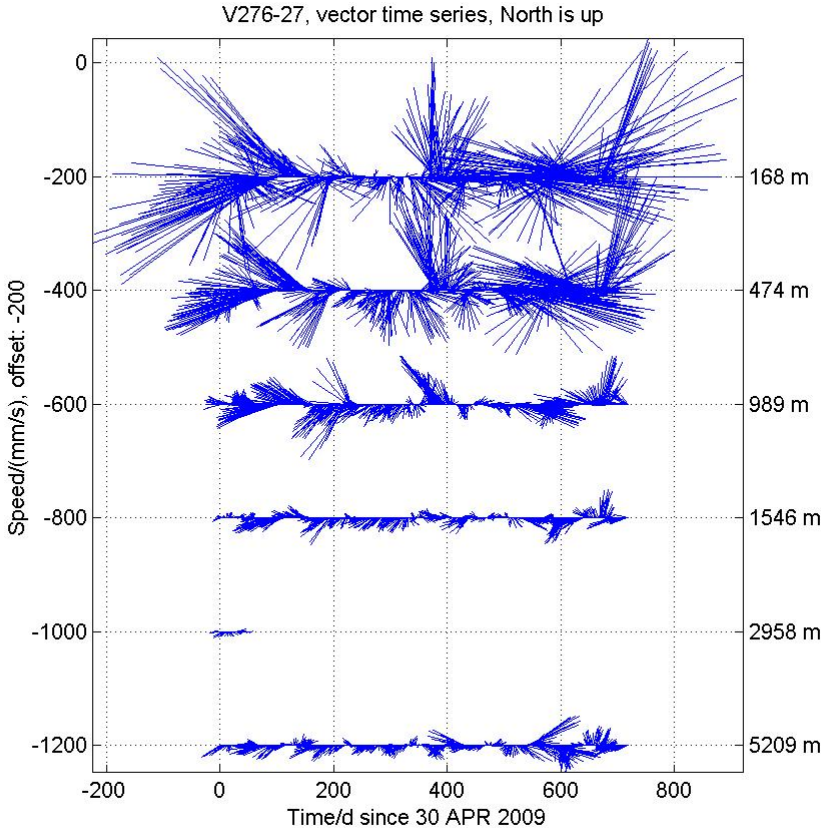
Compiled by: T.J. Mueller Date: 23-APR-2012

***V276-27**: Mooring sketch with nominal depths as from logs and mooring model (see sec. 2.4)*

Instruments: *All depths are nominal as from logs and mooring model (see sec. 2.4.)*

Depth	Moor_ID	Type	S/N	Sampling	Sensor	Remarks
216	2762701	RCM8	09349	7200 s	REF	511
					T_LR	ok
					PRES	ok, 6300 dbar linear range calibration initially 120 dbar, median 117 dbar
					DIR	ok
					SPD	ok until 21-MAR-2011, 22:08
522	2762702	RCM8	05881	7200 s	REF	ok, 392
					T_LR	ok
					DIR	ok
					SPD	ok until 04-APR-2011, 10:00
1037	2762703	RCM8	04562	7200 s	REF	ok, 280
					T_LR	ok
					DIR	ok
					SPD	ok
1588	2762704	RCM8	09932	7200 s	REF	ok, 615
					T_LR	ok
					PRES	ok, initially 1512dbar, median 1511dbar
					DIR	ok
					SPD	ok
1989	2762705	TRAP	001		SE particle TRAP and tilt sensor 1112; data at IOW	
2984	2762706	RCM8	09832	7200 s	REF	ok, 433
					T_AR	ok
					DIR	ok
					SPD	ok until 03-JUL-2009
3053	2762707	TRAP	-9999		SE particle TRAP	
5210	2762708	RCM8	10578	7200 s	REF	ok, 318
					T_LR	ok
					DIR	ok
					SPD	ok





V276-27: *Pressure and temperature (upper panel)and vector time series (lower) of low pass filtered daily averages; instrument depths are best estimates (see sec. 4)*

Mooring V276-27: statistics from low pass filtered daily averages

v27627

Depth	Days	Mean			Mean Stand.-Dev.			Time Scale its			Fluxes Momentum		Fluxes Temperature	
		SPD	DIR	STAB	U	V	T	u	v	t	<uv>	<dm>	<ut>	<vt>
168	720	1.3	269	0.13	-1.3	-0.0	17.8	24	11	25	8	84	-1.2	-0.3
					11.0	6.7	0.7							
474	703	1.8	276	0.21	-1.8	0.2	13.3	28	16	25	-3	-86	-0.1	-0.6
					8.6	5.8	0.4							
989	720	1.5	270	0.36	-1.5	0.0	9.3	38	17	62	-1	-83	-0.3	-0.0
					3.8	2.7	0.3							
1546	720	1.2	244	0.56	-1.1	-0.5	5.8	20	16	37	1	66	-0.2	0.1
					1.7	1.3	0.3							
2958	56	0.3	141	0.36	0.2	-0.3	2.8	7	7	11	0	77	-0.0	-0.0
					0.9	0.4	0.0							
5209	720	0.7	211	0.28	-0.3	-0.6	2.4	20	12	3	1	82	-0.0	-0.0
					2.5	1.4	0.0							

Legend:

Depth : best estimate of instrument depth as from logs, mooring model and measured data
Days : length of record
SPD, DIR: mean speed/(cm/s) and direction
s : directional stability of flow (mean vector speed / mean scalar speed)
U, V : mean East and North component of flow, cm/s
T : mean temperature
its : integral time scale (first zero crossing of autocorrelation function)
u, v, t :deviations from average
$\langle uv \rangle_d$: momentum flux
<md> : direction of momentum flux

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GEOMAR Reports

No.	Title
1	FS POSEIDON Fahrtbericht / Cruise Report POS421, 08. – 18.11.2011, Kiel - Las Palmas, Ed.: T.J. Müller, 26 pp, DOI: 10.3289/GEOMAR_REP_NS_1_2012
2	Nitrous Oxide Time Series Measurements off Peru – A Collaboration between SFB 754 and IMARPE –, Annual Report 2011, Eds.: Baustian, T., M. Graco, H.W. Bange, G. Flores, J. Ledesma, M. Sarmiento, V. Leon, C. Robles, O. Moron, 20 pp, DOI: 10.3289/GEOMAR_REP_NS_2_2012
3	FS POSEIDON Fahrtbericht / Cruise Report POS427 – Fluid emissions from mud volcanoes, cold seeps and fluid circulation at the Don-_Kuban deep sea fan (Kerch peninsula, Crimea, Black Sea) – 23.02. – 19.03.2012, Burgas, Bulgaria - Heraklion, Greece, Ed.: J. Bialas, 32 pp, DOI: 10.3289/GEOMAR_REP_NS_3_2012
4	RV CELTIC EXPLORER EUROFLEETS Cruise Report, CE12010 – ECO2@NorthSea, 20.07. – 06.08.2012, Bremerhaven – Hamburg, Eds.: P. Linke et al., 65 pp, DOI: 10.3289/GEOMAR_REP_NS_4_2012
5	RV PELAGIA Fahrtbericht / Cruise Report 64PE350/64PE351 – JEDDAH-TRANSECT -, 08.03. – 05.04.2012, Jeddah – Jeddah, 06.04 - 22.04.2012, Jeddah – Duba, Eds.: M. Schmidt, R. Al-Farawati, A. Al-Aidaroos, B. Kürten and the shipboard scientific party, 154 pp, DOI: 10.3289/GEOMAR_REP_NS_5_2013
6	RV SONNE Fahrtbericht / Cruise Report SO225 - MANIHIKI II Leg 2 The Manihiki Plateau - Origin, Structure and Effects of Oceanic Plateaus and Pleistocene Dynamic of the West Pacific Warm Water Pool, 19.11.2012 - 06.01.2013 Suva / Fiji – Auckland / New Zealand, Eds.: R. Werner, D. Nürnberg, and F. Hauff and the shipboard scientific party, 176 pp, DOI: 10.3289/GEOMAR_REP_NS_6_2013
7	RV SONNE Fahrtbericht / Cruise Report SO226 – CHRIMP CHatham RIse Methane Pockmarks, 07.01. - 06.02.2013 / Auckland – Lyttleton & 07.02. – 01.03.2013 / Lyttleton – Wellington, Eds.: Jörg Bialas / Ingo Klaucke / Jasmin Mögeltönder, 126 pp, DOI: 10.3289/GEOMAR_REP_NS_7_2013
8	The SUGAR Toolbox - A library of numerical algorithms and data for modelling of gas hydrate systems and marine environments, Eds.: Elke Kossel, Nikolaus Bigalke, Elena Piñero, Matthias Haeckel, 168 pp, DOI: 10.3289/GEOMAR_REP_NS_8_2013
9	RV ALKOR Fahrtbericht / Cruise Report AL412, 22.03.-08.04.2013, Kiel – Kiel. Eds: Peter Linke and the shipboard scientific party, 38 pp, DOI: 10.3289/GEOMAR_REP_NS_9_2013
10	Literaturrecherche, Aus- und Bewertung der Datenbasis zur Meerforelle (*Salmo trutta trutta L.*) Grundlage für ein Projekt zur Optimierung des Meerforellenmanagements in Schleswig-Holstein. Eds.: Christoph Petereit, Thorsten Reusch, Jan Dierking, Albrecht Hahn, 158 pp, DOI: 10.3289/GEOMAR_REP_NS_10_2013
11	RV SONNE Fahrtbericht / Cruise Report SO227 TAIFLUX, 02.04. – 02.05.2013, Kaohsiung – Kaohsiung (Taiwan), Christian Berndt, 105 pp, DOI: 10.3289/GEOMAR_REP_NS_11_2013

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No.	Title
12	RV SONNE Fahrtbericht / Cruise Report SO218 SHIVA (Stratospheric Ozone: Halogens in a Varying Atmosphere), 15.-29.11.2011, Singapore - Manila, Philippines, Part 1: SO218- SHIVA Summary Report (in German), Part 2: SO218- SHIVA English reports of participating groups, Eds.: Birgit Quack & Kirstin Krüger, 119 pp, DOI: 10.3289/GEOMAR_REP_NS_12_2013

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