

Berichte
aus dem
Institut für Meereskunde
an der
Christian-Albrechts-Universität Kiel

Nr. 37

1977

DATENDOKUMENTATION ZUM METEOROLOGISCHEN
MESSPROJEKT 'KIELER BUCHT' 1976

von

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DOI 10.3289/IFM_BER_37

Kopien dieser Arbeit können bezogen werden vom:

Institut für Meereskunde
Abt. Maritime Meteorologie

Düsternbrooker Weg 20
D 2300 K i e l 1

ISSN 0341-8561

ZUSAMMENFASSUNG

Diese Datendokumentation ist eine Zusammensetzung des in Verbindung mit dem Projekt Kieler Bucht 1976 gesammelten Datenmaterials. Sie gibt einen Überblick über die vorliegenden Registrierungen der synoptischen Stationen des Projektgebietes und des meteorologischen Meßmastes der Abteilung Maritime Meteorologie des Instituts für Meereskunde, Kiel. Neben der Beschreibung der Meßanordnung und der Art der Datenübermittlung werden die im Rahmen des Projekts von der Meteorologie durchzuführenden Untersuchungen erläutert. Ferner wird die Verarbeitung und Speicherung der Daten dokumentiert.

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1. EINLEITUNG

Im Rahmen eines interdisziplinären Forschungsprojektes, welches vom Bundesministerium für Forschung und Technologie gefördert wurde, soll im Institut für Meereskunde die Art und Auswirkung der Meeresverschmutzung aus biologischer, meteorologischer und ozeanographischer Sicht untersucht werden. Die diesbezüglichen Untersuchungen beschränken sich auf das Gebiet der Kieler Bucht, eine durch die dänischen Inseln, die deutsche Küste mit Fehmarn begrenzte See, die durch die Belte mit der Ostsee und dem Kattegat in Verbindung steht. Die Belastbarkeit der vorgenannten Region ist weitgehend durch die Dynamik im Seegebiet vorgegeben. Die auftretenden Strömungen werden einerseits durch Zufluß bzw. Abfluß durch die natürlichen Wasserstraßen und damit großräumig gesteuert; andererseits sind sie auch durch die lokale Verteilung der meteorologischen Parameter bedingt. Neben den Temperatur- und Feuchteflüssen ist insbesondere das Windfeld für die Eingabe in ozeanographische Modellierungen der Bedingungen in der Kieler Bucht von Bedeutung.

INTRODUCTION

In 1976 a research program, supported by the Federal Ministry of Research and Technology, was established at Institut für Meereskunde to investigate the biological, meteorological and oceanographic aspects of sea pollution. The investigations are restricted to the Kiel Bight, a region which is surrounded by the Danish Islands and the German coast with the island of Fehmarn and which is connected to the Baltic and the Kattegat by the Belts. The rate of pollution in this region is influenced by the dynamic processes. The observed currents are mainly driven by large scale processes, but they are also influenced by the local distribution of meteorological parameters. In addition to the vertical fluxes of temperature and moisture the determination of the wind field is important as an input for oceanographic modelling of conditions inside the Kiel Bight.

2. ÜBERSICHTSKARTE DER METEOROLOGISCHEN SYNOPTISCH MESSENDEN STATIONEN

Das Meßgebiet und die Lage der vorliegenden Stationen sind auf der Karte (Abb. 1) dargestellt. Zur Erfassung des meteorologischen Feldes stehen die Stationen des dänischen und des deutschen Wetterdienstes sowie des geophysikalischen Beratungsdienstes der Bundeswehr zur Verfügung. Ferner liegen die Registrierungen des Meßmastes der Abteilung maritime Meteorologie am Institut für Meereskunde vor. Die unterschiedliche Kennzeichnung der Stationen in der Abb. 1 gibt Auskunft über die Beobachtungszeit am jeweiligen Meßort. Die Bedeutung der Symbole ist der Tabelle 1 zu entnehmen. Die ausgefüllten Stationskreise repräsentieren Meßorte, wo stündlich bzw. alle drei Stunden Messungen durchgeführt wurden; lediglich am Meßmast liegen 4-minütige Mittelwerte vor. Die Registrierungen der übrigen Stationen sind zeitlich nicht äquidistant. An allen Stationen wurden folgende meteorologische Parameter gemessen: Windrichtung, Windgeschwindigkeit, Druck (nicht am Meßmast), Trockentemperatur und Feuchttemperatur bzw. relative Feuchte.

3. METEOROLOGISCHER MESSGERÄTETRÄGER IN DER KIELER BUCHT

Die mechanische und elektronische Konfiguration des meteorologischen Geräteträgers wurde bereits an anderer Stelle dokumentiert (UHLIG, 1977). Der Meßmast ist als Profilmessanlage konzipiert (Abb. 2). In vier Niveaus befinden sich Sensoren zur Messungen der Trockentemperatur T , der Feuchttemperatur T_f und der Windgeschwindigkeit v . Im dritten Niveau (4,1 m) befinden sich ferner Sensoren für die Windrichtung und die kurzwellige Strahlung. Die Oberflächentemperatur des

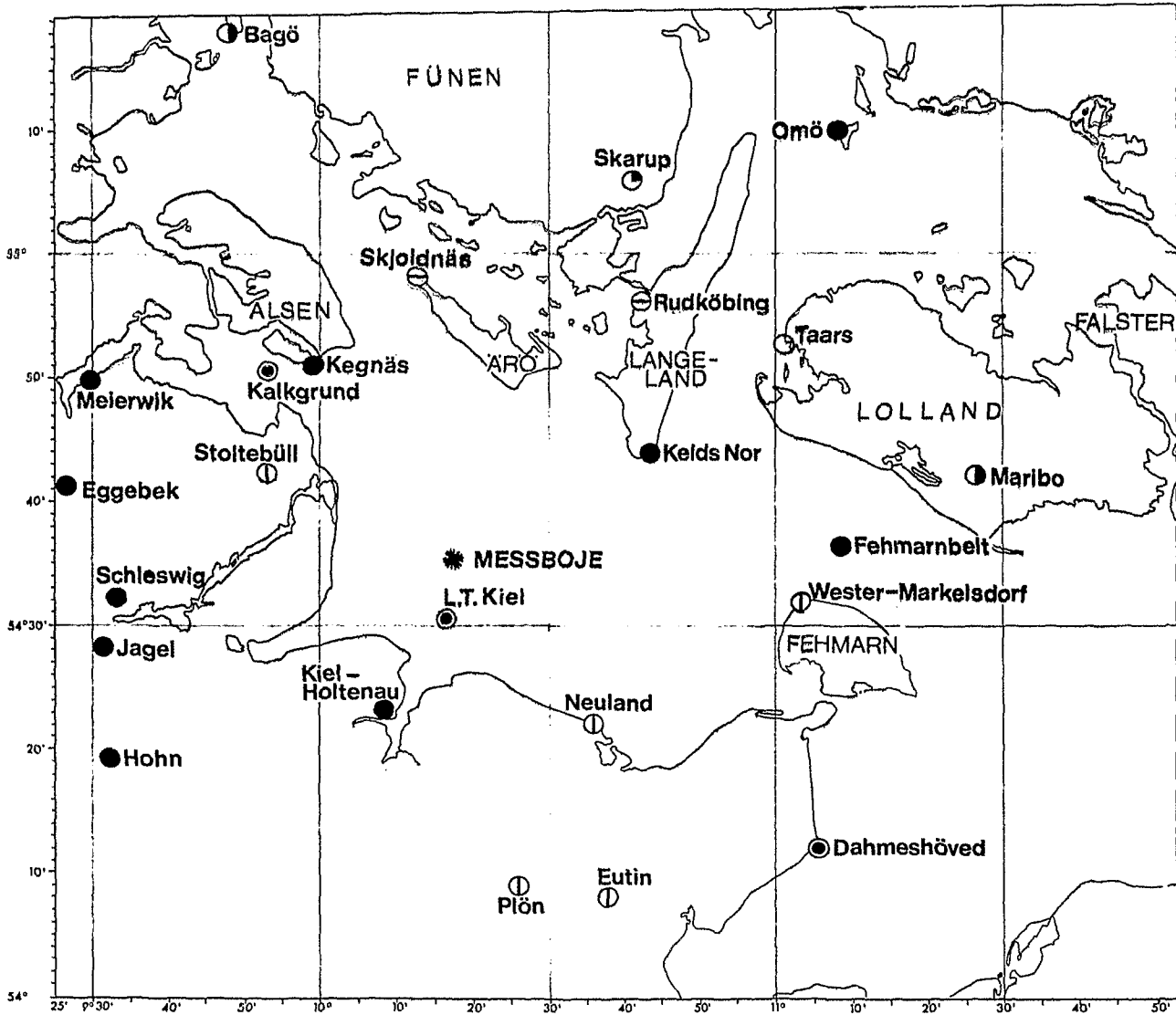


Abb. 1 Das Meßgebiet Kieler Bucht und die Anordnung der Stationen

Synop.- und Klimastationen um die Kieler Bucht

Station Nr.	Station	Geogr.		Höhe m	Beobachtungszeiten in GMT											
		Breite	Länge		0	3	6	9	12	13	15	18	20	21	23	
06111	Bagoe	55 18 N	09 48 E	2	.	.	6	.	9	12	..	15	18	..	..	..
06119	Kegnaes	54 51 N	09 59 E	23	0	3	6	.	9	12	..	15	18	..	21	..
06122	Skarup	55 06 N	10 41 E	49	.	.	6	.	.	12	..	..	18	..	..	..
06139	Keldsnor	54 44 N	10 44 E	8	0	3	6	.	9	12	..	15	18	..	21	..
06144	Maribo	54 42 N	11 27 E	5	.	.	6	.	9	12	..	15	18	..	..	..
06151	Omoe	55 10 N	11 08 E	2	0	3	6	.	9	12	..	15	18	..	21	..
10006	Fehmarnbelt	54 36 N	11 09 E	4	0	3	6	.	9	12	..	15	18	..	21	..
10033	Meierwik	54 50 N	09 30 E	27	stündlich											
10034	Eggebek	54 38 N	09 21 E	20	stündlich											
10037	Jagel	54 28 N	09 31 E	22	stündlich											
10038	Hohn	54 19 N	09 32 E	10	stündlich											
10041	Kalkgrund	54 50 N	09 53 E	13	stündlich											
10044	Kiel LT	54 30 N	10 16 E	21	stündlich 6-18											
10046	Kiel Holtenau	54 23 N	10 09 E	31	stündlich											
10151	Dahmeshöved	54 12 N	11 06 E	8	stündlich											
10156	Lübeck	53 53 N	10 42 E		.	.	6	.	..	13	..	..	..	..	20	..
1442	Stoltebüll	54 42 N	09 53 E		.	.	6	.	..	13	..	..	..	..	20	..
3816	Neuland	54 23 N	10 36 E	5	.	.	6	.	..	13	..	..	..	..	20	..
3820	Plön	54 09 N	10 26 E		.	.	6	.	..	13	..	..	..	..	20	..
3822	Eutin	54 08 N	10 37 E		.	.	6	.	..	13	..	..	..	..	20	..
3835	Westermarkelsdorf	54 32 N	11 04 E		.	.	6	.	..	13	..	..	..	..	20	..
1	Met. Meßmast	54 34,5N	10 19 E	4 Niv.	4-minütige Mittelwerte											
2	Taars	54 52,8N	11 01 E	6	0	3	6	.	9	12	..	15	18	..	21	..
6147	Kadetrenden	54 47 N	12 45 E		0	3	6	.	9	12	..	15	18	..	21	..
10035	Schleswig	54 32 N	09 33 E	43	0	3	6	.	9	12	..	15	18	..	21	..

Tabelle 1 : Lage- und Übermittlungszeit der Kieler Bucht Stationen

Wassers wurde von einem Sensor registriert, der an einem Schwimmkörper befestigt und über zwei Führungstangen mit dem Mast verbunden war. Mittels eines Druckfühlers, der in einer bestimmten Tiefe installiert war, wurden weiterhin die Wasserstandsschwankungen gemessen. Die vertikale Temperaturverteilung des Wassers wurde mittels einer Thermistorkette registriert.

Wie aus Abb. 2 zu ersehen ist, erfolgte der Datentransfer vom Meßmast zum Institut auf zwei Übertragungswegen. Die Daten wurden einerseits on-line über eine Funkstrecke im vierminütigen Abstand zum Institut gesendet, dort decodiert, geeicht und auf Lochstreifen und Magnetband gespeichert. Andererseits wurden die Meßwerte auf Magnetbandcassette am Meßmast aufgenommen. Der Datenträger wurde in Verbindung mit Wartungsarbeiten am Mast etwa alle 14 Tage ausgewechselt und in der Abteilung mit der Rechenanlage NOVA auf 7-Spur Magnetband kopiert.

4. UNTERSUCHUNGEN IM RAHMEN DES PROJEKTS 'KIELER BUCHT' IM SYNOPTISCHEN SCALE

Die zur Eingabe in ein ozeanographisches Mehrschichtenmodell benötigten meteorologischen Feldverteilungen werden im dreistündigen Intervall für den Zeitraum April bis Oktober 1976 aus den Meldungen der synoptischen Stationen im Bereich der Kieler Bucht und den Daten des Meßmastes mittels objektiver Analyse an äquidistanten Gitterpunkten berechnet und auf Datenträger abgespeichert (KIRK, 1977). Zu den Zeitpunkten, an denen Messungen der nicht äquidistant registrierenden Stationen (Klimastationen) vorliegen, werden diese zusätzlich einbezogen und damit die Genauigkeit der berechneten Feldverteilung erhöht. Das Temperaturfeld für vier Termine am 1. April ist als Beispiel in der Abb. 3 dargestellt. Während mit Hilfe der objektiven

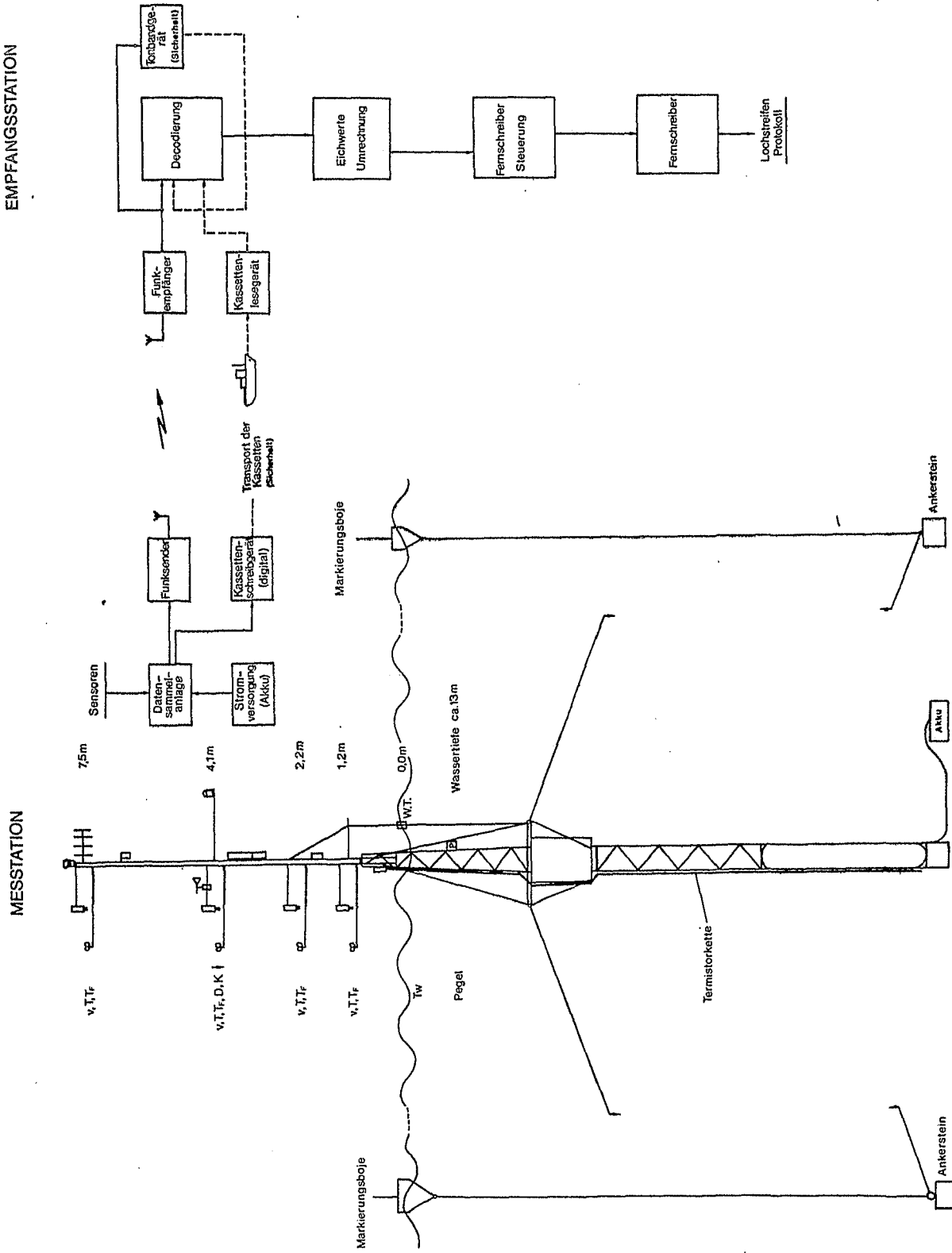


Abb. 2 Konfiguration des Meßmastes und Datentransfer

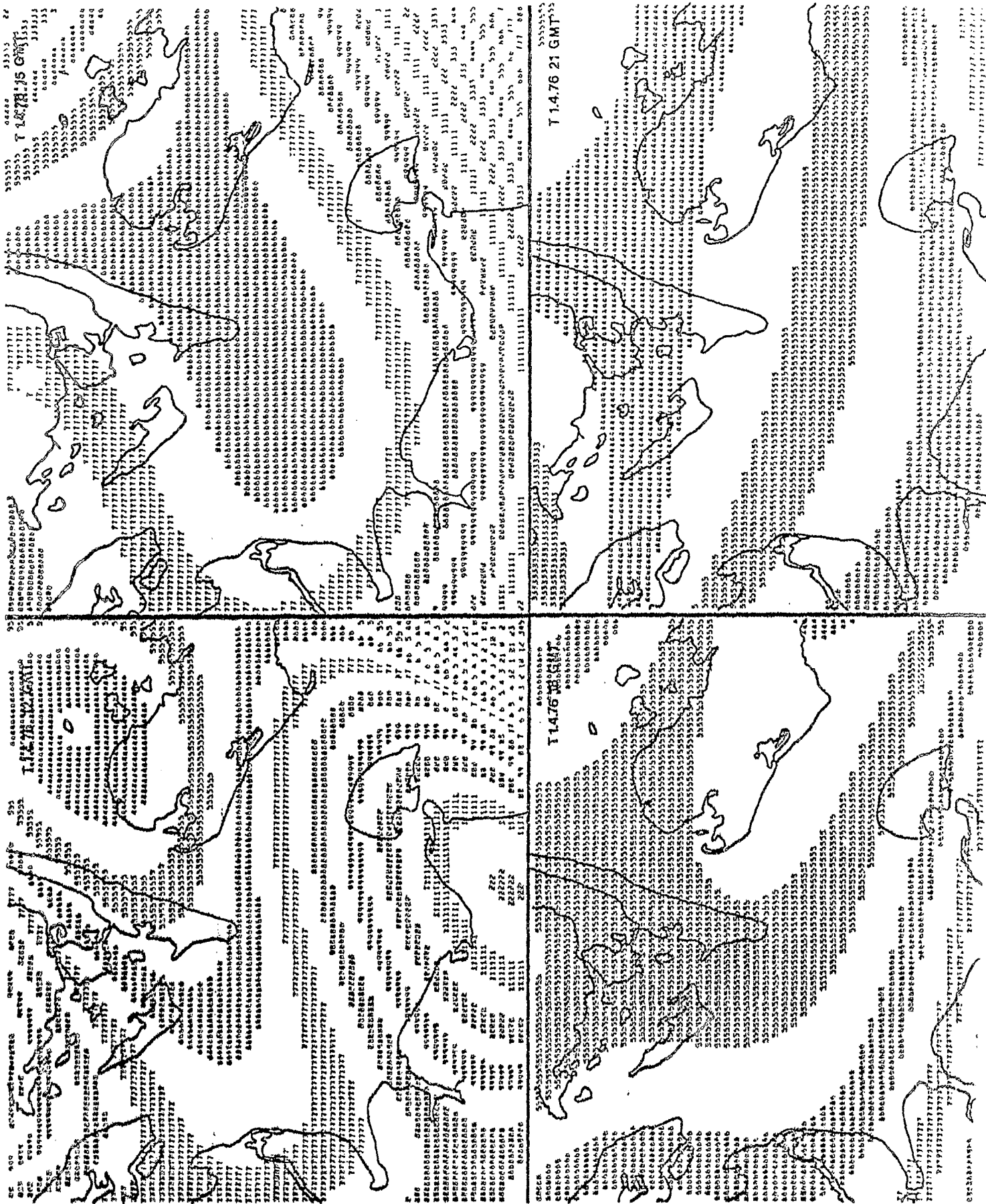


Abb. 3 Zeitliche Entwicklung des räumlichen Feldes der Lufttemperatur

Analyse die skalaren und vektoriellen Felder von Temperatur und Wind im Untersuchungsgebiet bestimmt werden, soll die Wechselwirkung der meteorologischen Parameter zwischen den synoptischen Stationen und der Meßanordnung auf See mittels Spektralanalyse eingehend untersucht werden. Hierzu sind aus den Auto- und Querkorrelationsfunktionen die Kohärenz und Phasenspektren bestimmt worden (HESSLER, 1977, noch nicht veröffentlichtes Material). Ziel dieser Analysen soll es u.a. sein, aus den Messungen der synoptischen Stationen an Land eine bessere Aussage über die Verhältnisse auf See machen zu können. Derartige Untersuchungen sind besonders dann von Interesse, wenn aufgrund einer schwach ausgeprägten großräumigen Zirkulation die meteorologischen Verhältnisse auf See durch lokale Effekte bedingt sind. Dies war während mehrerer Perioden des Meßzeitraums der Fall. Ferner soll die kleinräumige Zirkulation im Bereich der Kieler Bucht mittels Modellrechnung verifiziert werden.

5. UNTERSUCHUNGEN IM RAHMEN DES PROJEKTS 'KIELER BUCHT' IM MIKROSCALE

Während die Analysen im synoptischen Scale die Verteilung und Wechselwirkung der meteorologischen Parameter im Untersuchungsgebiet beschreiben, sollen die Profildaten des Meßmastes mit dem Abtastintervall von vier Minuten zur Bestimmung des vertikalen turbulenten Impuls-, Wärme- und Feuchteflusses am Meßort und zur Überprüfung der bestehenden Theorien dienen. Die Berechnung geschieht mit den bekannten Ansätzen durch Bestimmung aus logarithmischen Profilen. Als Beispiel sind für vier Tage des Meßzeitraums die registrierten Profile und Zeitreihen in den Abbildungen 4a-d wiedergegeben. Zur besseren Übersicht wurden nur die stündlichen Momentanwerte in die Zeichnung übertragen. Die Profildaten und Zeitreihen liegen auf Magnetband vor.

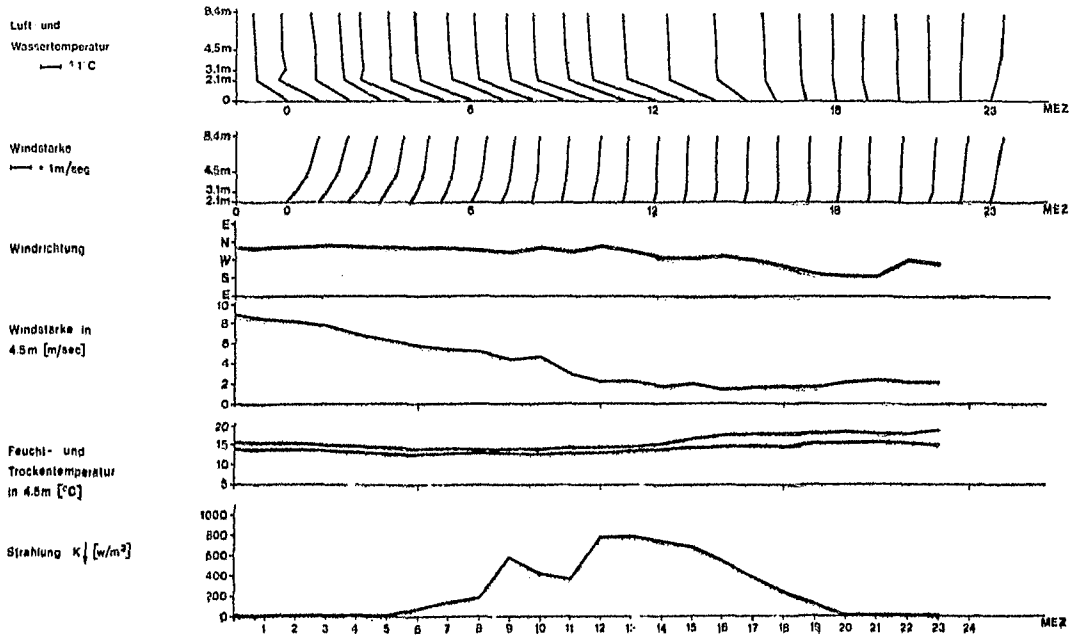


Abb. 4a Stündliche Momentanwerte der Profile und Zeitreihen am 1. Juli 1976, Meßmast IfM

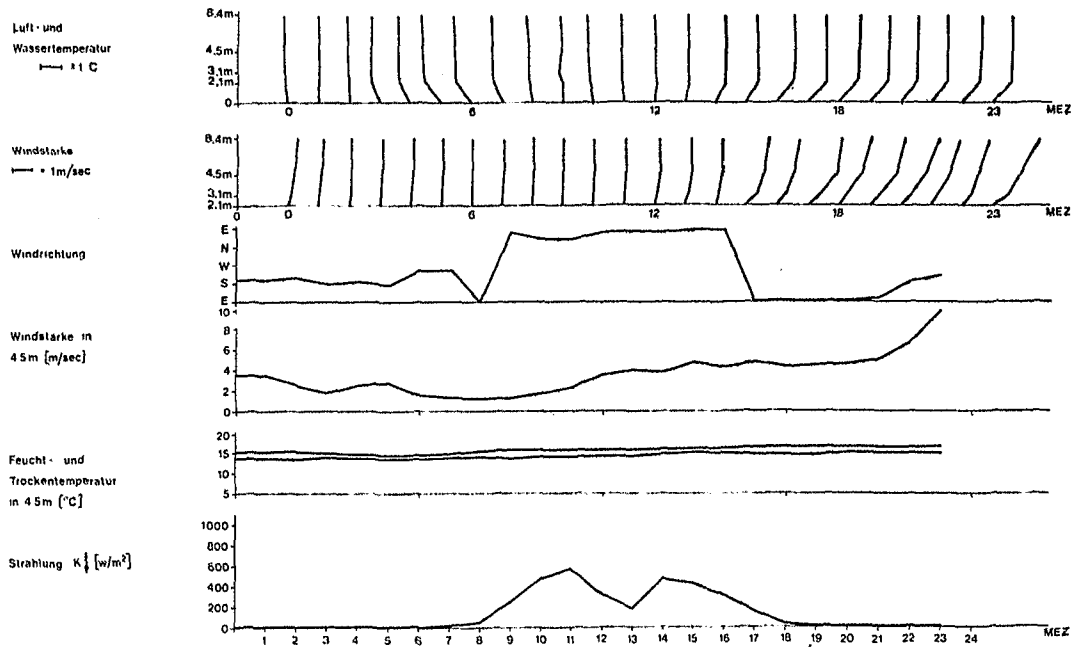


Abb. 4b Daten Meßmast 7. August 1976

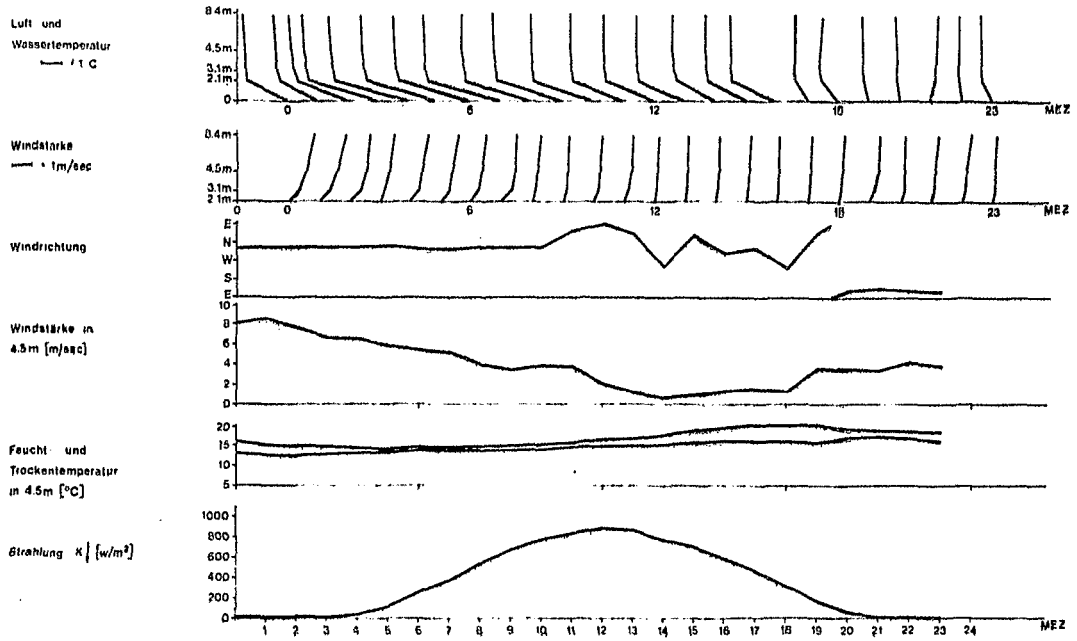


Abb. 4c Daten Meßmast 13, September 1976

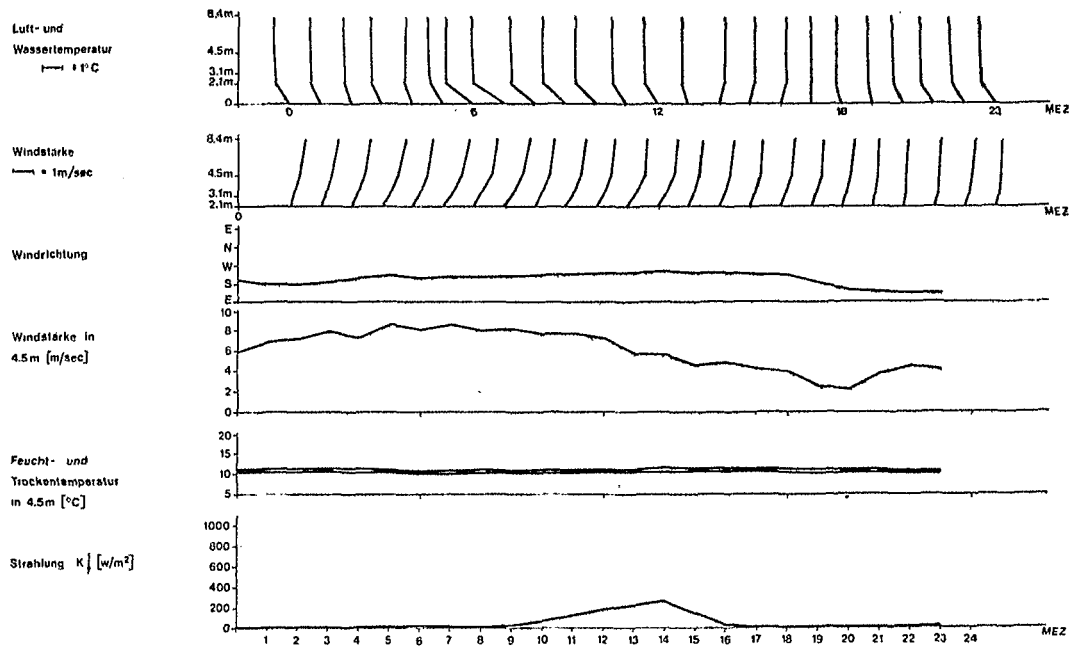


Abb. 4d Daten Meßmast 22. Oktober 1976

6. AUFBEREITUNG UND SPEICHERUNG DER DATEN

Die auf dem Funkwege übermittelten Daten des Meßmastes liegen geeicht auf Lochstreifen und Magnetband vor. Die Rohdaten wurden am Rechenzentrum der Universität Kiel weiterverarbeitet und als Arrays gespeichert. Diese Arrays bestehen aus 24 Kanälen (Spalten) und jeweils 360 Zeilen; dies entspricht einem Tag. Die Daten des Meßmastes stehen auf den Kanälen 1 bis 16. Darüberhinaus wurden entsprechend den Angaben der Tabelle 2 weitere meteorologische Parameter zeitlich synchron auf dem Dach des Instituts für Meereskunde gemessen und mit abgespeichert. Dieser Datensatz liegt für die Zeit vom 14. April bis 25. Oktober 1976 auf X1-Band vor. Weiter sind auf X8-Band die Daten für jeden Kanal als Zeitreihe im B2X8-Format umgesetzt. Die von Cassetten auf Magnetband kopierten Daten wurden mittels Transferprogramm an der Rechenanlage PDP-11 des IfM umcodiert und geeicht. Die Daten liegen für den Zeitraum vom 21. Mai bis 25. Oktober 1976 in den Codes DOS-ASCII und IfM-binär vor.

Aufgrund der besseren Qualität der Cassettdaten (weniger Ausfälle, da Störungen bei der Funkübertragung entfielen), wurde für die Darstellung der Zeitreihen dieser Dokumentation der letztere Datensatz verwendet. Neben den Originalreihen des Mastes mit einem Abtastintervall von vier Minuten wurden noch Reihen mit stündlichem Werteabstand gebildet. Da die Zeitreihen des Mastes mit den Registrierungen der synoptischen Stationen, welche nur stündliche Momentanwerte melden, verglichen werden, wurde hierbei keine arithmetische Mittelung vorgenommen, sondern es wurden zu jeder vollen Stunde die vierminütigen Mittelwerte für die Temperatur und zwölfminütige für die Windgeschwindigkeit ausgewählt.

Diese Reihen und die Daten der stündlich bzw. dreistündlich registrierenden synoptischen Stationen sind im Code IfM-binär auf Magnetband gespeichert. Die synoptischen

Kanalnr.	Sensor
-7	Temperatur des Strahlungsmeßfühlers
-6	Gesamtstrahlung
-5	kurzwellige Strahlung
-4	Windrichtung
-3	Windgeschwindigkeit
-2	Feuchttemperatur
-1	Trockentemperatur
0	Zeit der Messung
1	Trockentemperatur in 7,5 m
2	Feuchttemperatur in 7,5 m
3	Trockentemperatur in 4,1 m
4	Feuchttemperatur in 4,1 m
5	Trockentemperatur in 2,2 m
6	Feuchttemperatur in 2,2 m
7	Trockentemperatur in 1,2 m
8	Feuchttemperatur in 1,2 m
9	Windgeschwindigkeit in 7,5 m
10	Windgeschwindigkeit in 4,1 m
11	Windgeschwindigkeit in 2,2 m
12	Windgeschwindigkeit in 1,2 m
13	Windrichtung in 4,1 m
14	Wassertemperatur an der Oberfläche
15	kurzwellige Strahlung
16	Pegel

Zeitreihen umfassen den Zeitraum vom 1. April bis 31. Oktober 1976. Die Daten der Klimastationen liegen auf Magnetband und Lochkarten vor.

7. VERGLEICHENDE DARSTELLUNG METEOROLOGISCHER PARAMETER ÜBER LAND UND SEE

Zur Veranschaulichung des zeitlichen Verlaufs einiger meteorologischer Parameter über Land und See wurden die Registrierungen der Stationen Meßmast und Schleswig in Diagrammen aufgetragen (Abb. 5a-g). Es ist jeweils für einen Monat der Verlauf von Windrichtung, Windgeschwindigkeit, Lufttemperatur und relativer Feuchte dargestellt. Ferner wurde der Luftdruck der Station Schleswig und die am Mast gemessene Oberflächentemperatur des Wassers aufgetragen. Die Darstellung in einem Koordinatensystem zeigt in Ergänzung der nachfolgenden Zeitreihen einzelner Stationen und Parameter die charakteristischen Unterschiede hinsichtlich Amplitude und Phase auf, welche im Rahmen der in Kapitel 2.2. dargelegten Untersuchungen näher zu analysieren sind. Insbesondere während der Hochdrucklagen in den Monaten Juli (Abb. 5d) und August (Abb. 5e) wird der Verlauf der meteorologischen Parameter durch lokale Effekte geprägt.

8. AUSGEWÄHLTE ZEITREIHEN SYNOPTISCHER STATIONEN

Für eine Anzahl synoptischer Stationen sind im folgenden für den Zeitraum vom 1. April bis 31. Oktober 1976 die zeitlichen Verläufe von Windrichtung, Windgeschwindigkeit, Druck, Temperatur und Taupunkt dargestellt (siehe Anhang, Teil 1). Ein Koordinatennetz umfaßt hierbei jeweils einen halben Monat. Es wurden im westlichen Teil der Kieler Bucht die Stationen Hohn und Schleswig, im Norden Kalkgrund, im Osten Keldsnor und im Süden Fehmarnbelt ausgewählt.

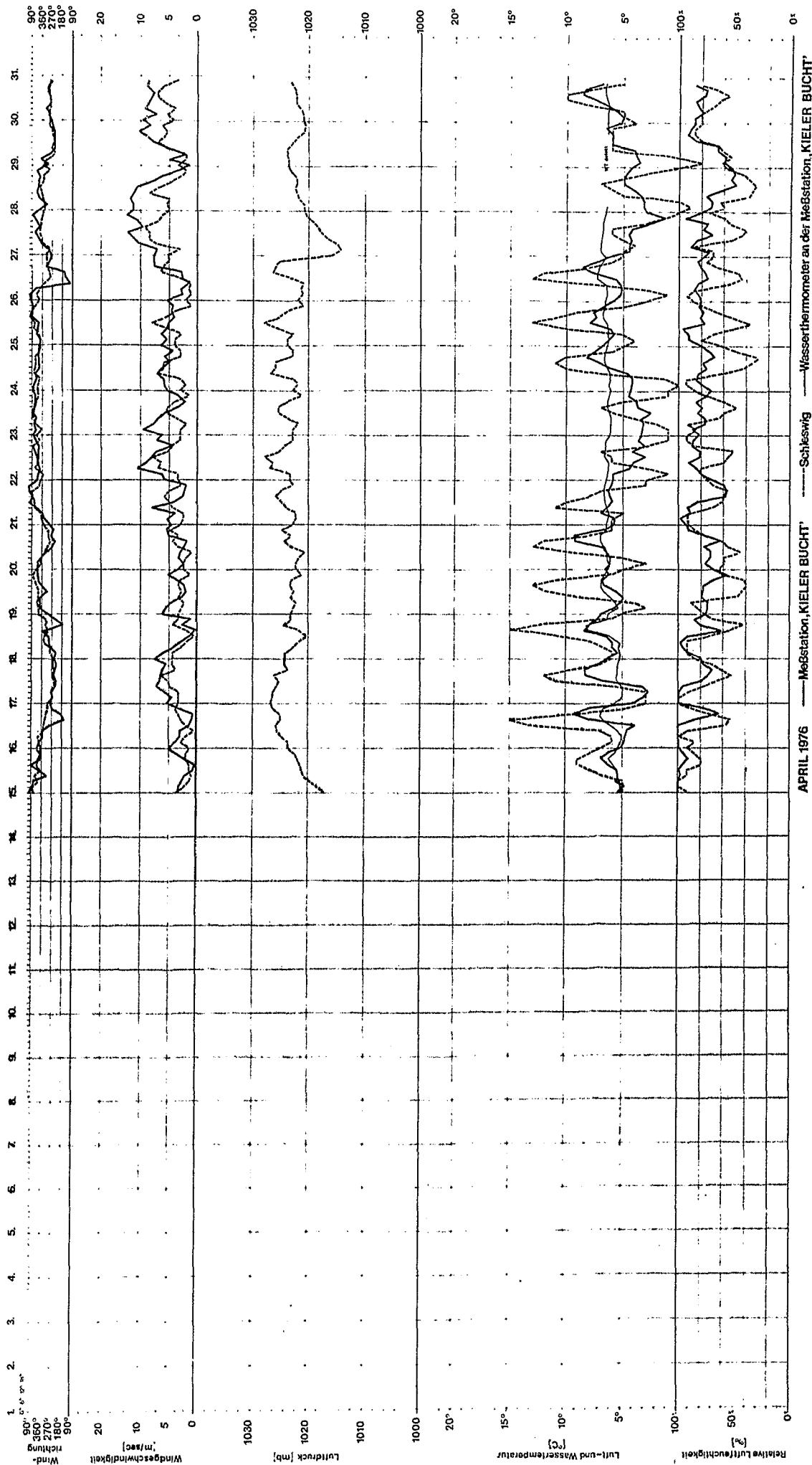


Abb. 5a Zeitlicher Verlauf der Stationen Schleswig und Meßst. April 1976

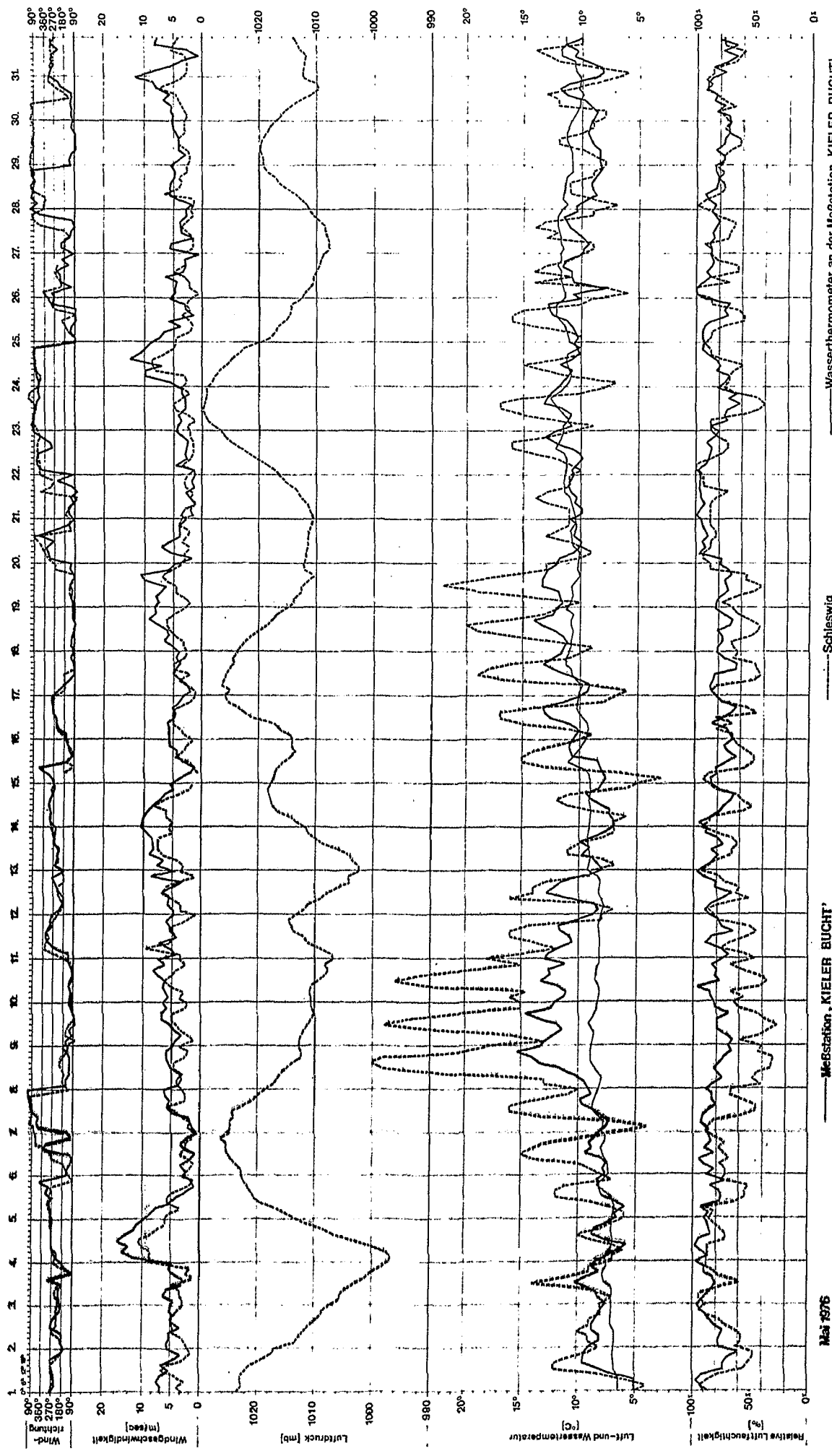
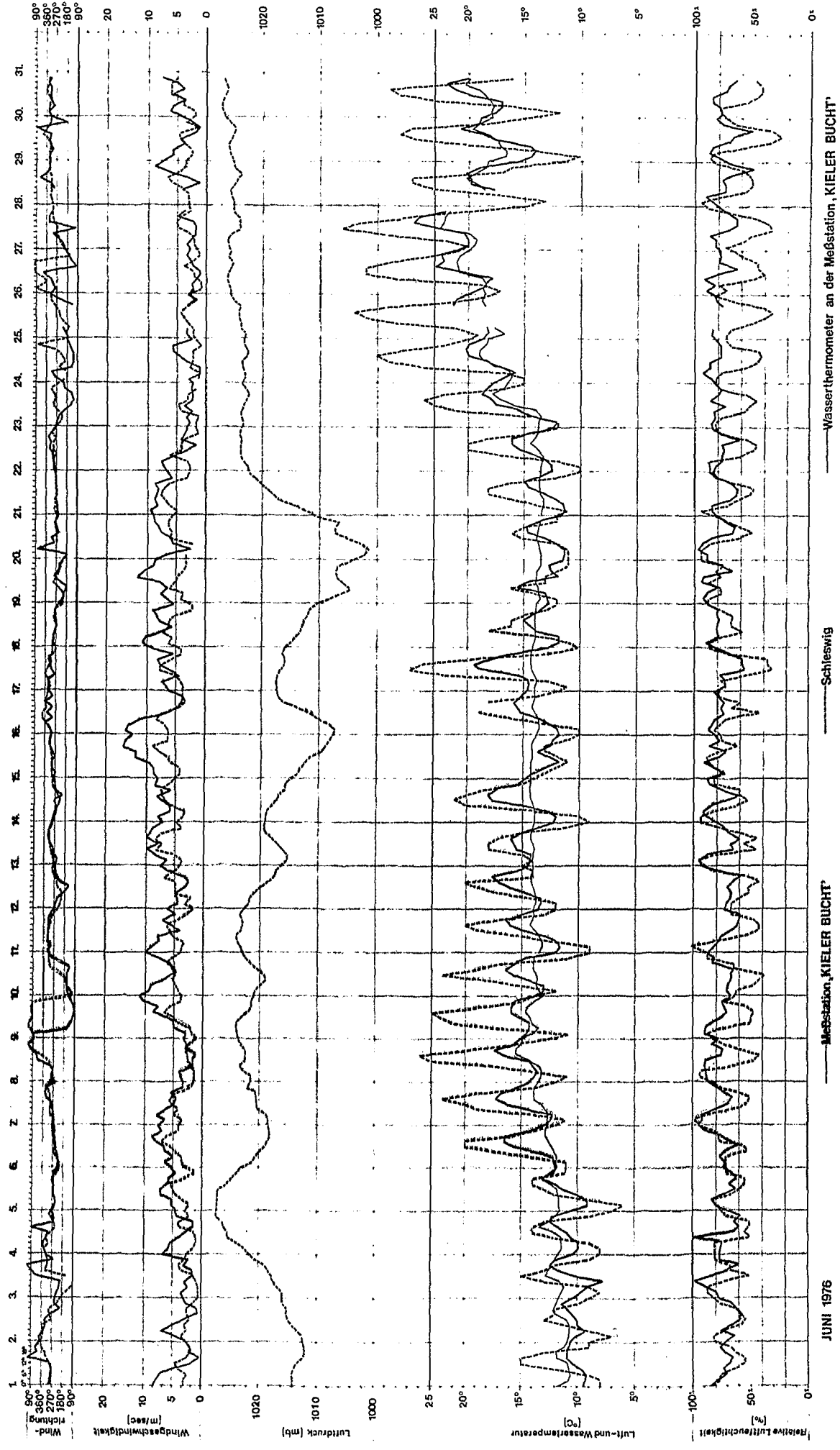


Abb. 5b

Zeitliche Verteilung der Stationen 1976

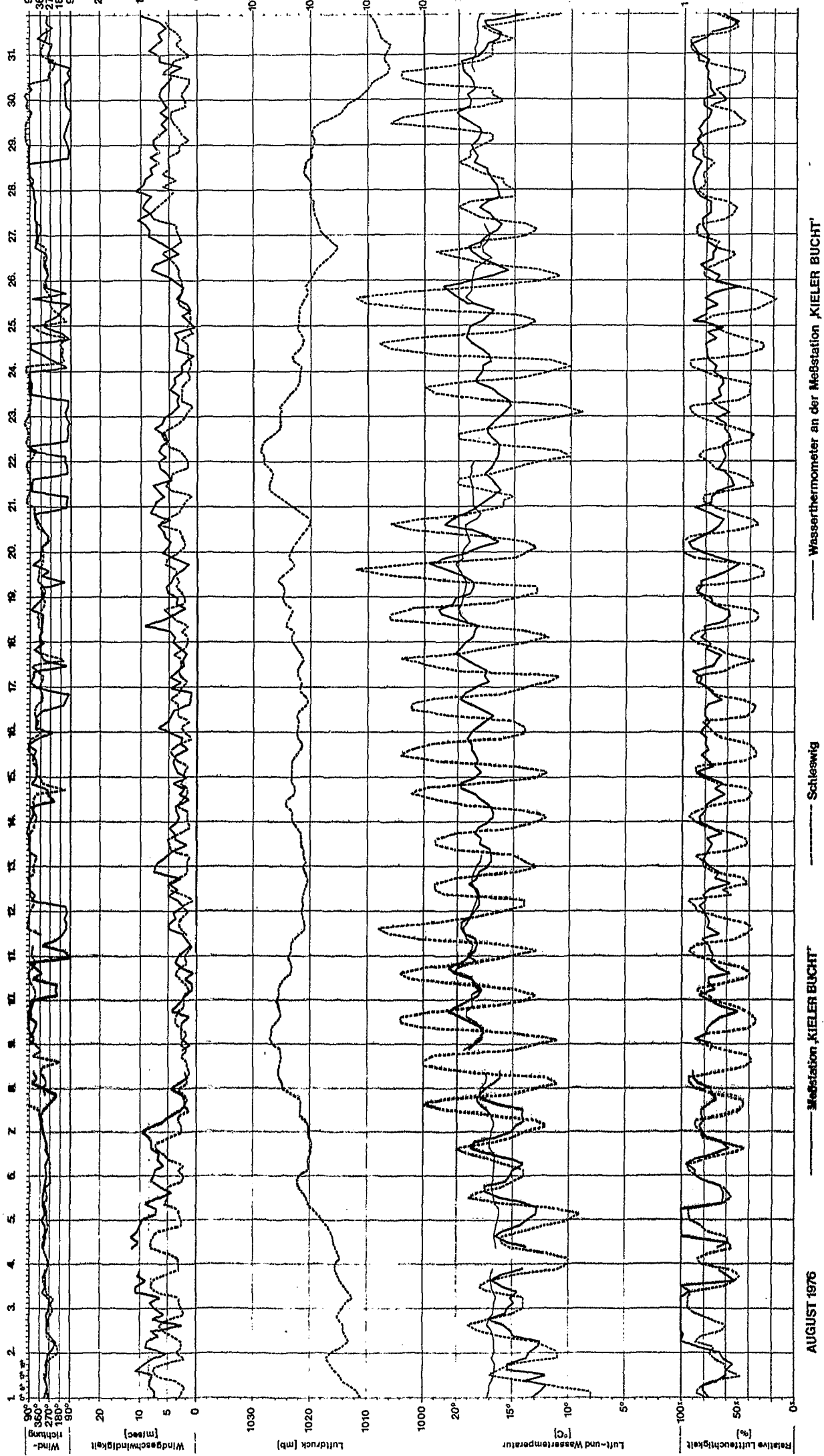


JUNI 1976



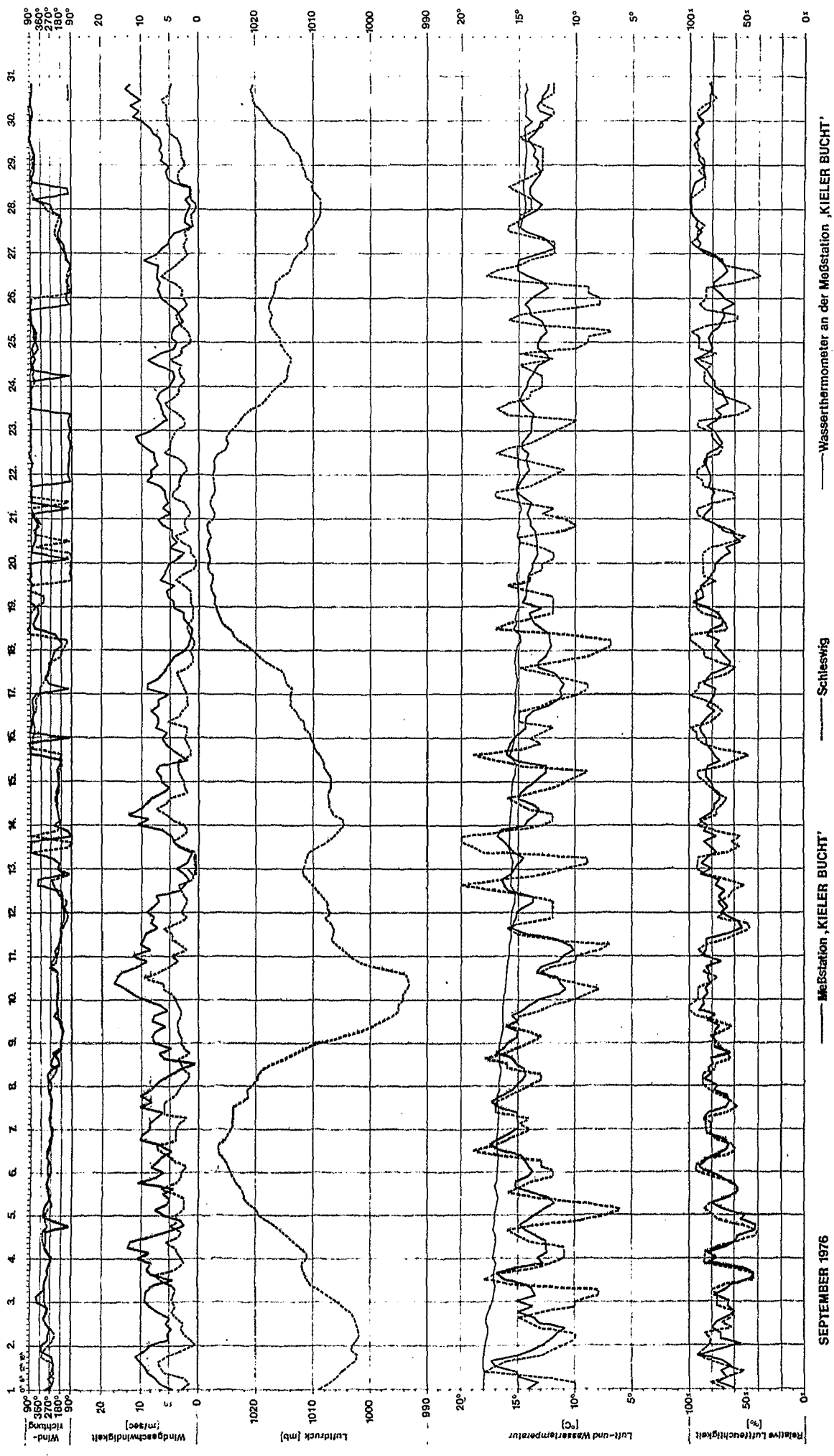
Abb. 5d Zeitlicher Verlauf der Stationen Schleswig und Meßmast Juli 1976

Abb. 5d Zeitlicher Verlauf der Stationen Schleswig und Meßmast Juli 1976



AUGUST 1976

Abb. 5e Zeitlicher Verlauf der Stationen Schleswig und Meßmast August 1976



SEPTEMBER 1976

Abb. 5f Zeitlicher Verlauf der Stationen Schleswig und Meßmast September 1976

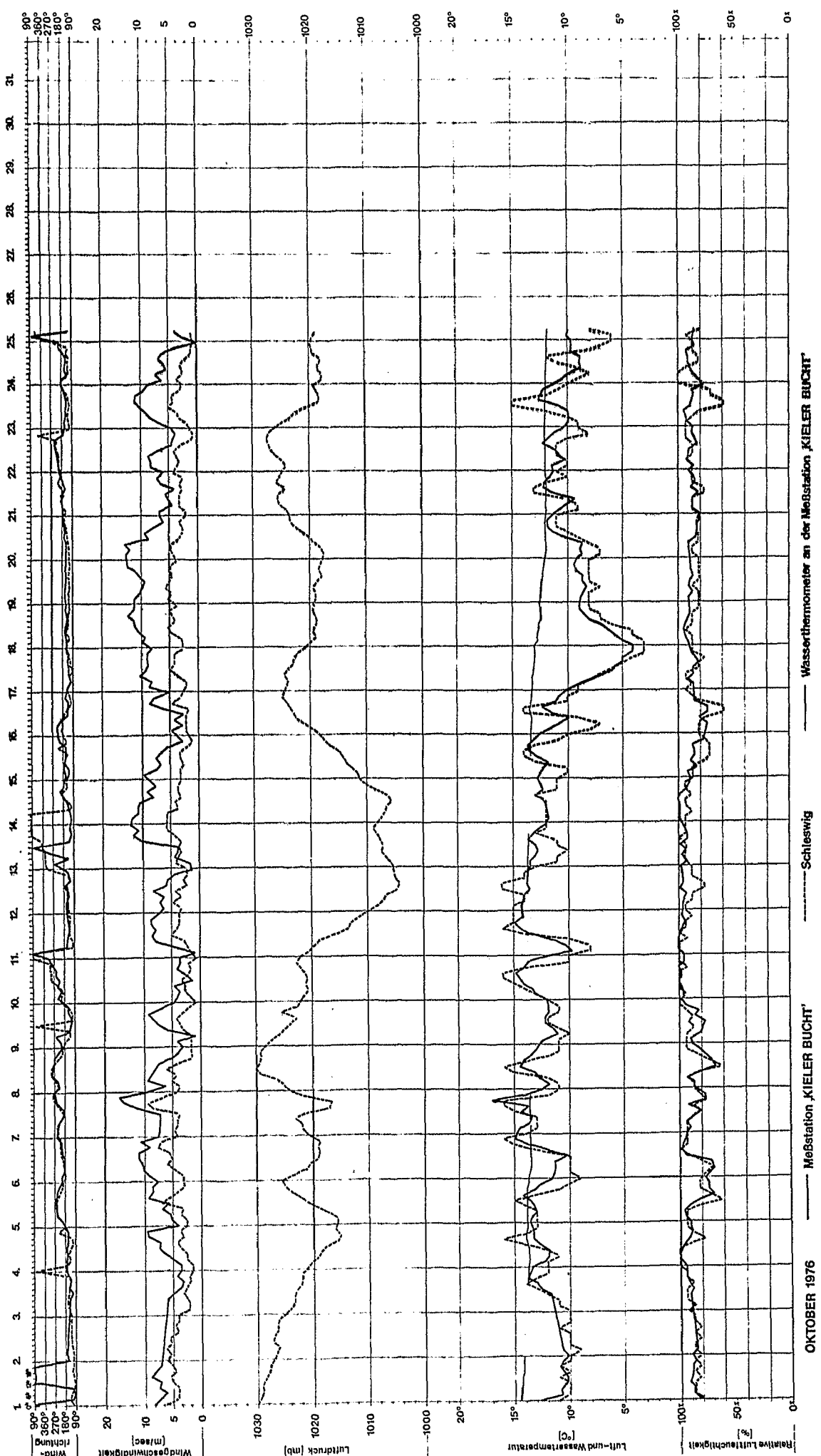


Abb. 5g Zeitlicher Verlauf der Stationen Schleswig und Meßmast Oktober 1976

Diese Stationen geben somit einen repräsentativen Überblick über die raum-zeitliche Verteilung der meteorologischen Parameter im Projektgebiet. Ein Vergleich zwischen Schleswig und Hohn im Landesinneren und den Küsten - bzw. Seestationen Keldsnor, Kalkgrund und Fehmarnbelt zeigt die charakteristischen Unterschiede im Verlauf der meteorologischen Parameter von Land- und Seestationen.

9. REGISTRIERUNGEN DES METEOROLOGISCHEN MESSMASTES

Die von der Abteilung maritime Meteorologie durchgeführten Profilmessungen am Geräteträger sind im Teil 2 des Anhangs für den Zeitraum vom 21. Mai bis 25. Oktober 1976 abgebildet. Es sind die Profile der Windgeschwindigkeit und der Trockentemperatur beginnend mit dem obersten Niveau (ANE⁴ bzw. PST⁴) aufgetragen. In die Zeitreihen der Temperatur ist der Verlauf der Feuchttemperatur gestrichelt mit eingetragen. Ferner sind Windrichtung und Wasseroberflächentemperatur dargestellt. Insbesondere im unteren Niveau sind die Zeitreihen durch Ausfälle der Sensoren einige Male gestört.

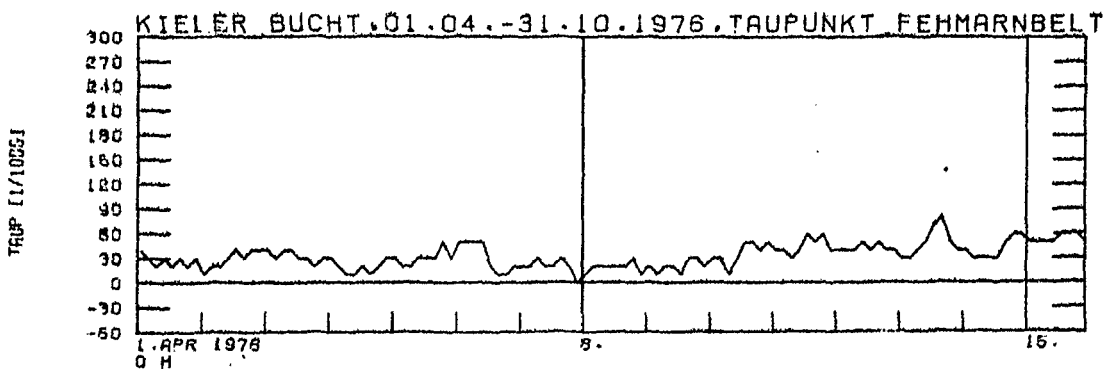
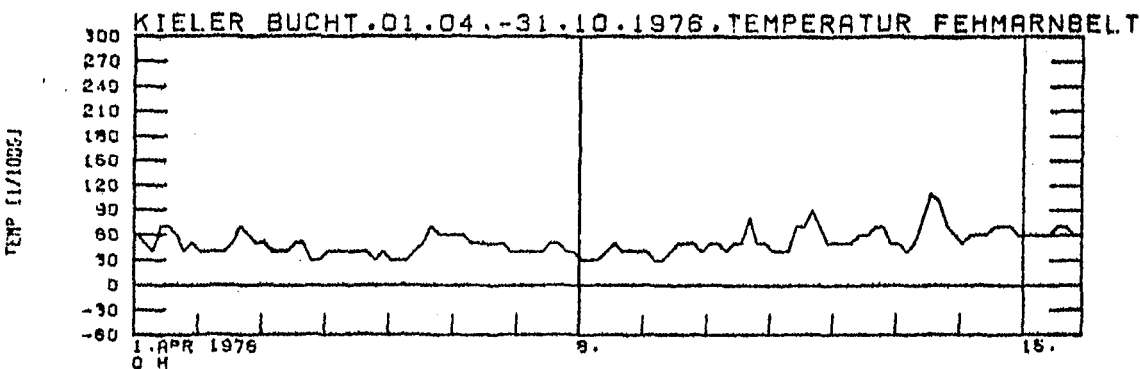
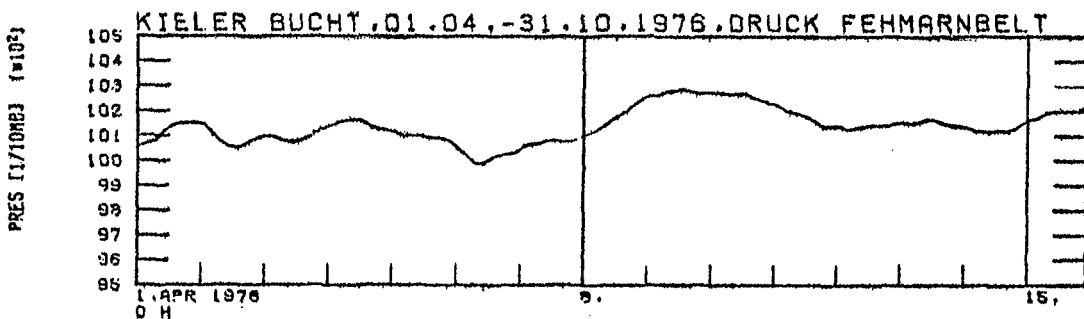
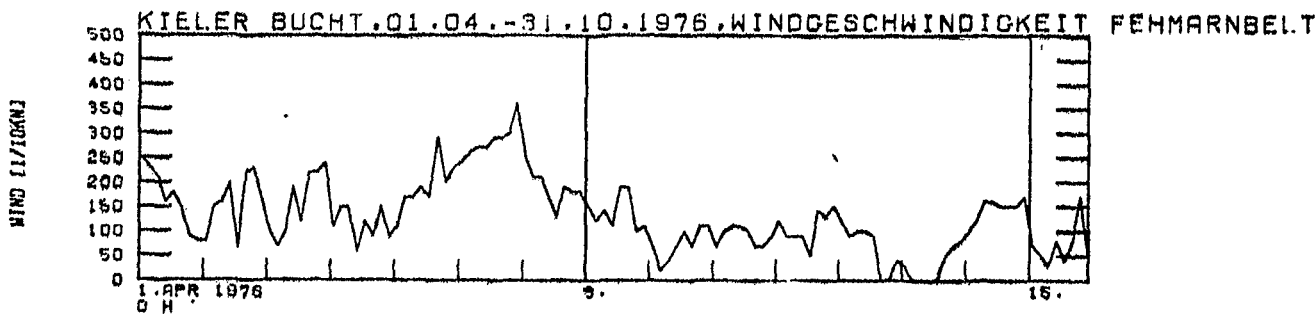
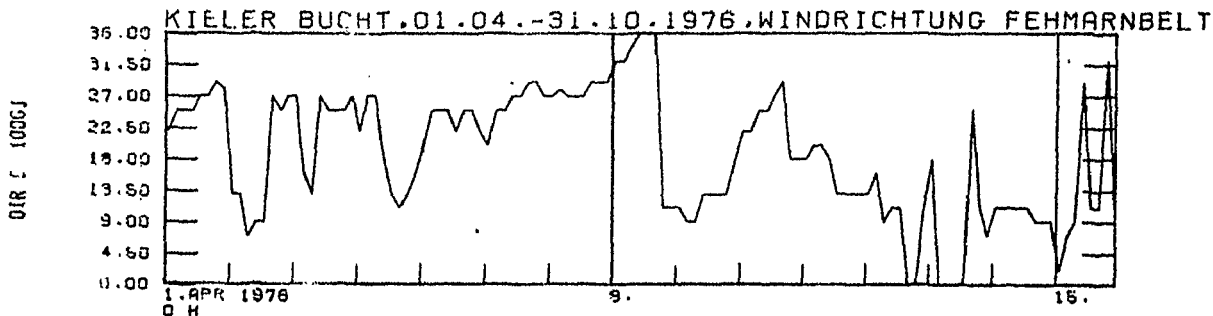
Im dritten Teil des Anhangs sind weiter die Reihen für die kurzweilige Strahlung und die Wasserstandsschwankungen am Mast wiedergegeben.

LITERATURVERZEICHNIS

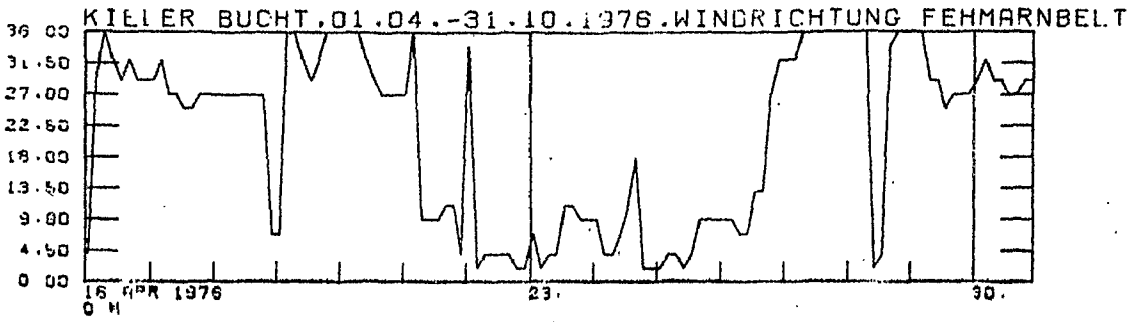
- E. Kirk, Objektive Analysen meteorologischer
Parameter über der Kieler Bucht,
Diplomarbeit Kiel, z.Zt. in Bearbeitung
- K. Uhlig, Ein Meßsystem zur Erfassung von Mittel-
werten meteorologischer Größen,
Technisches Messen atm 10/77, Oldenbourg-
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A N H A N G

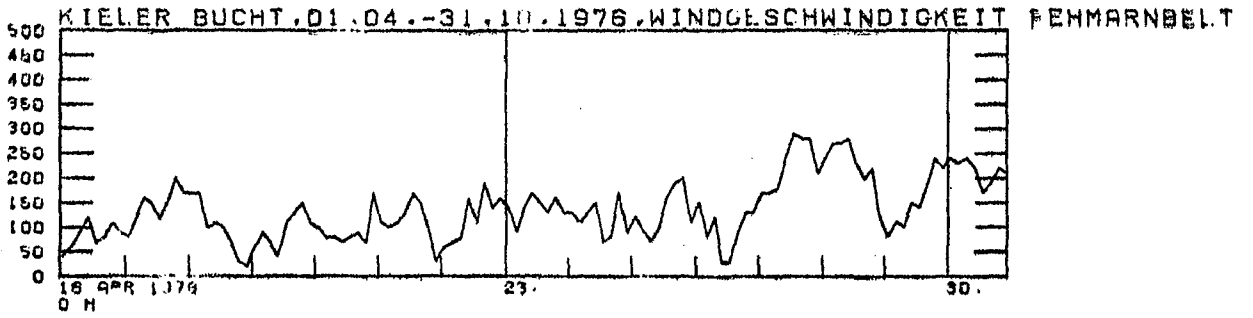
TEIL I ZEITREIHEN DER SYNOPTISCHEN STATIONEN
FEHMARNBELT, HOHN, SCHLESWIG, KALKGRUND,
KELDSNOR



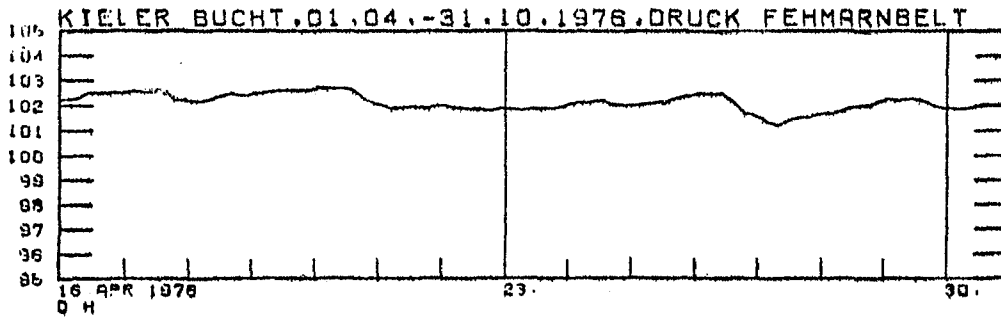
DIR [105G]



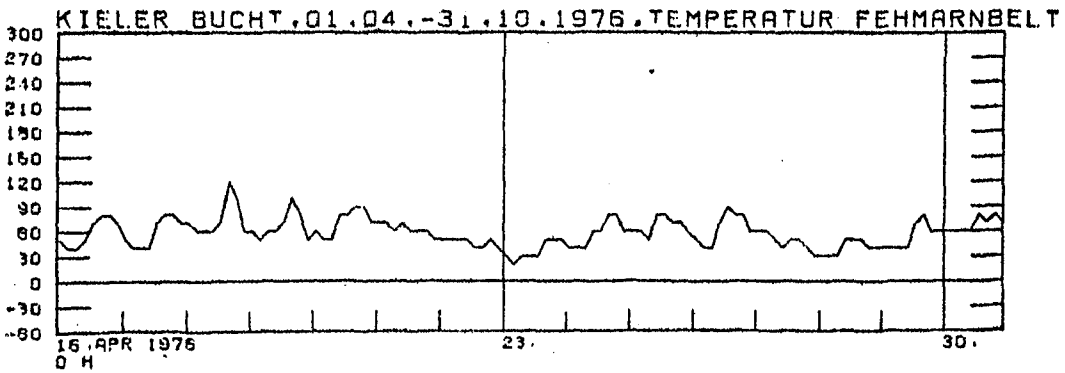
WIND [1/10M]



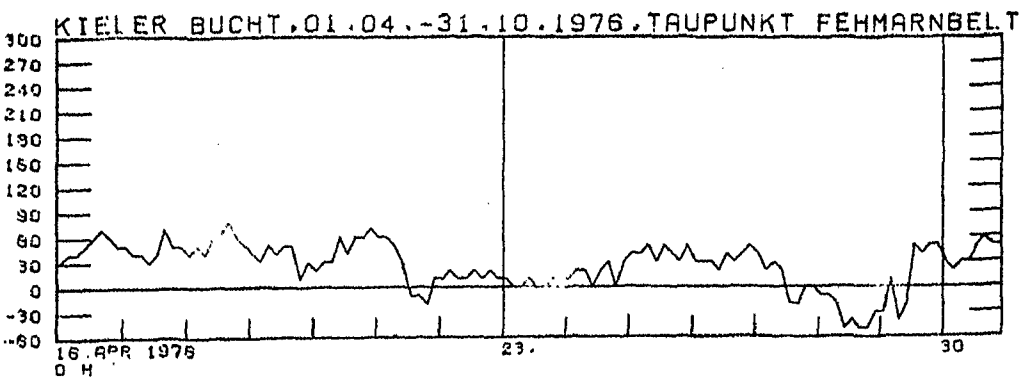
PRES [1/10M] [m10^2]



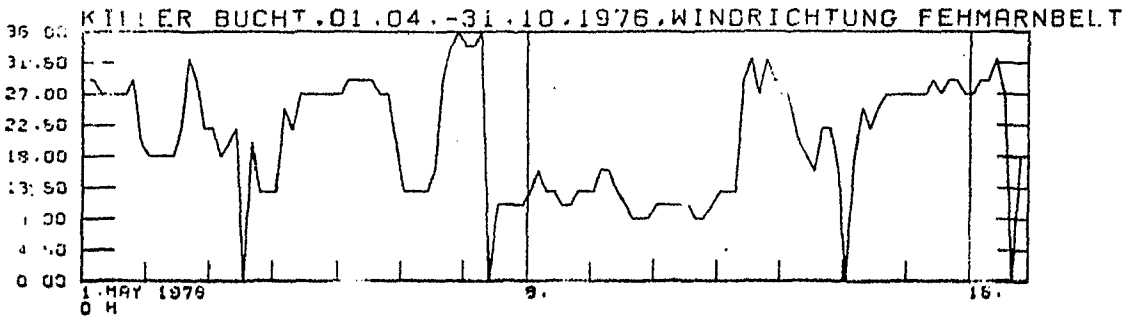
TEMP [1/105G]



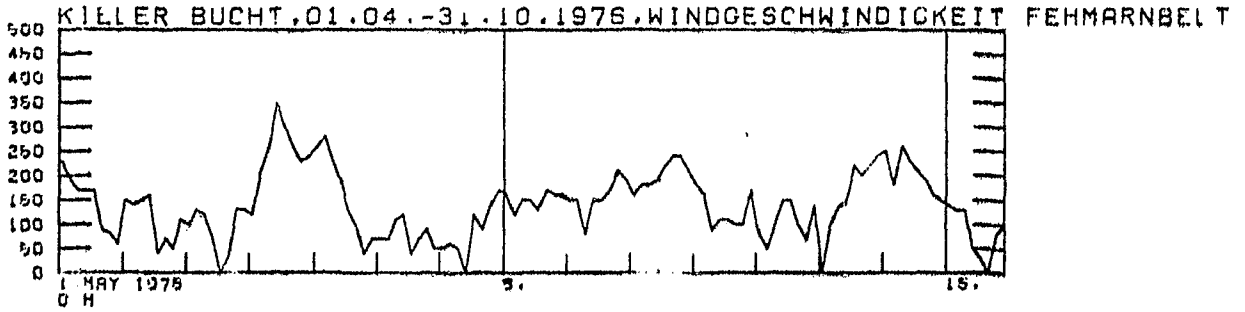
TAUP [1/105G]



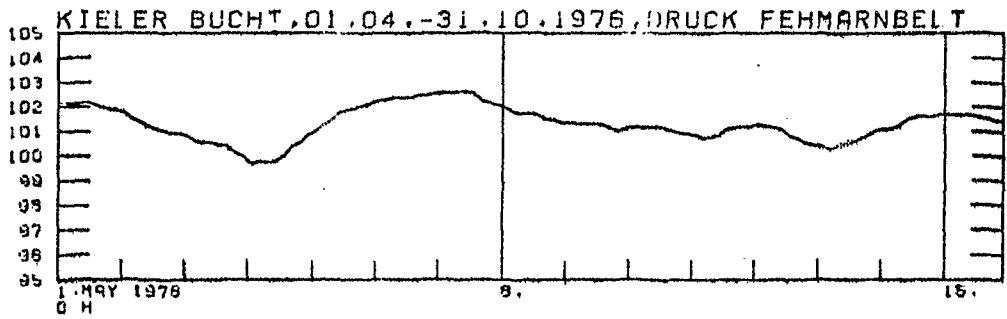
DIR [1/1000]



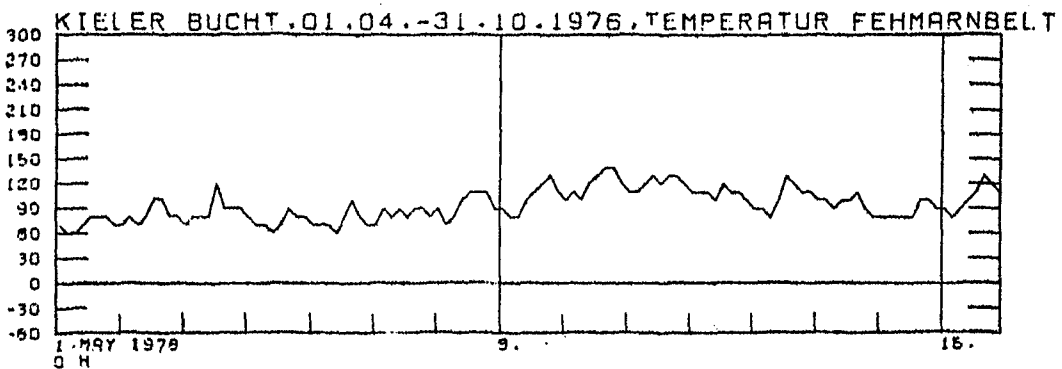
WIND [1/1000]



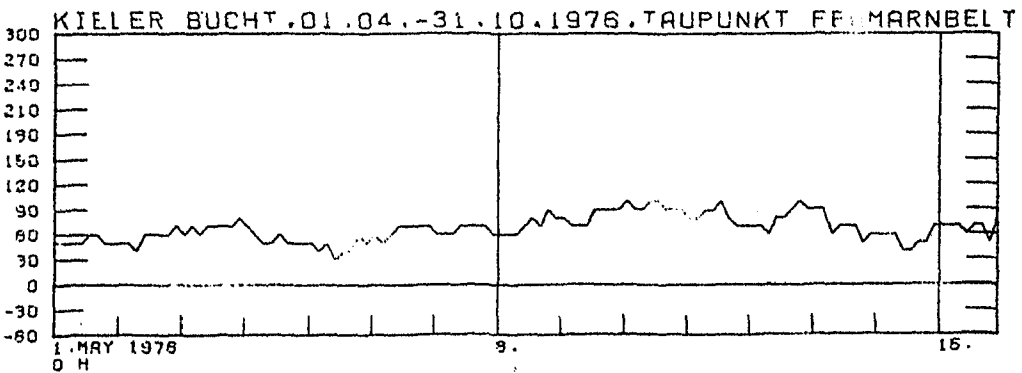
PRES [1/1000] (hPa)



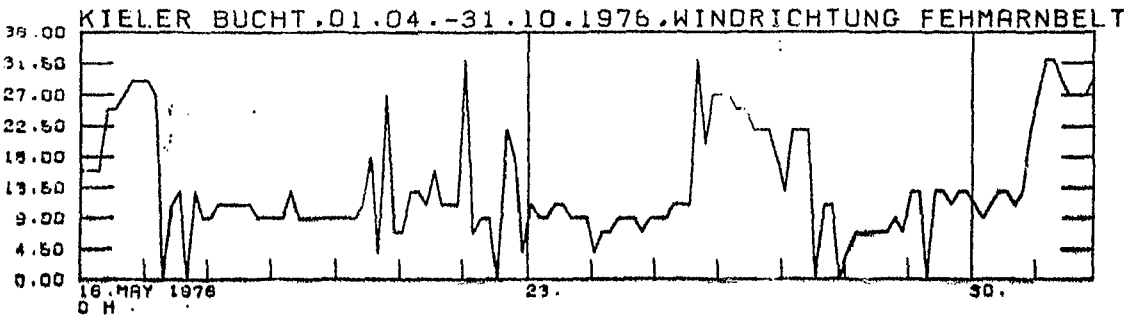
TEMP [1/1000]



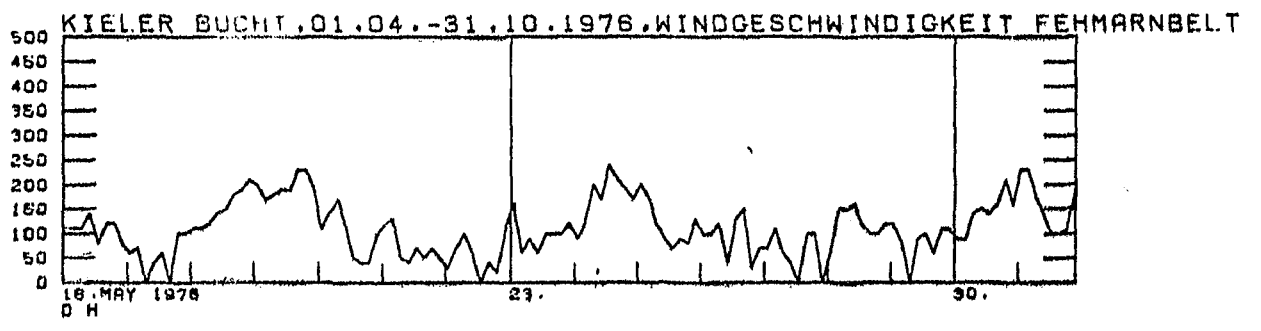
TAUPUNKT [1/1000]



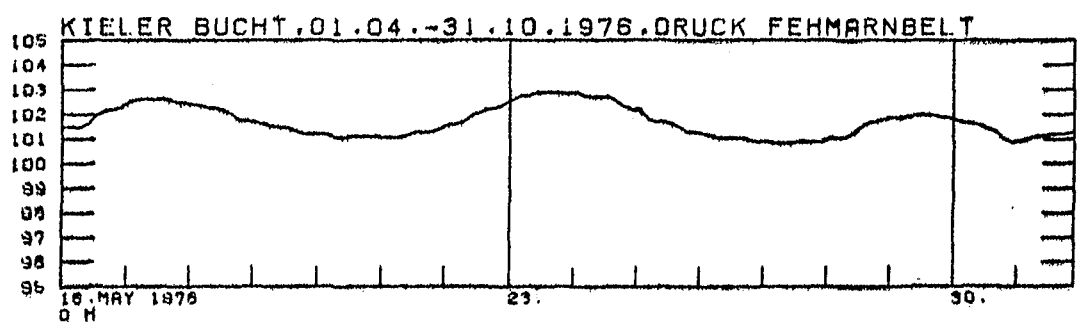
DIRK 1 (1000)



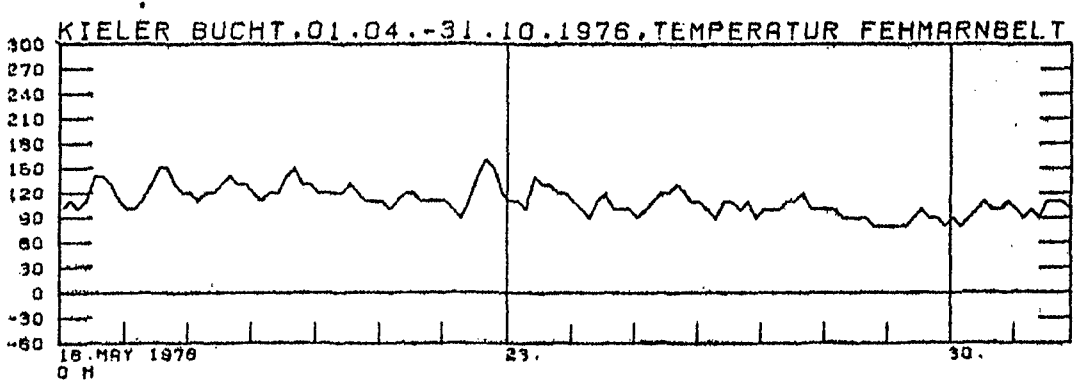
WIND II/1000



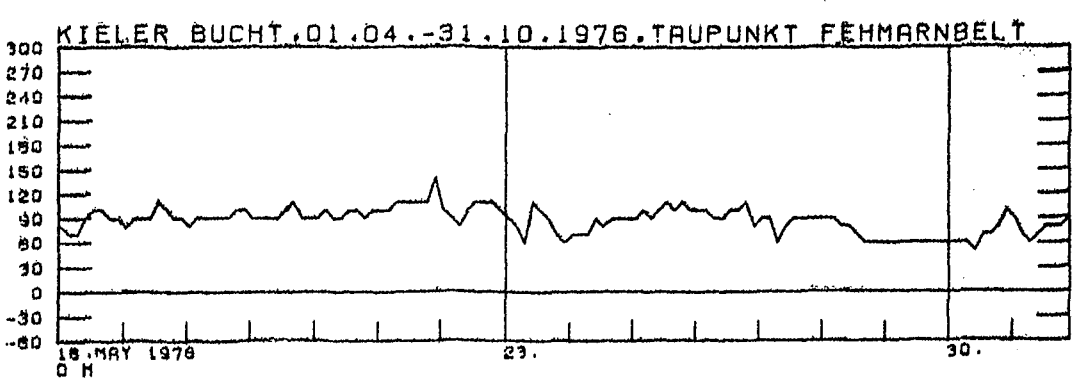
PRES II/1000 (1=10⁵)

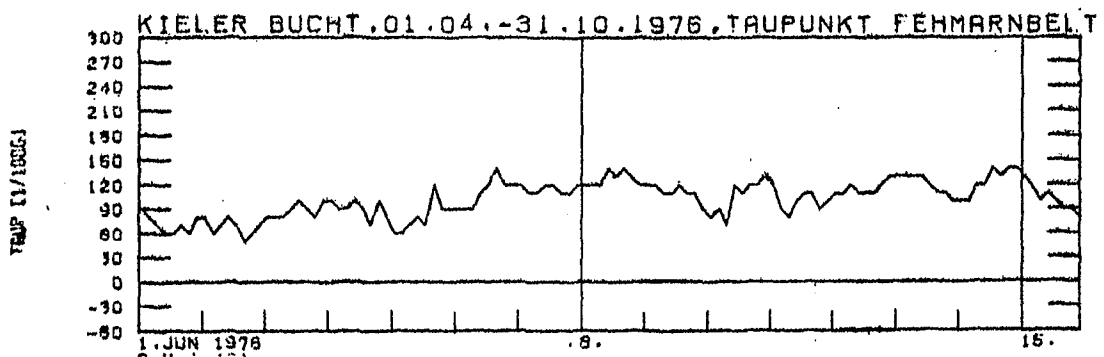
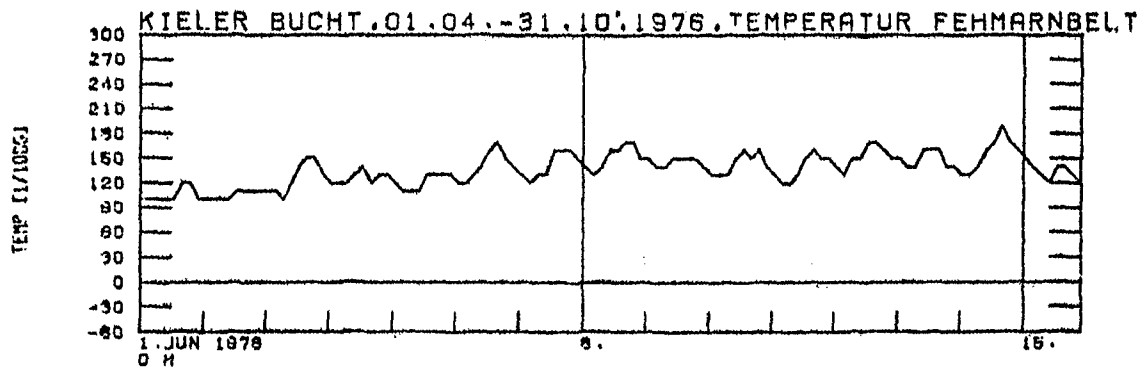
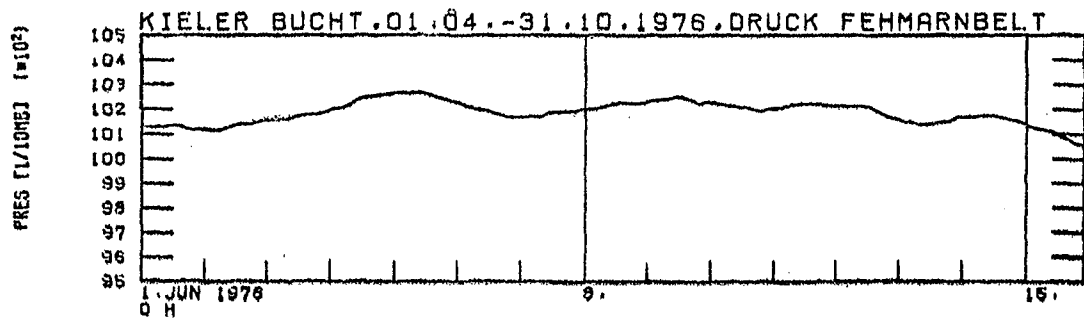
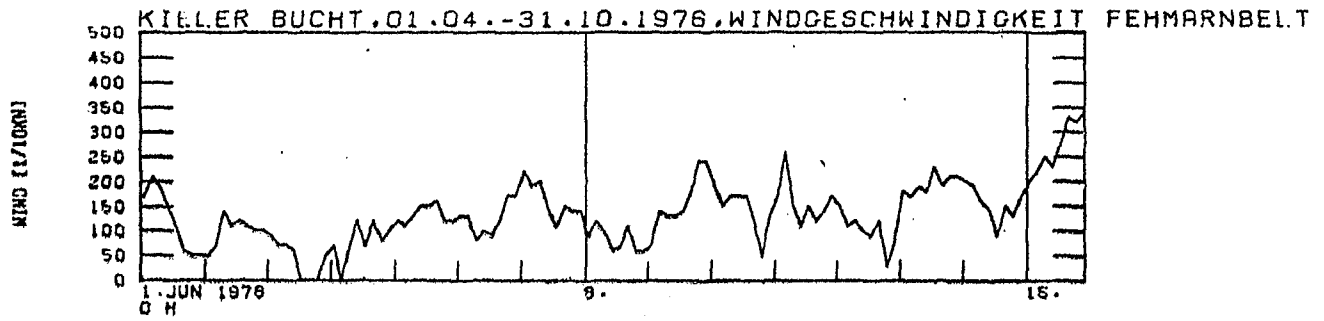
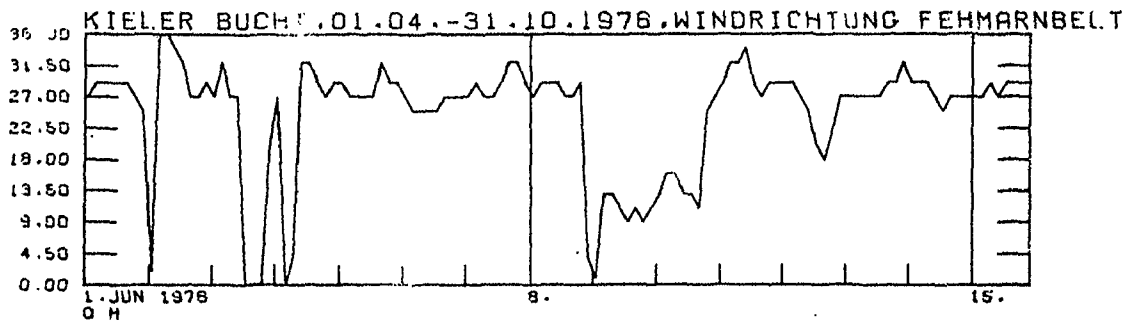


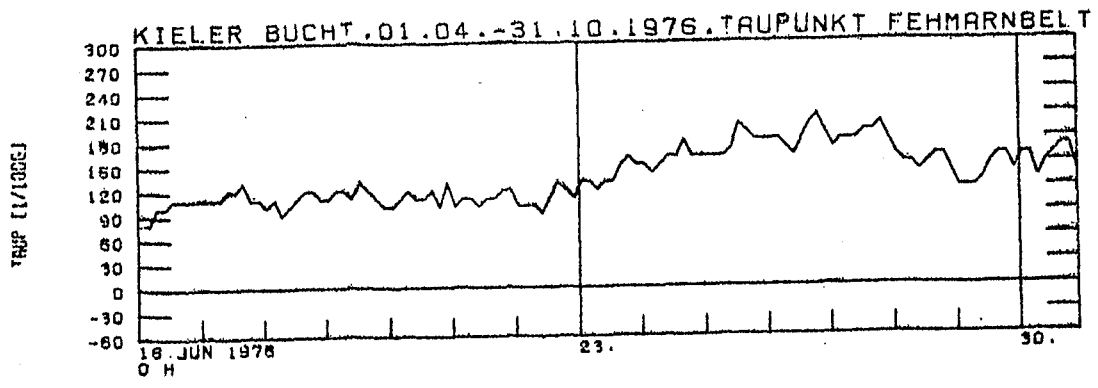
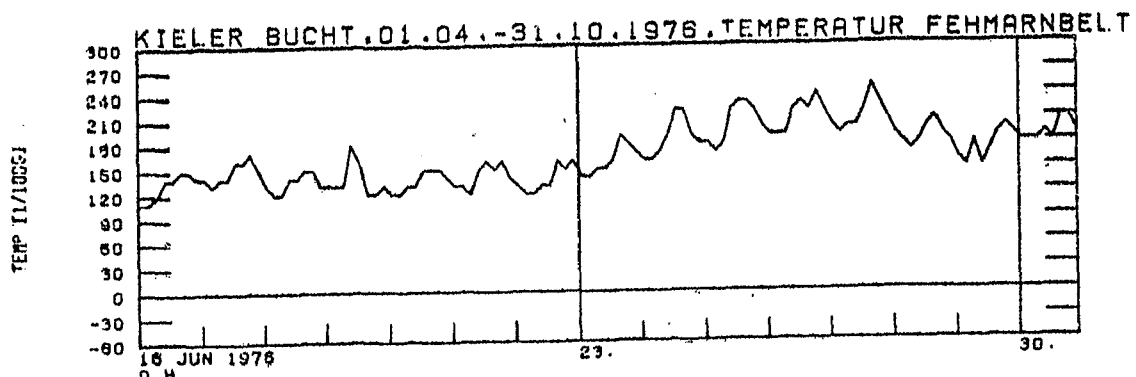
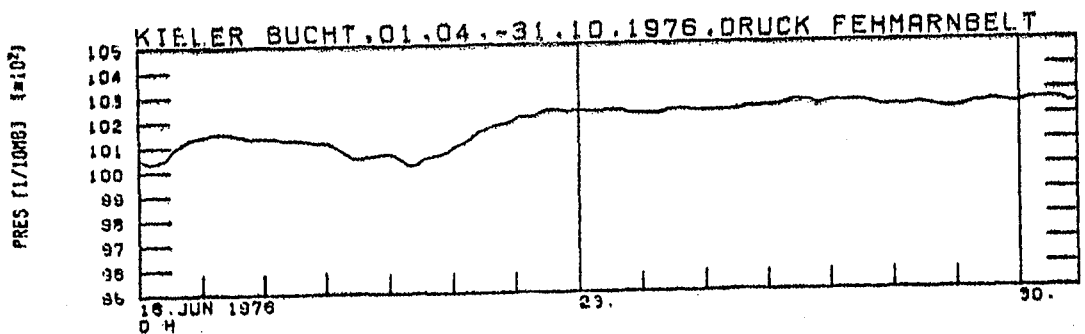
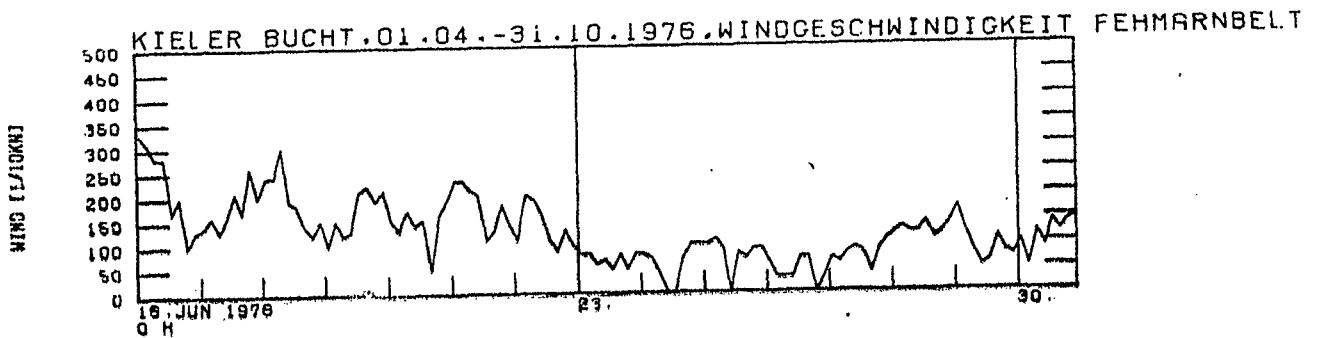
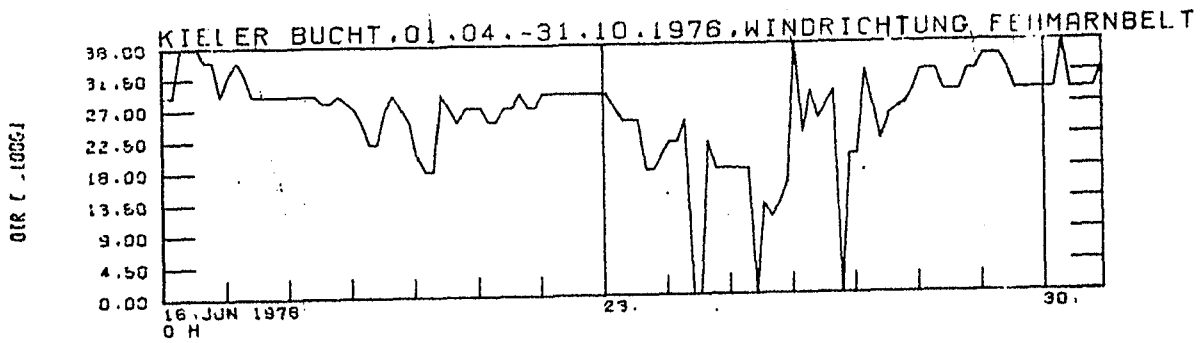
TEMP II/1000



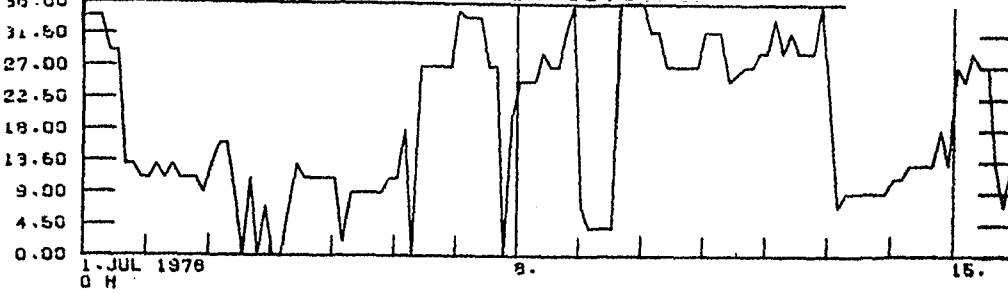
TAUP II/1000





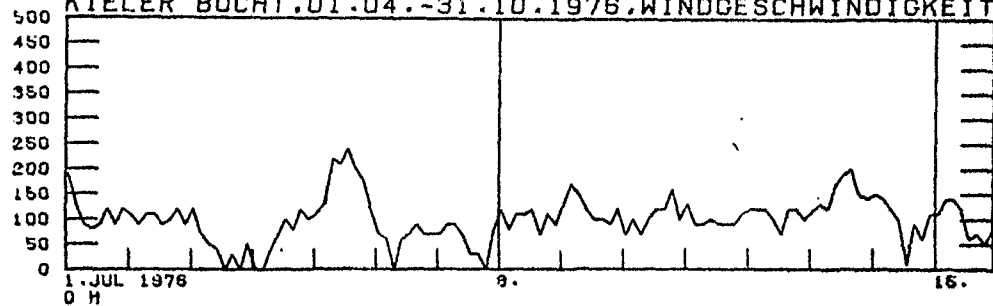


DIR [100GJ



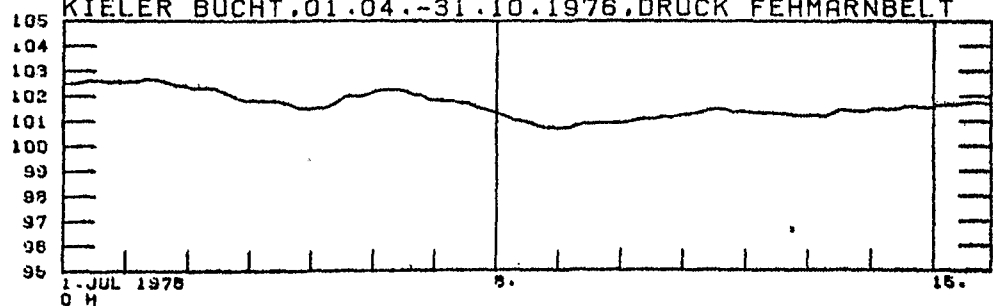
WIND [1/10AN]

KIELER BUCHT, 01.04.-31.10.1976, WINDGESCHWINDIGKEIT FEHMARNBELT



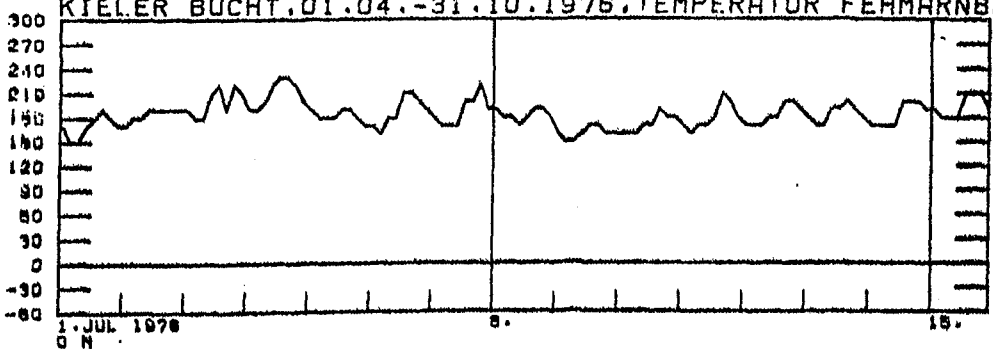
PRES [1/10MBJ (#10^2)

KIELER BUCHT, 01.04.-31.10.1976, DRUCK FEHMARNBELT



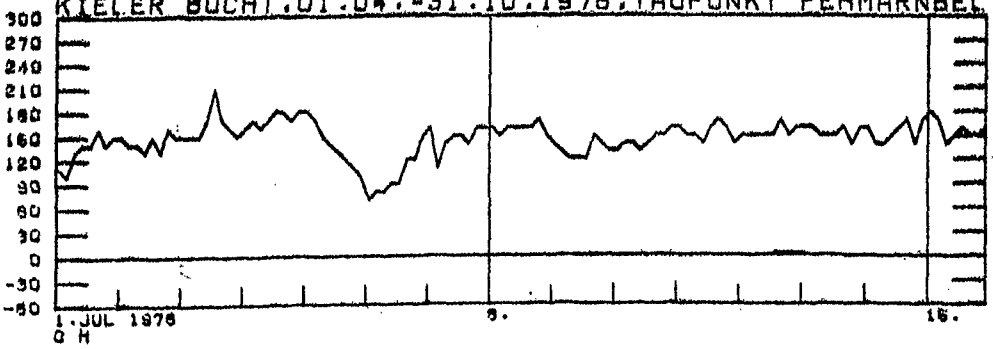
TEMP [1/100C]

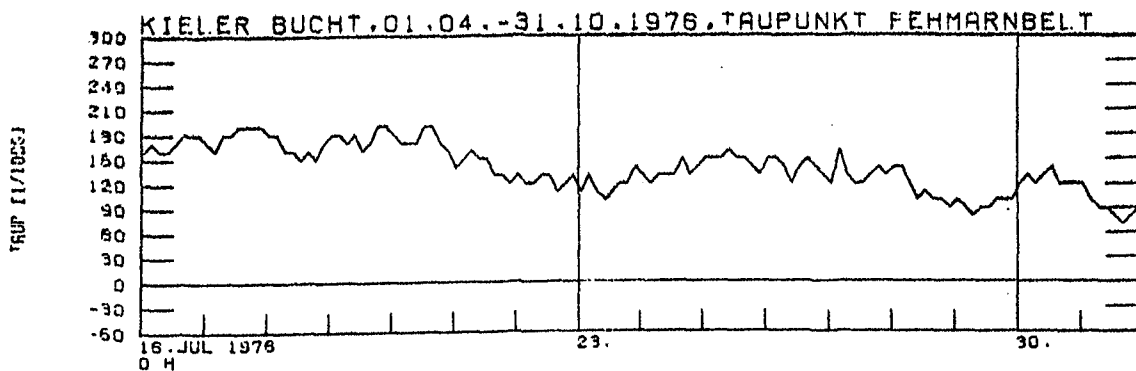
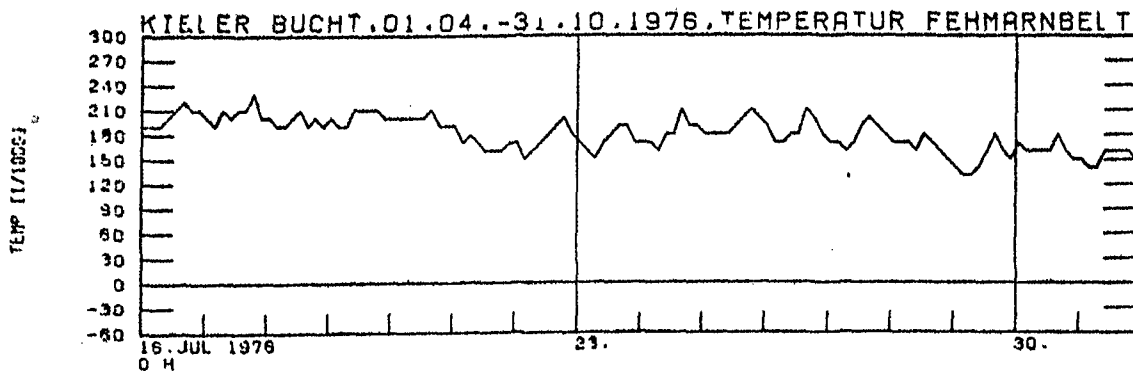
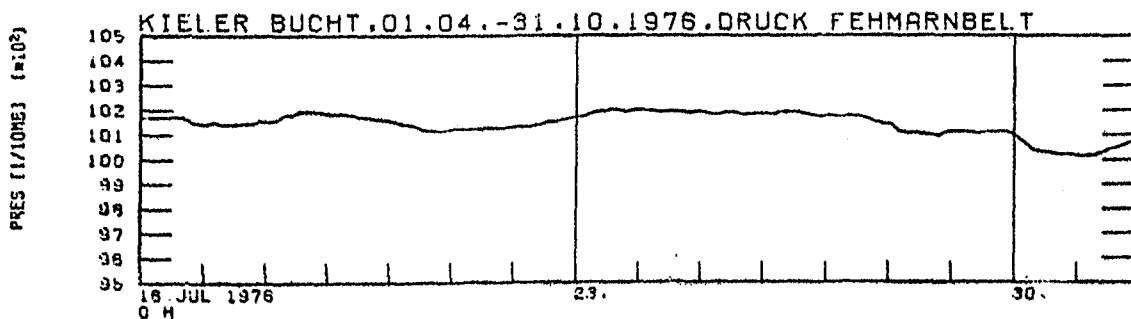
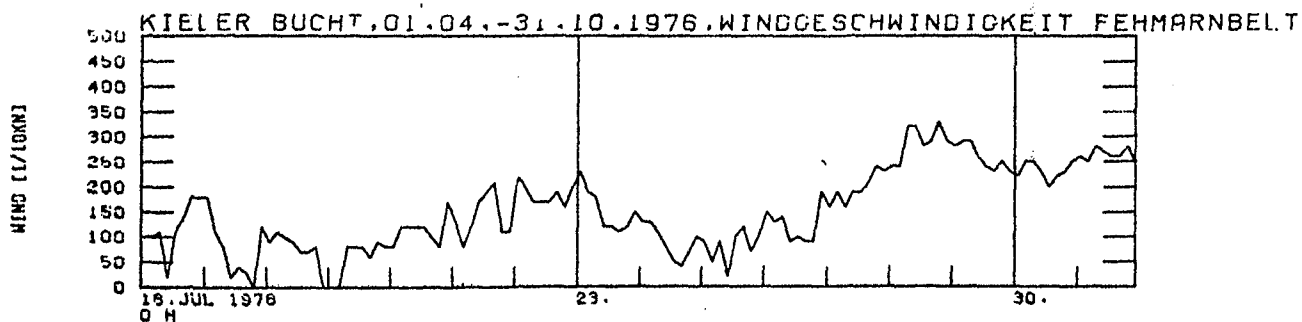
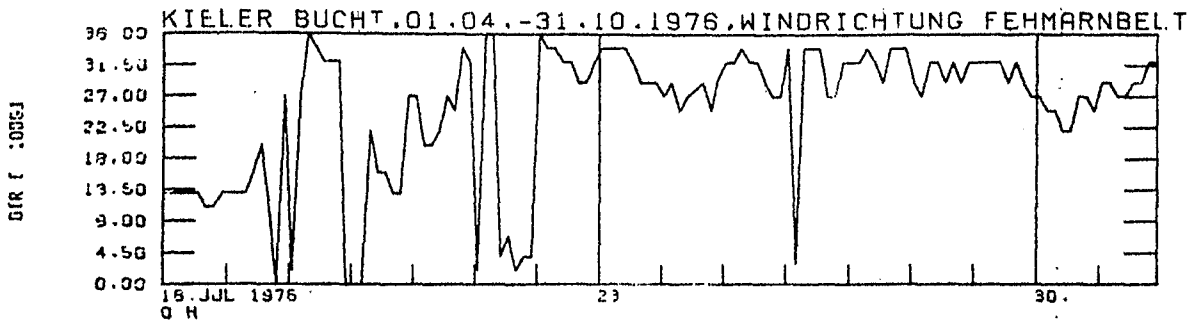
KIELER BUCHT, 01.04.-31.10.1976, TEMPERATUR FEHMARNBELT

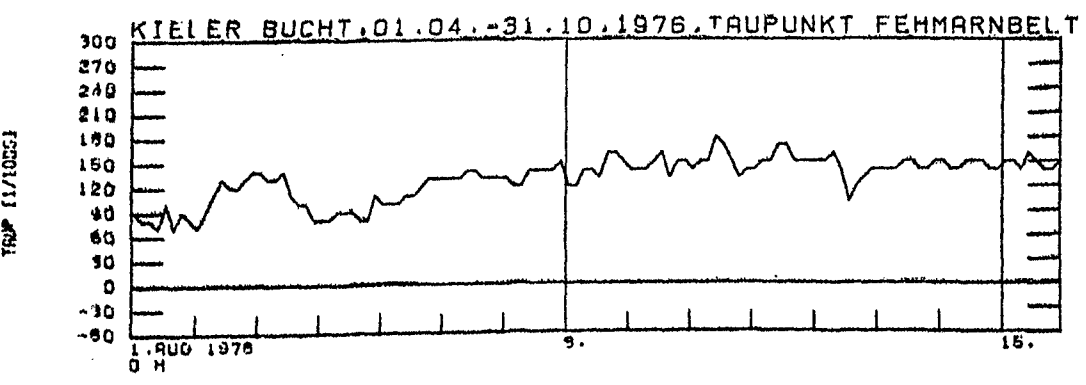
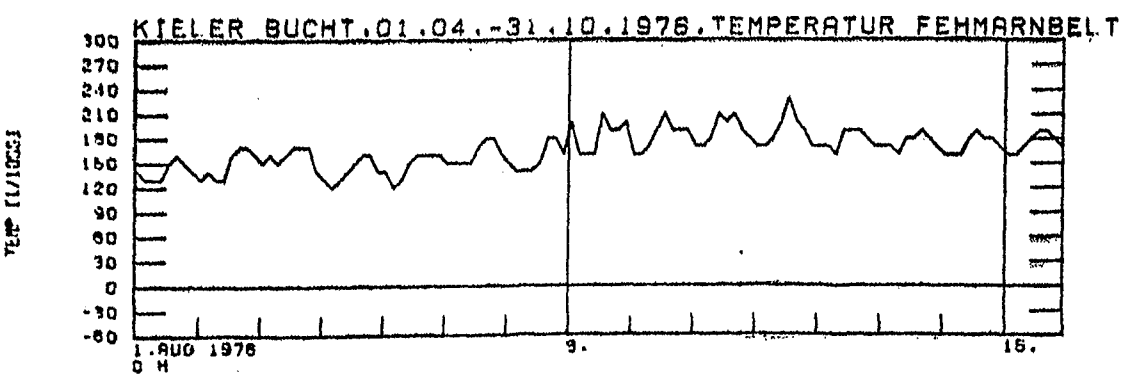
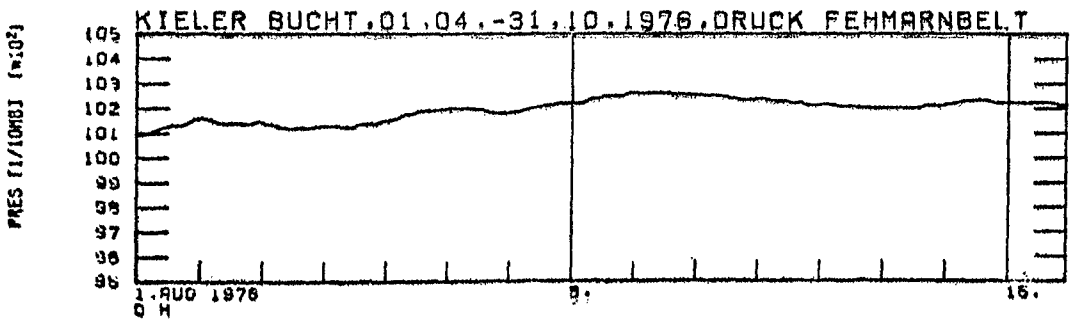
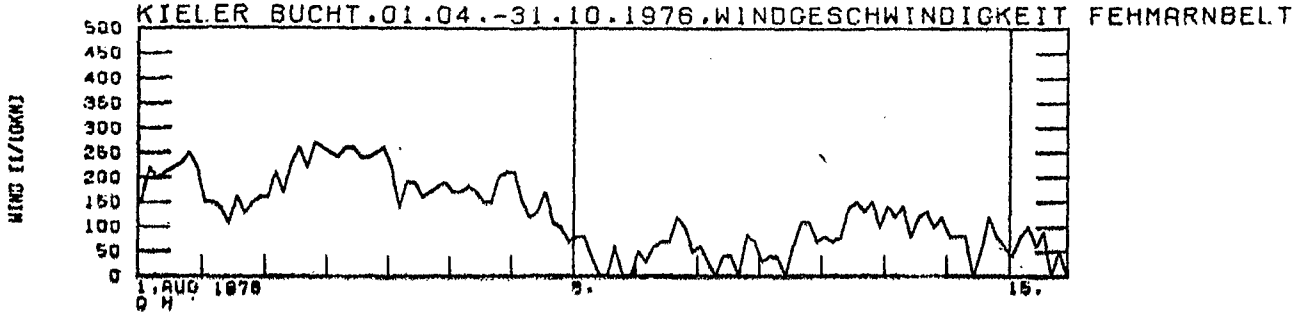
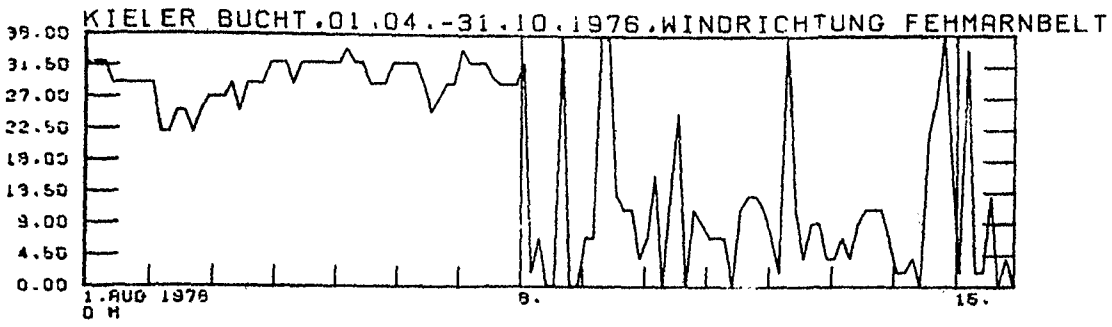


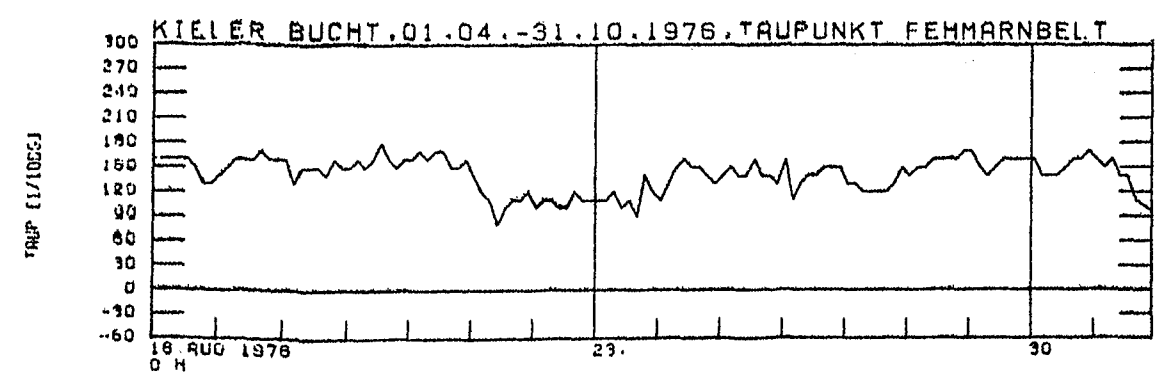
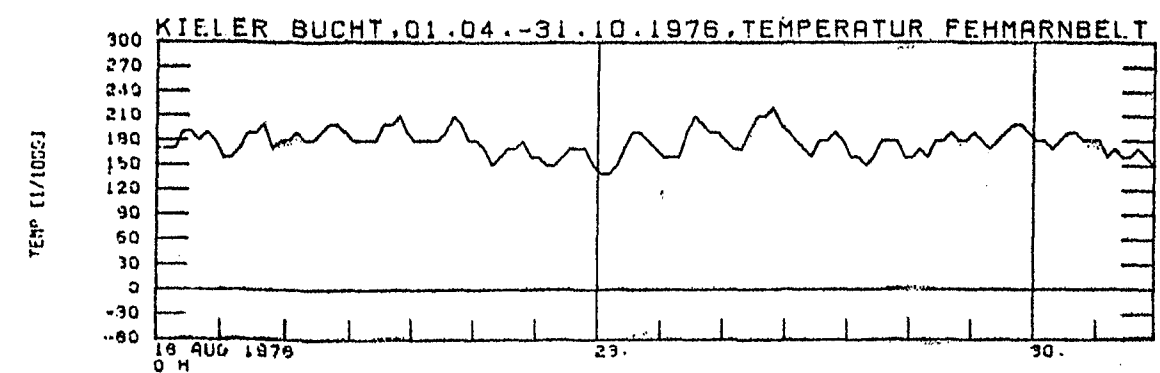
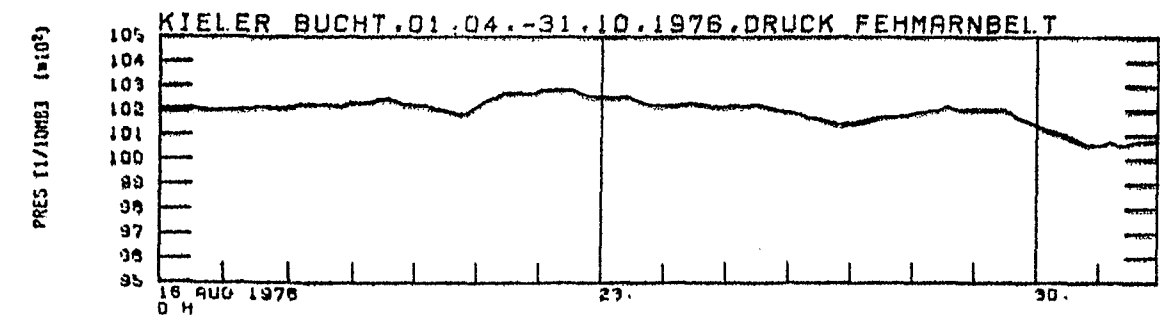
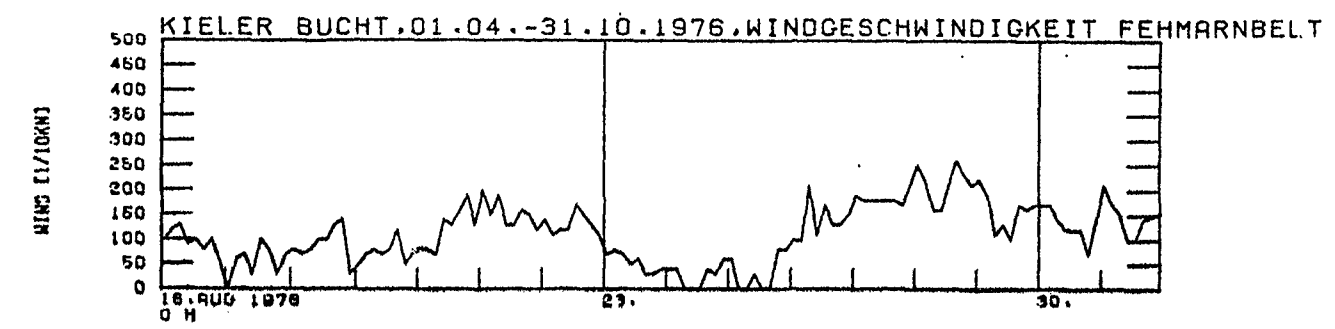
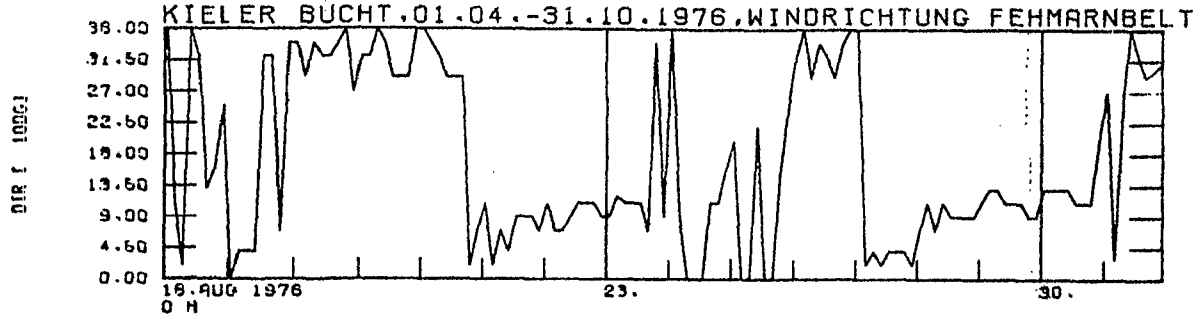
TAUP [1/100C]

KIELER BUCHT, 01.04.-31.10.1976, TAUPUNKT FEHMARNBELT

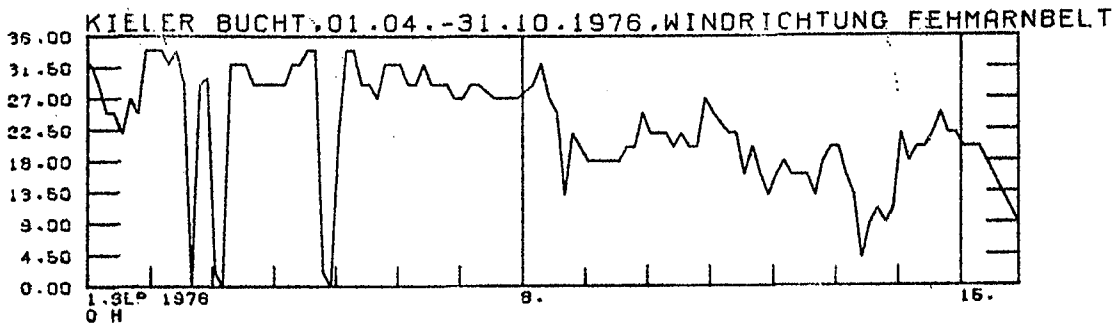




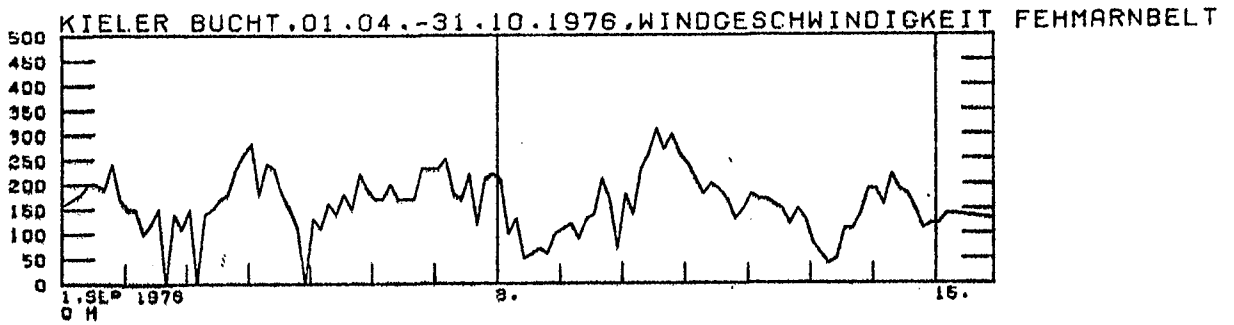




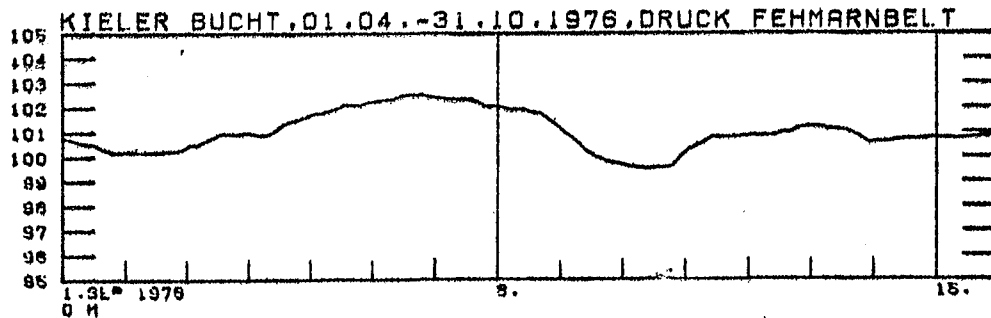
DIR [1056]



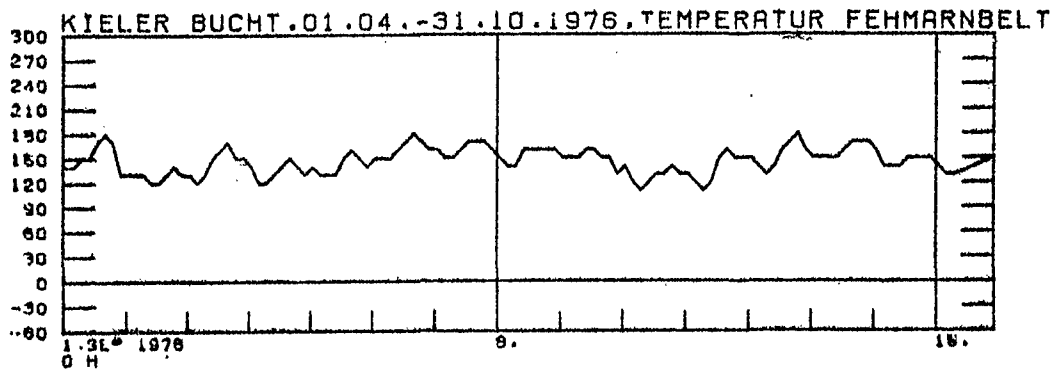
WIND [1/10M]]



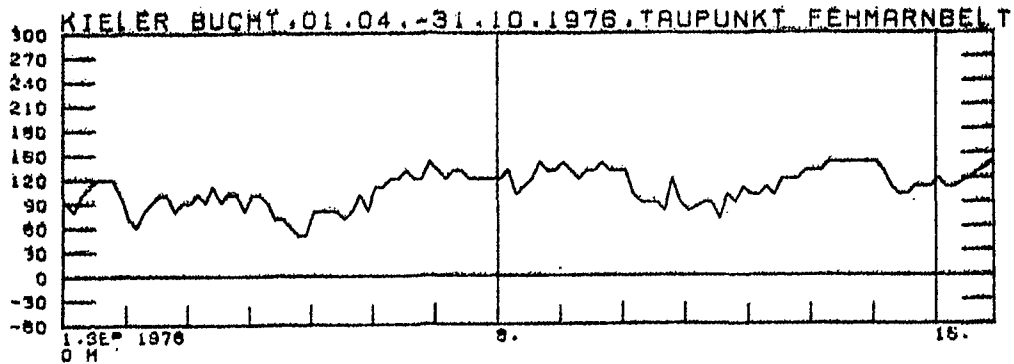
PRES [1/10HE] [m102]

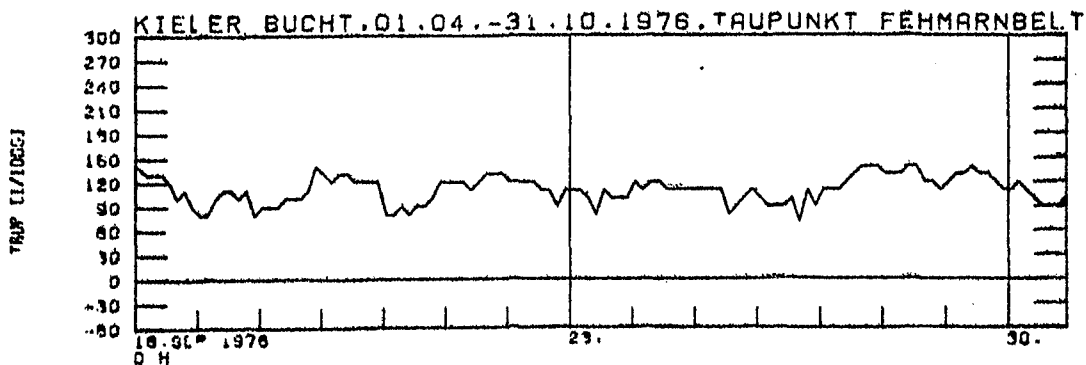
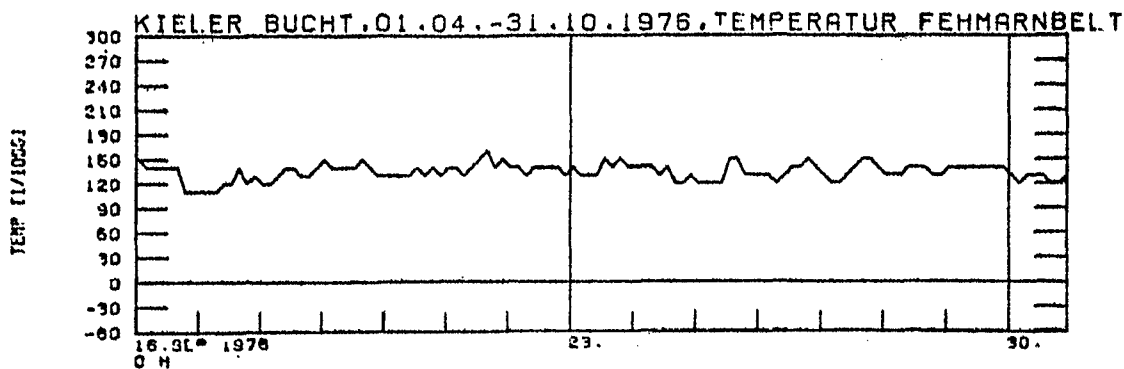
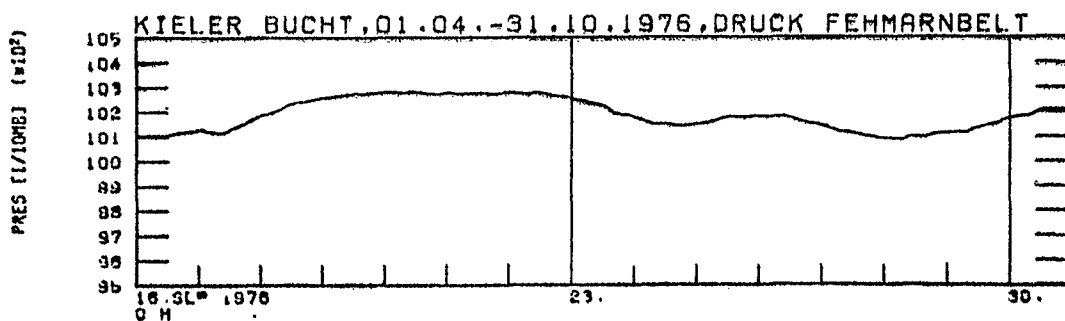
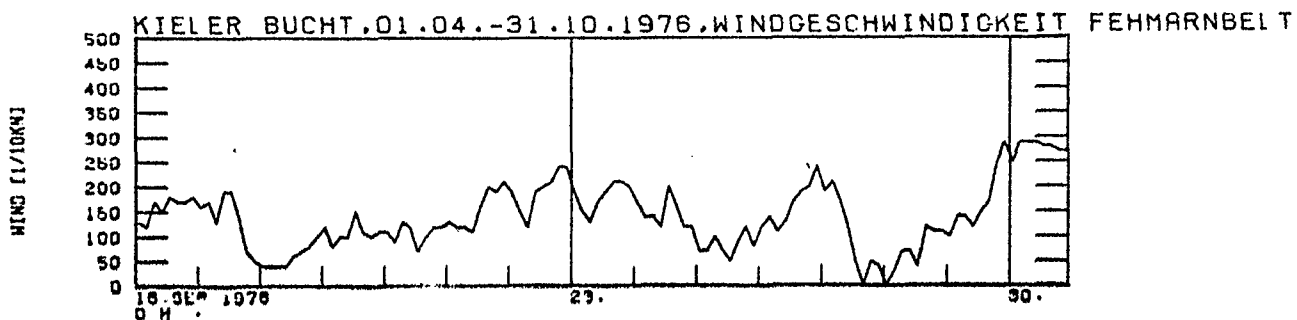
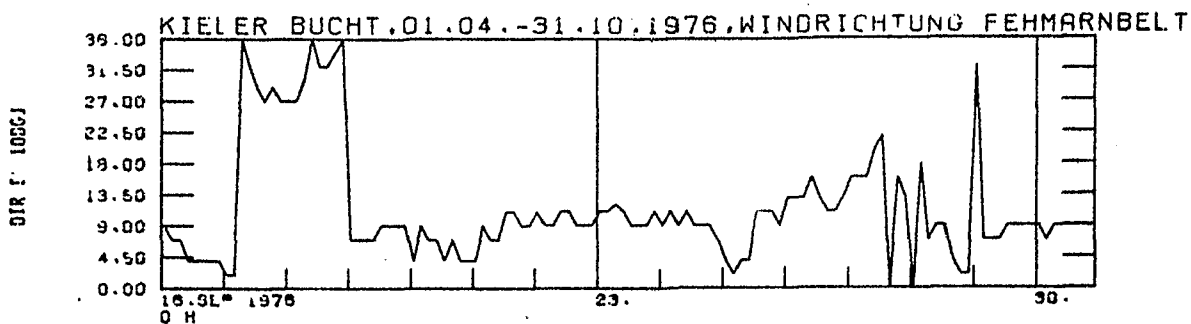


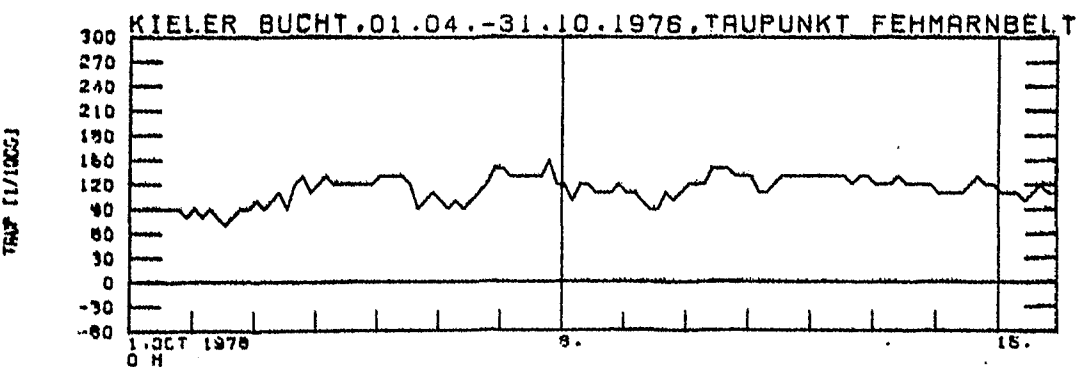
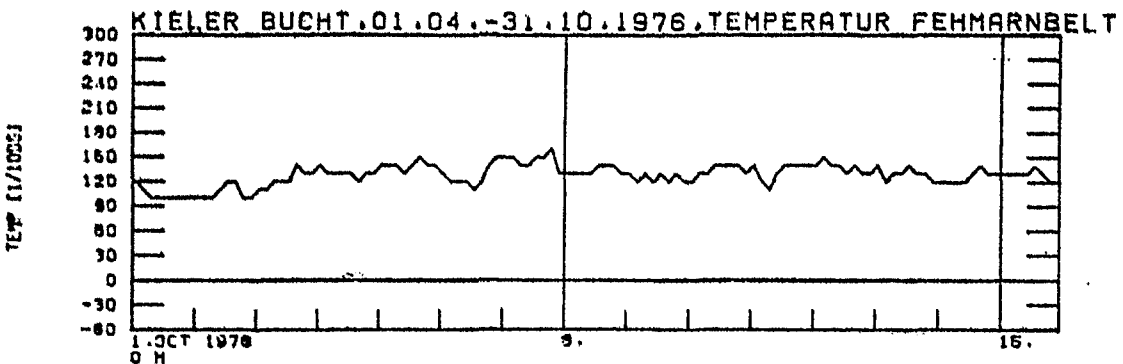
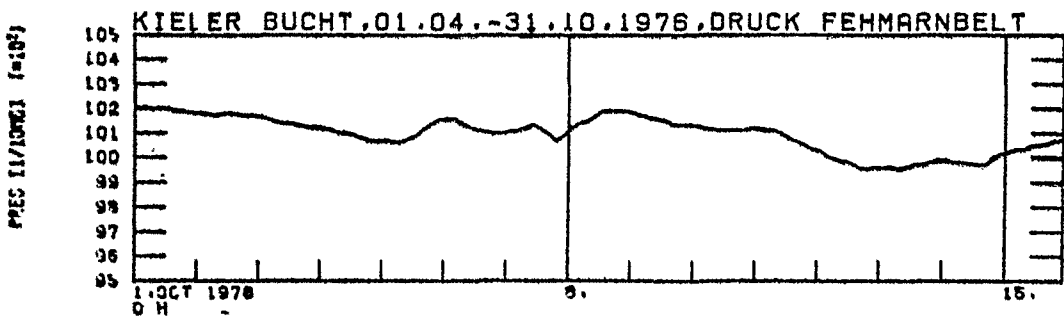
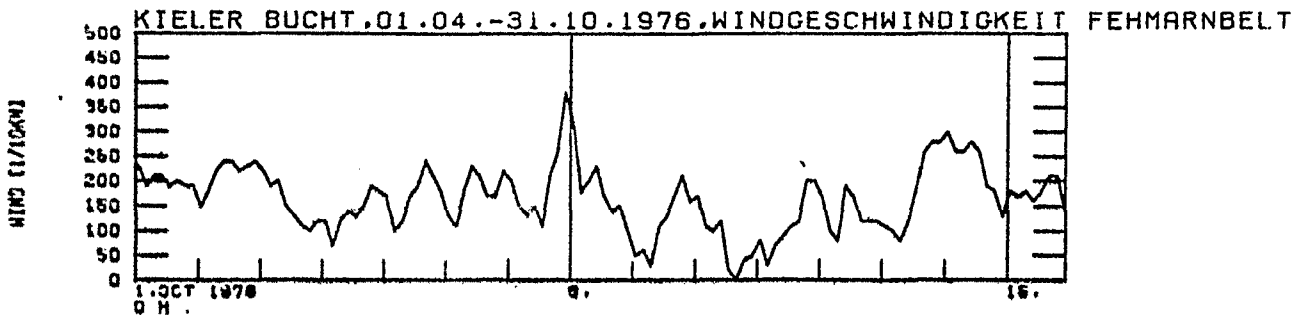
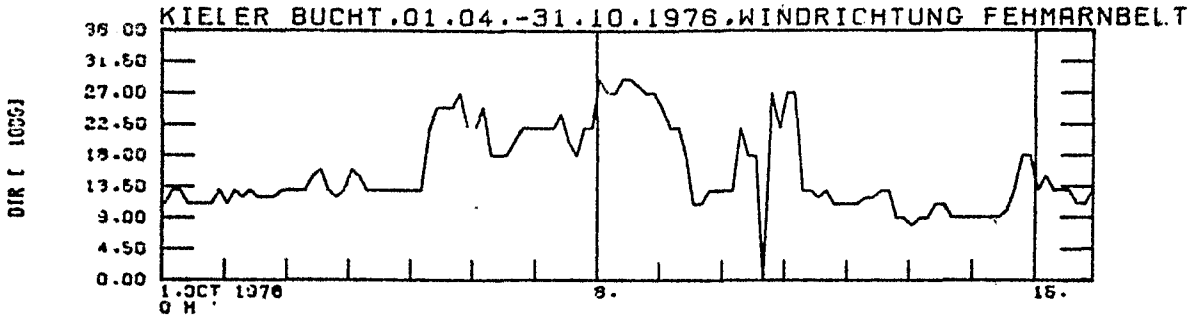
TEMP [1/10CC]]

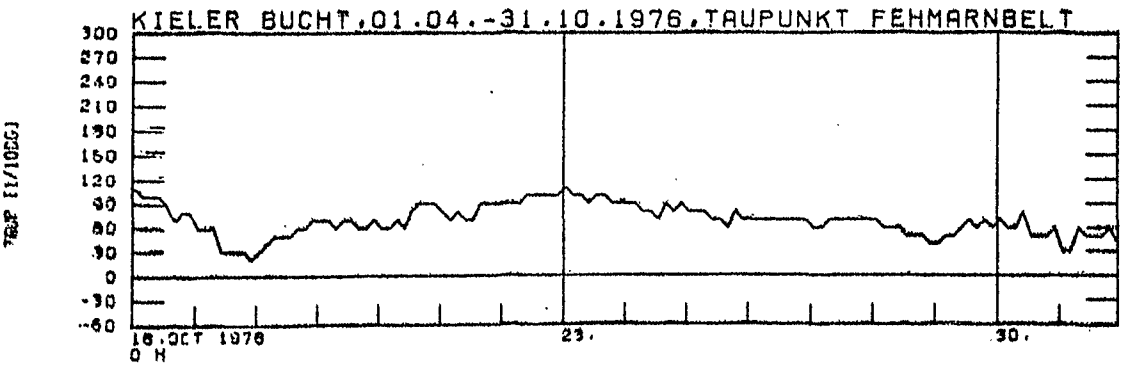
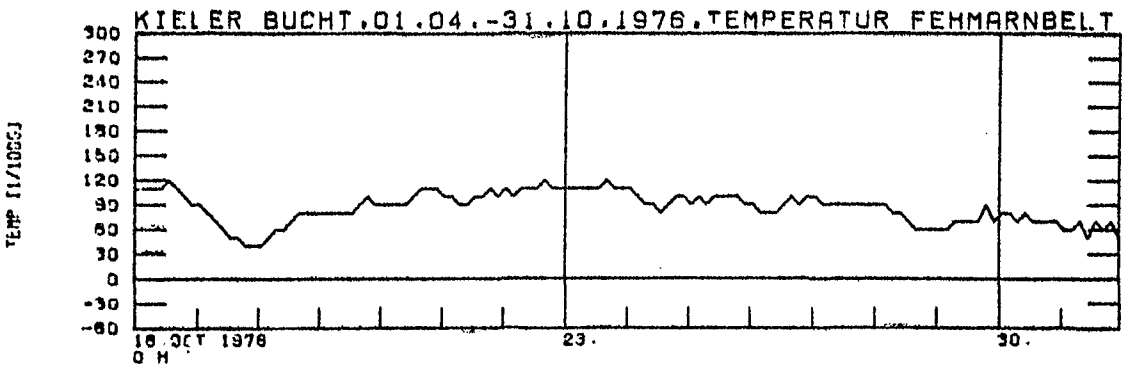
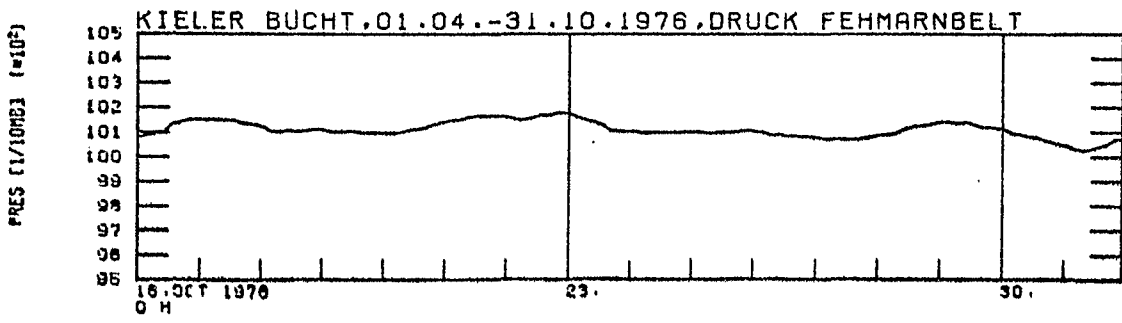
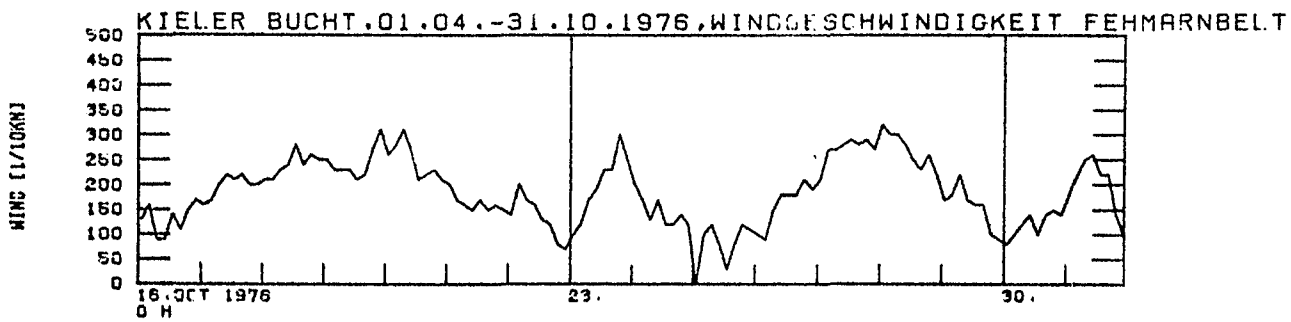
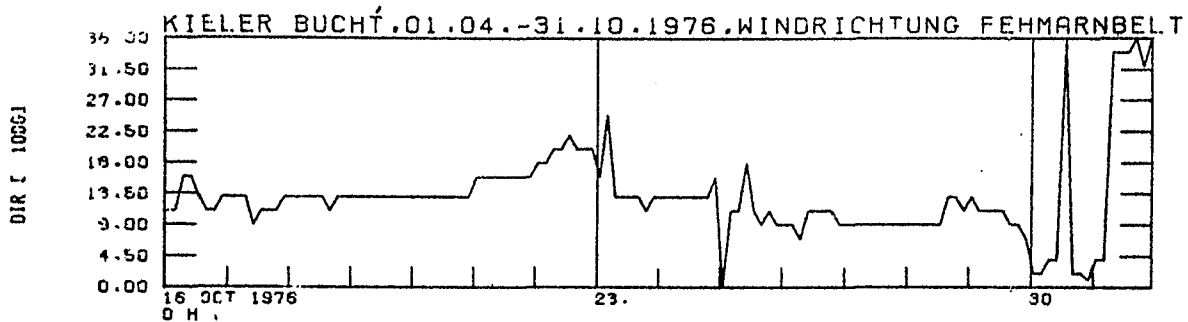


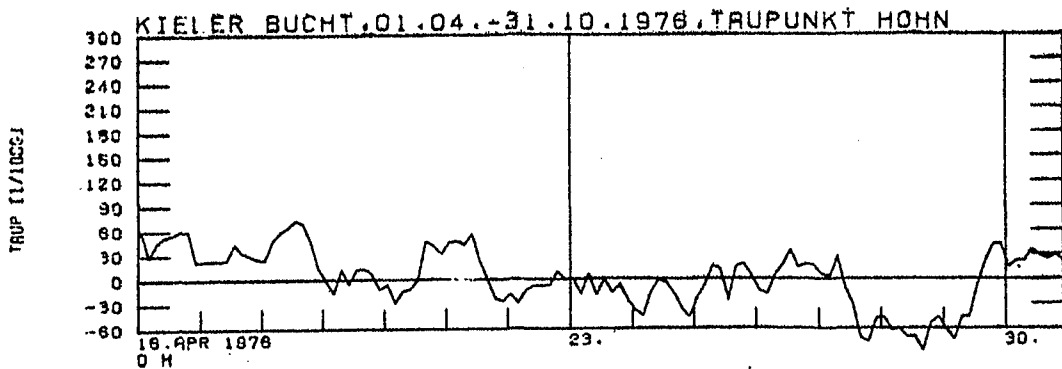
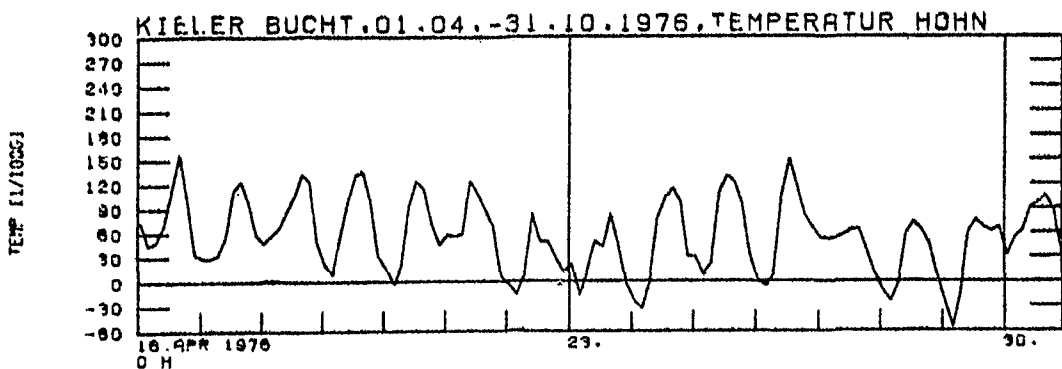
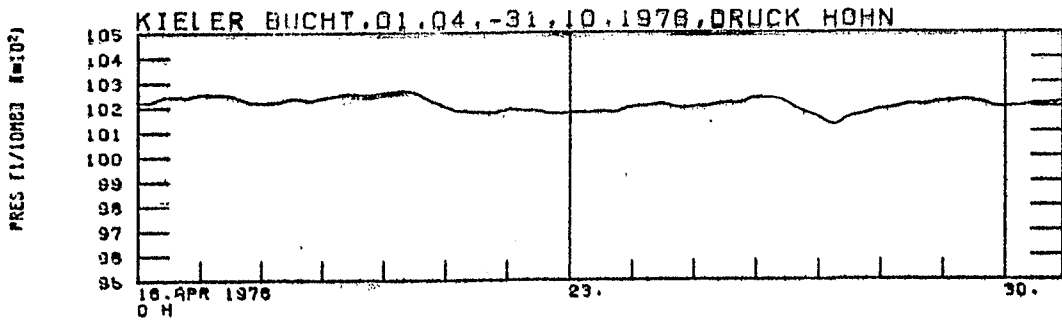
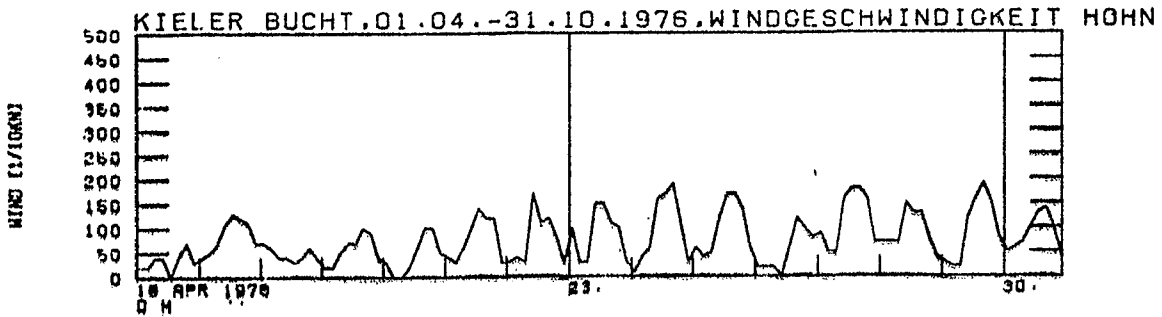
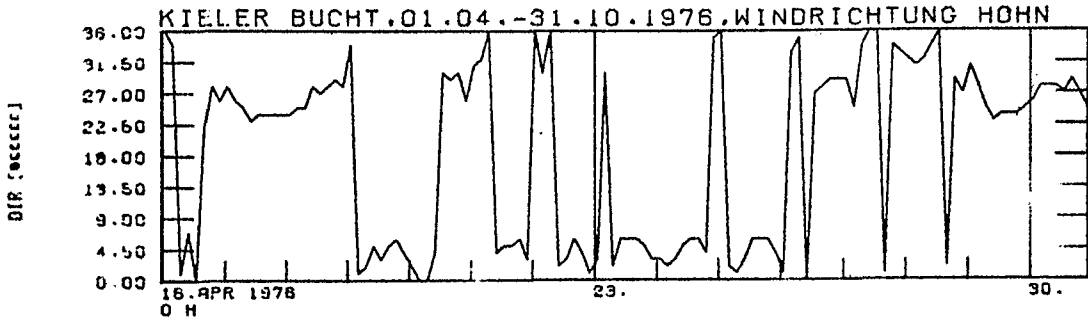
TAUP [1/10CC]]

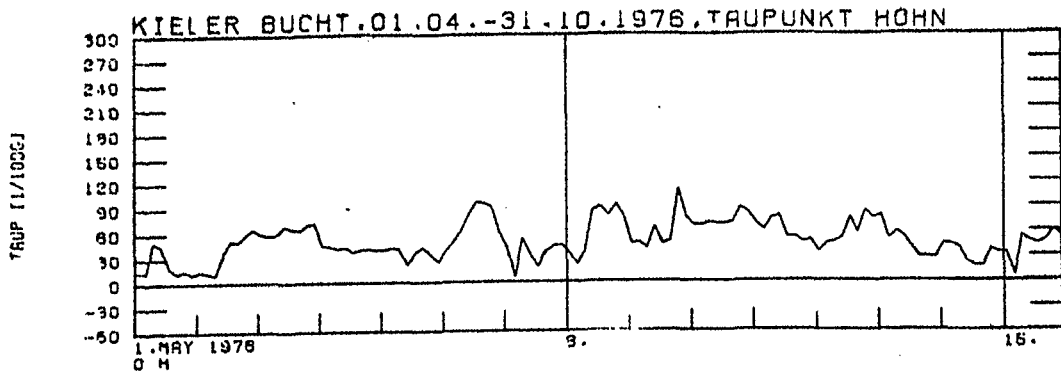
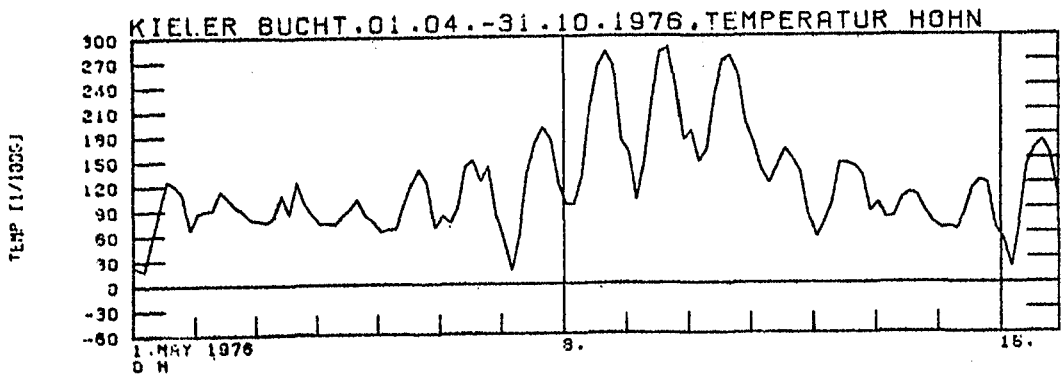
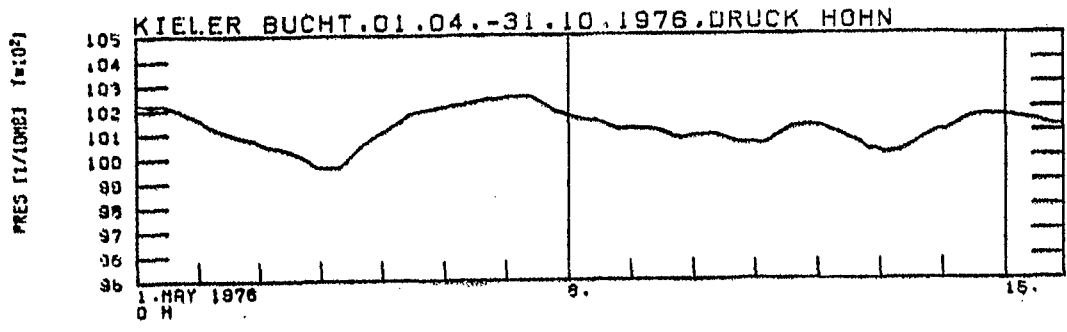
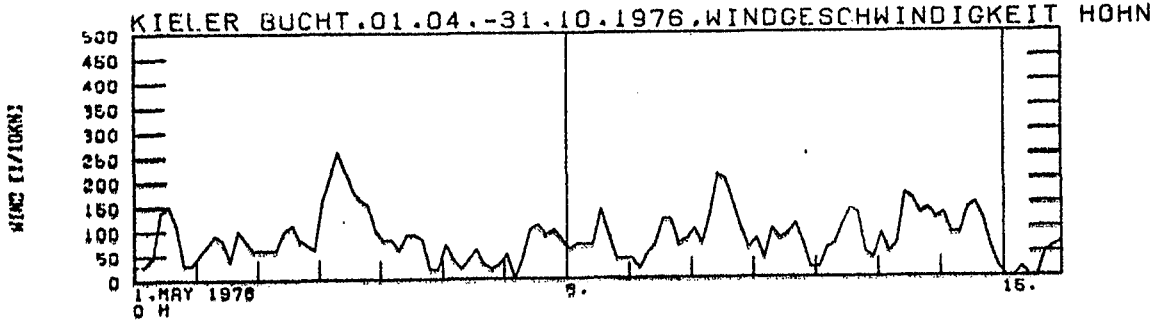
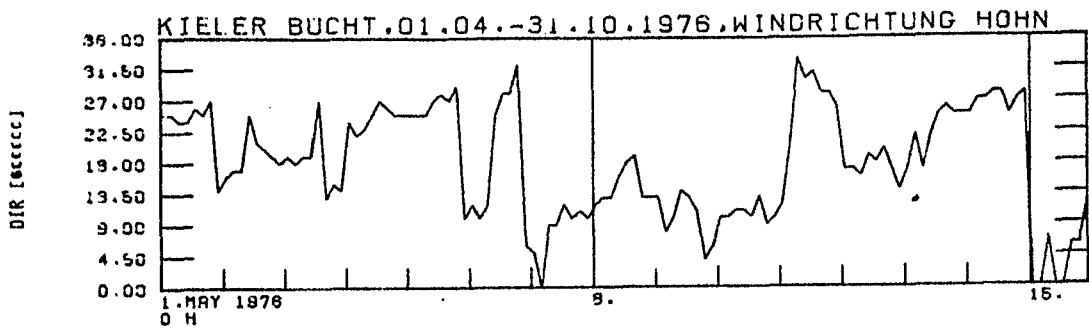


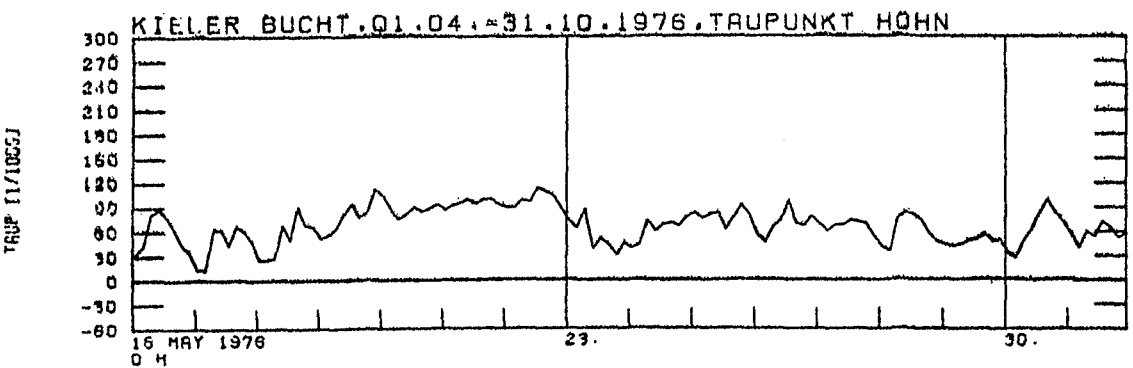
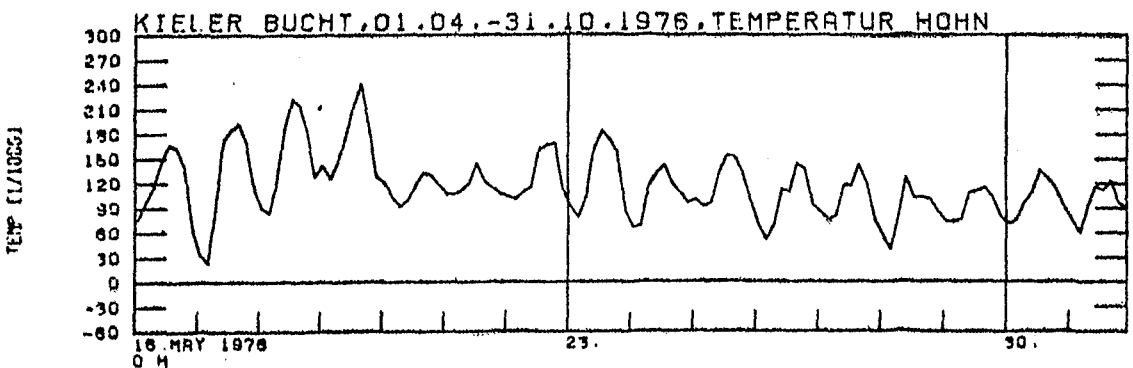
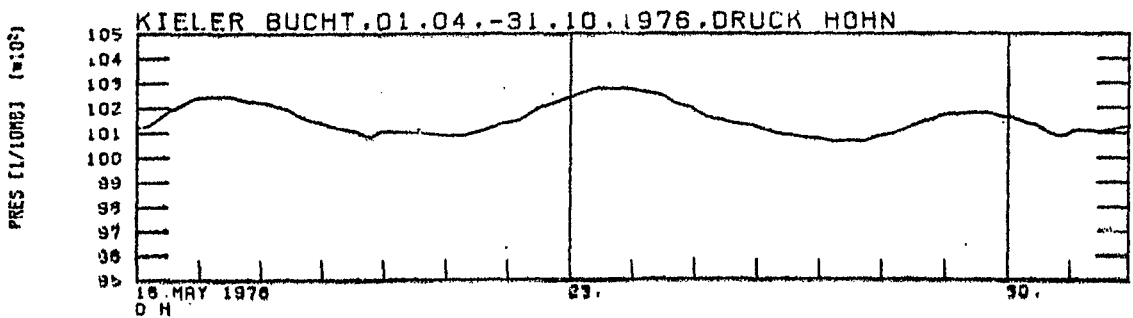
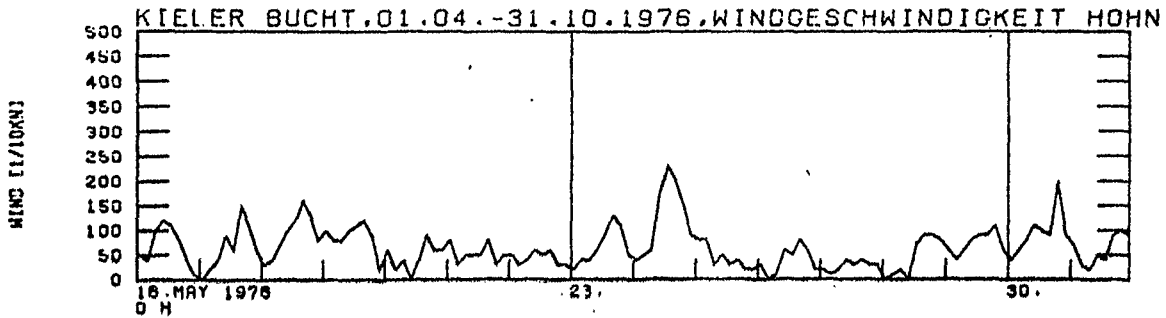
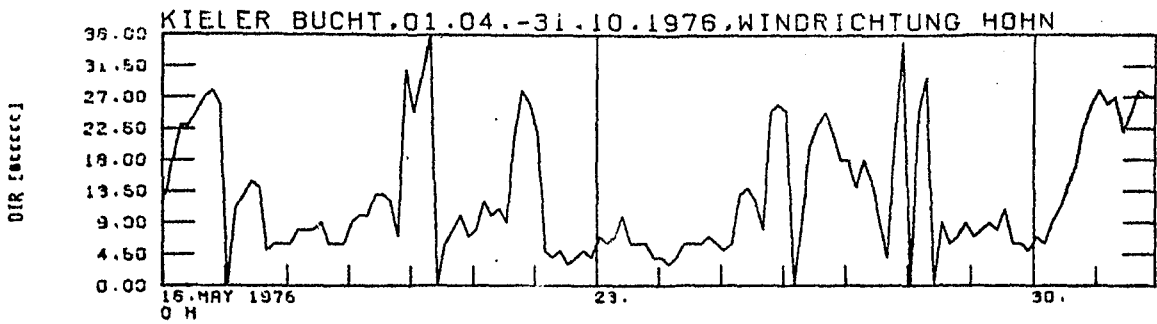


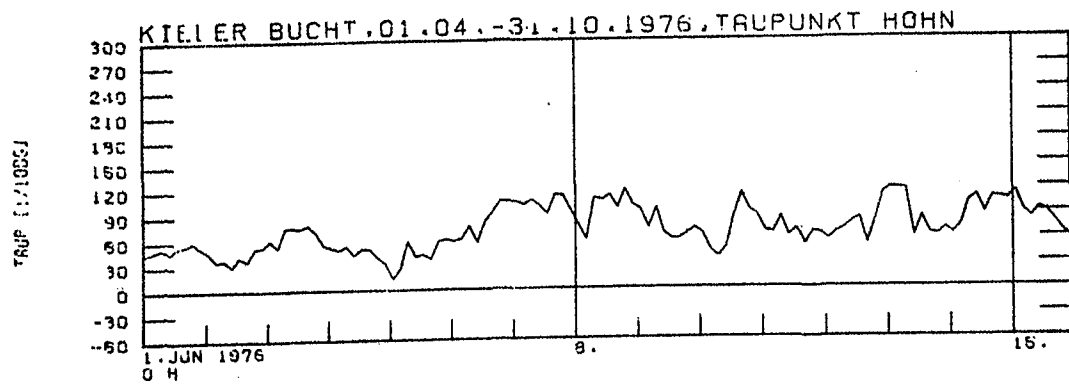
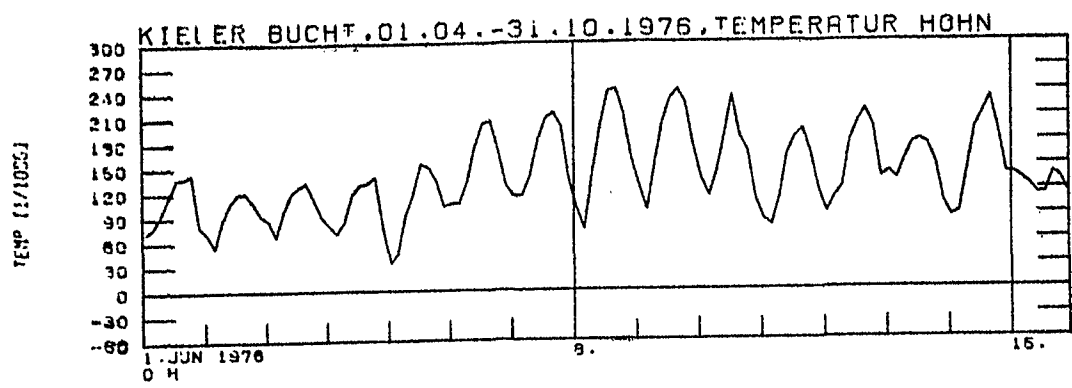
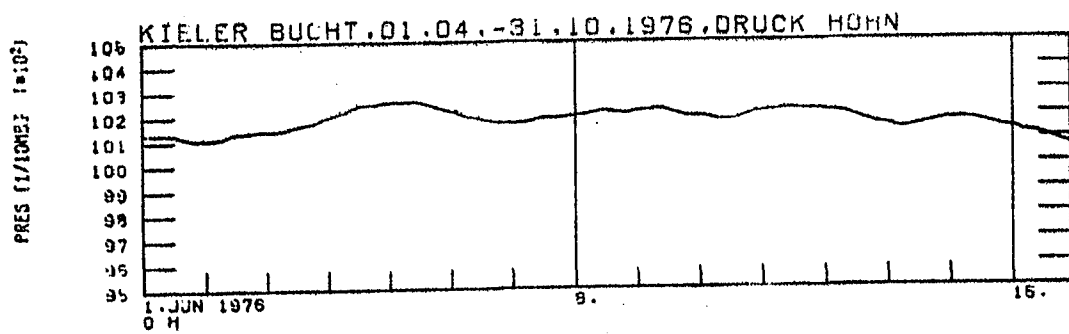
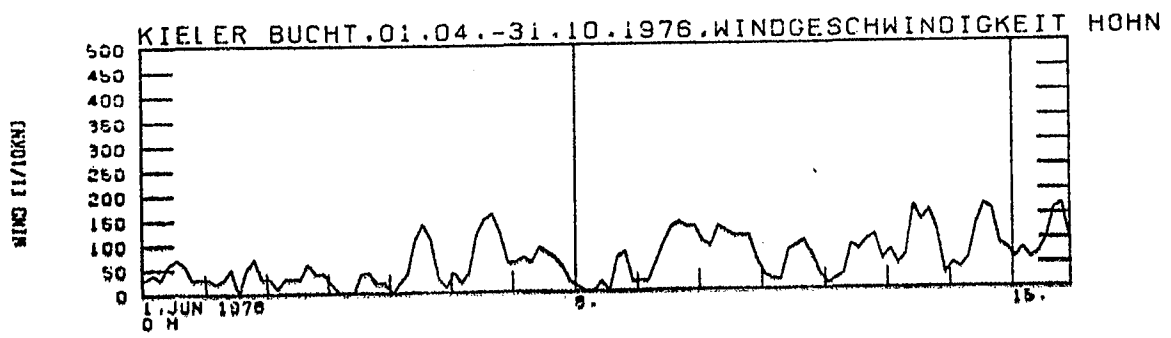
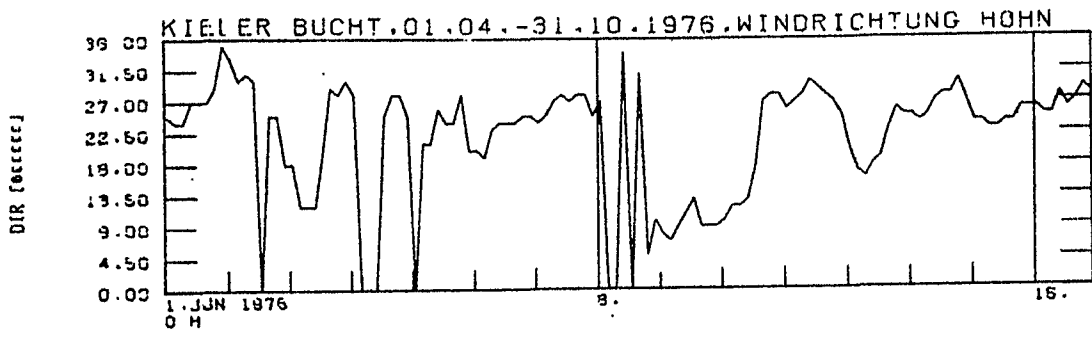


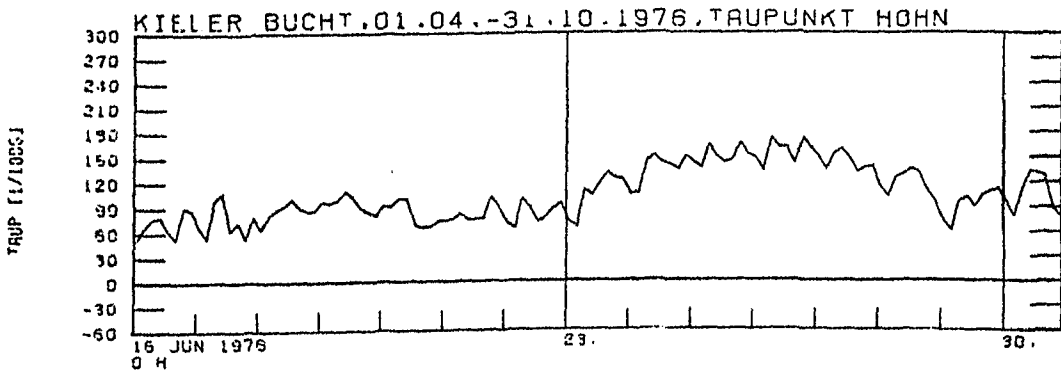
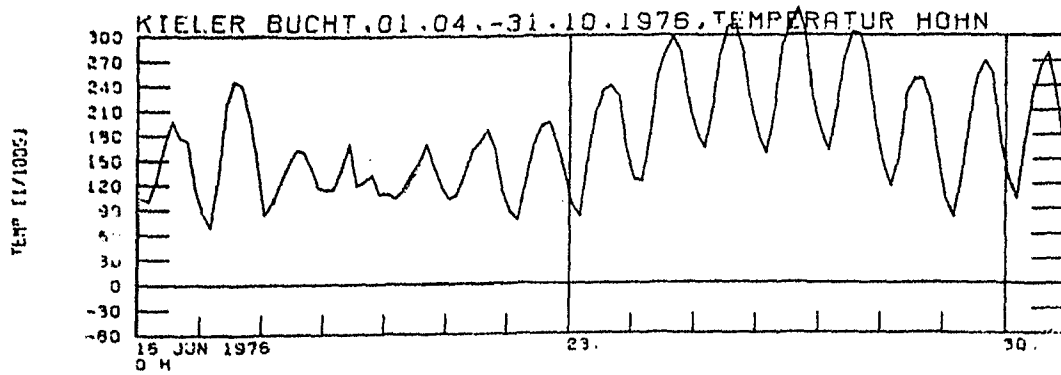
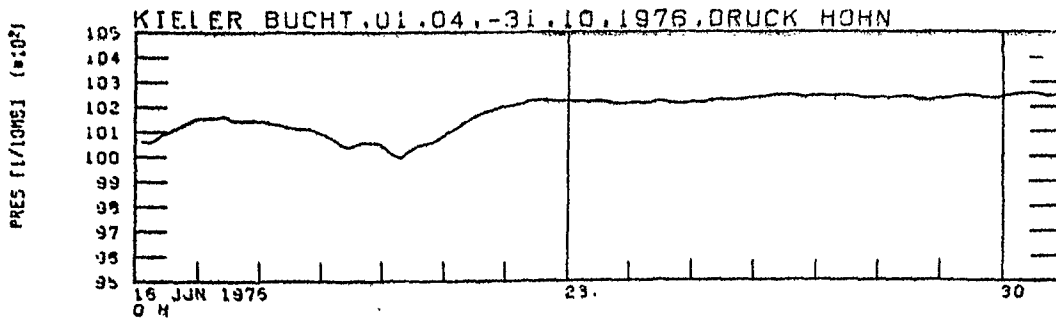
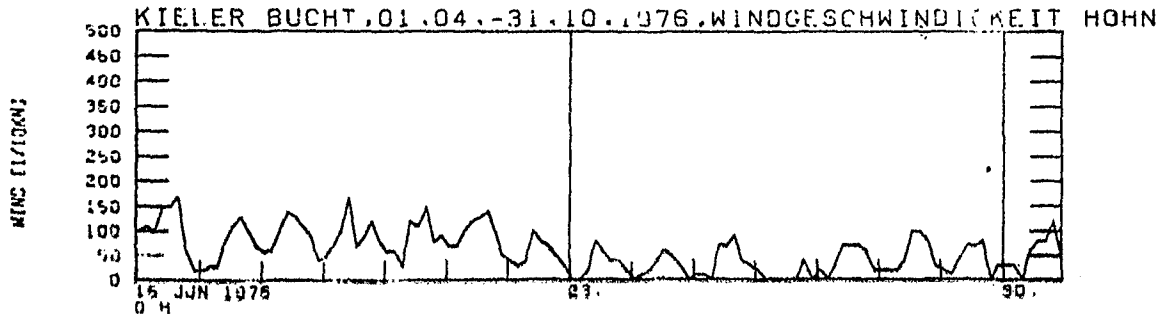
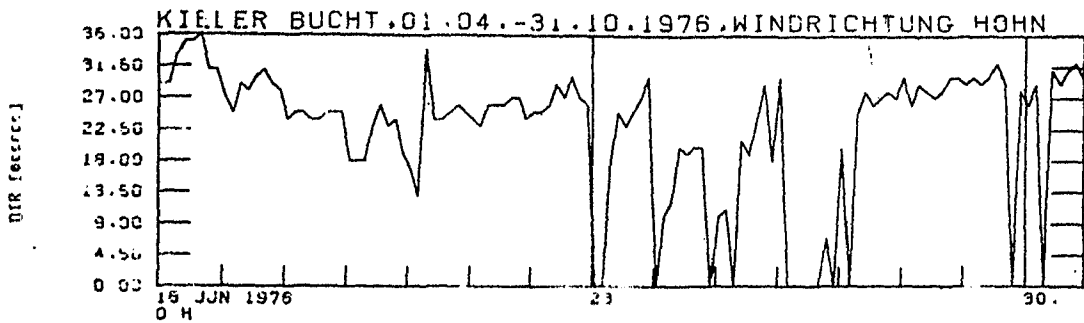


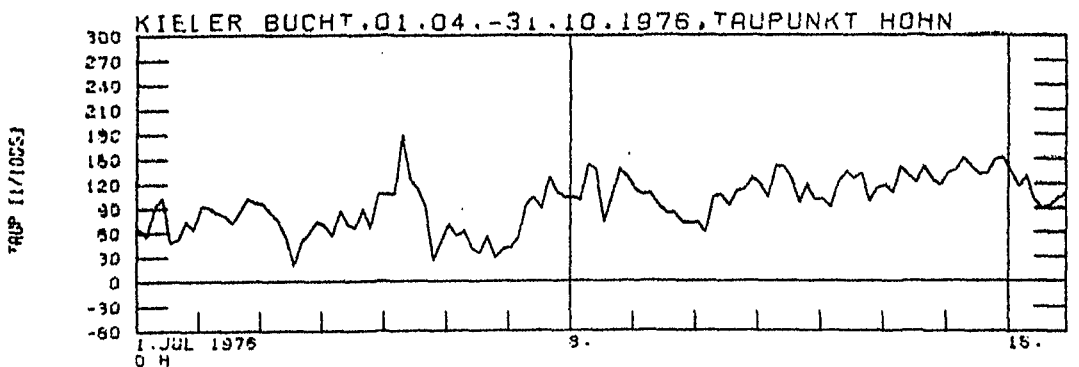
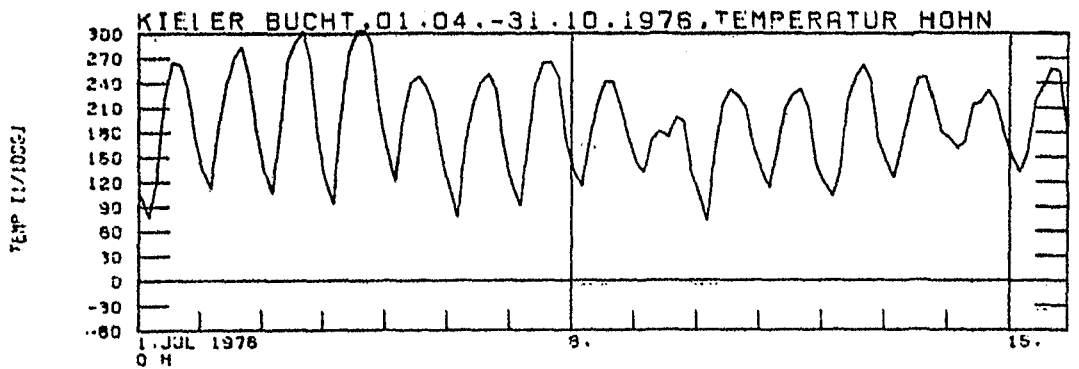
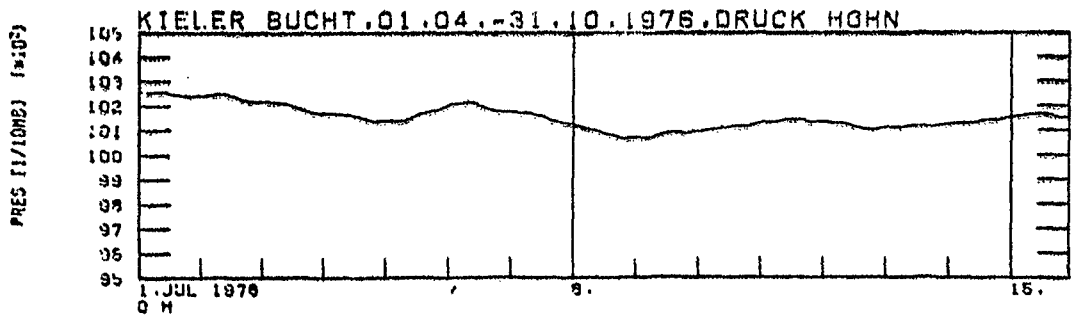
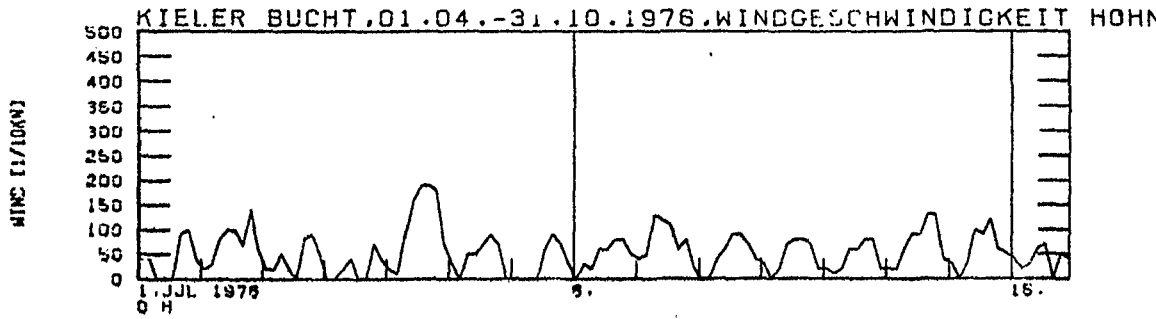
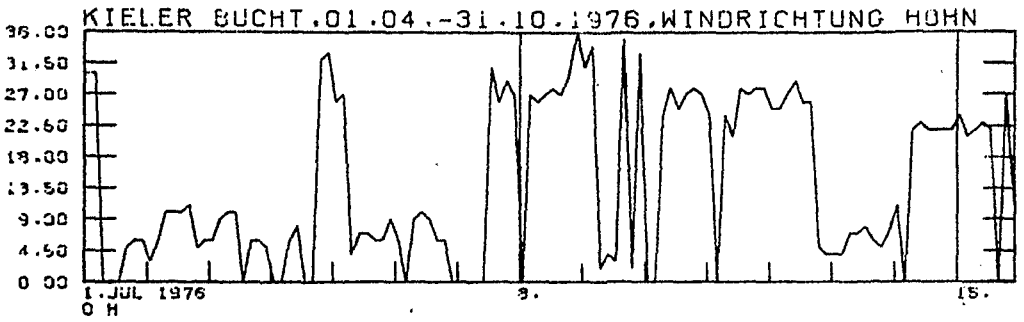


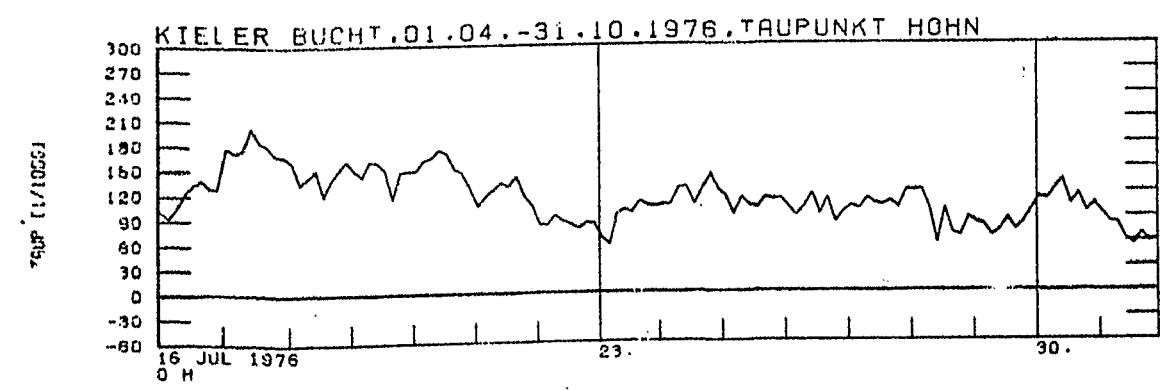
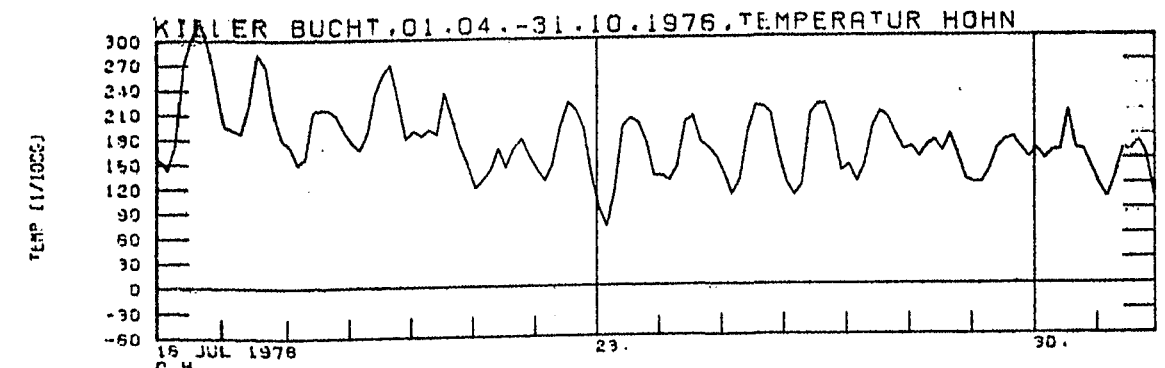
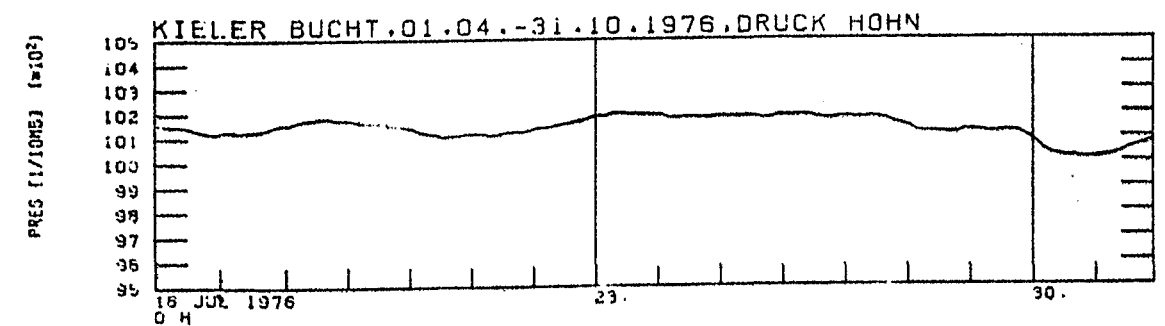
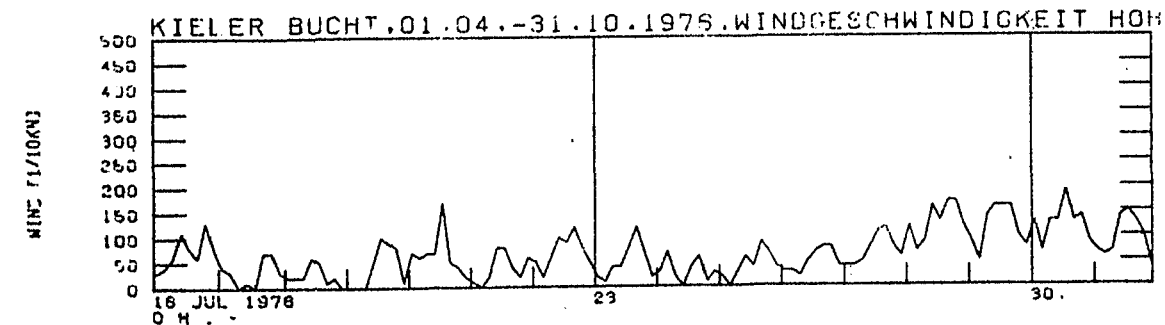
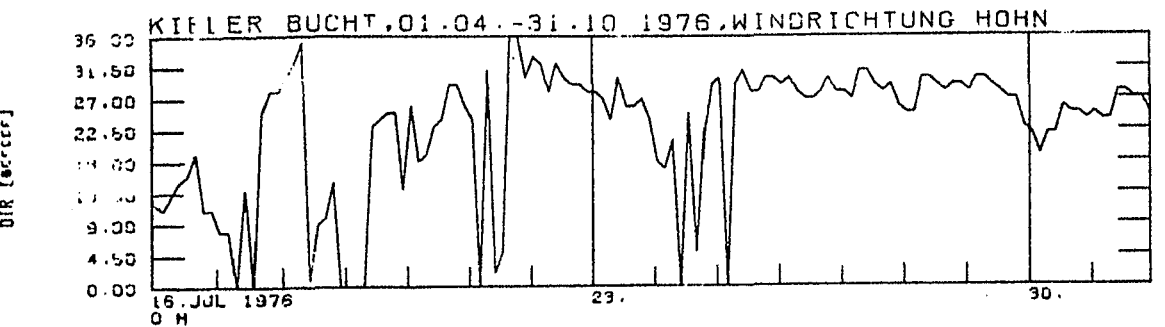


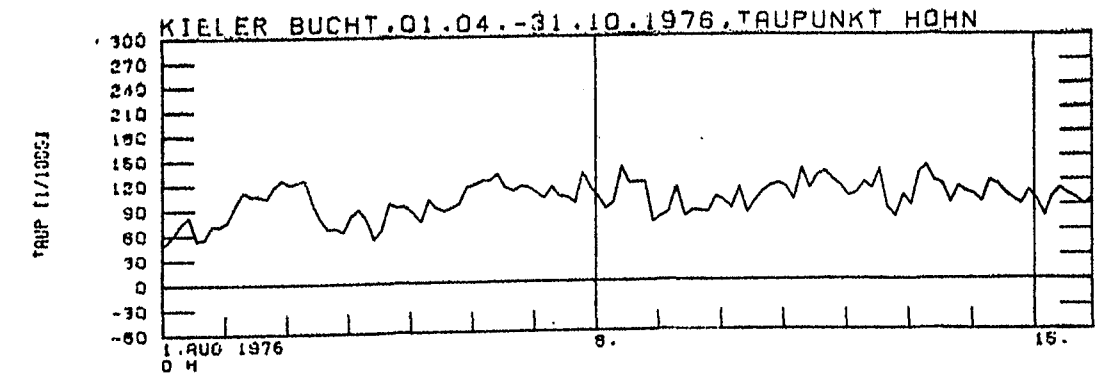
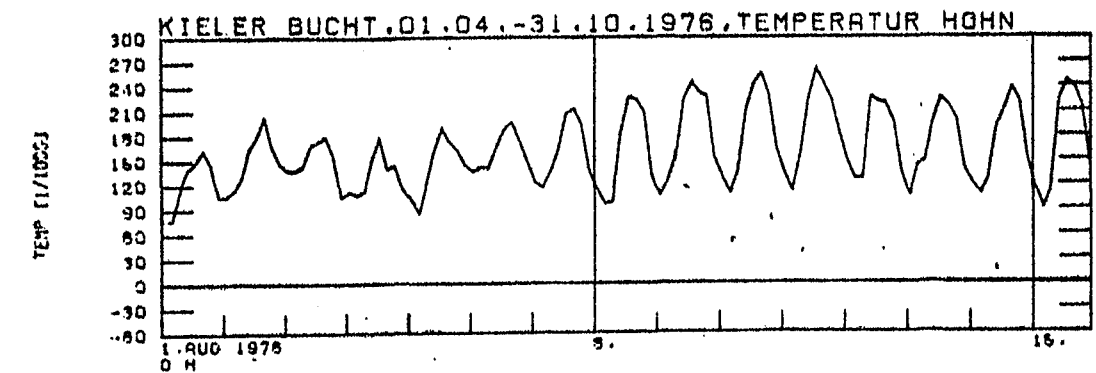
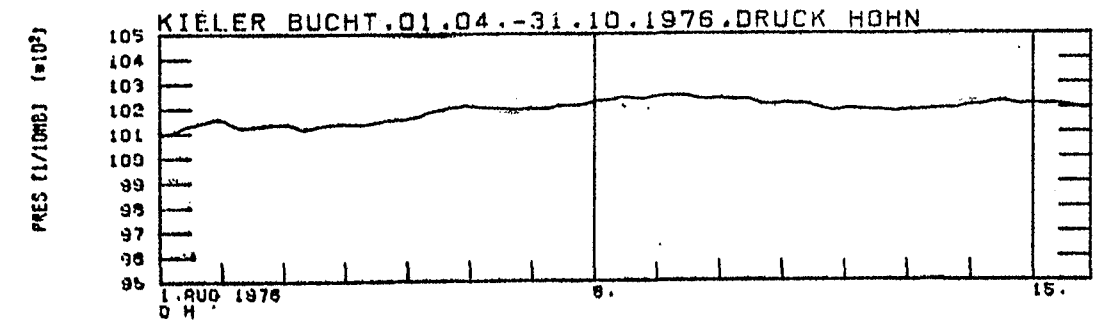
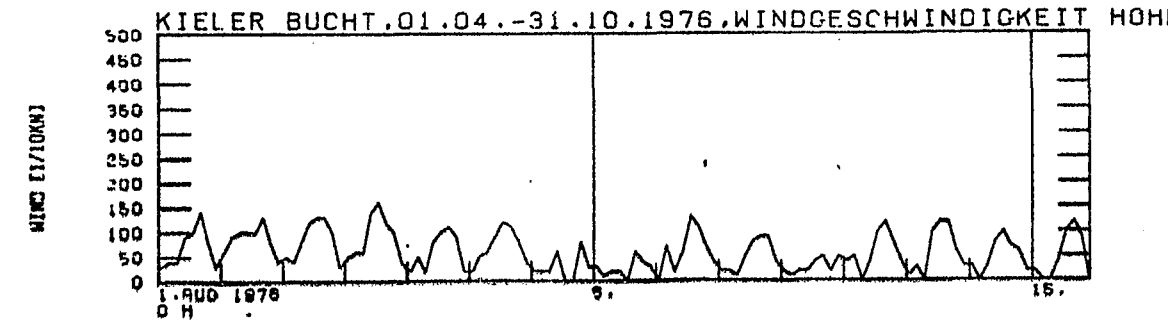
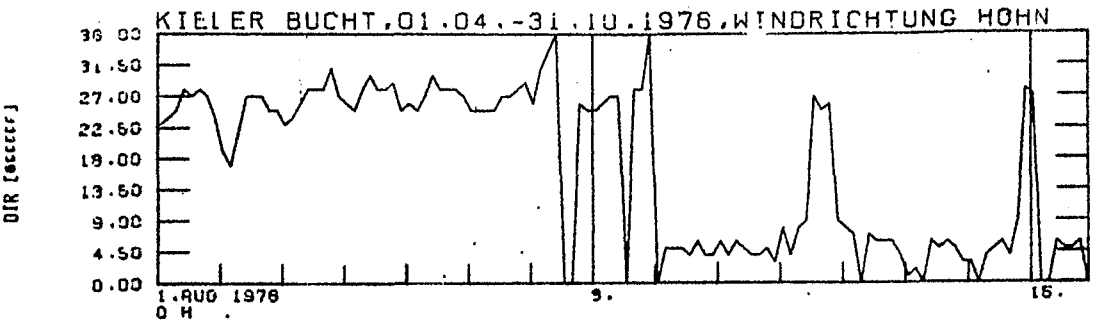


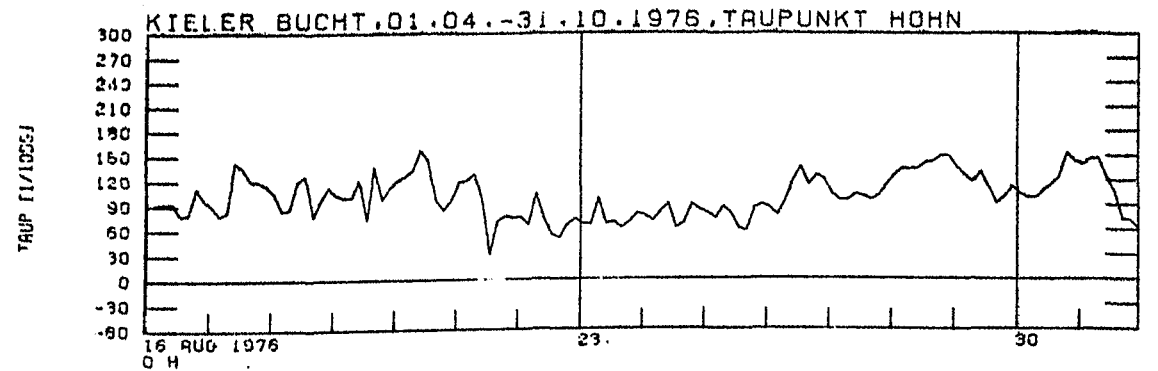
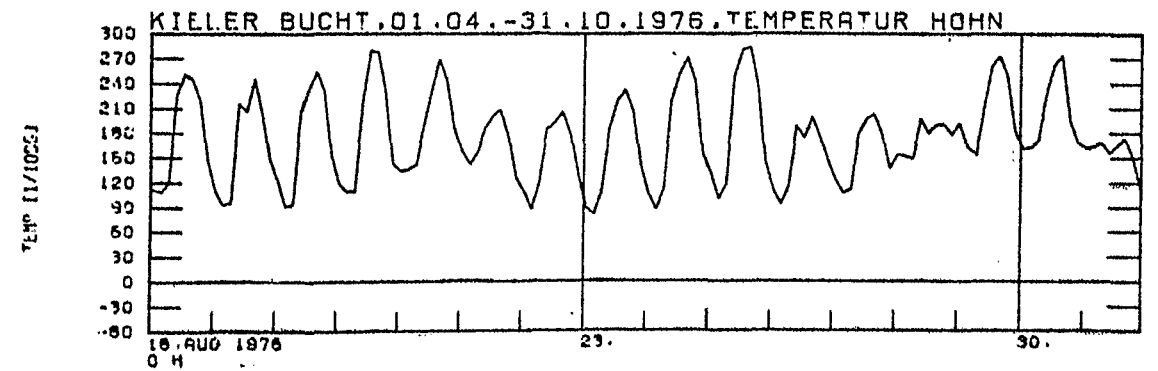
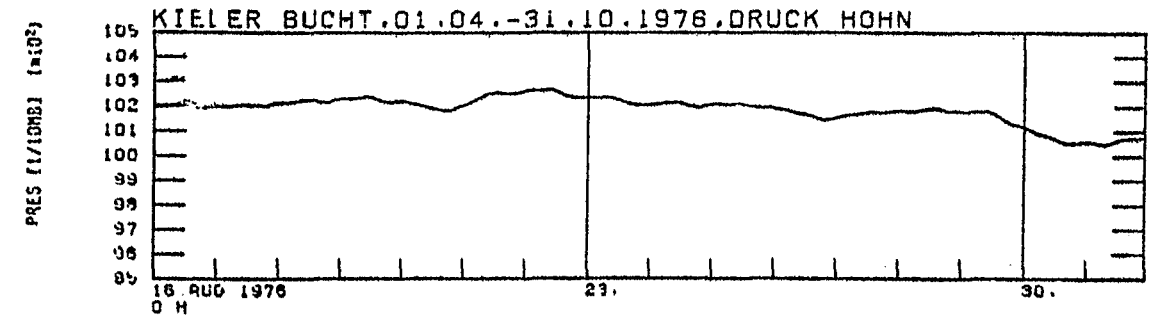
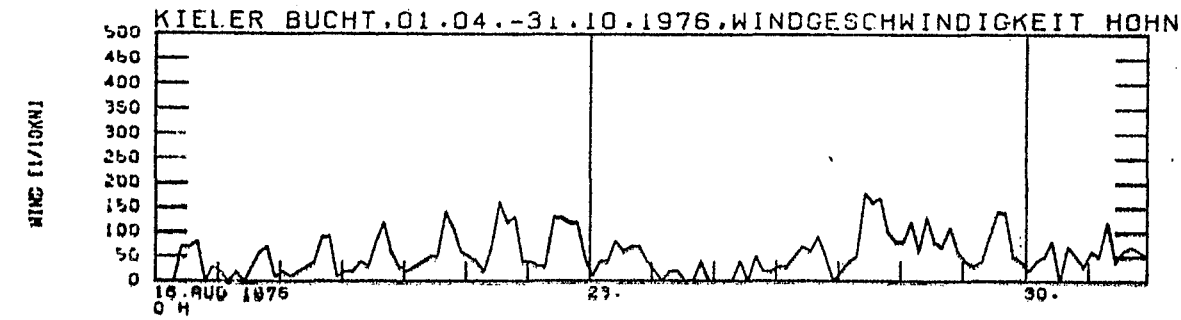
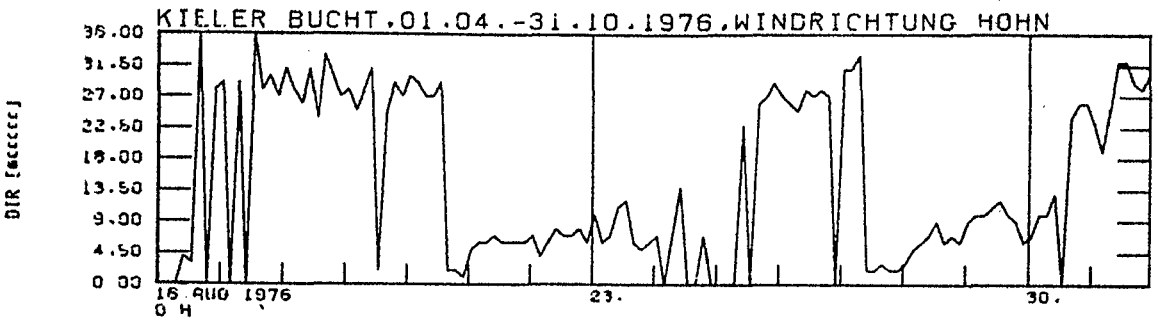


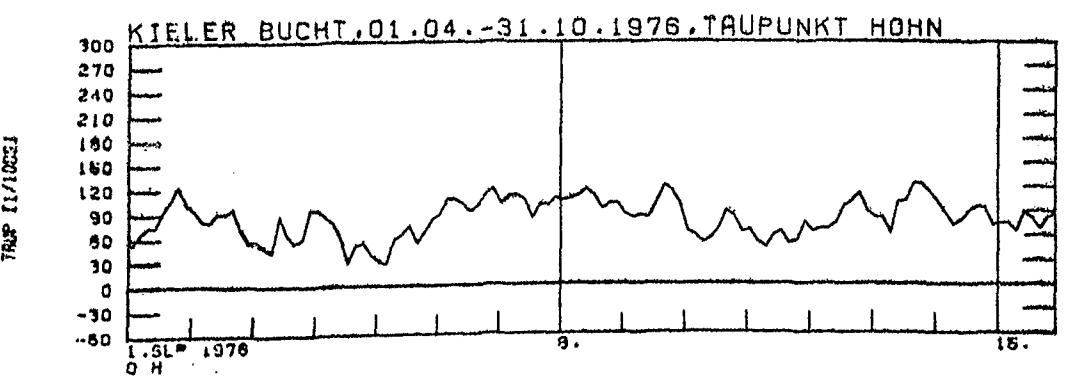
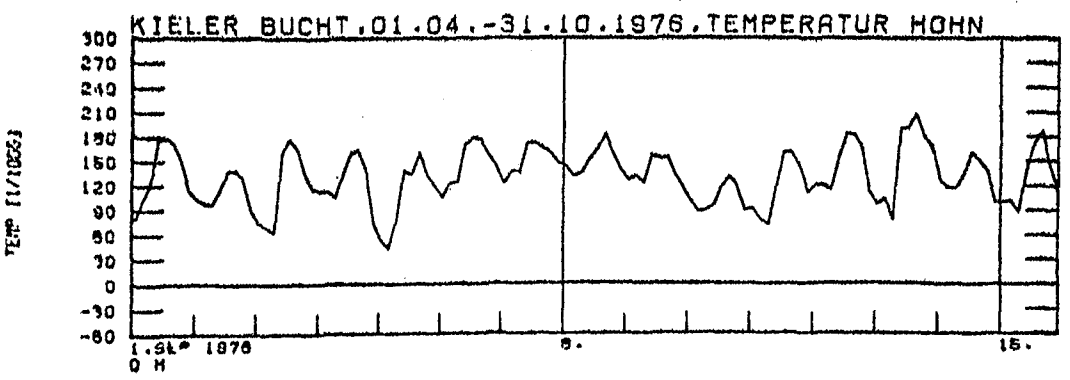
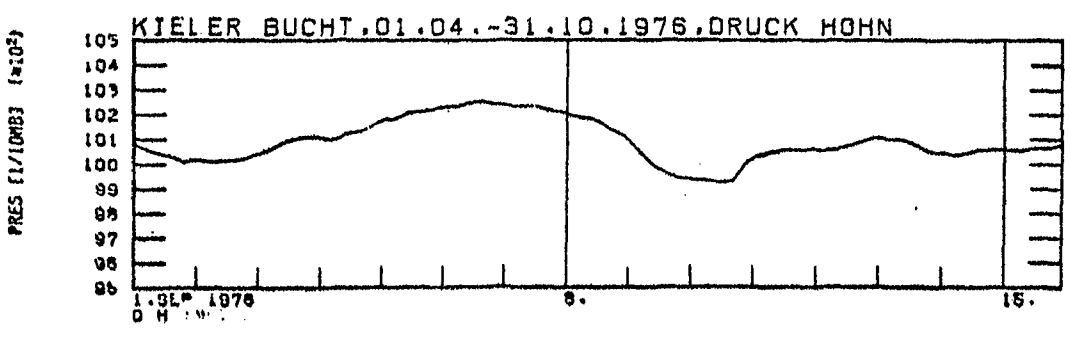
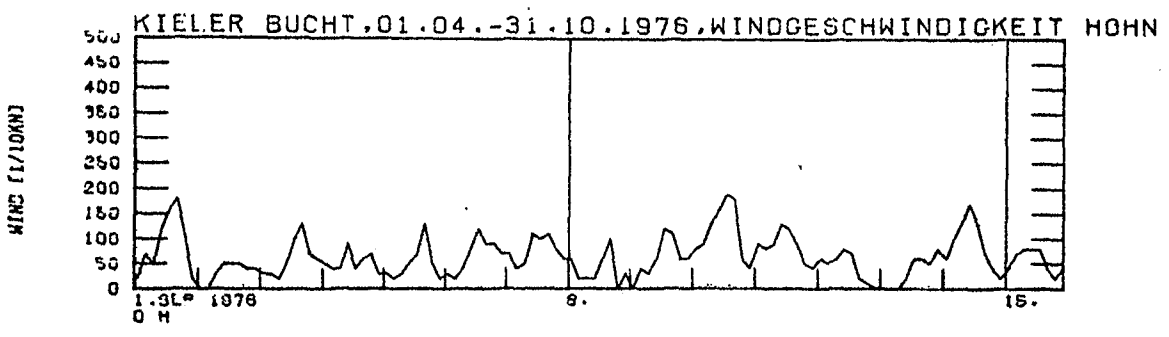
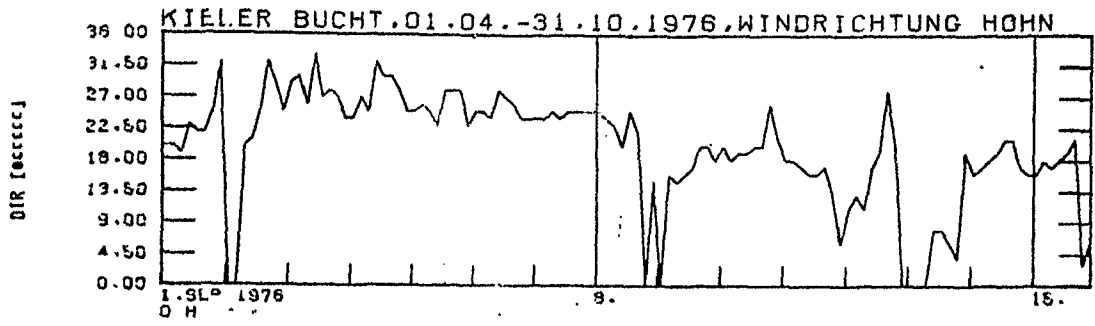


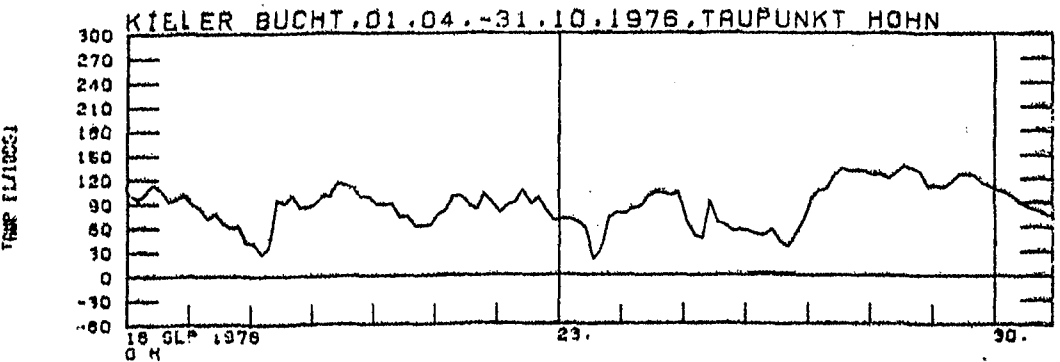
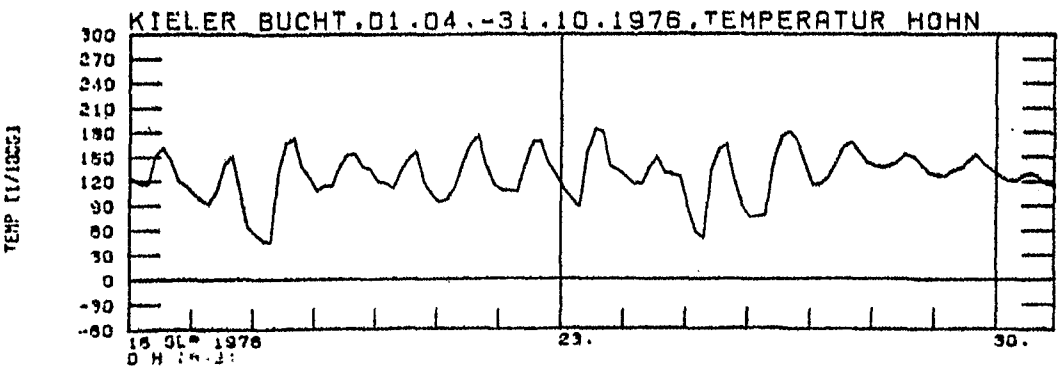
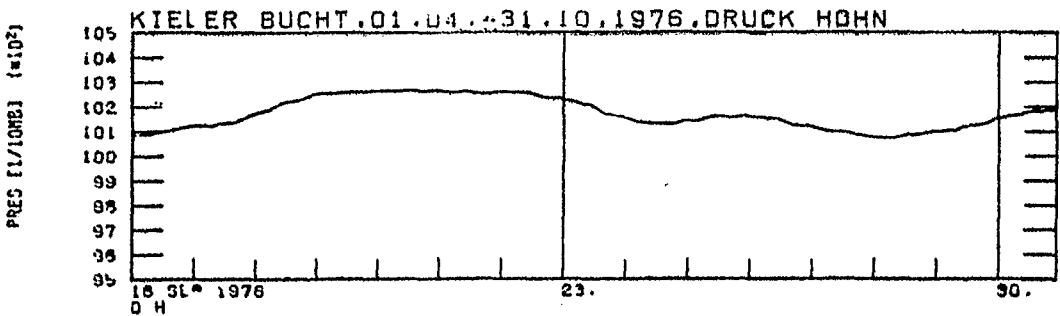
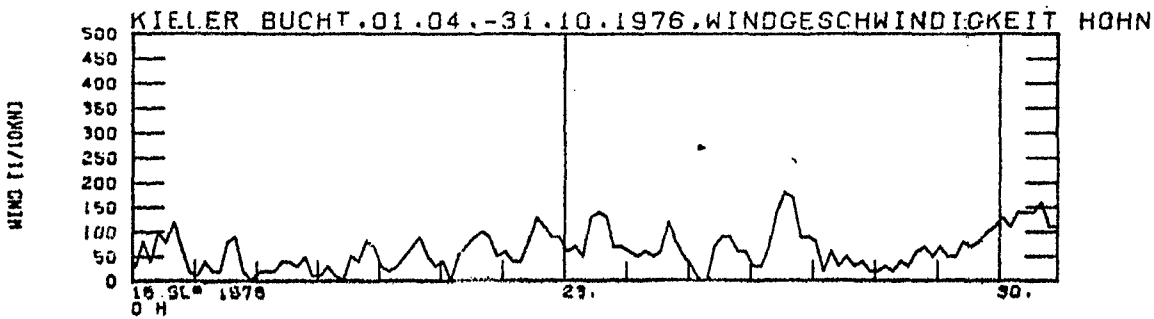
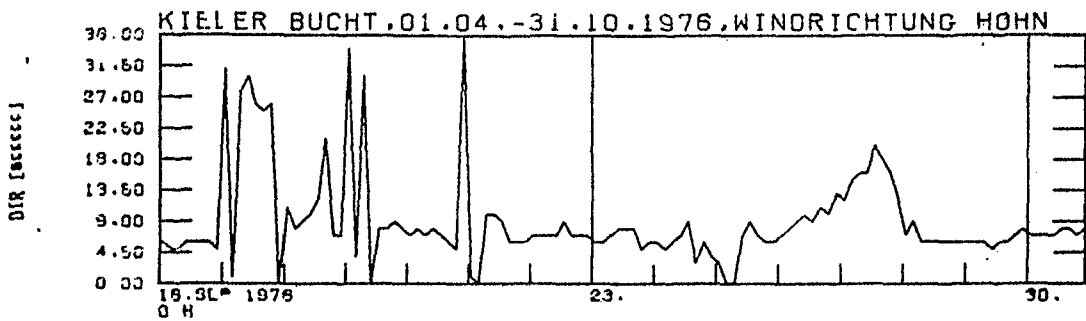


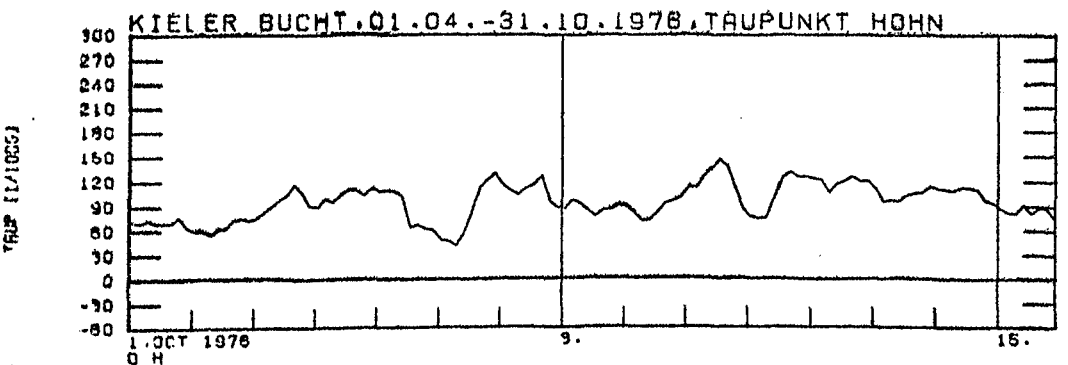
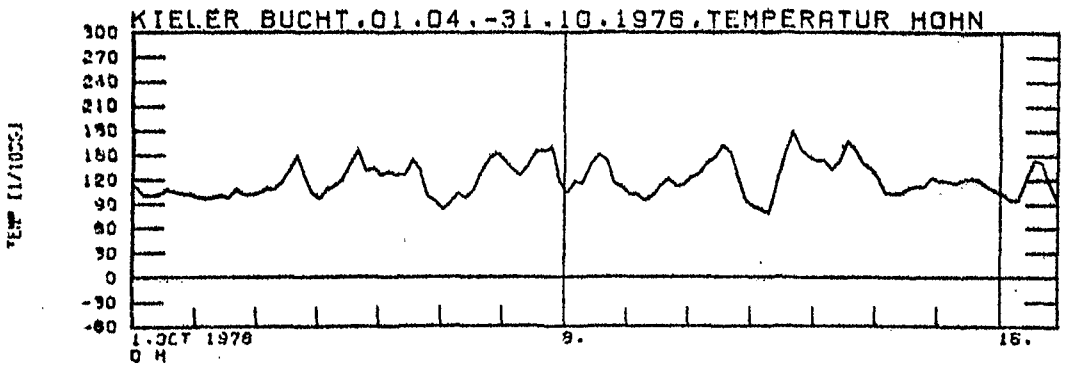
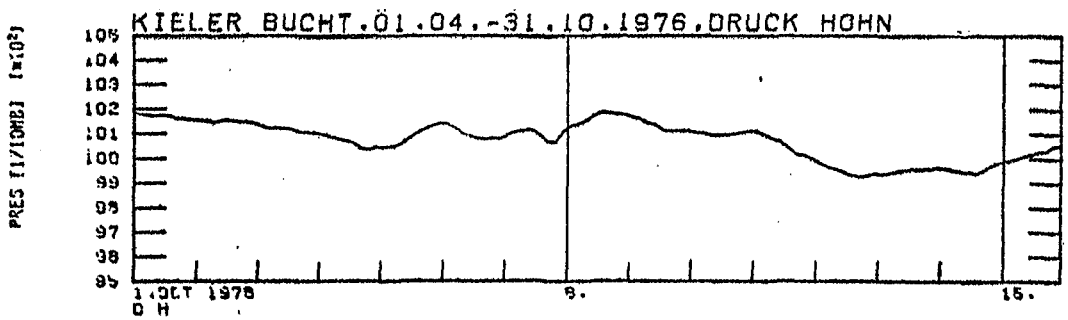
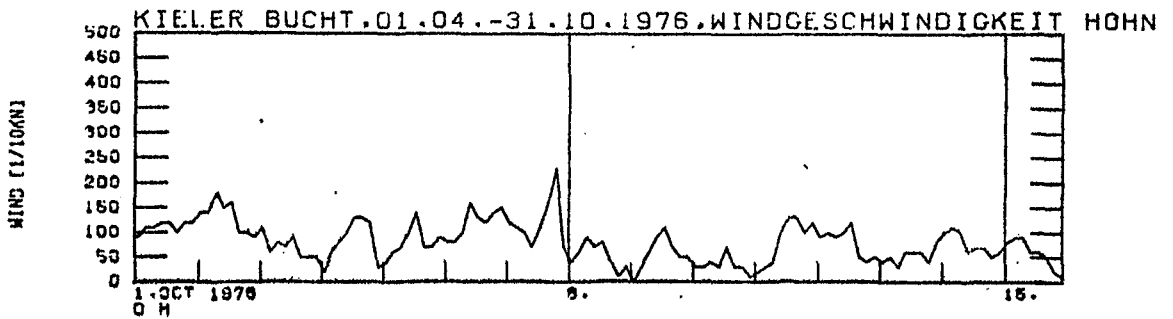
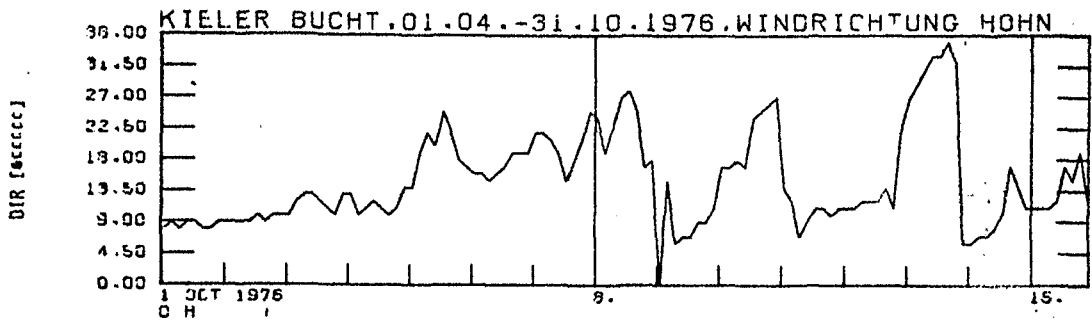




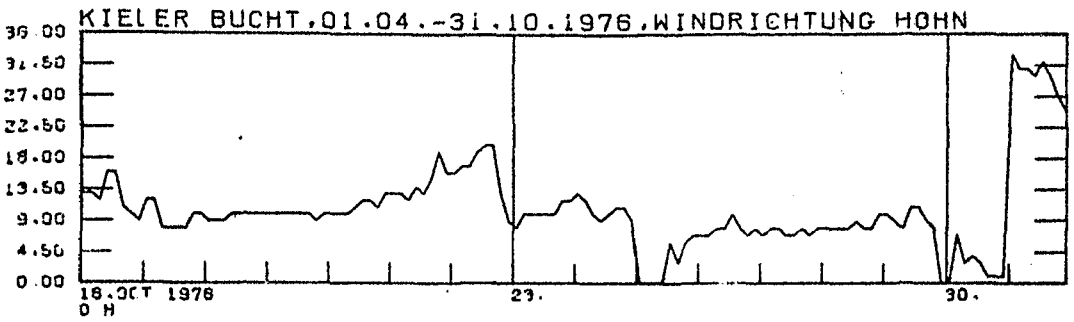




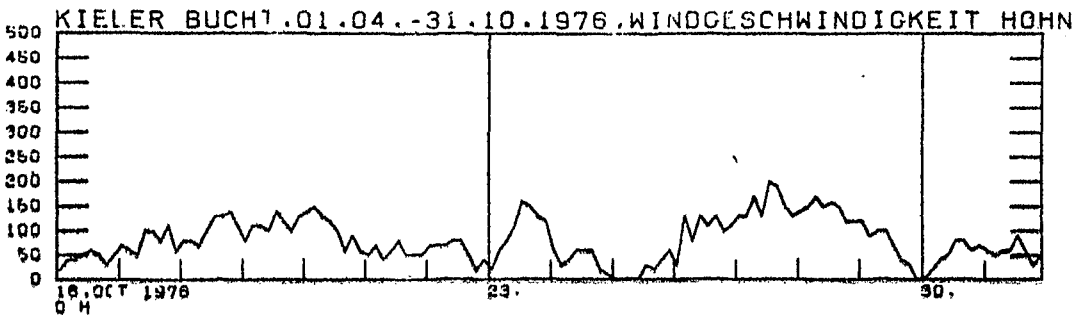




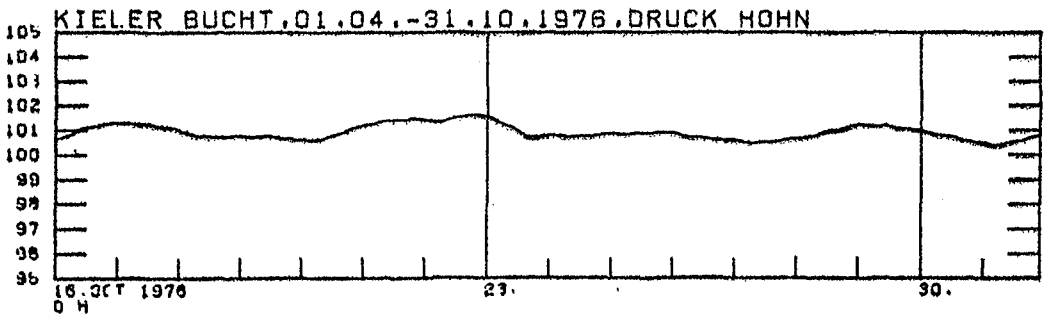
DIR [000000]



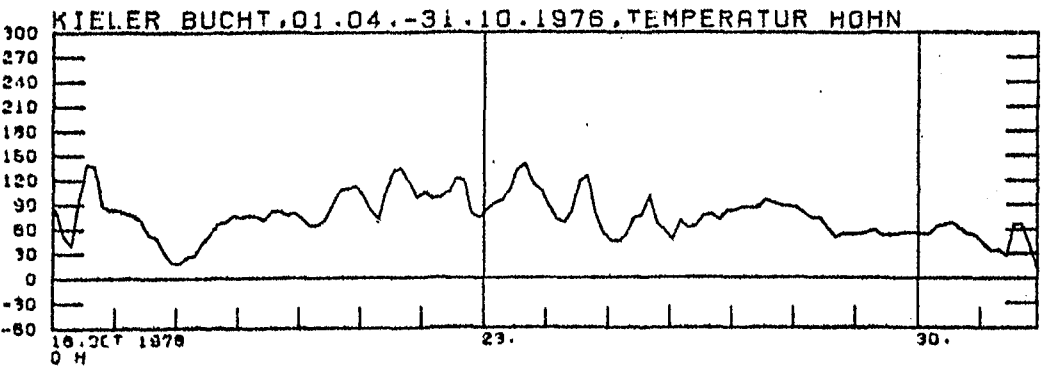
WIND [1/1000]



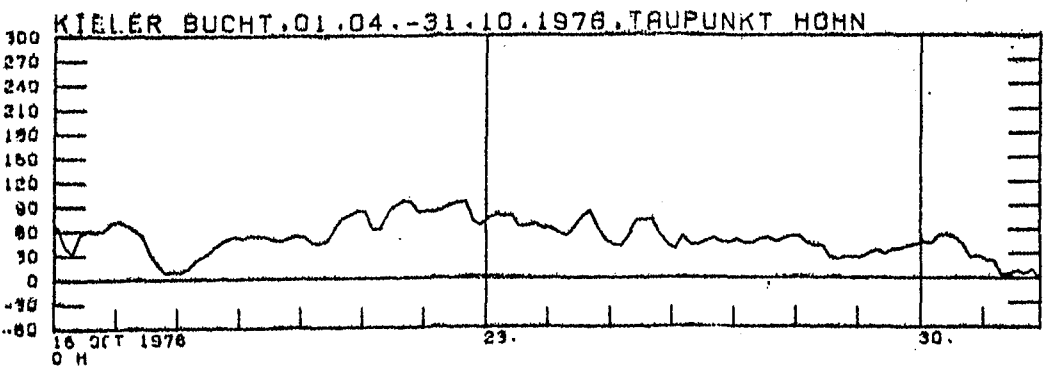
PRES [1/1000] [m103]



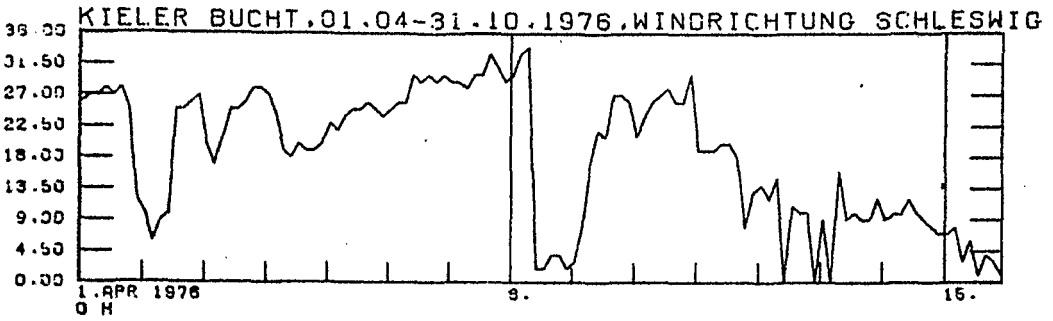
TEMP [1/1000]



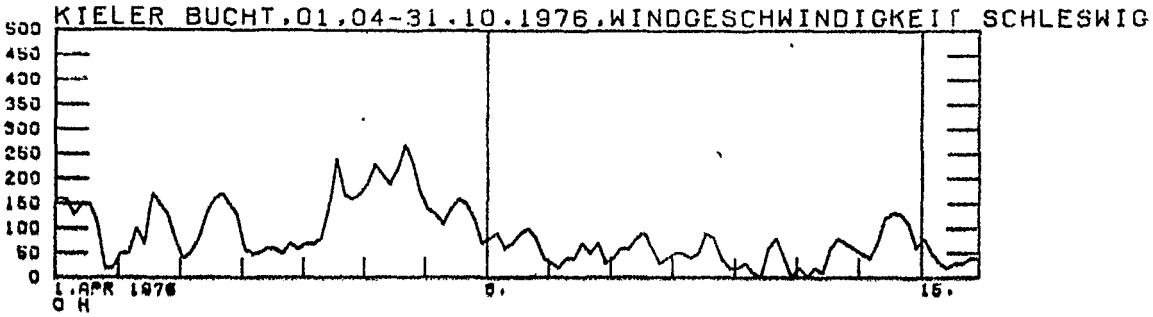
TAUP [1/1000]



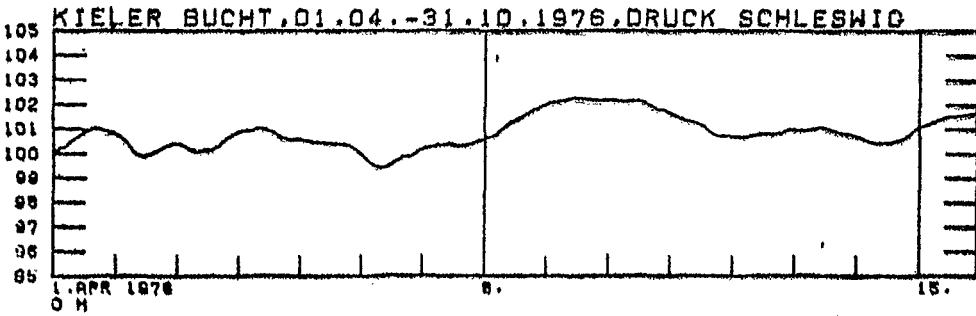
DIR [100G]



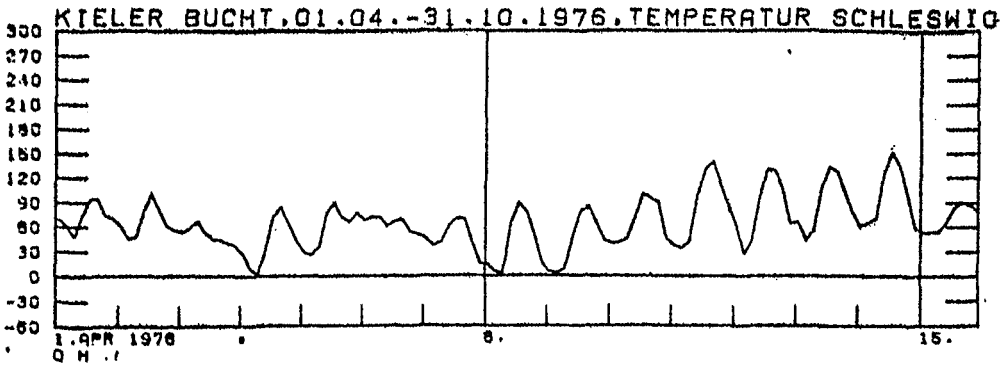
WIND [100KM]



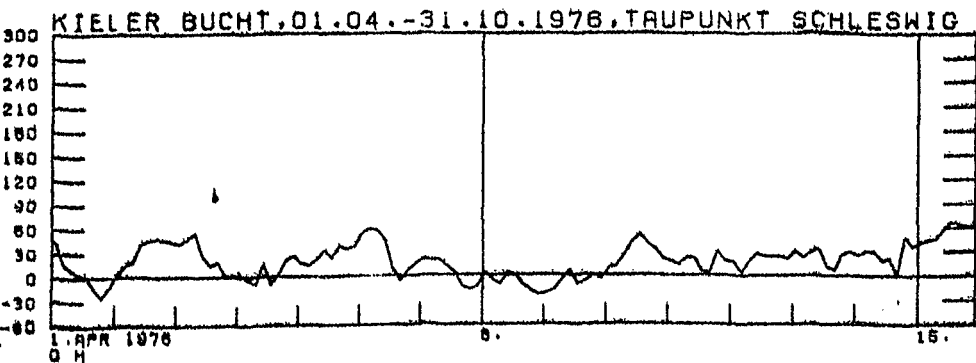
PRES [1/10MB]

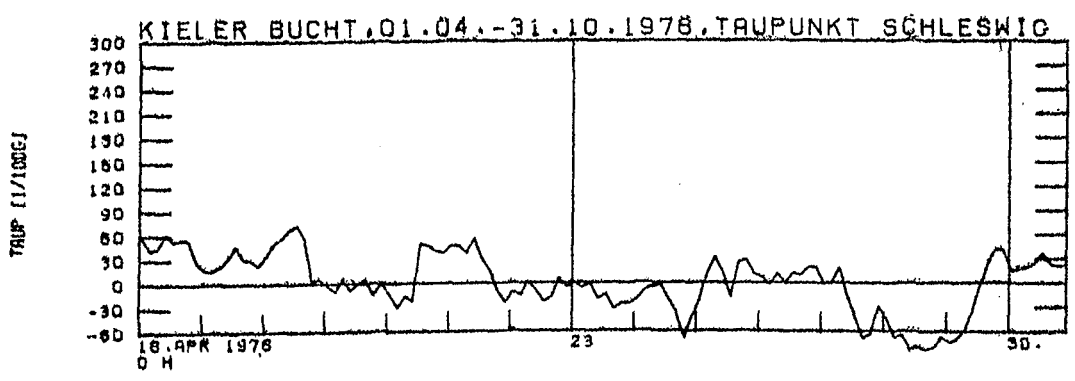
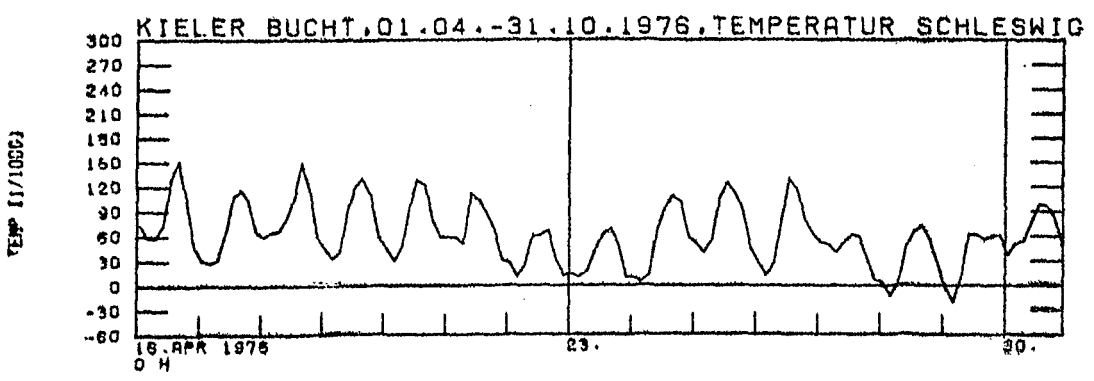
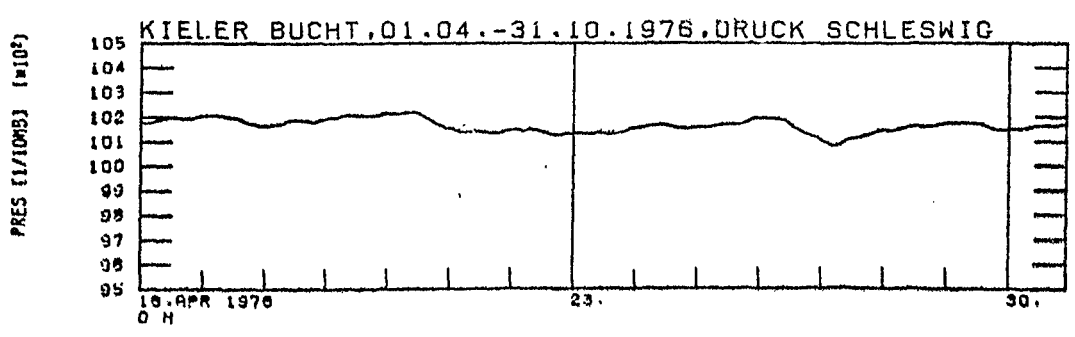
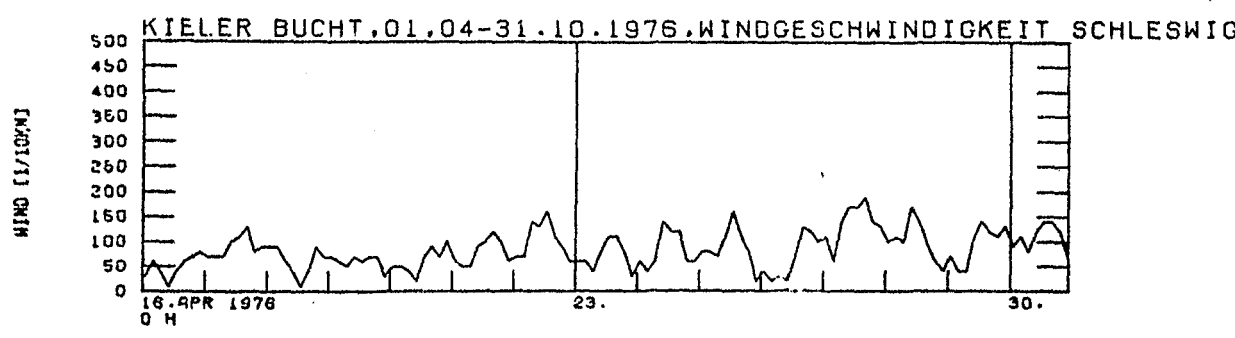
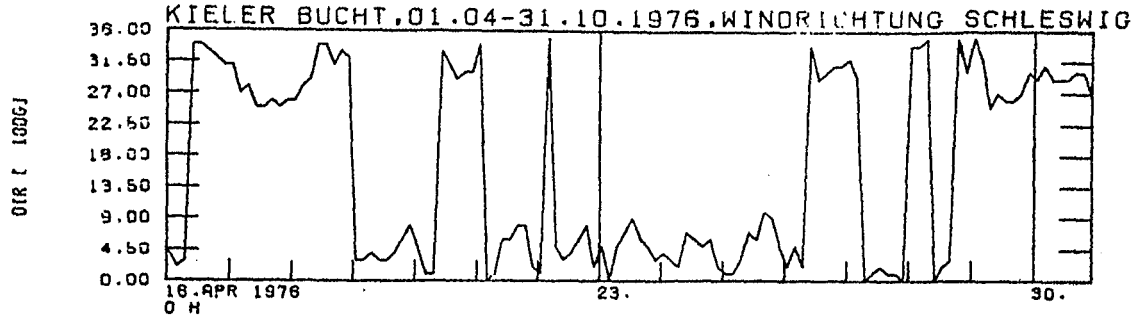


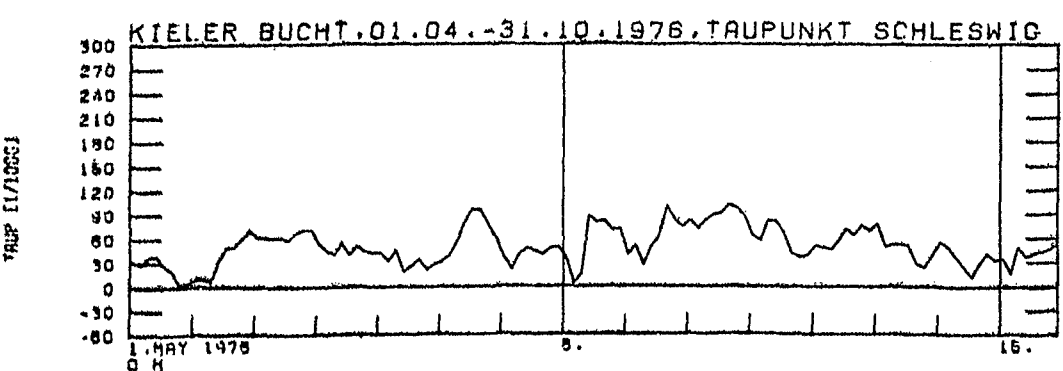
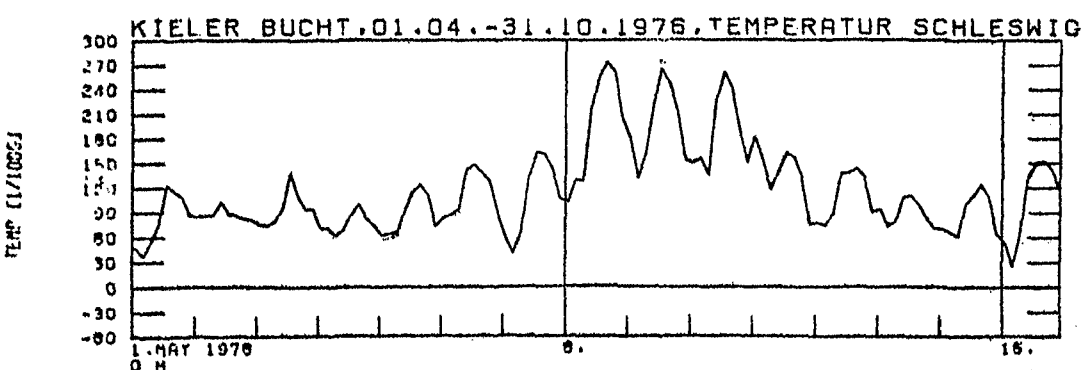
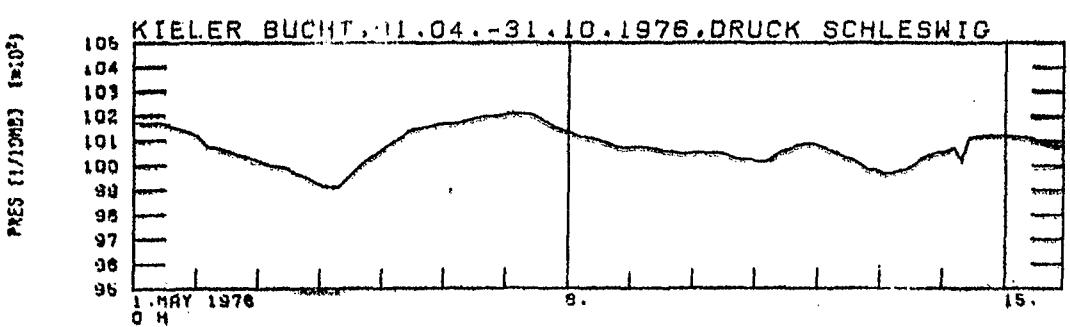
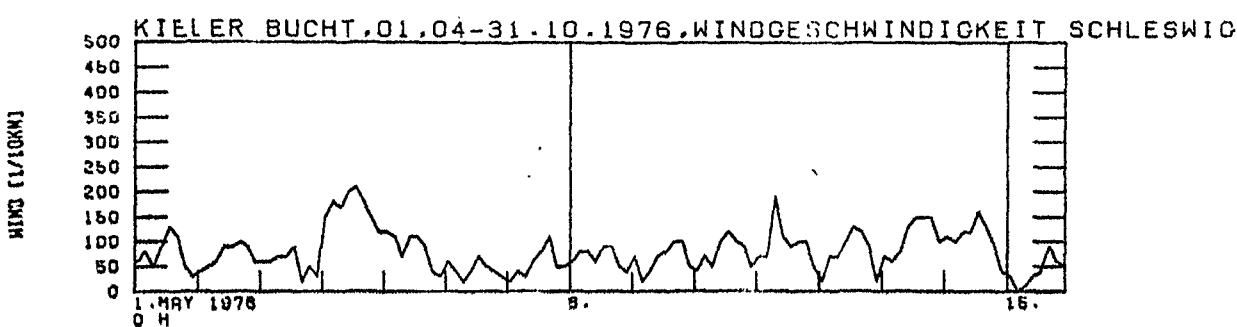
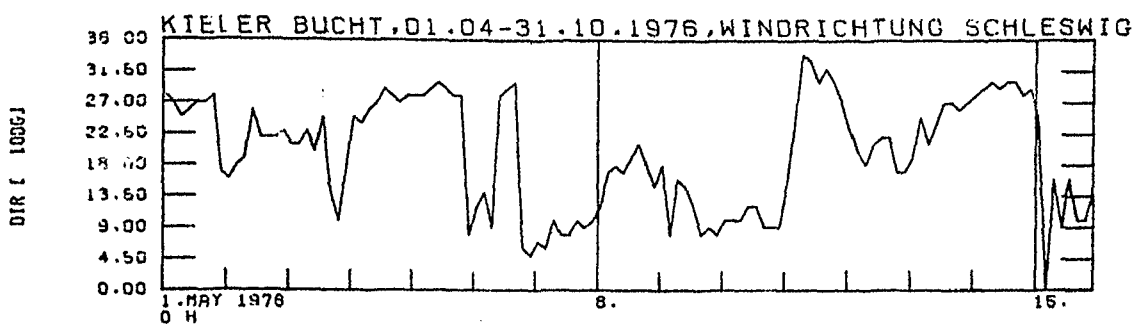
TEMP [1/100C]



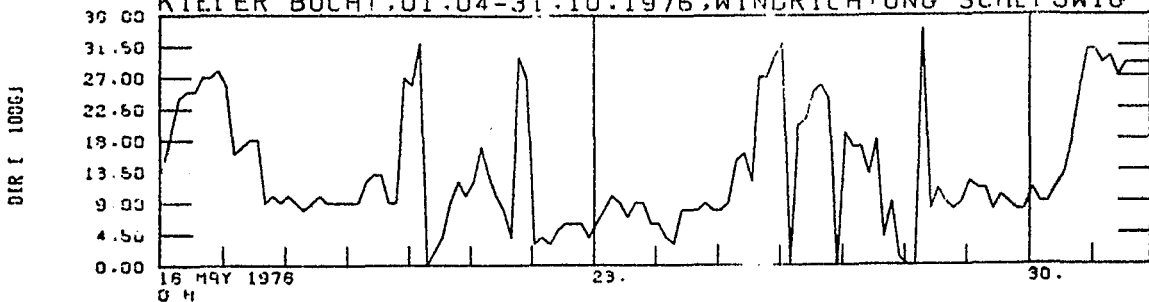
TEMP [1/100C]



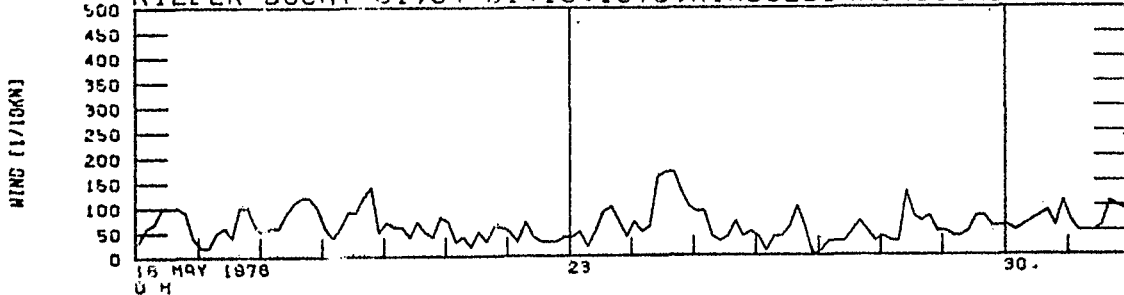




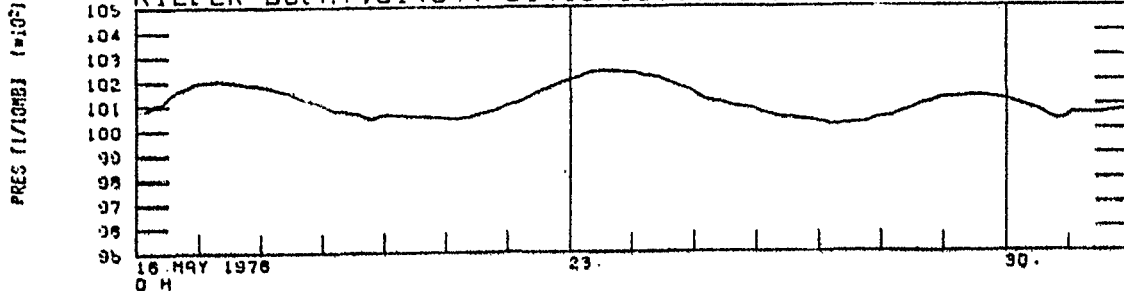
KIELER BUCHT, 01.04.-31.10.1976, WINDRICHTUNG SCHLESWIG



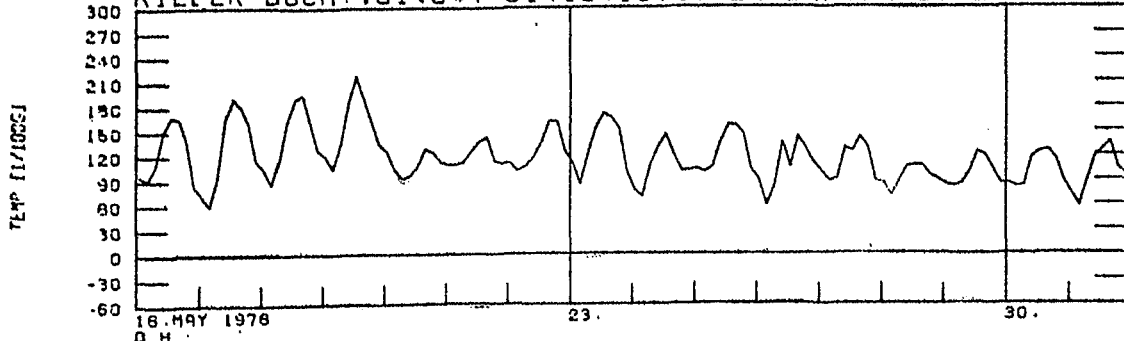
KIELER BUCHT, 01.04.-31.10.1976, WINDGESCHWINDIGKEIT SCHLESWIG



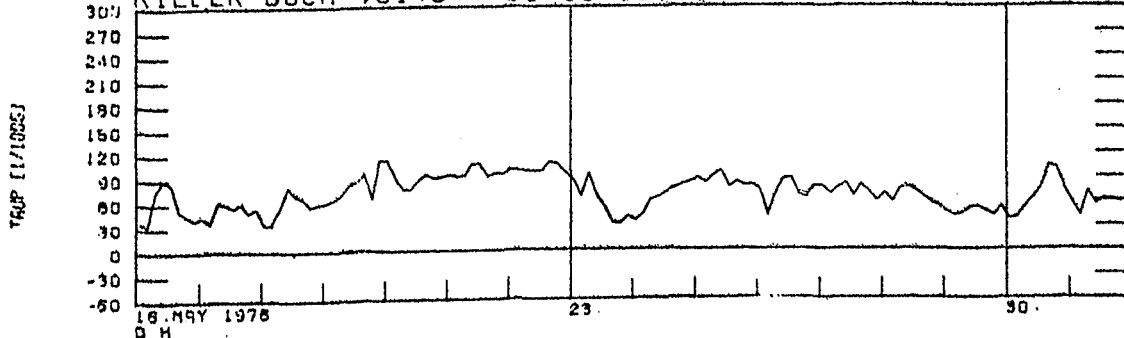
KIELER BUCHT, 01.04.-31.10.1976, DRUCK SCHLESWIG



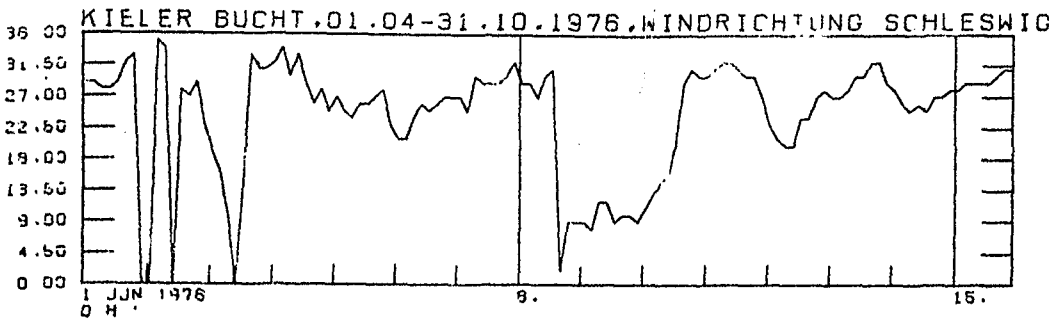
KIELER BUCHT, 01.04.-31.10.1976, TEMPERATUR SCHLESWIG



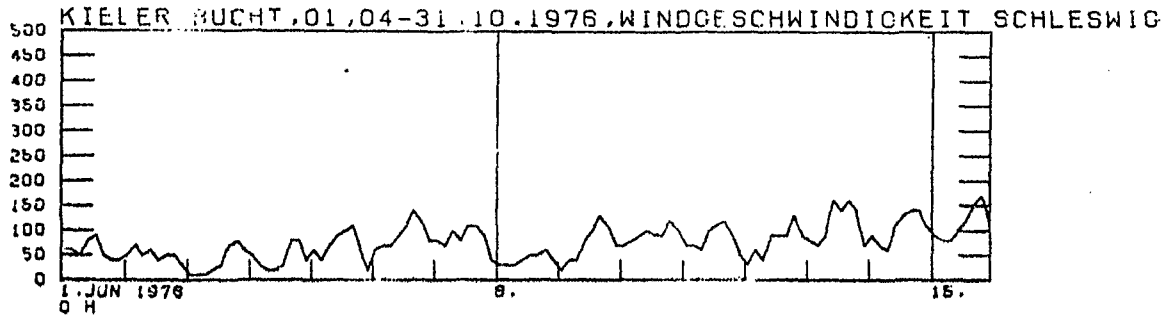
KIELER BUCHT, 01.04.-31.10.1976, TAUPUNKT SCHLESWIG



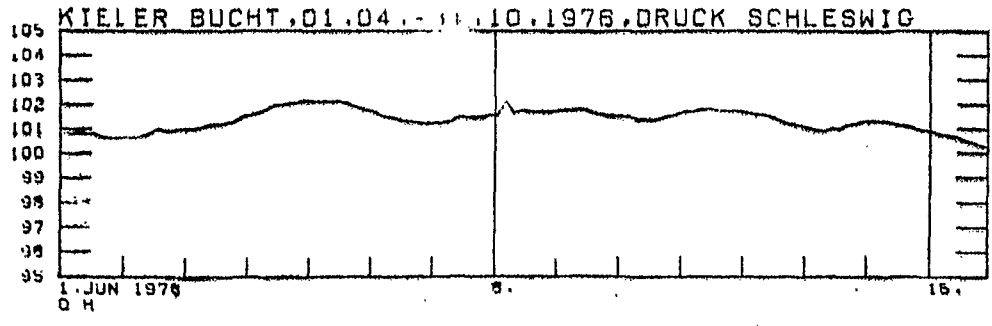
DIR [100G]



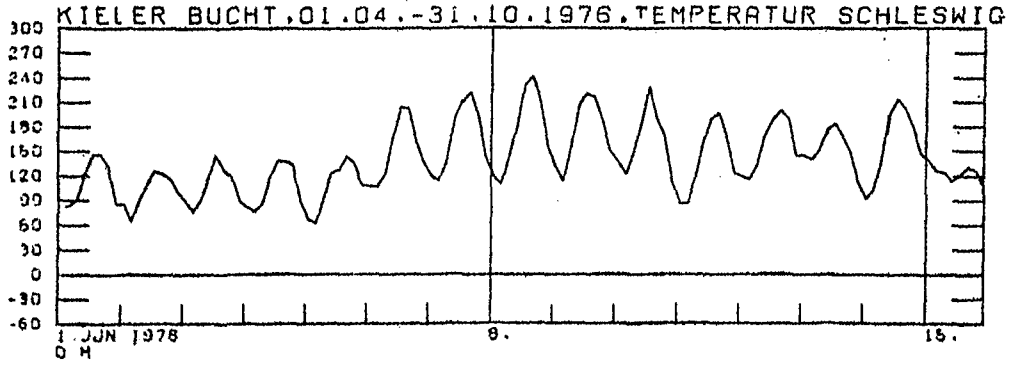
WIND [1/10KM]



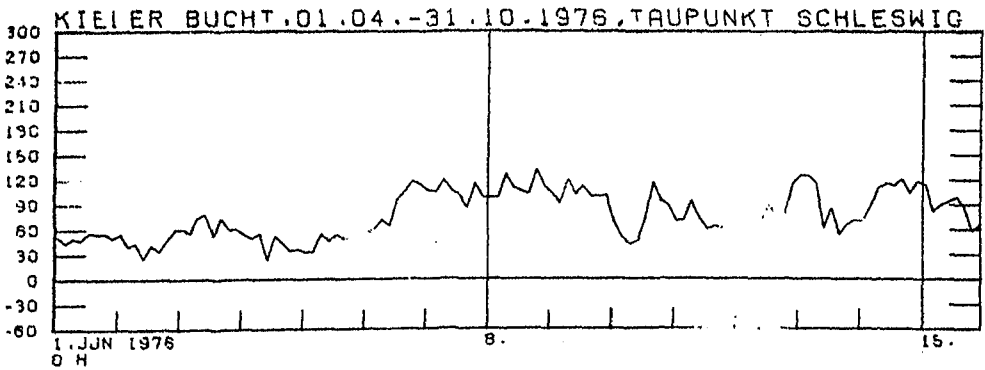
PRES [1/10MB] (#30°)

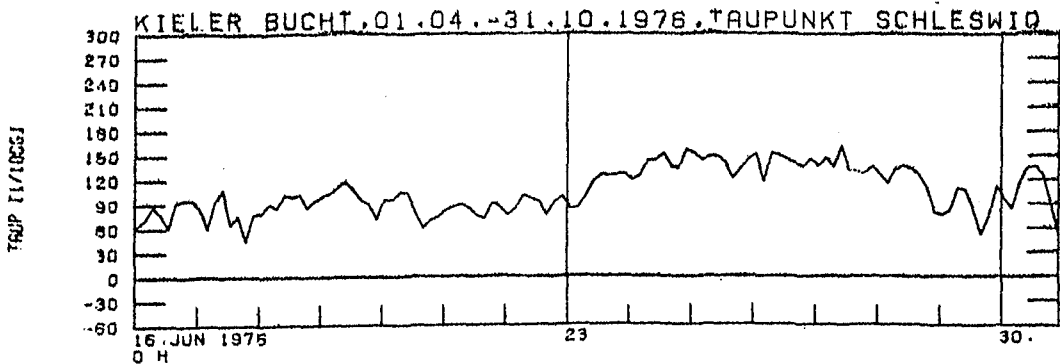
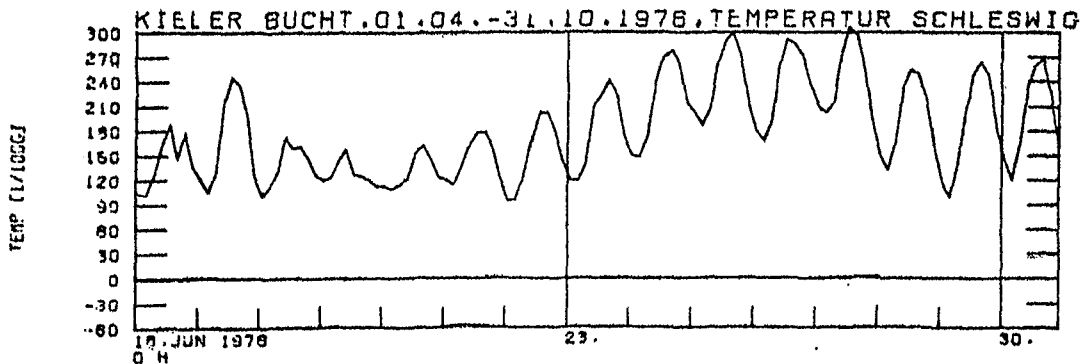
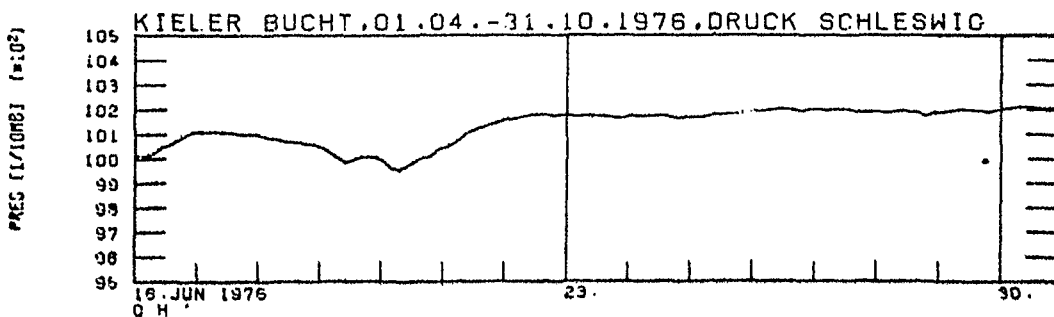
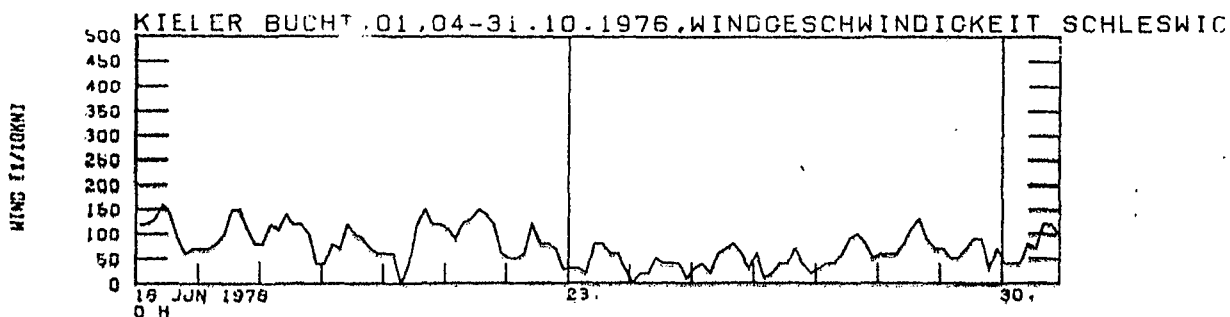
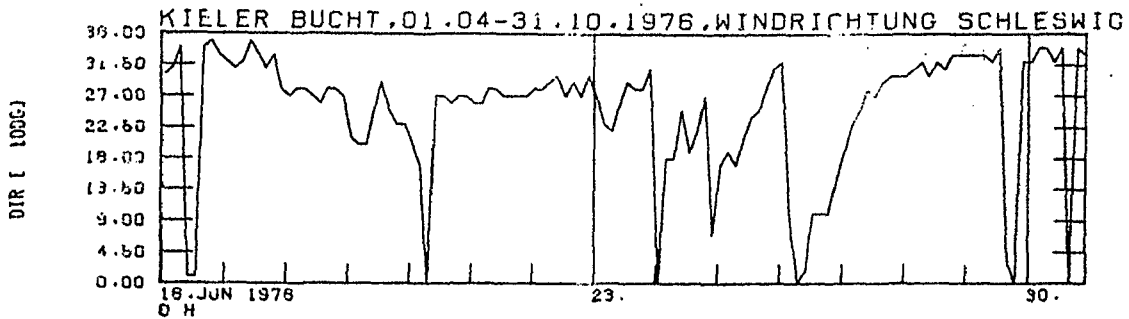


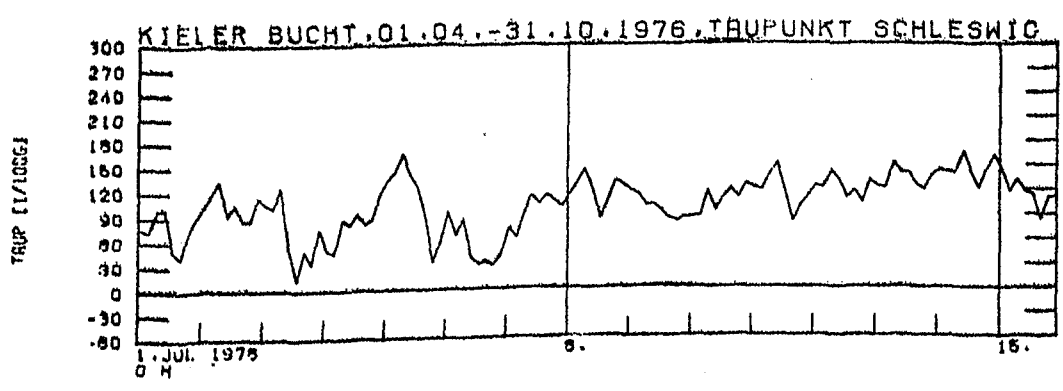
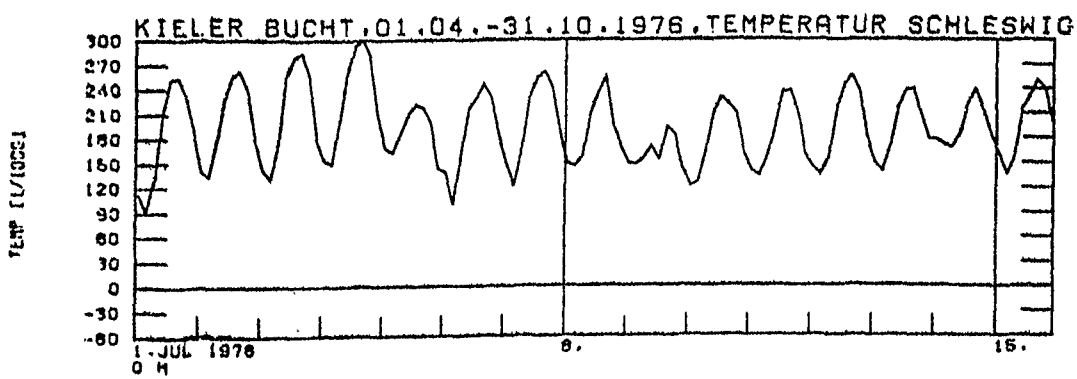
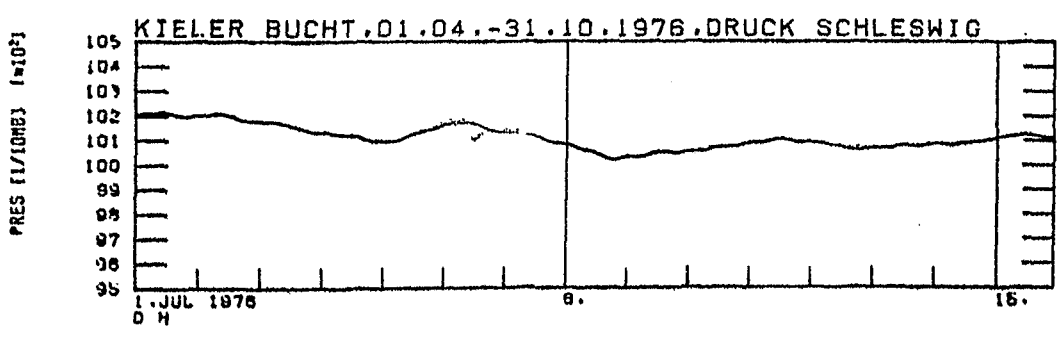
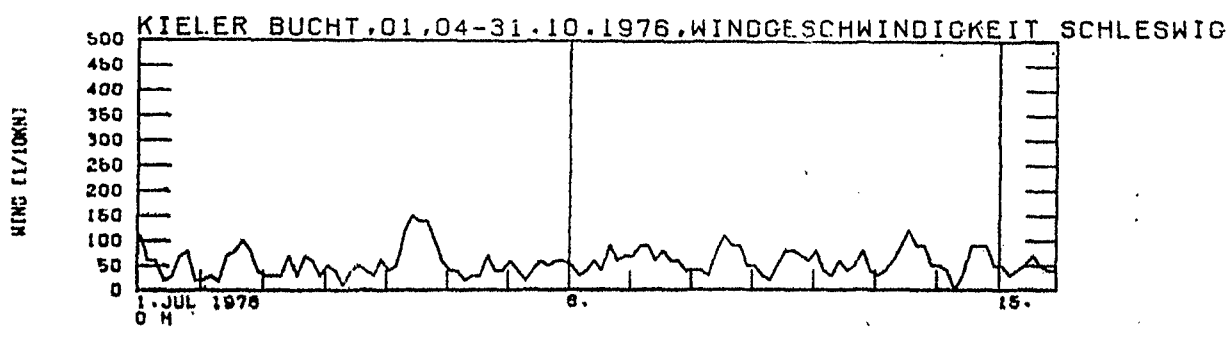
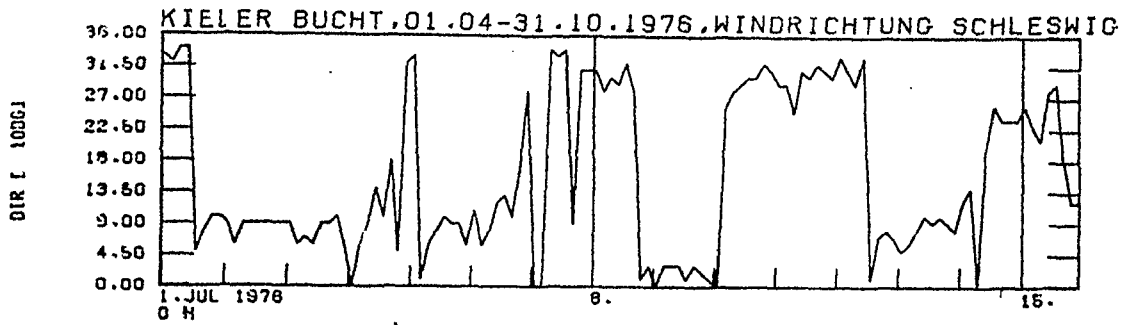
TEMP [1/100G]

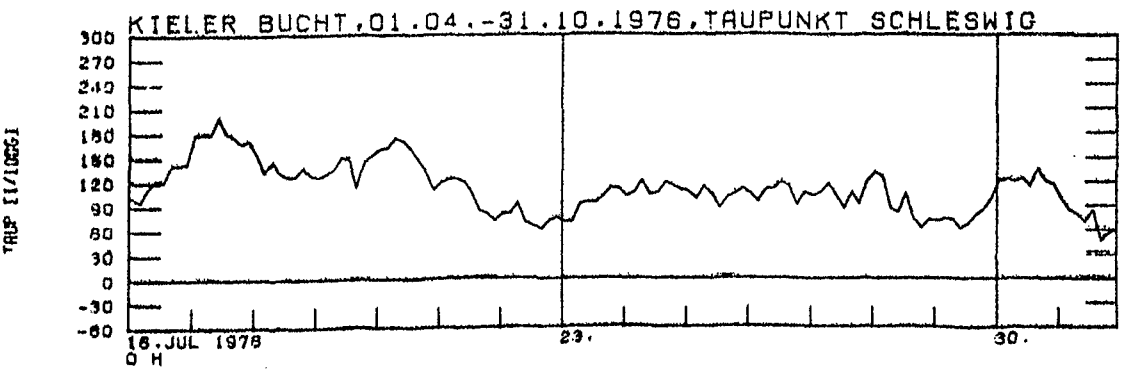
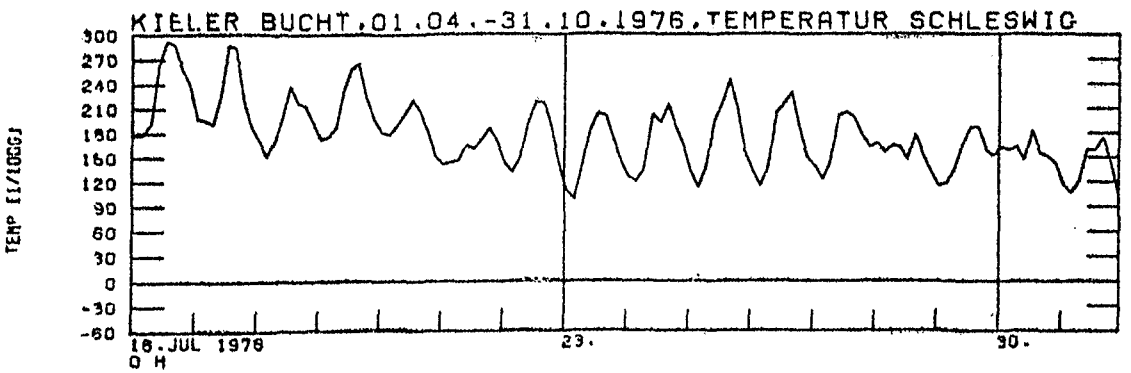
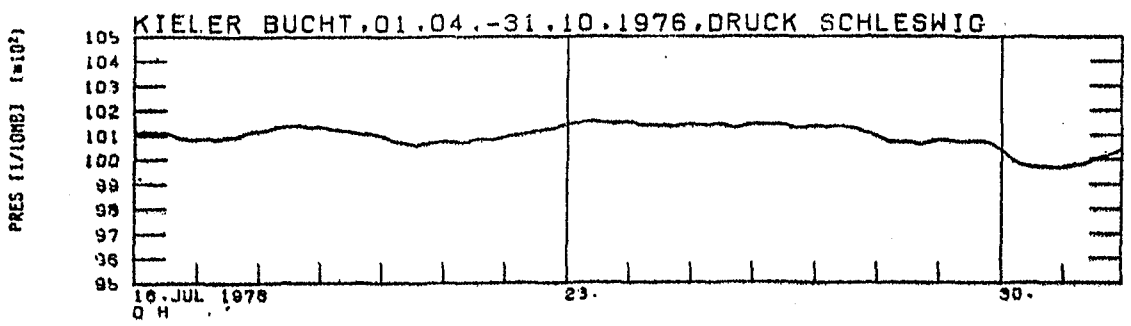
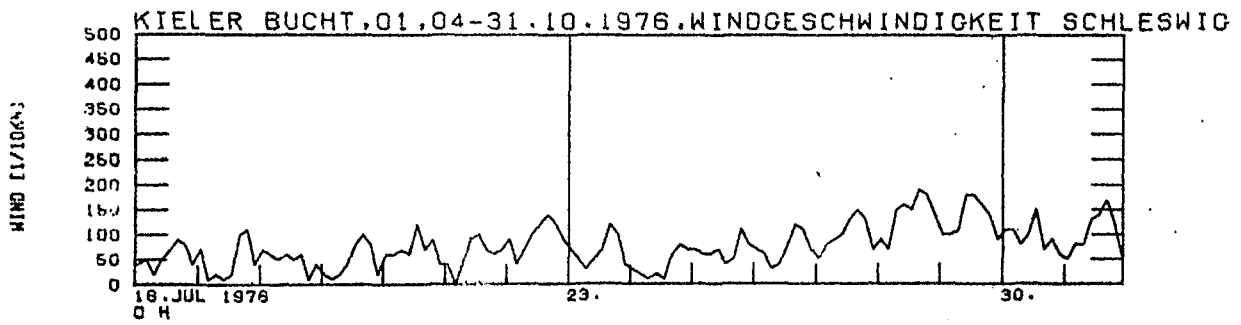
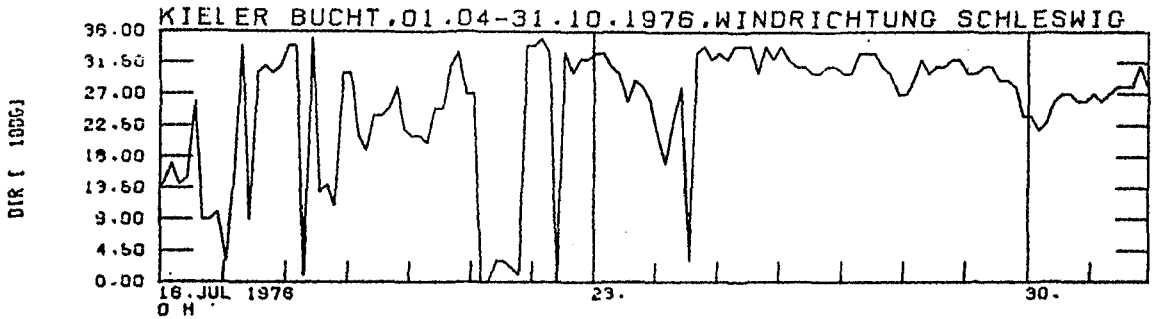


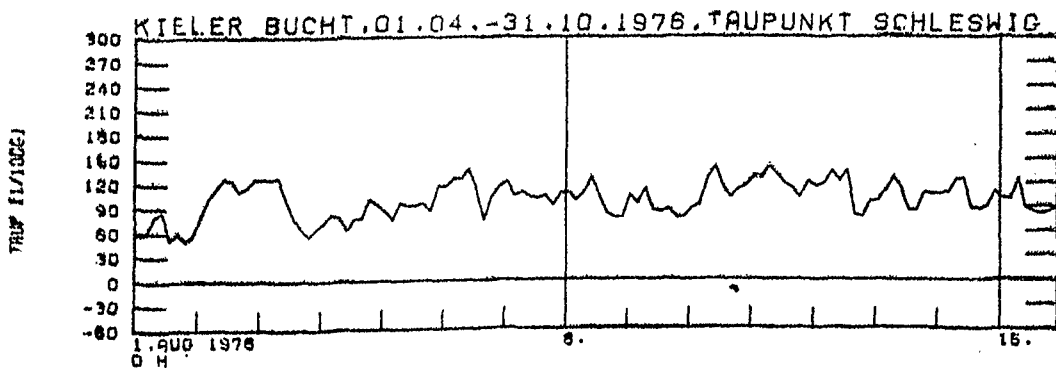
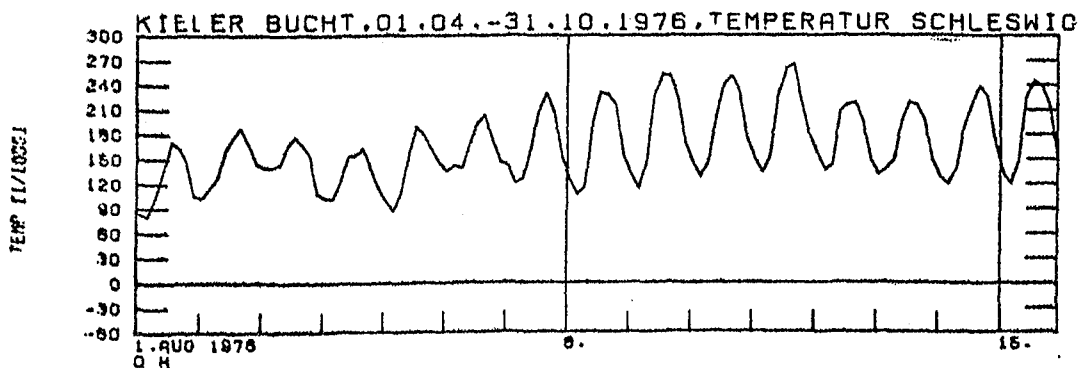
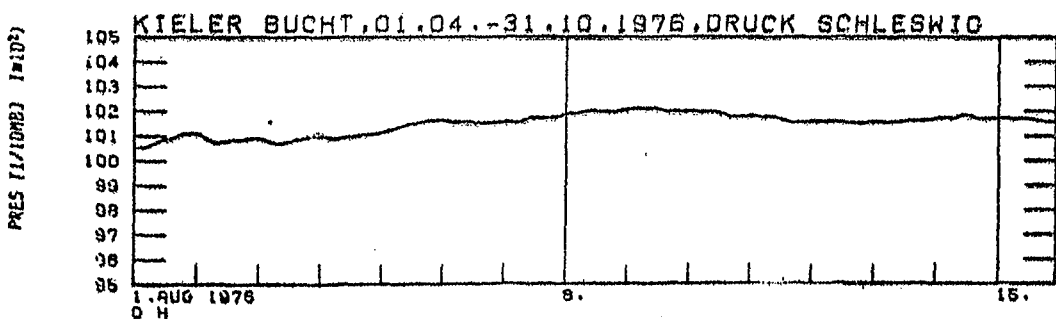
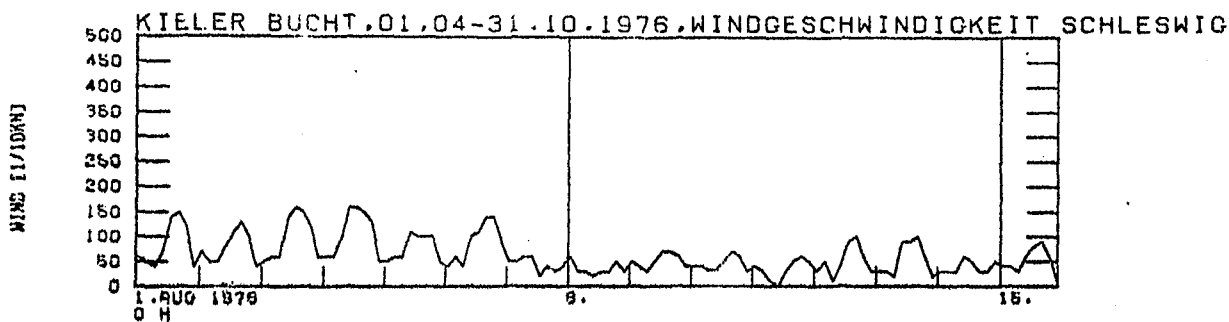
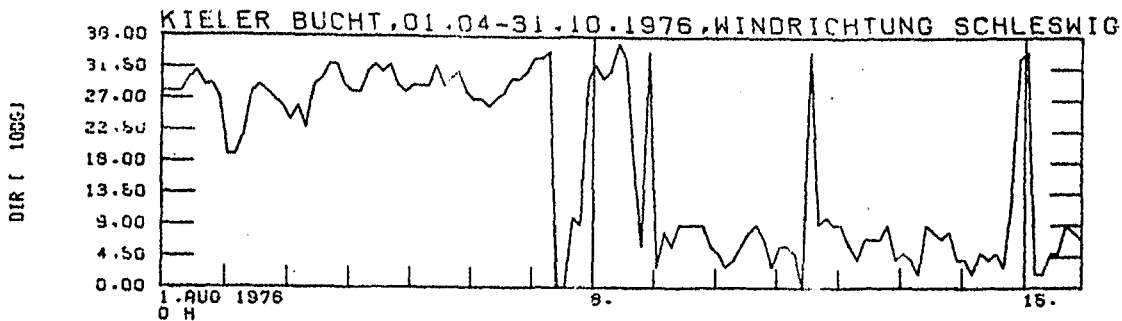
TAUP [1/100G]

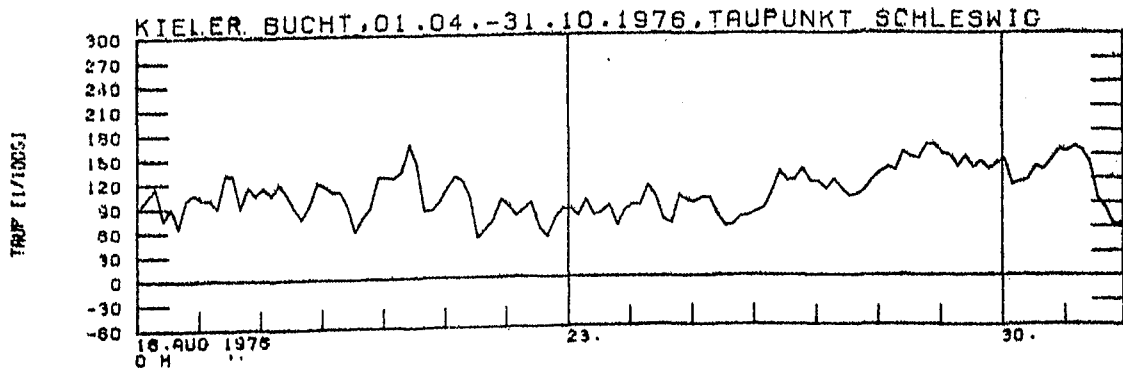
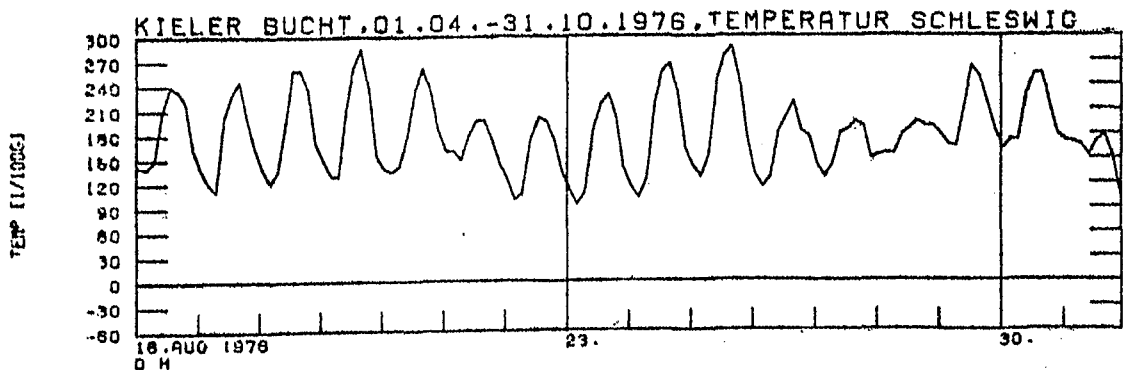
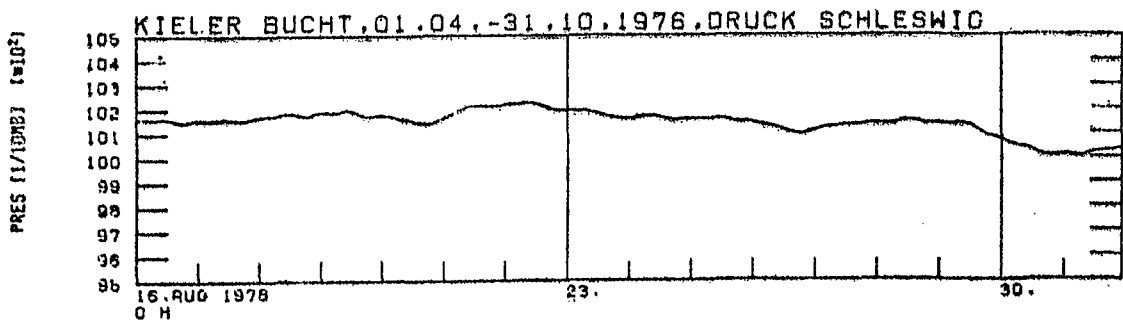
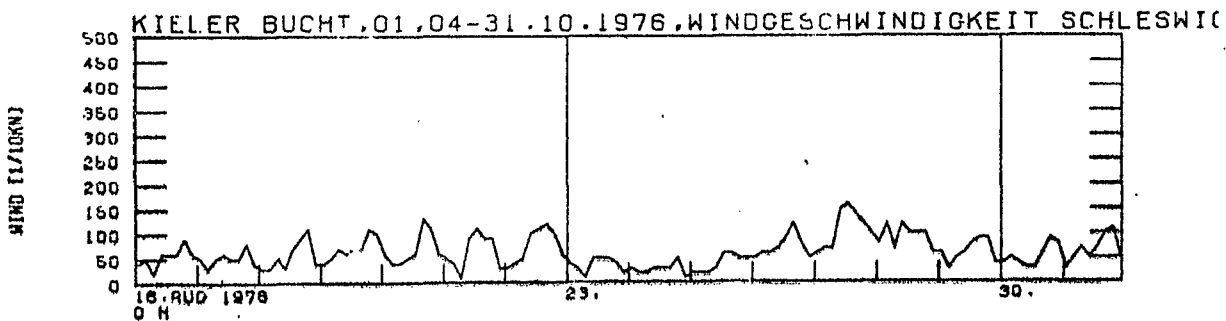
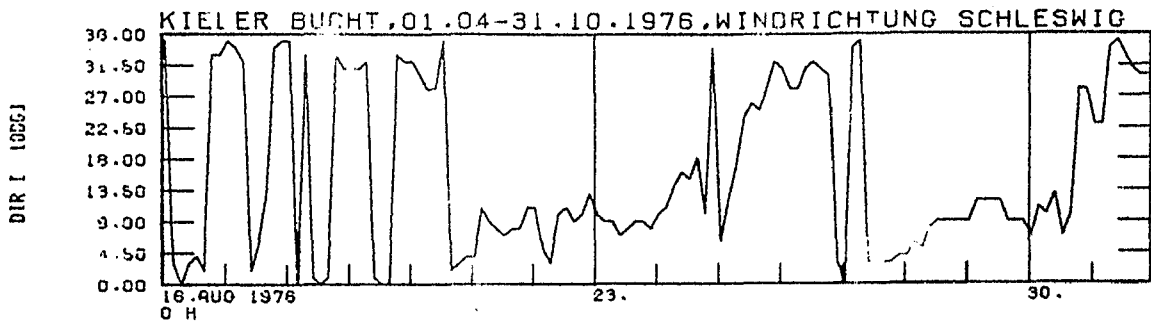


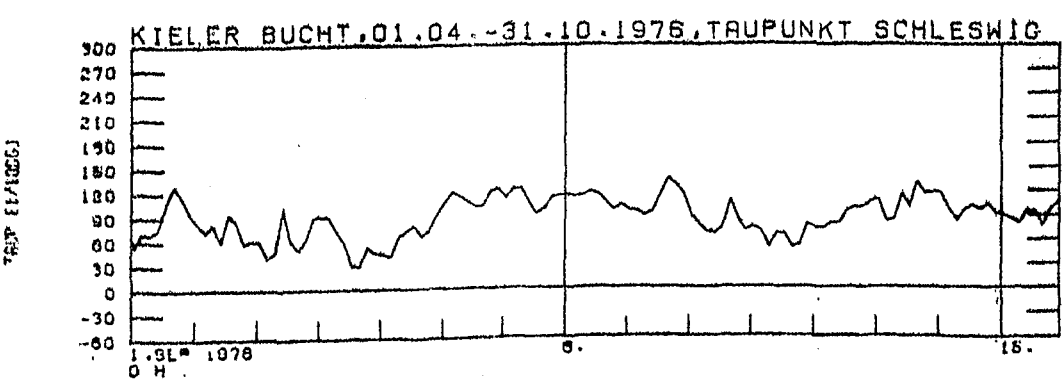
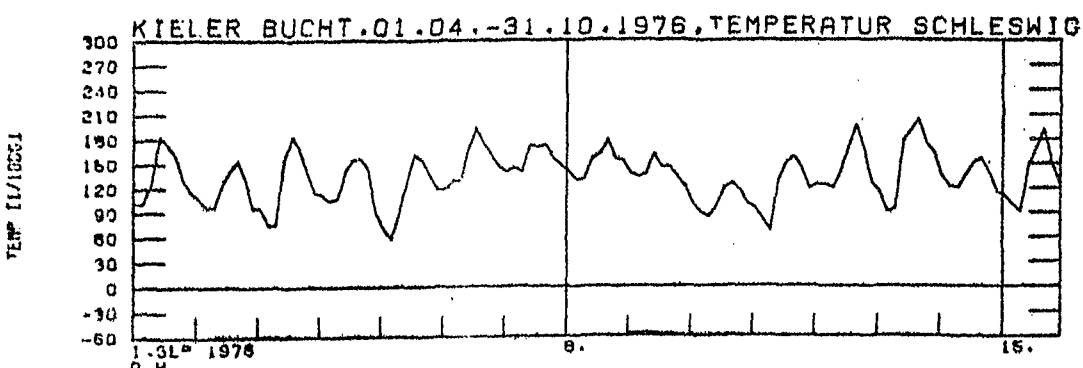
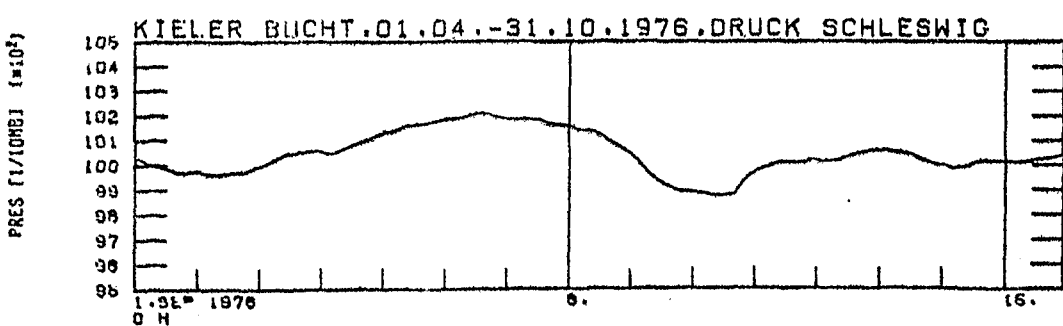
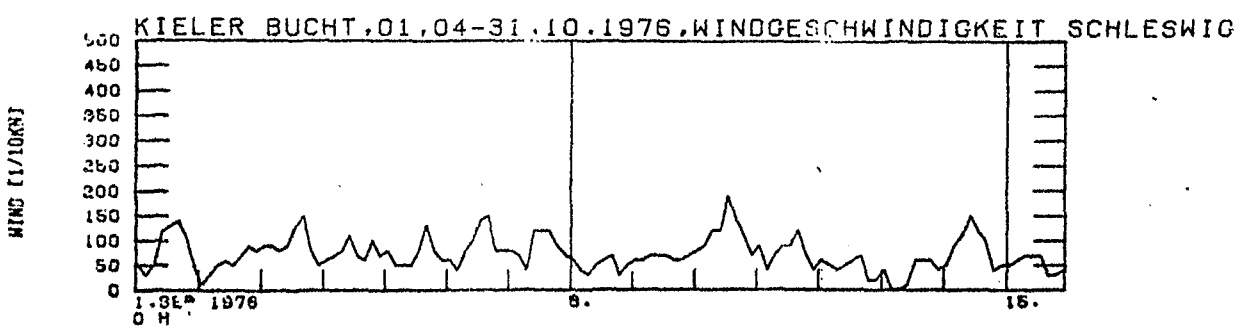
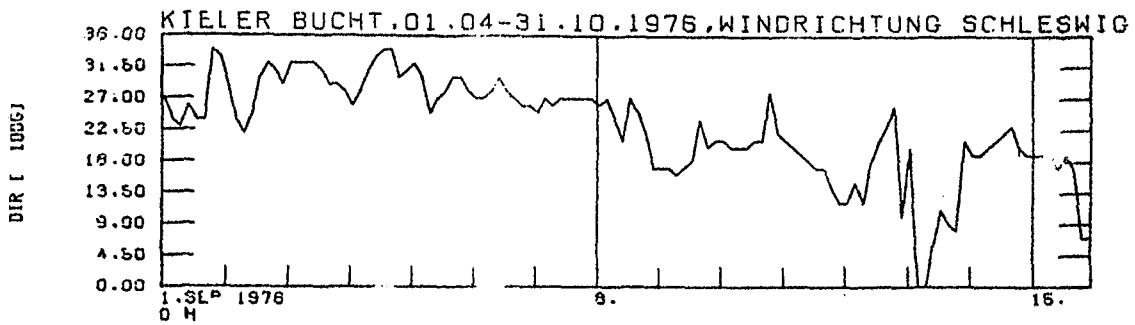




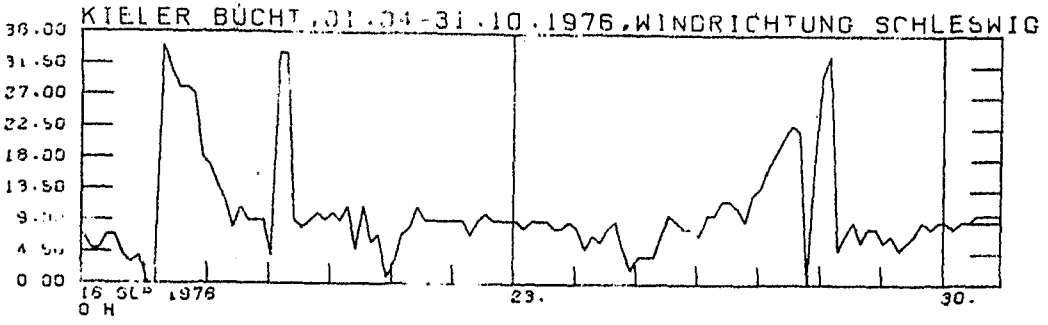




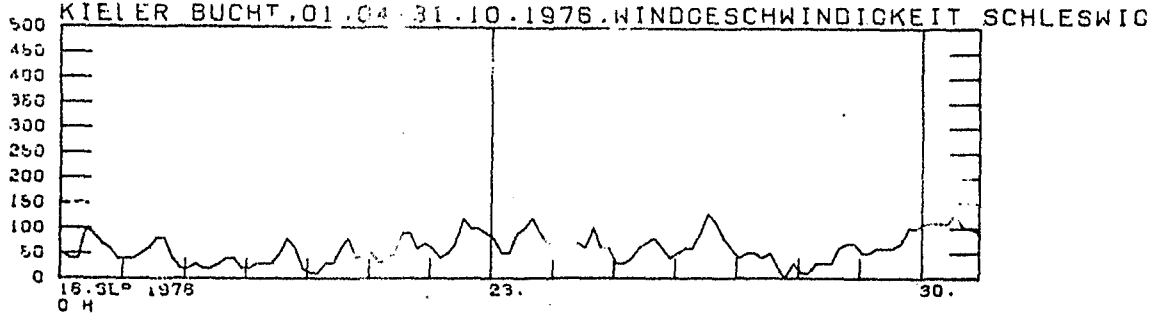




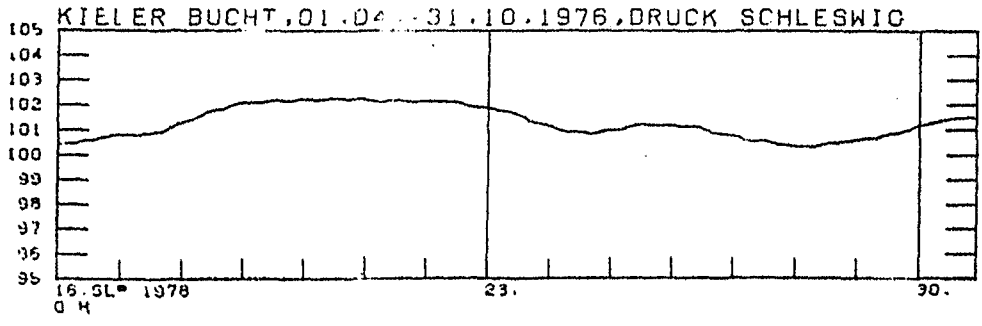
DIR [105G]



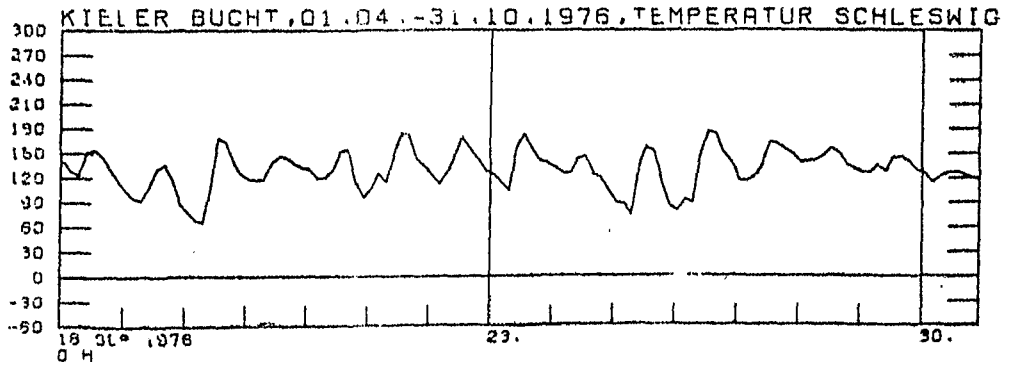
WIND [104M]



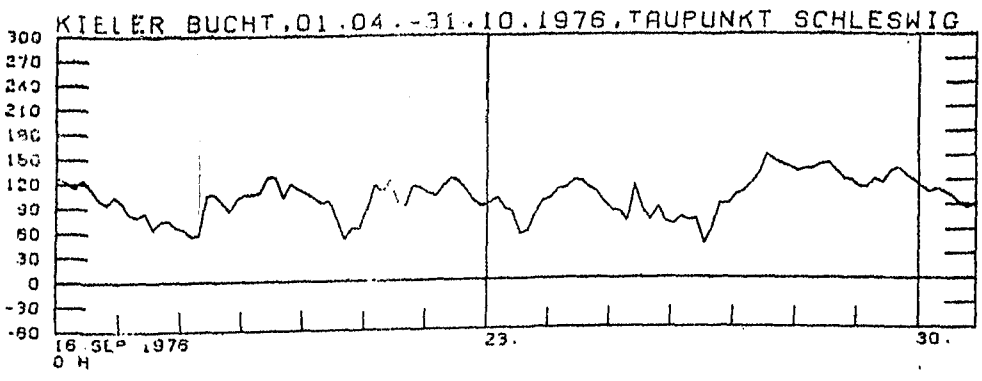
PRES [104MB] [105G]

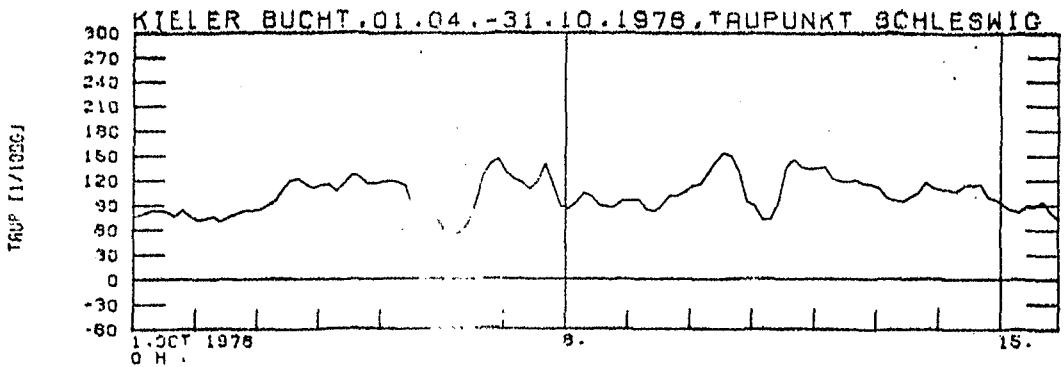
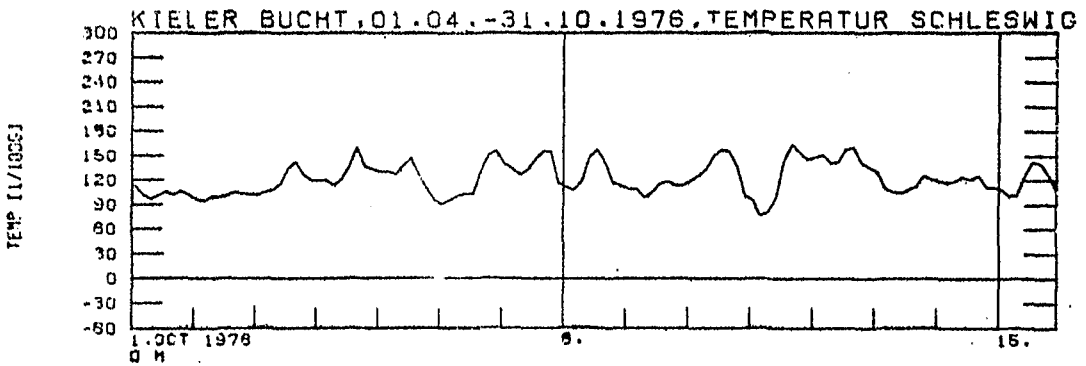
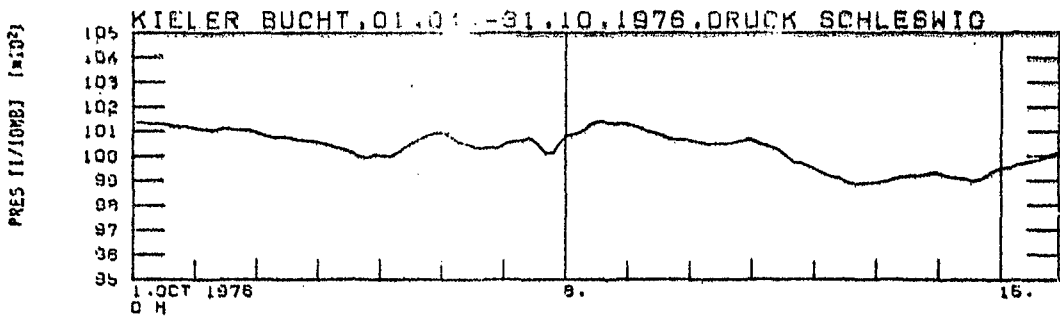
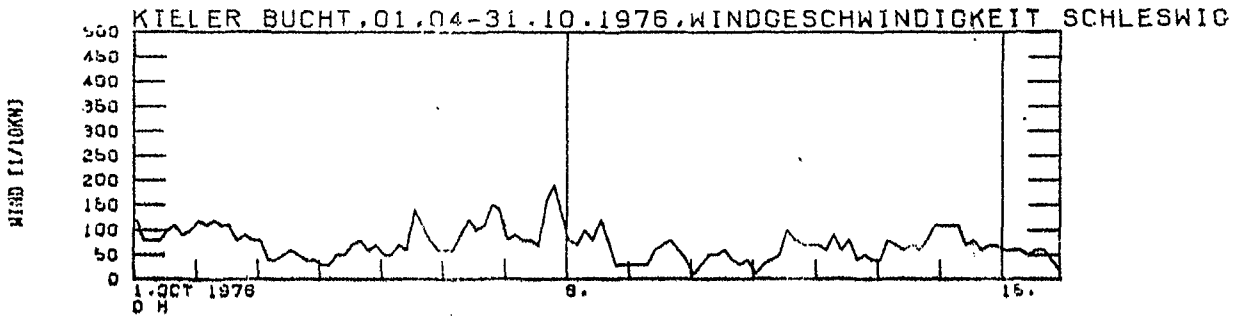
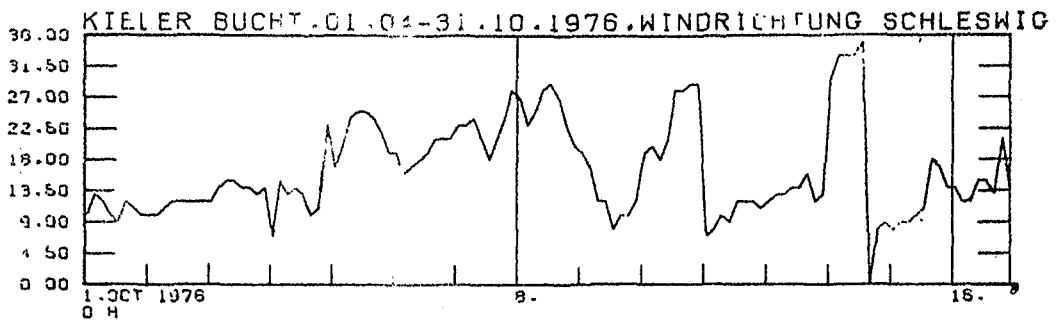


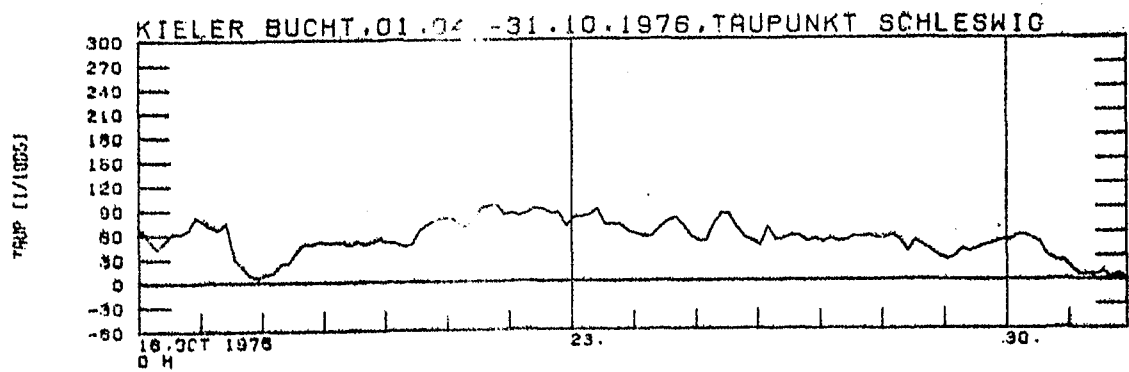
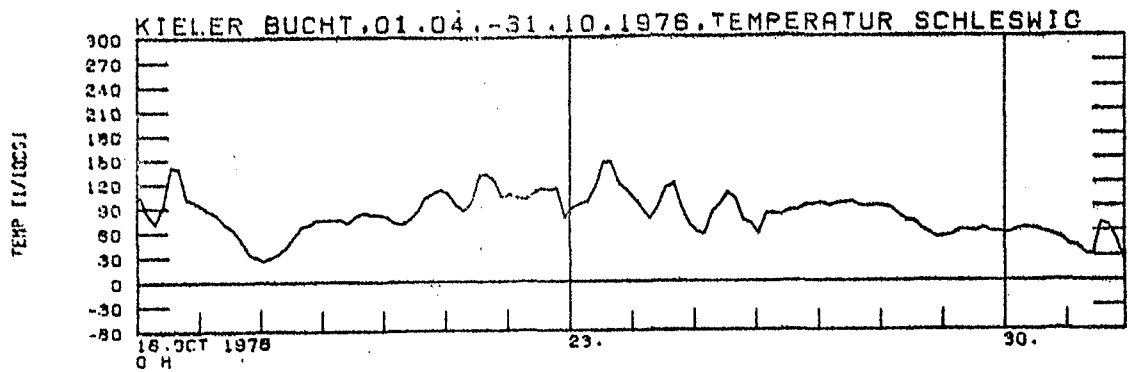
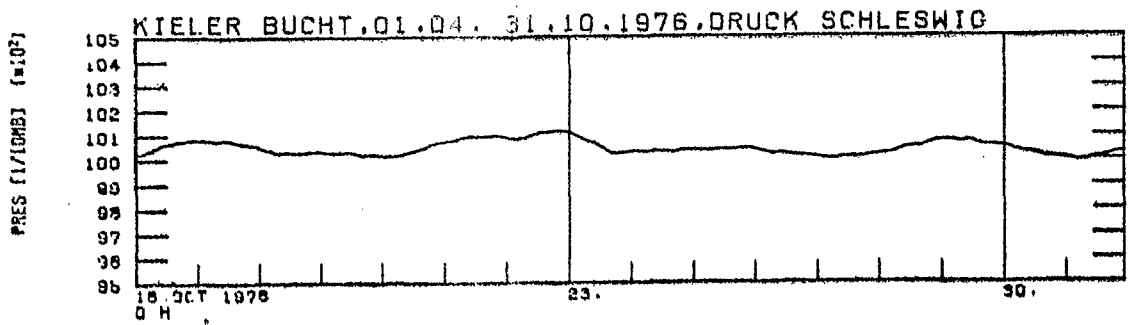
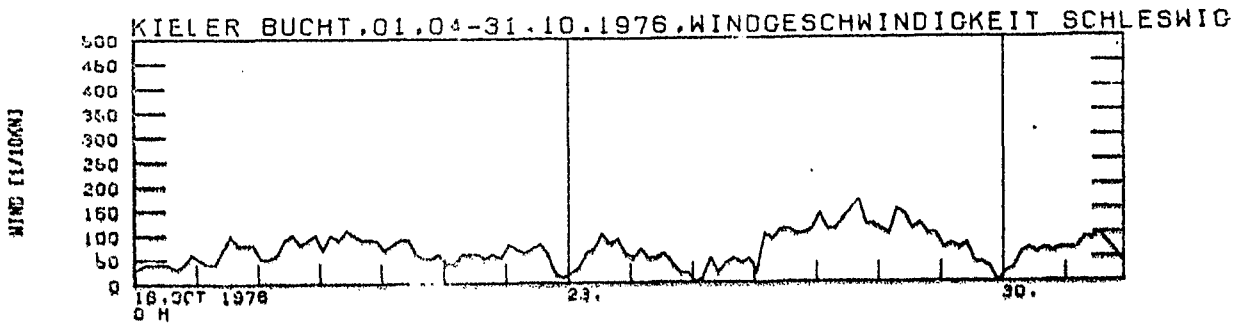
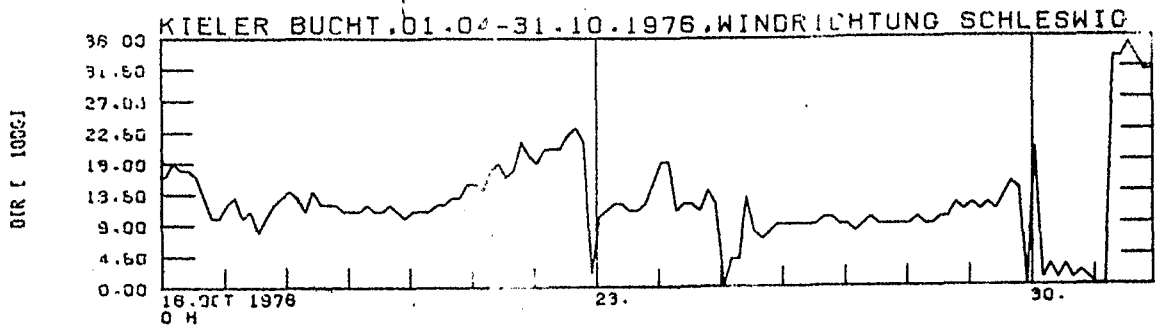
TEMP [105C]

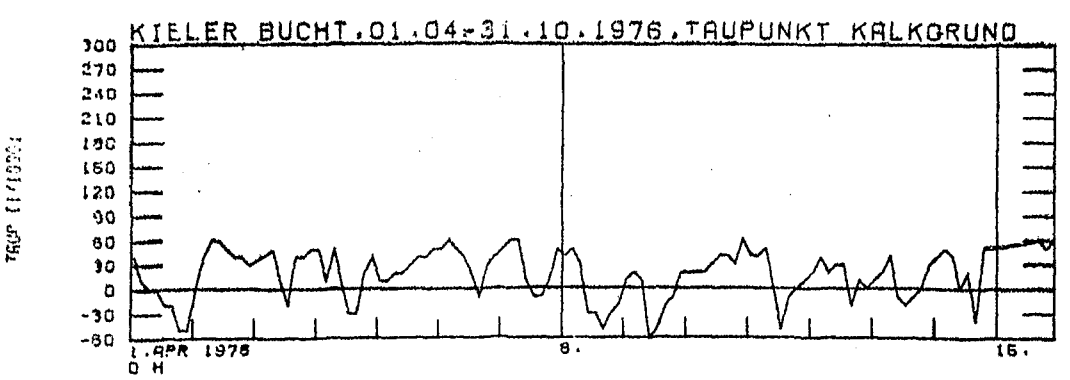
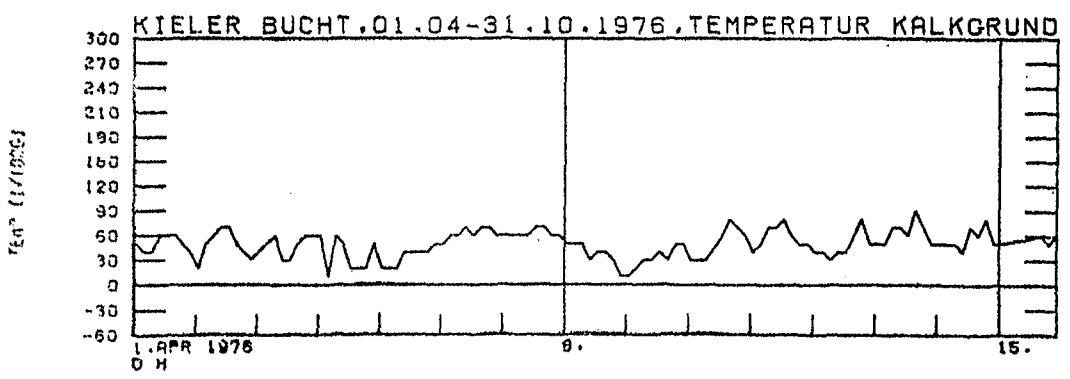
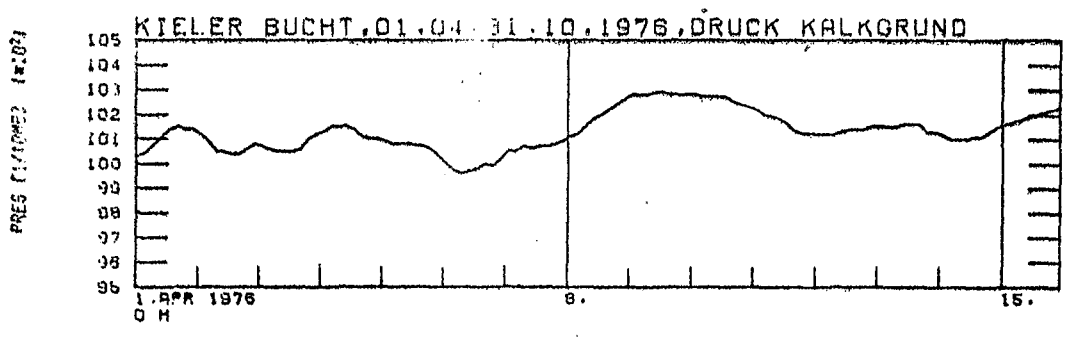
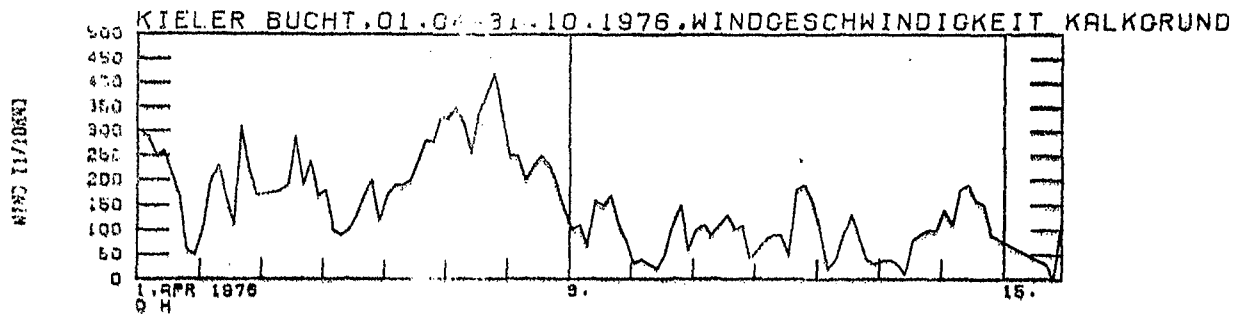
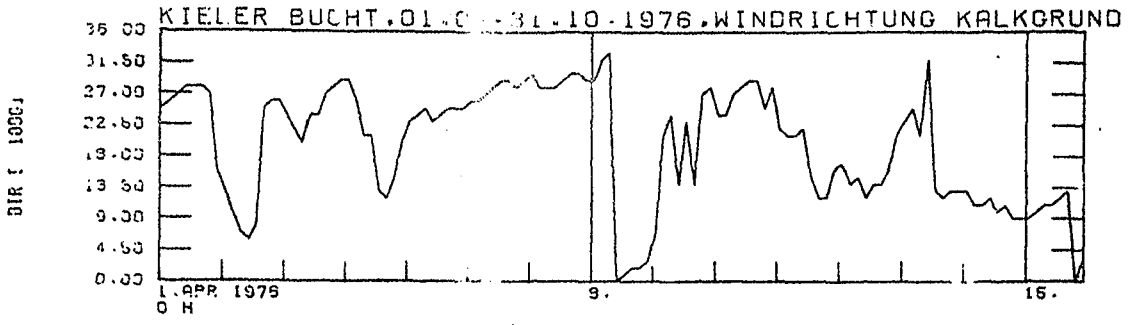


TRUP [105C]

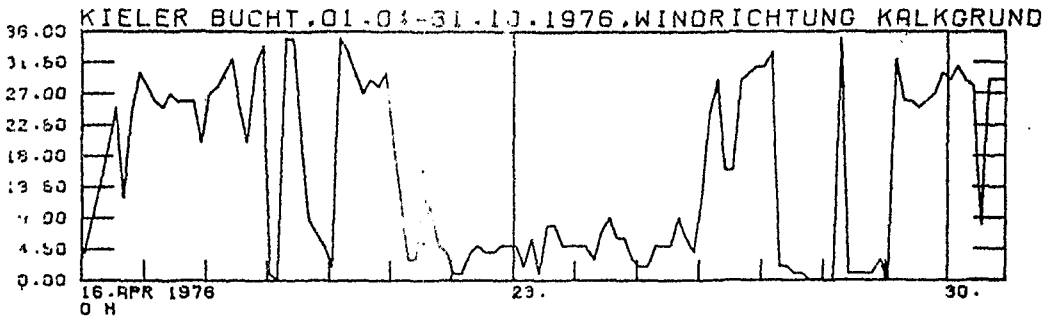




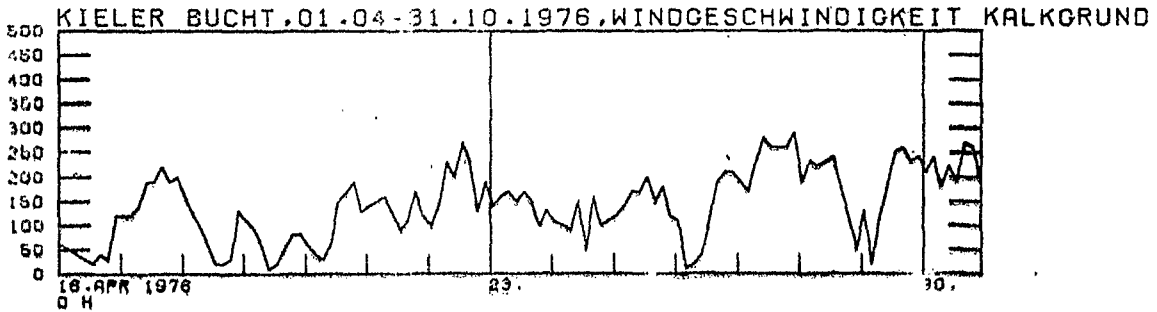




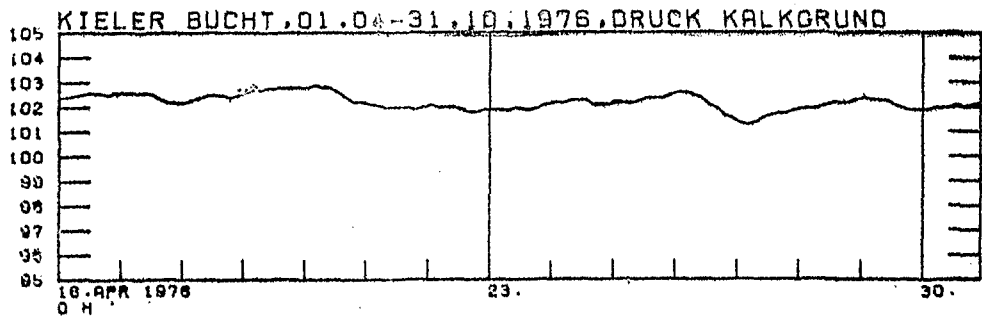
DIR [1000]



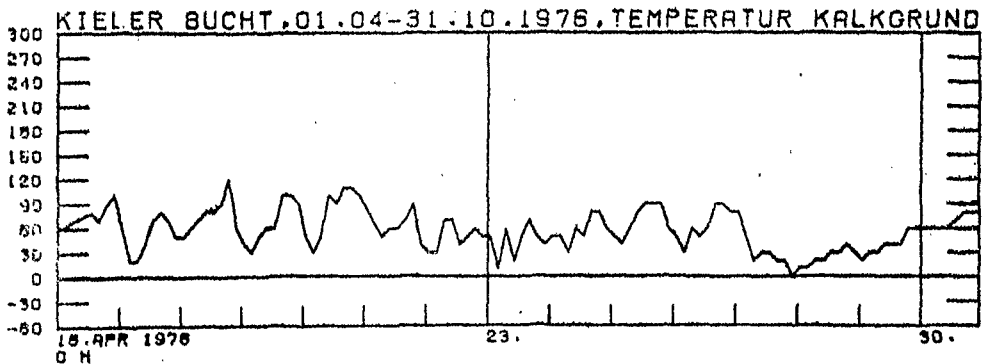
WIND [1/1000]



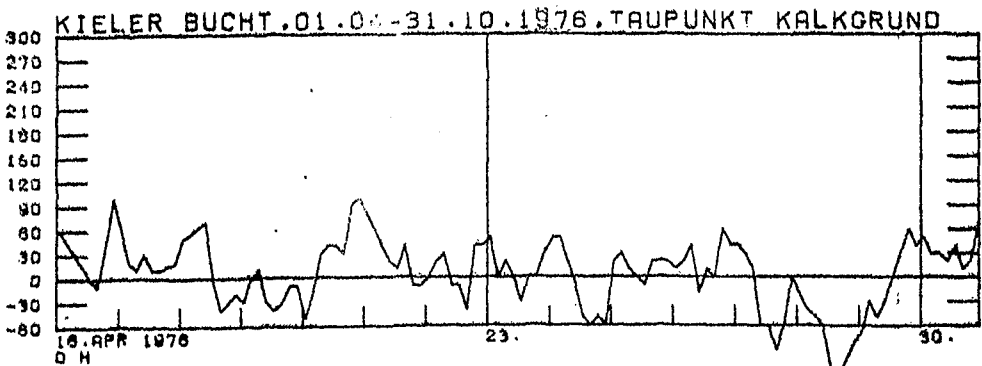
PRES [1/1000] [hPa]



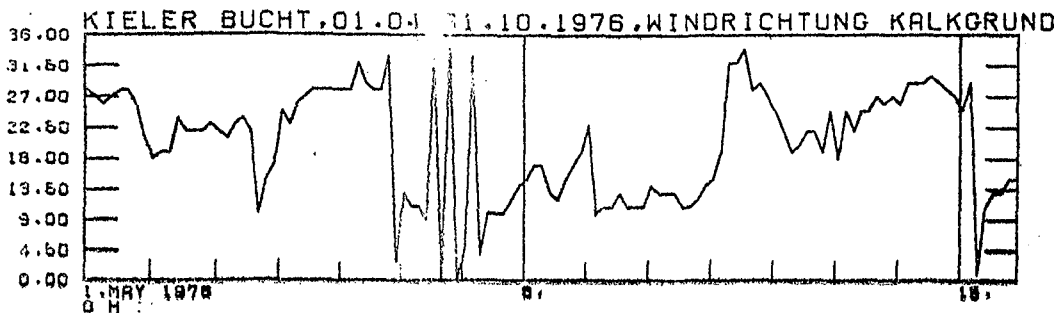
TEMP [1/1000]



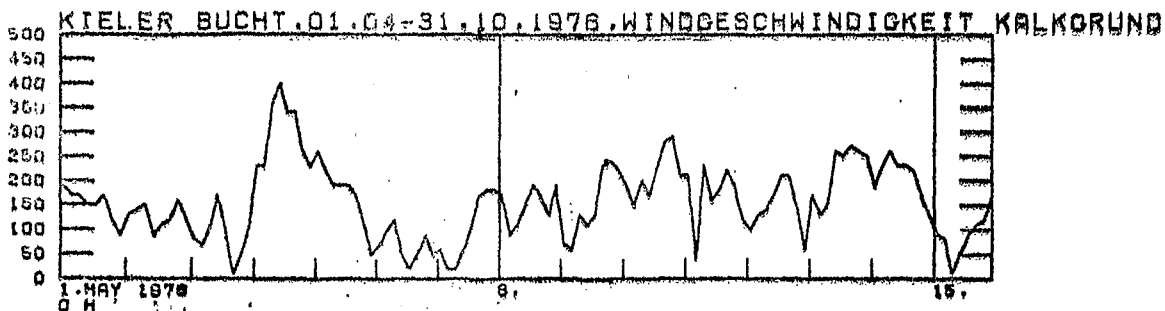
TEMP [1/1000]



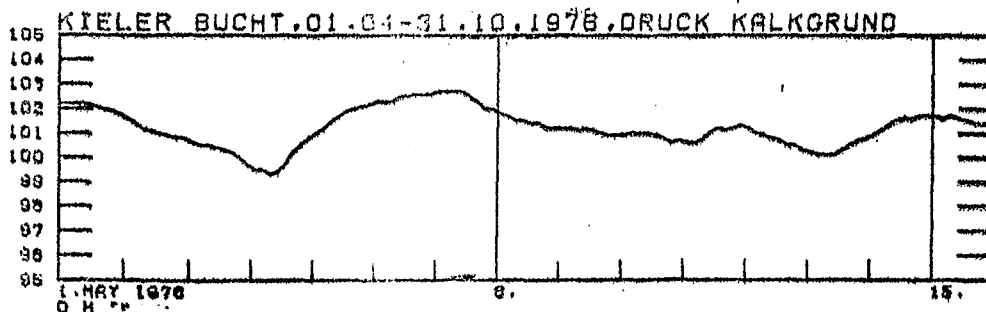
DIR [100G]



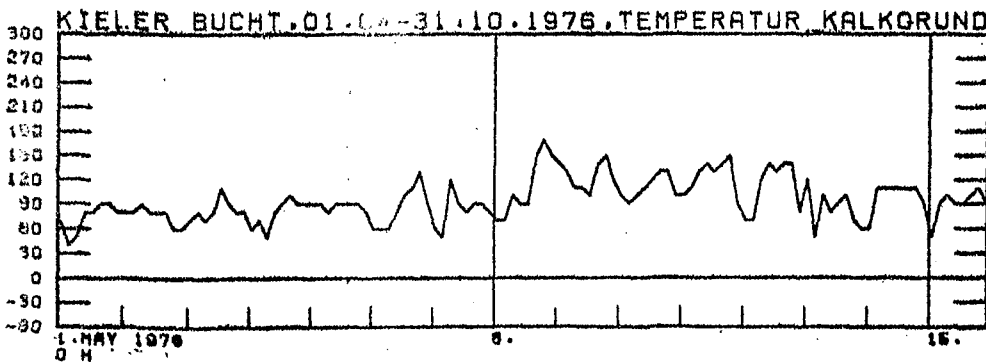
WIND [100G]



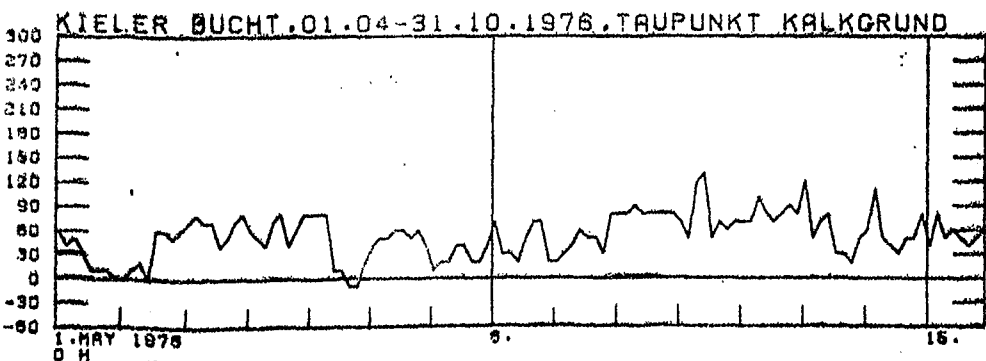
PRES [100G] [10G]

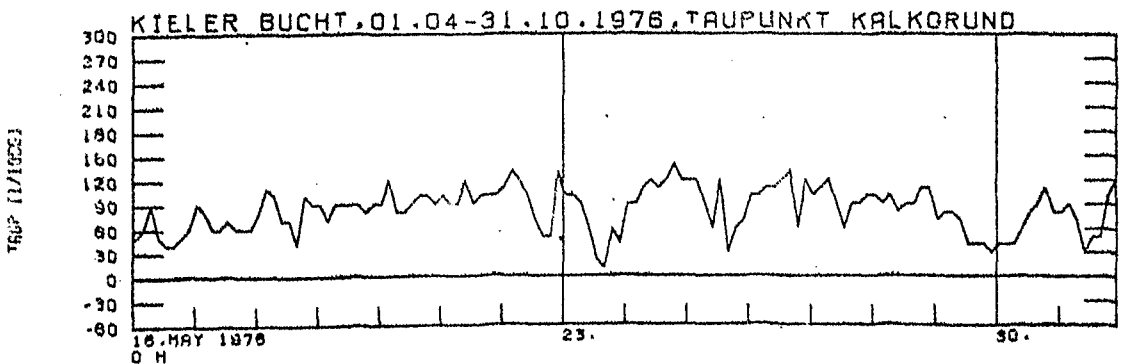
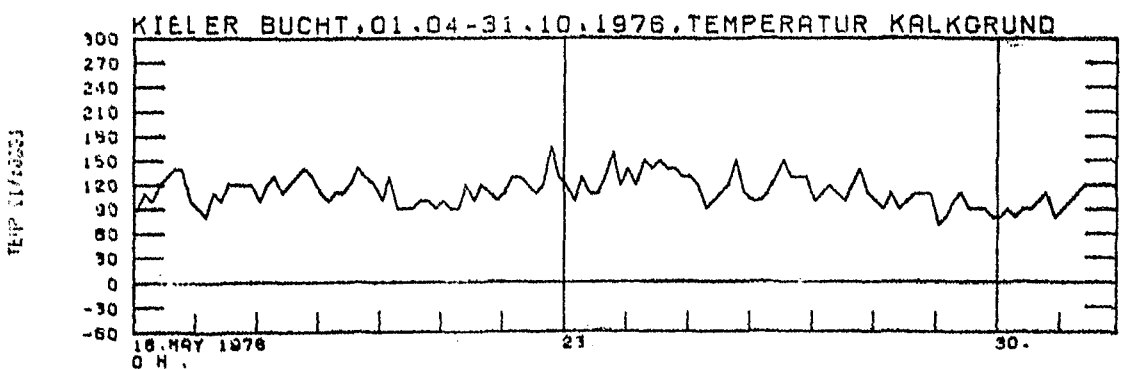
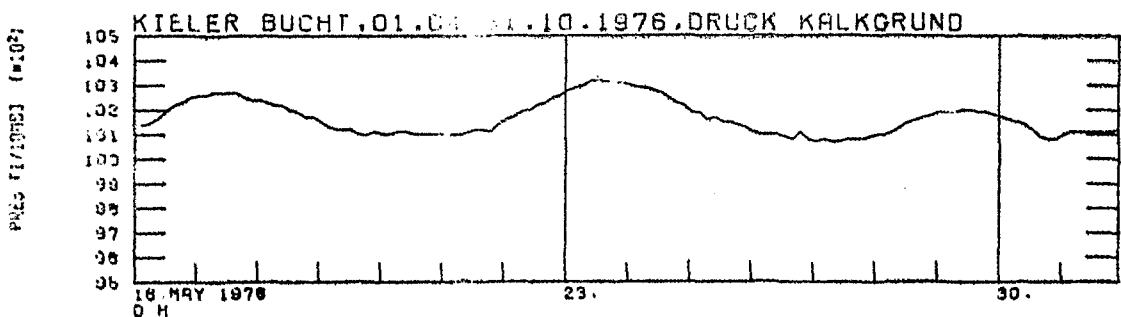
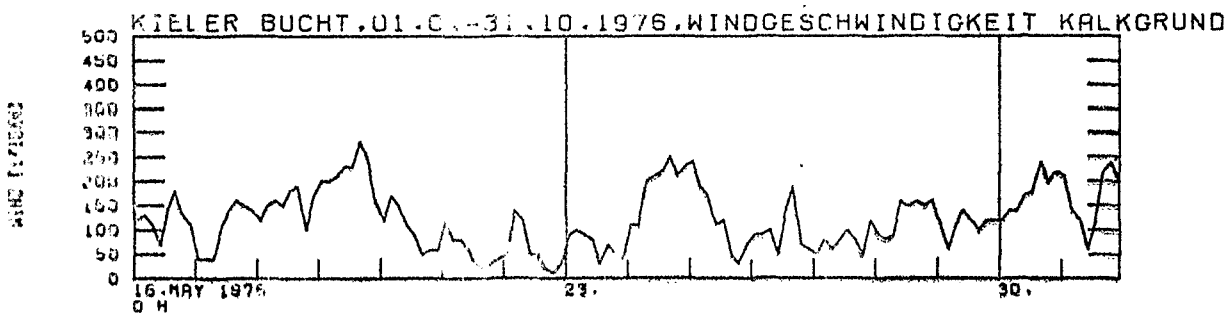
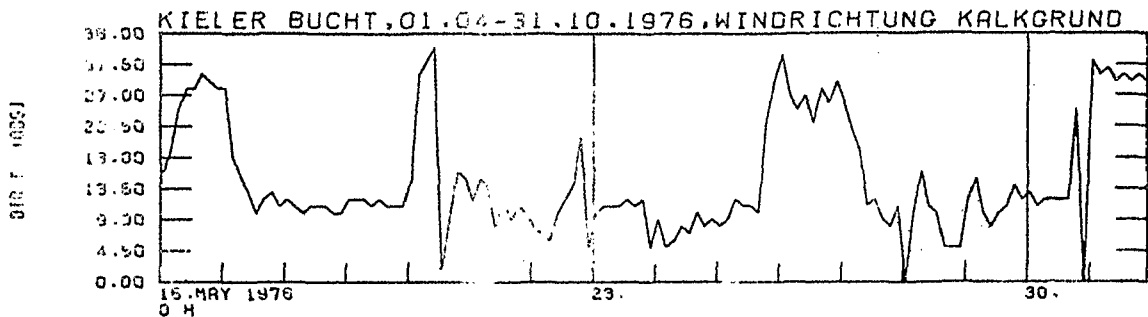


TEMP [100G]

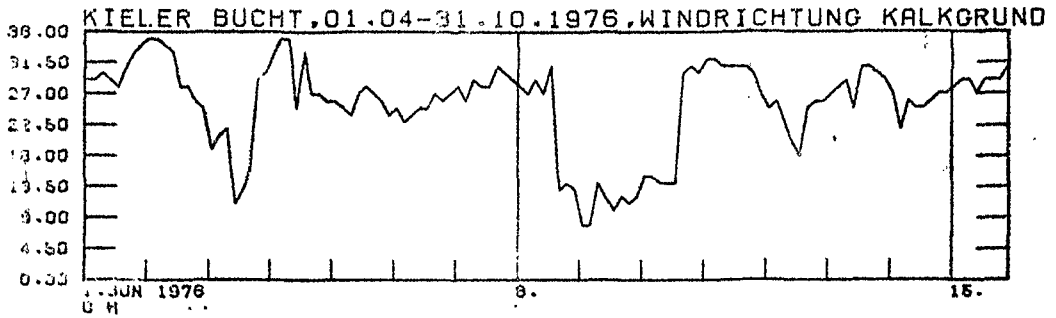


TAUP [100G]

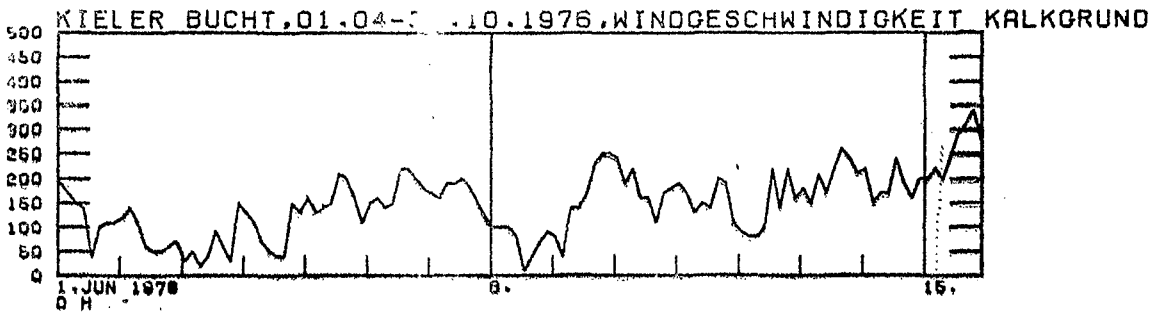




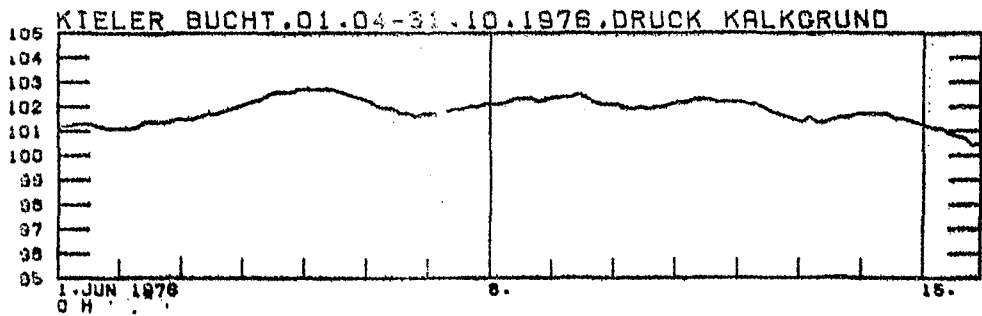
DIR (100G)



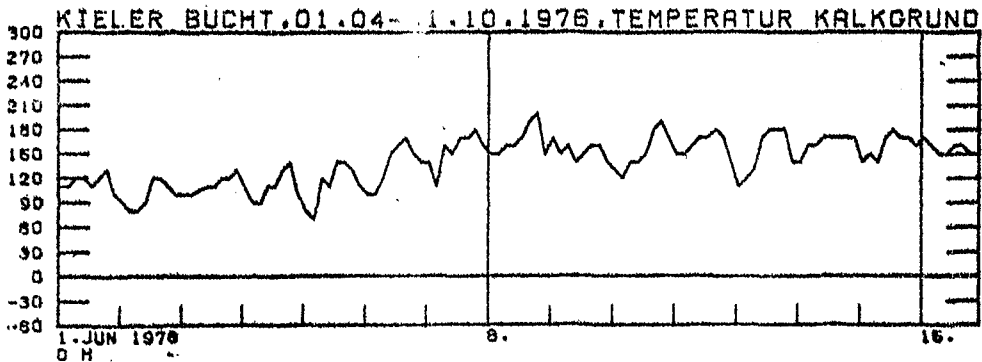
WIND (100G)



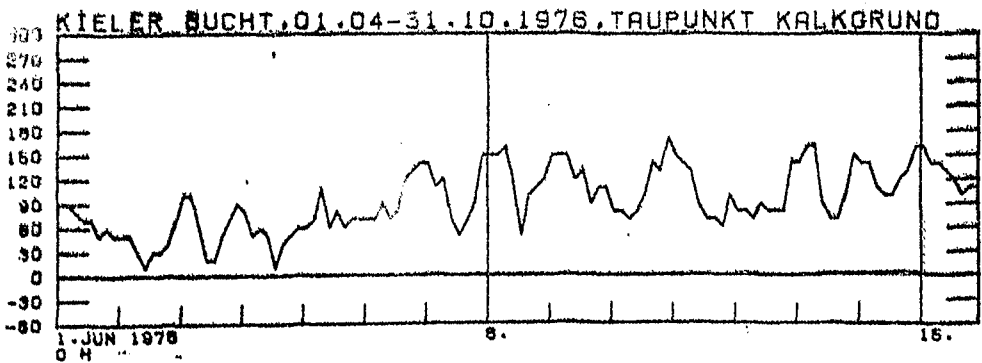
DRUCK (1/100G)



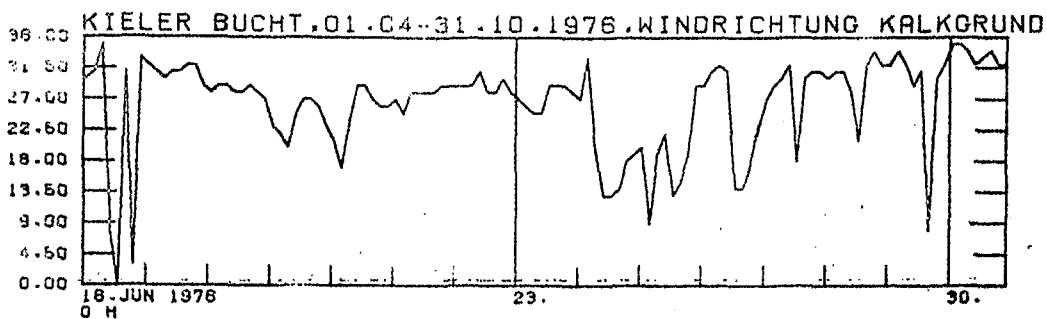
TEMP (1/100G)



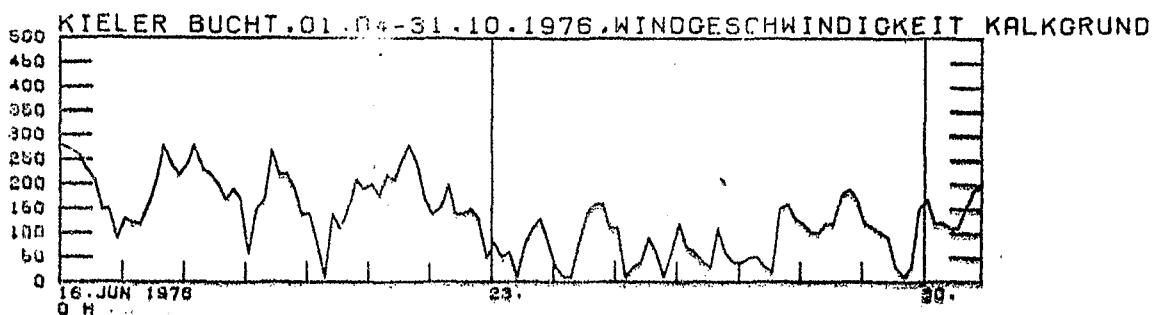
TAUPUNKT (1/100G)



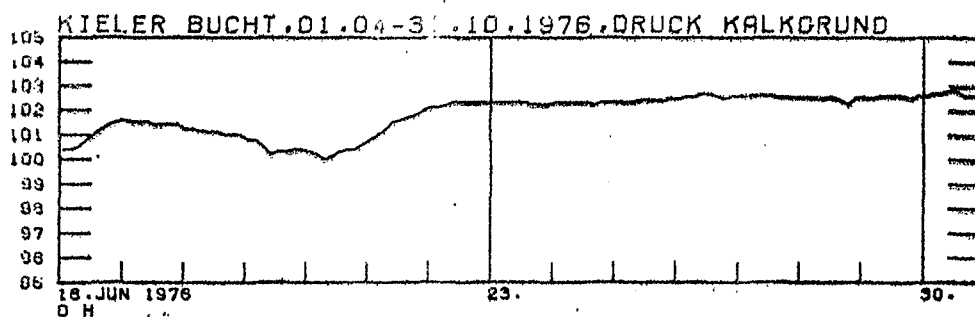
DUR [1000]



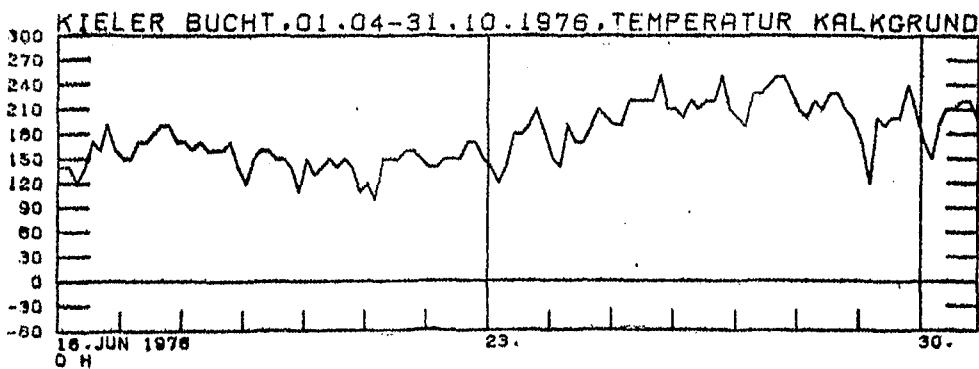
WIND [1000]



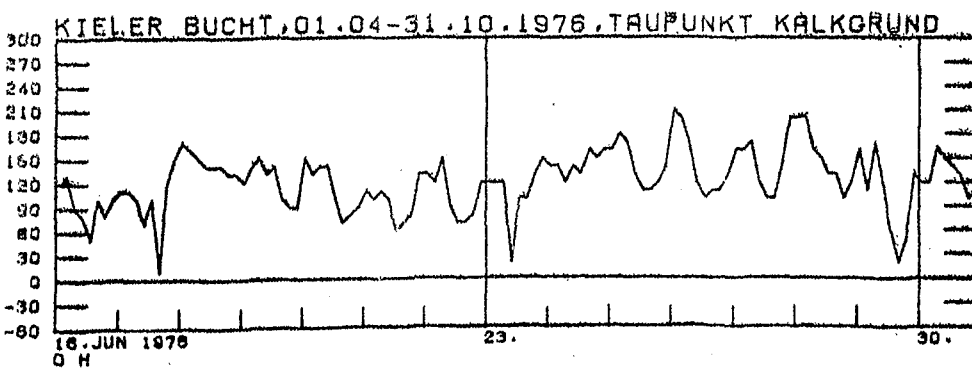
PRES [1000] *103



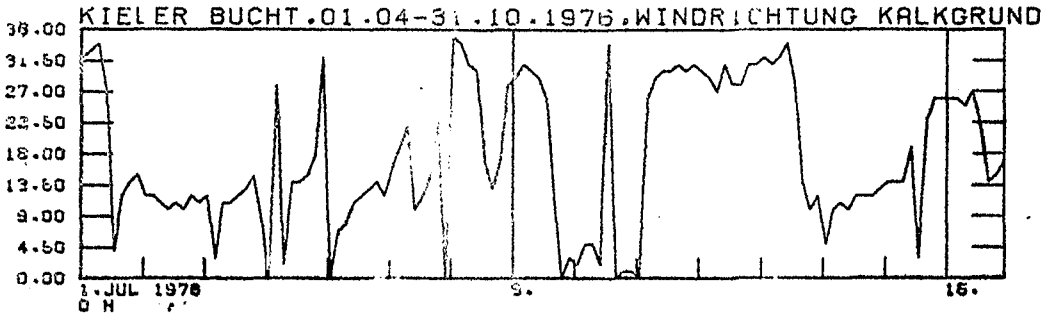
TEMP [1000]



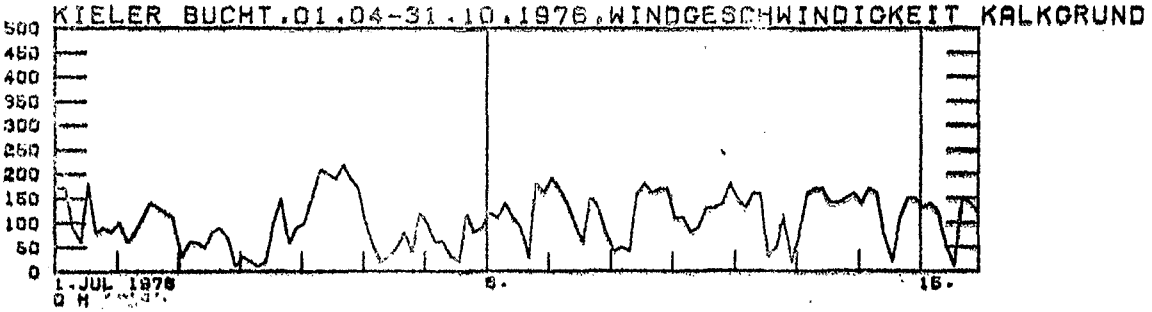
TAUP [1000]



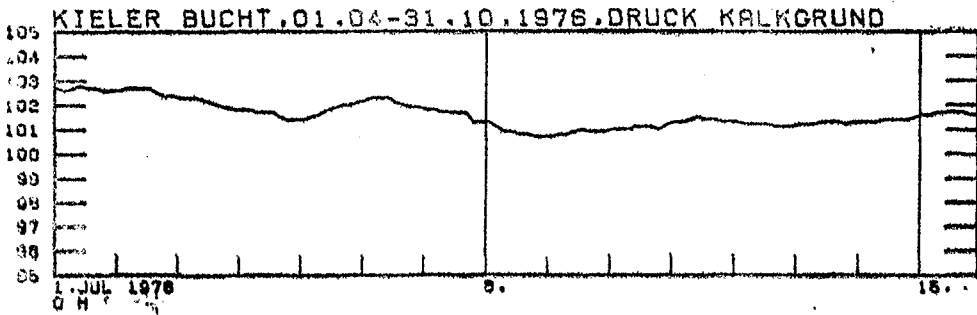
DIR (1000)



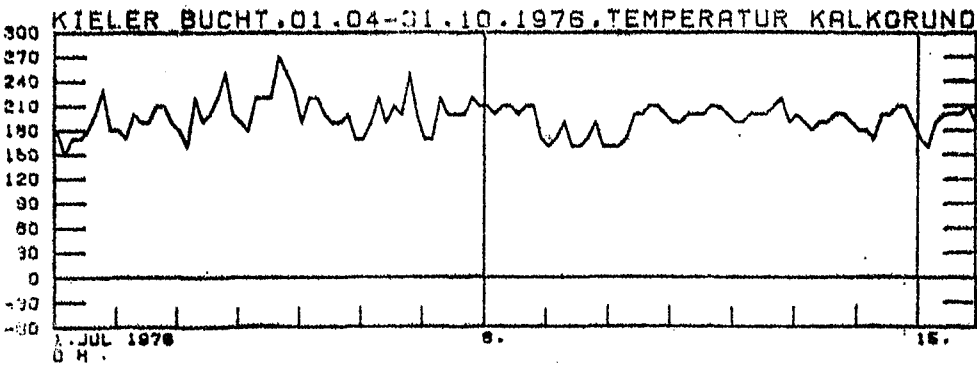
WIND (1/1000)



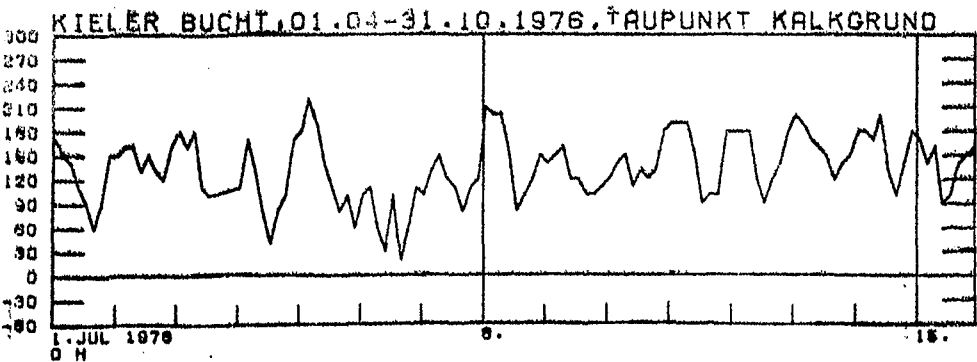
PRES (1/1000) (10³)

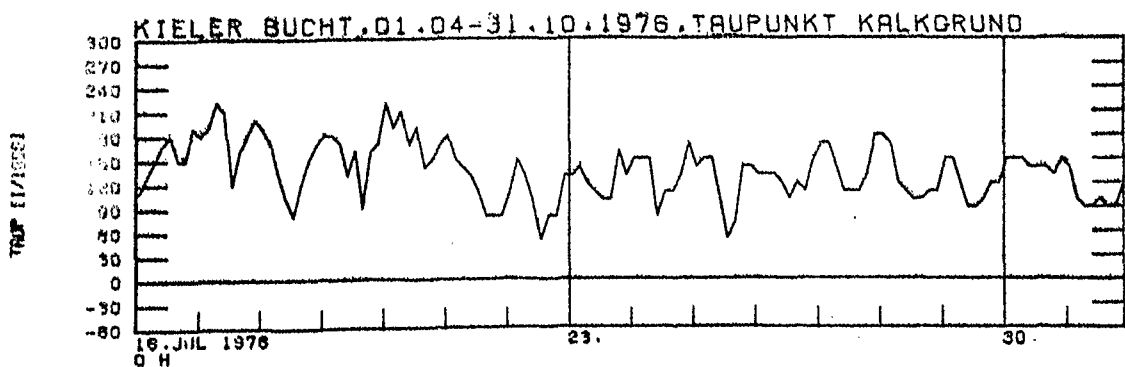
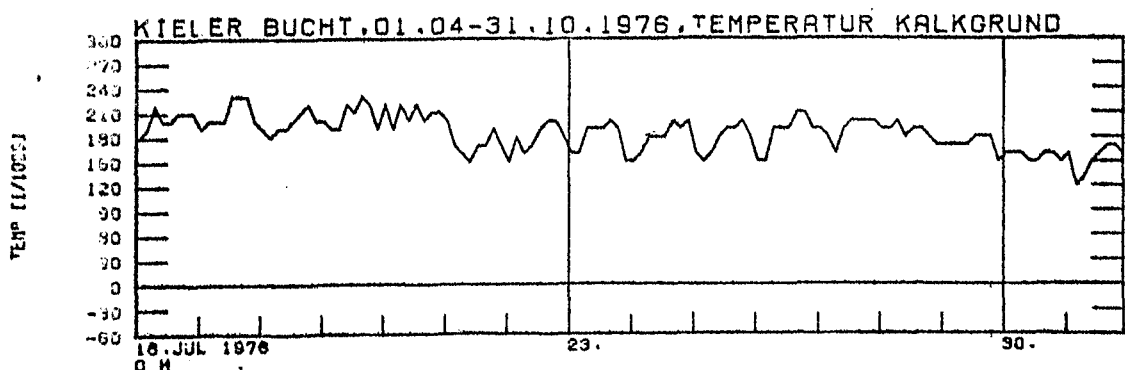
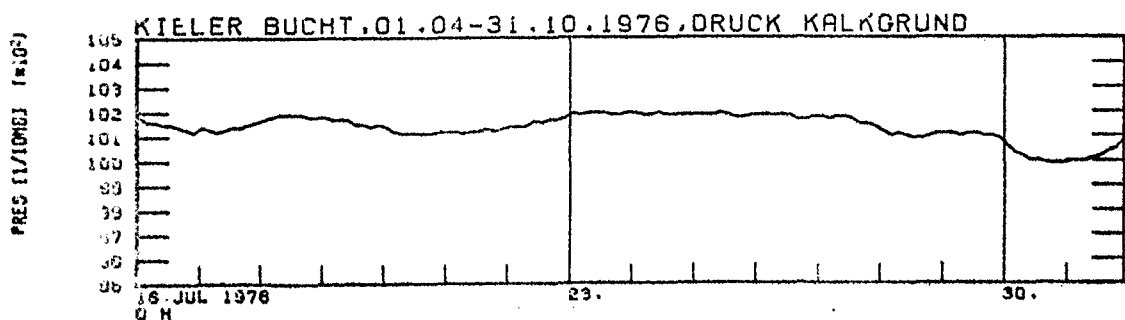
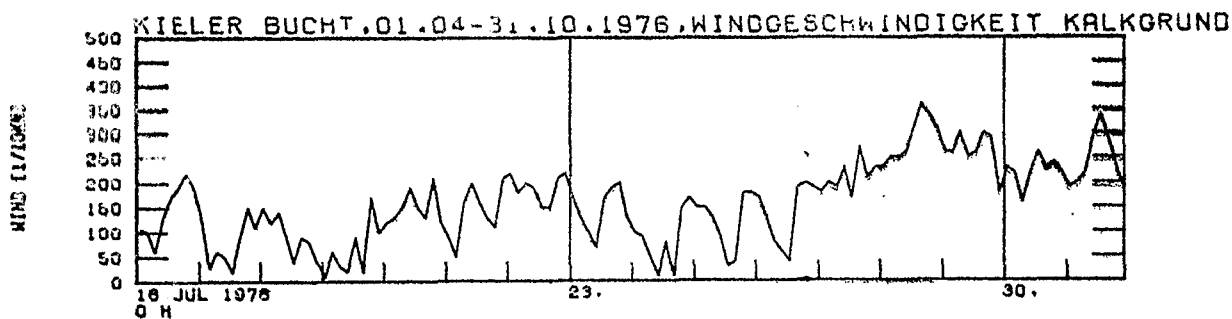
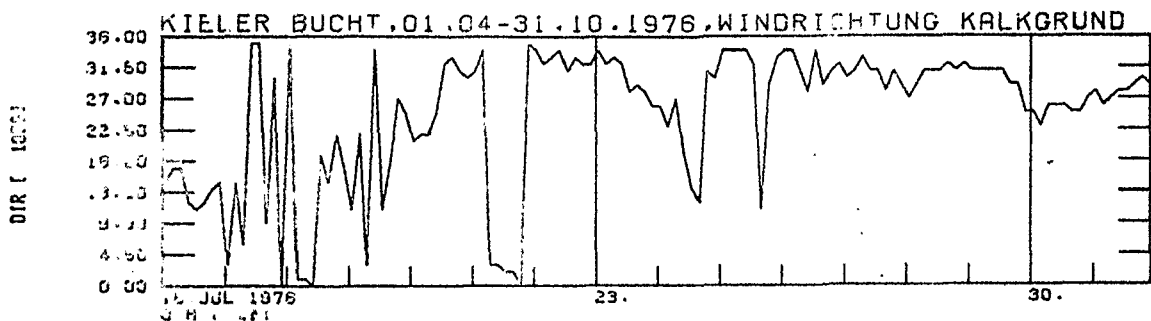


TEMP (1/1000)

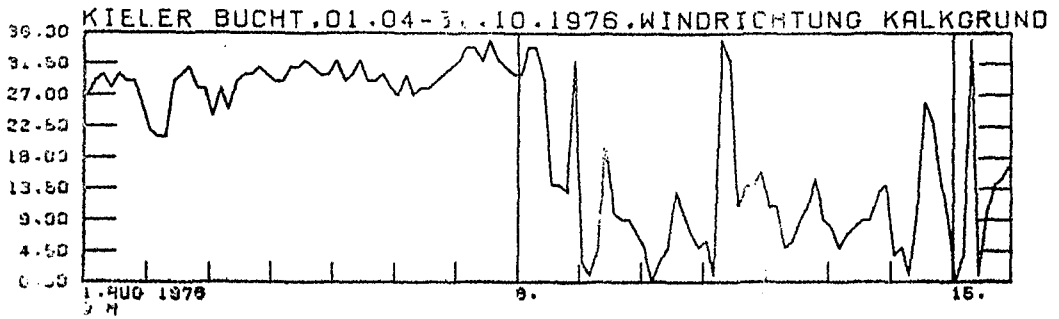


TAUP (1/1000)

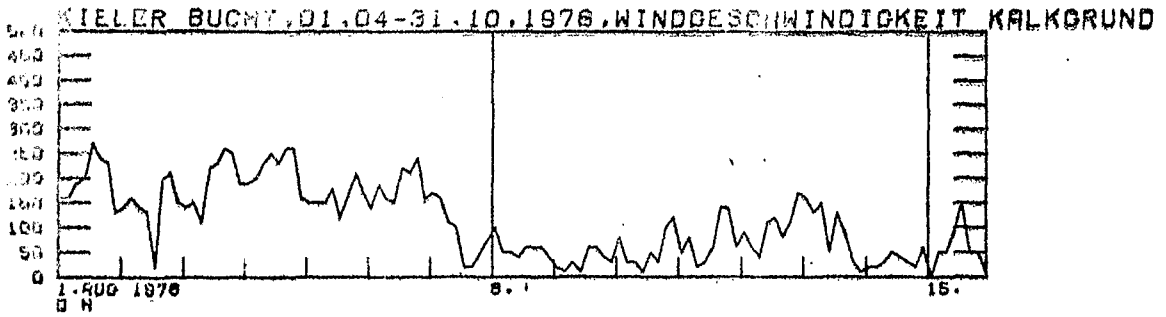




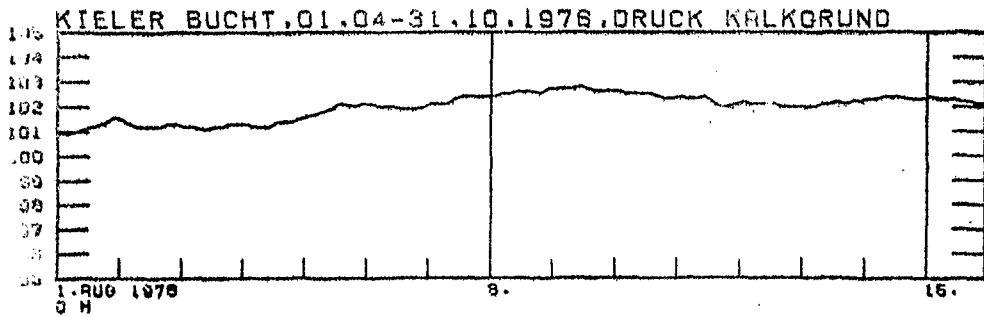
DIR [1000]



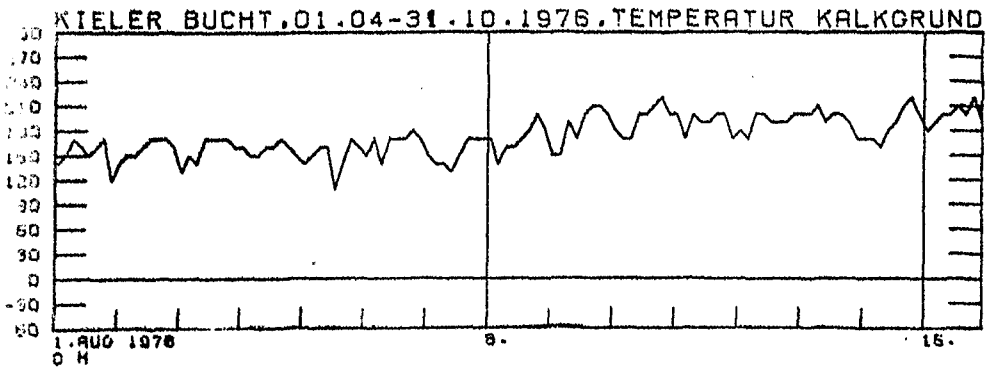
WIND [1/1000]



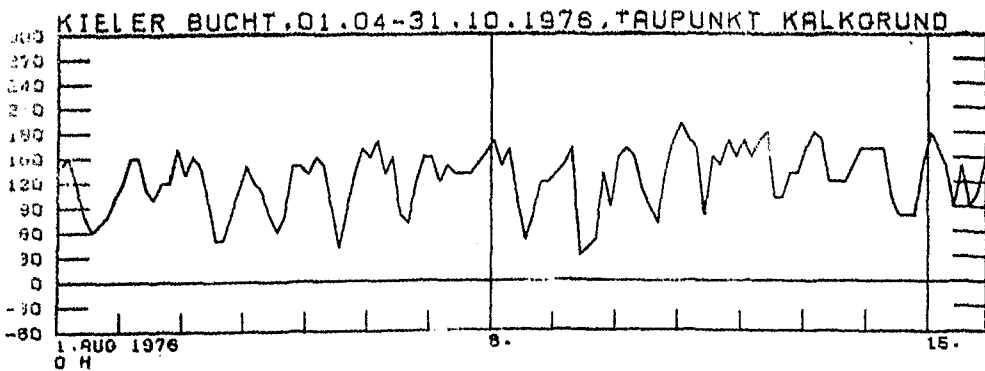
PRES [1/1000] [mbar]



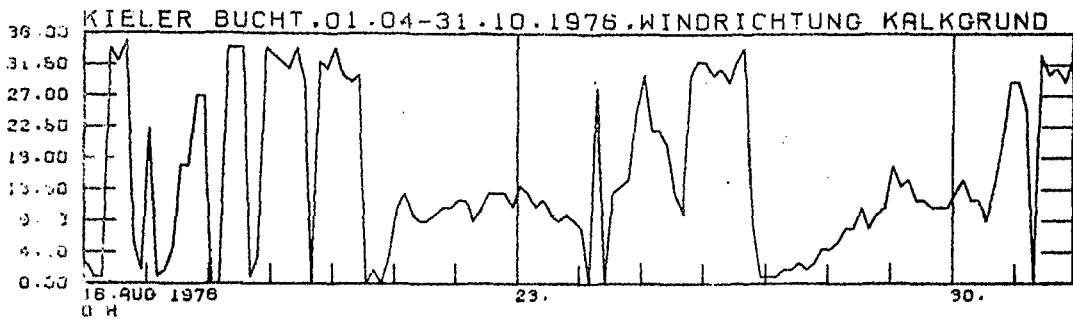
TEMP [1/1000]



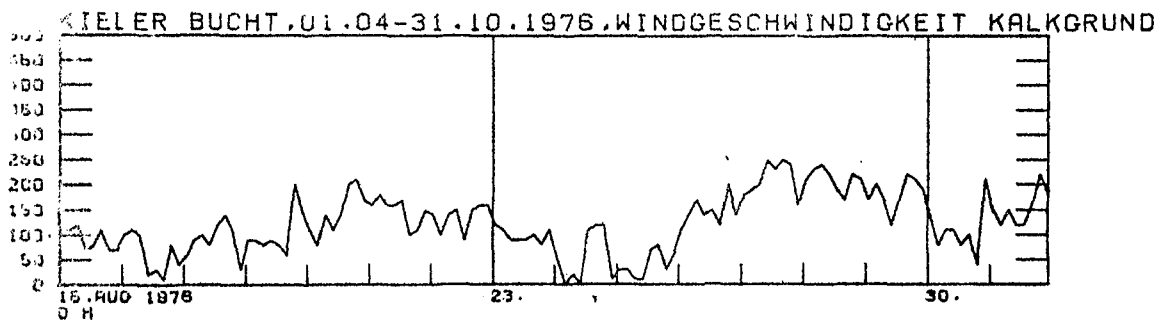
TAUP [1/1000]



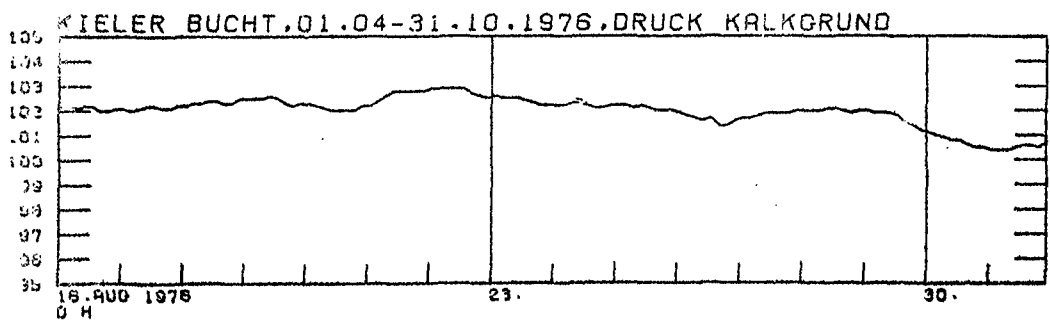
DIR [10051



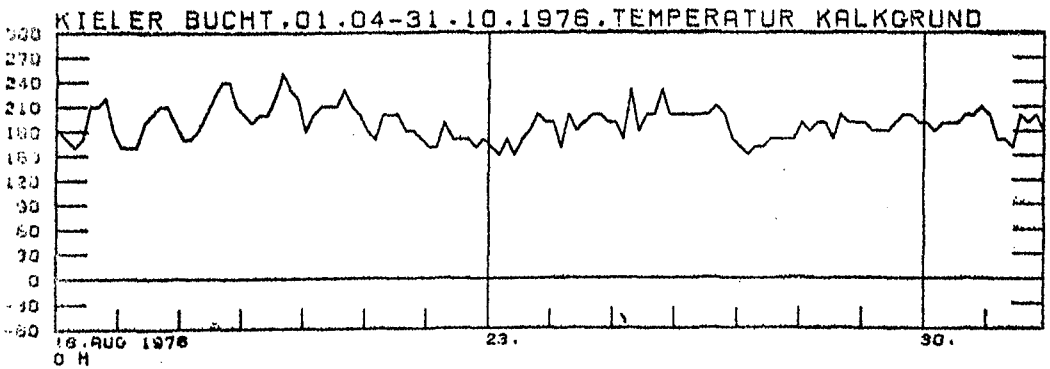
WIND [1/1000]



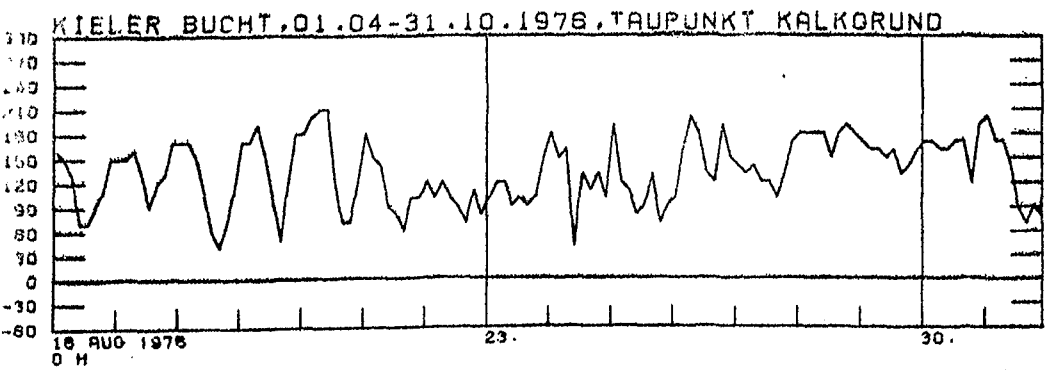
PRES [1003] [hPa]



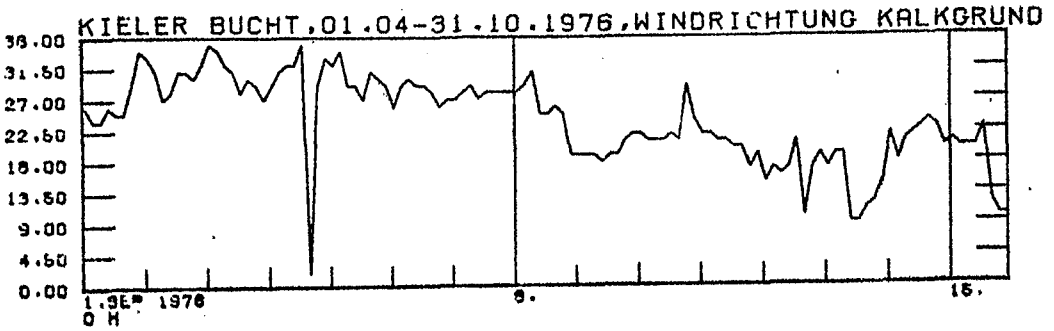
TEMP [1/1000]



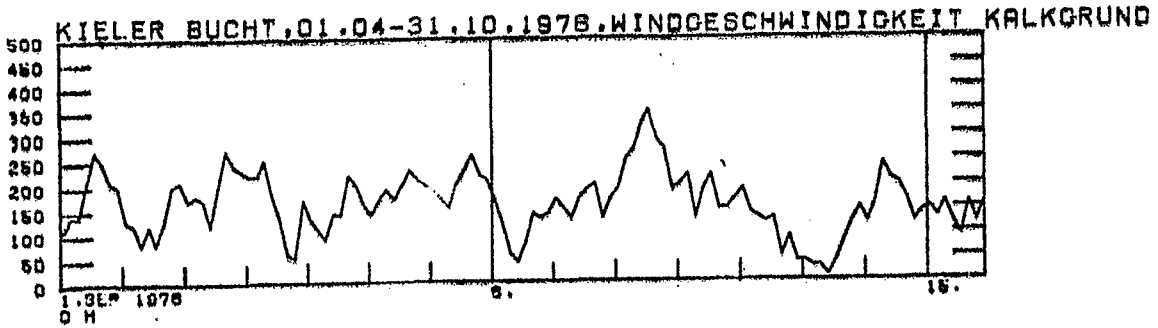
TAUP [1/1000]



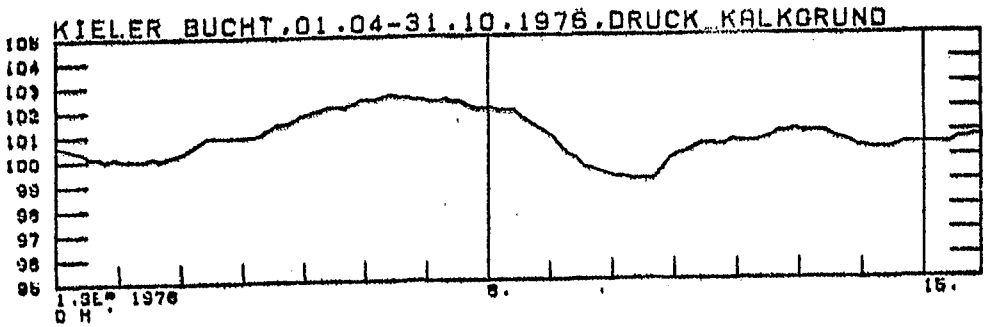
DIR [100GJ



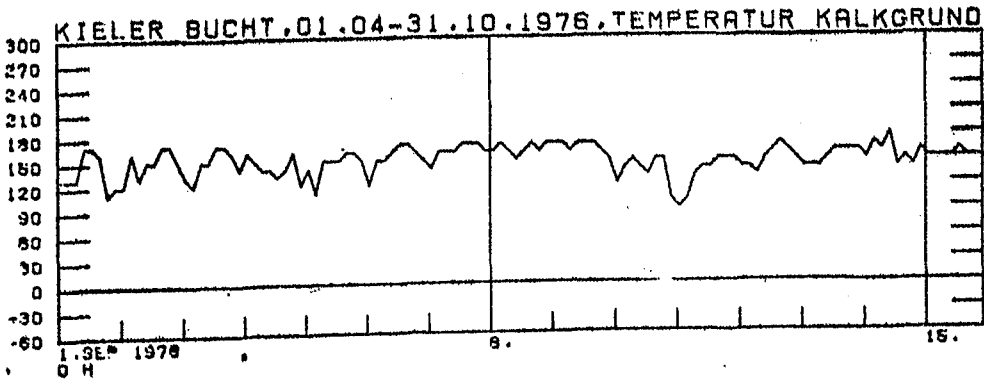
WIND [1/10KM]



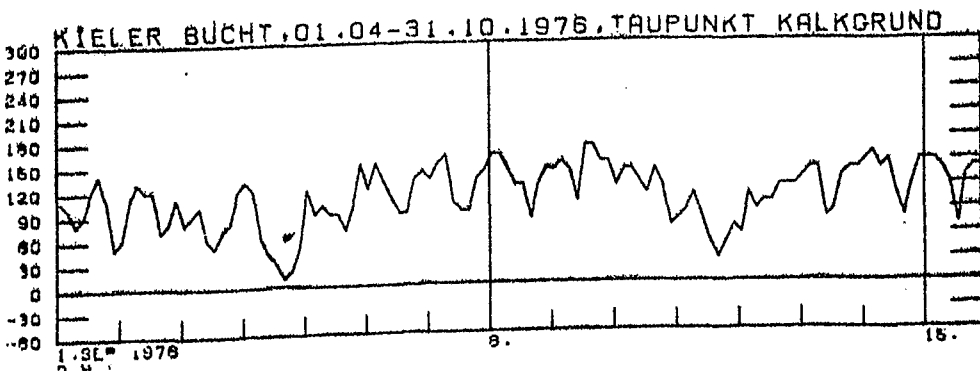
PRES [1/10MB] [m105]

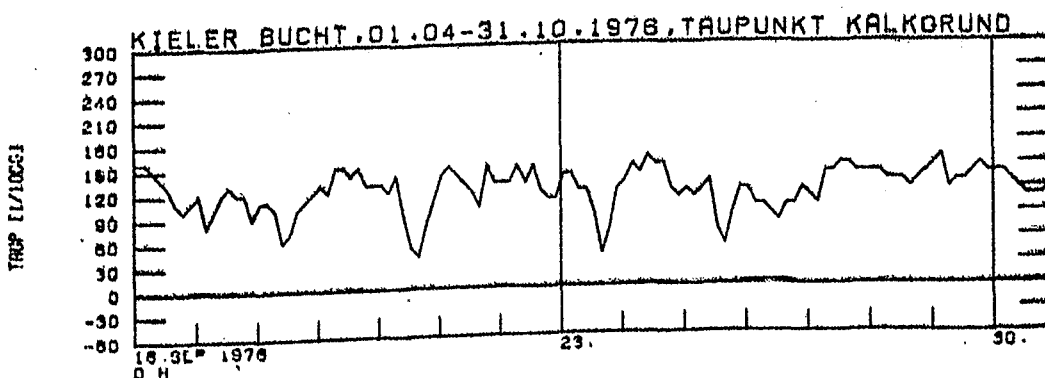
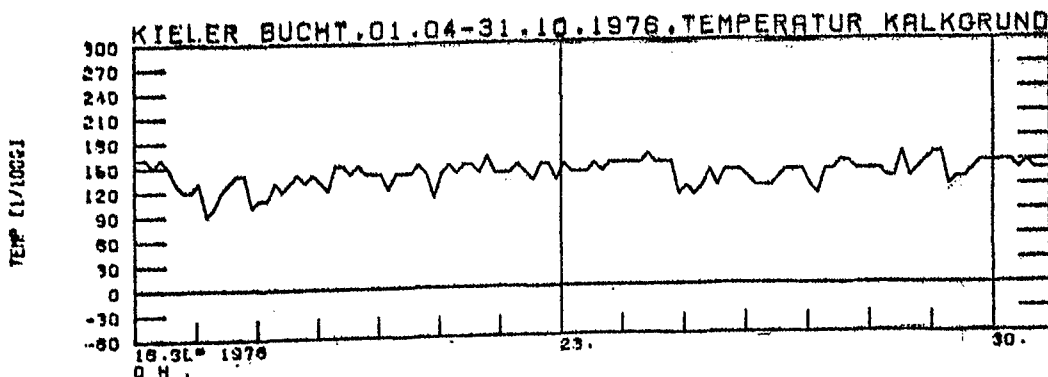
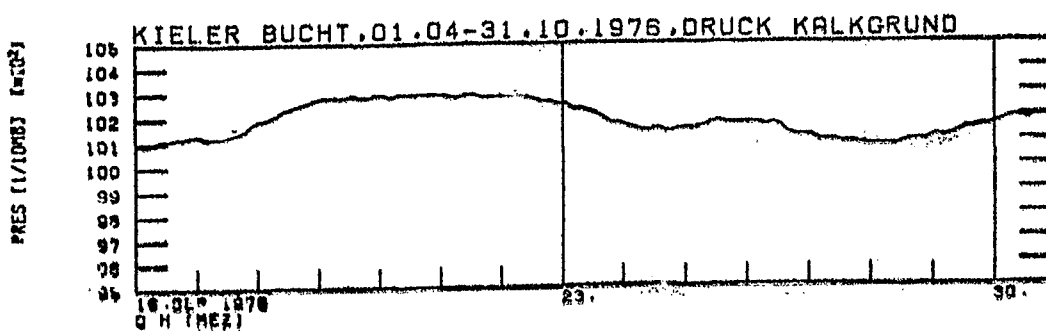
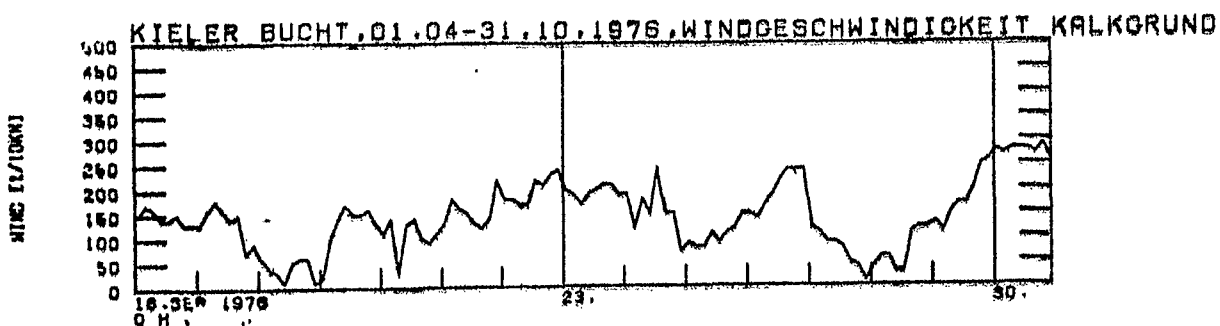
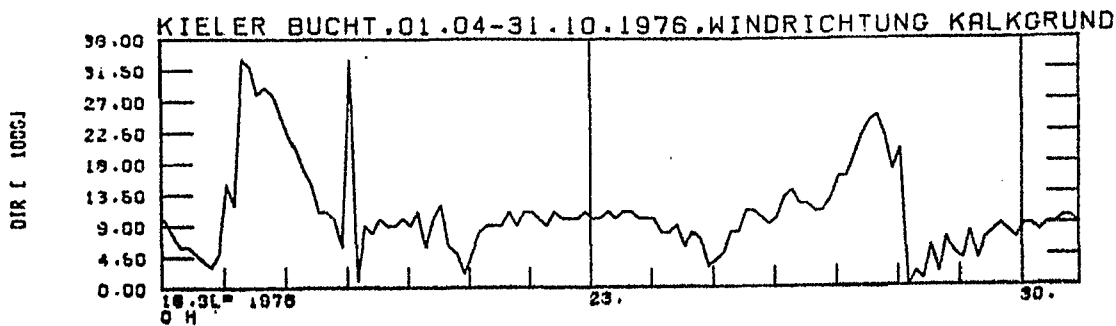


TEMP [1/100C]

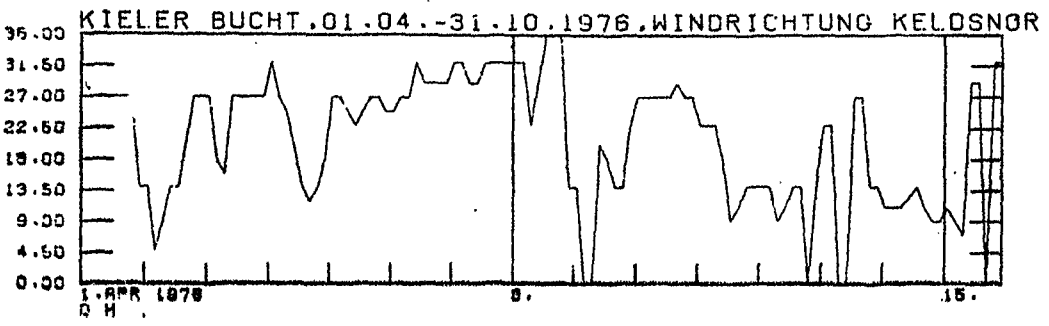


TAUP [1/100C]

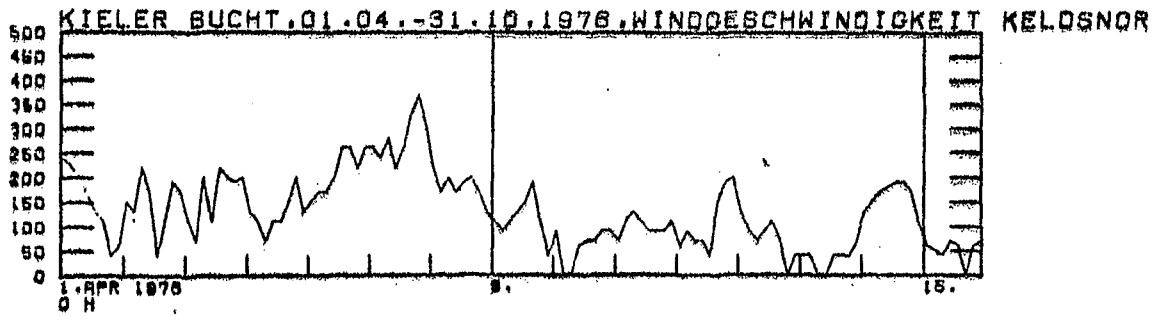




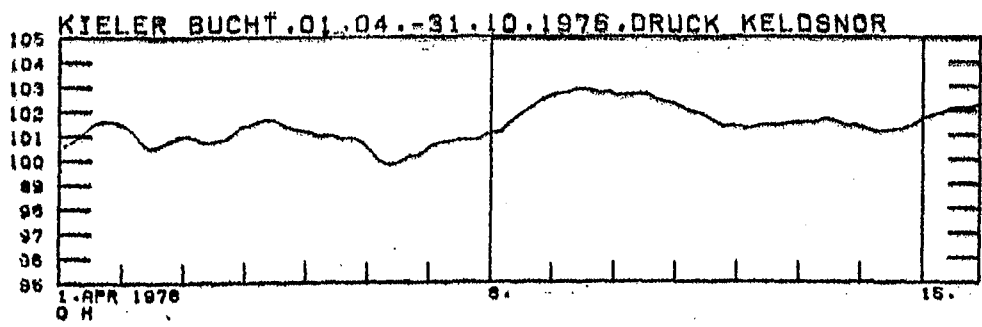
DIR (1/100G)



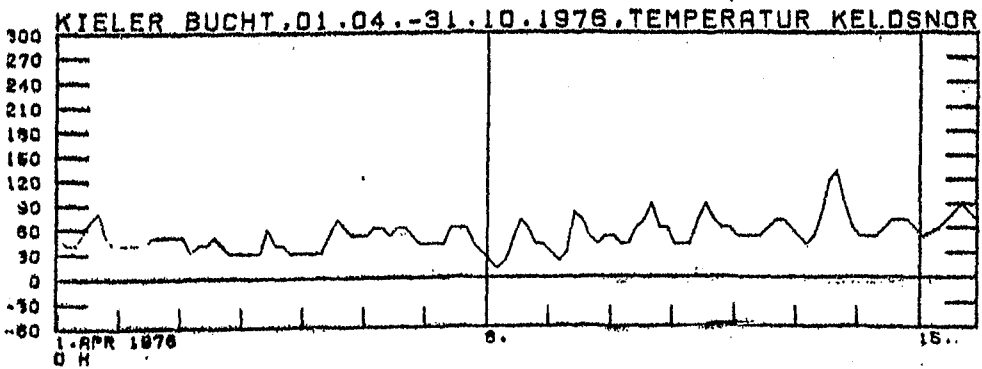
WIND (1/100K)



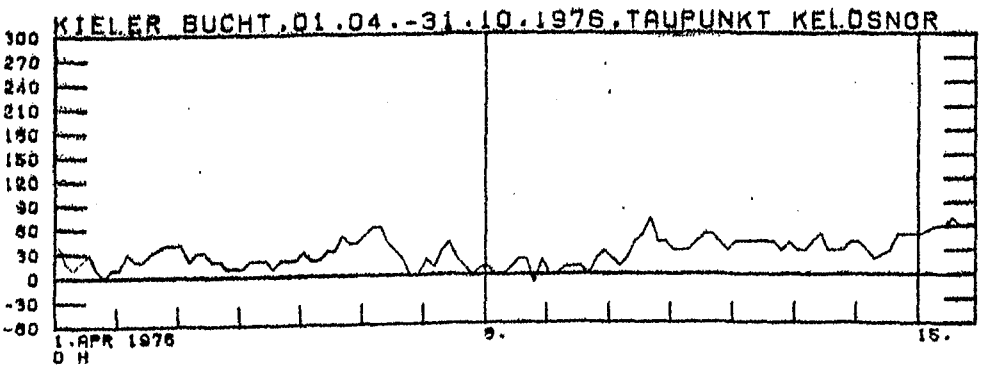
PRES (1/100G) (x10³)



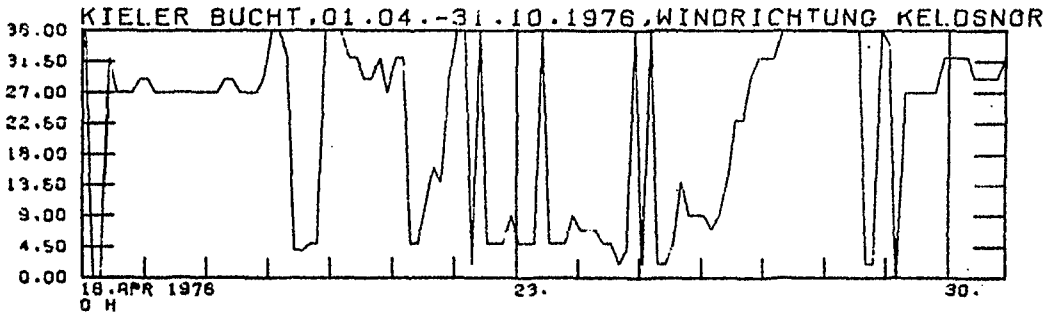
TEMP (1/100G)



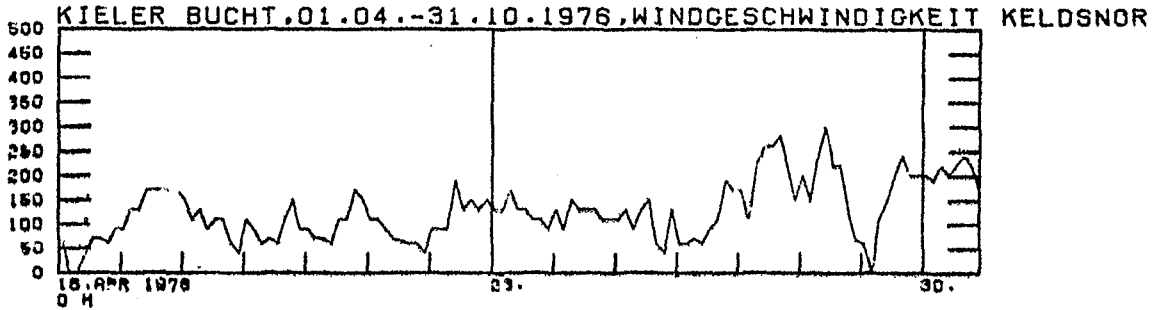
TAUP (1/100G)



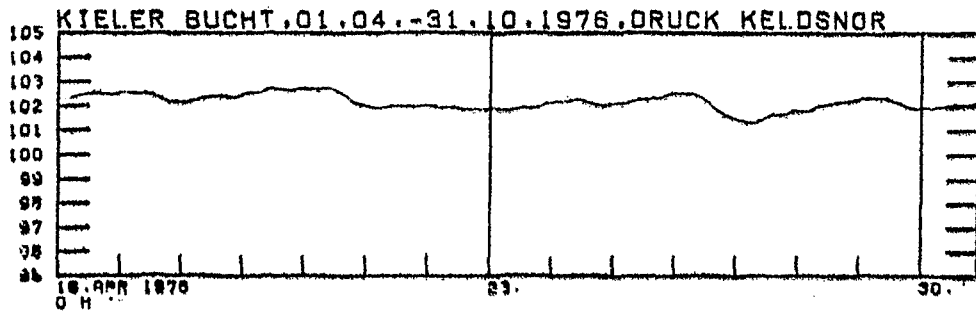
DIR [1/1000]



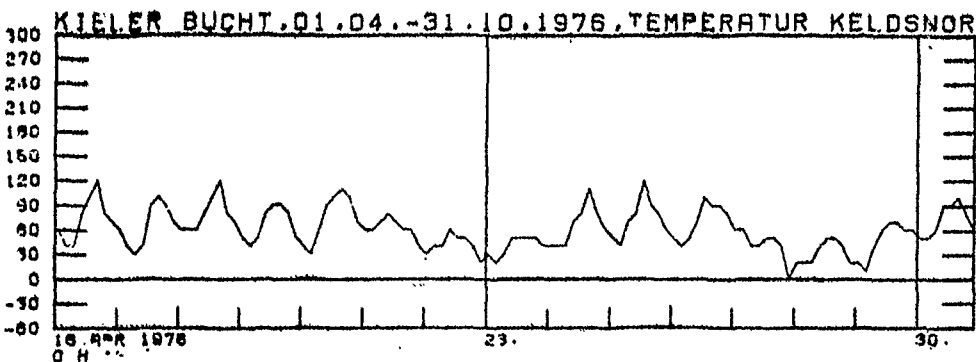
WIND [1/1000]



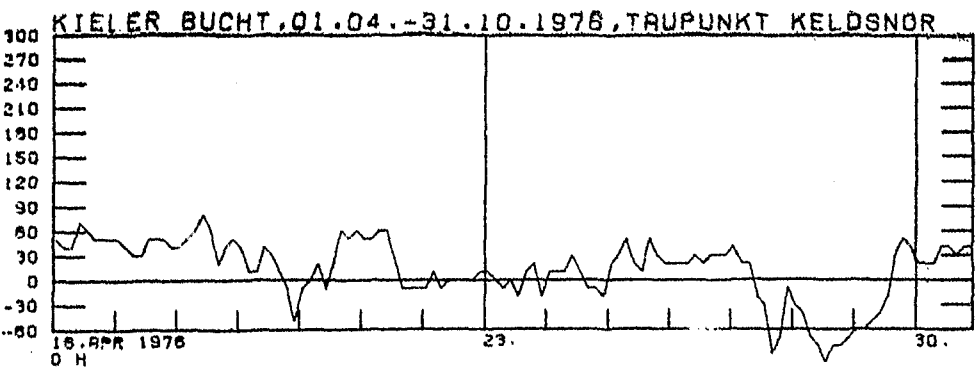
PRES [1/1000]

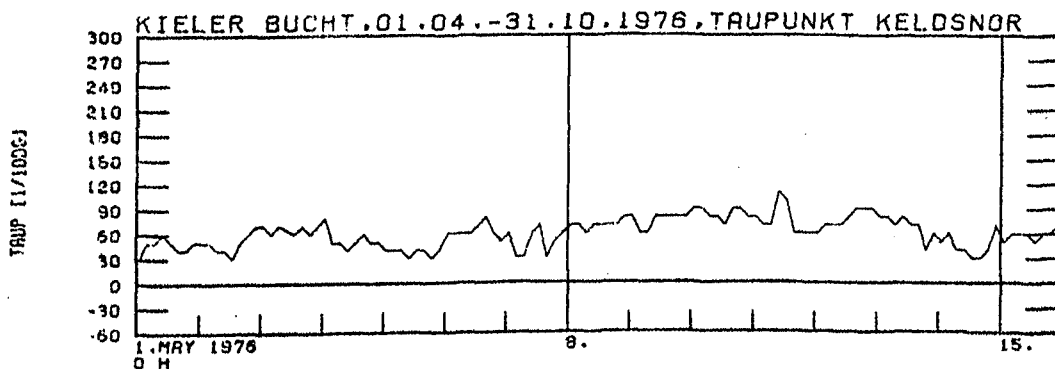
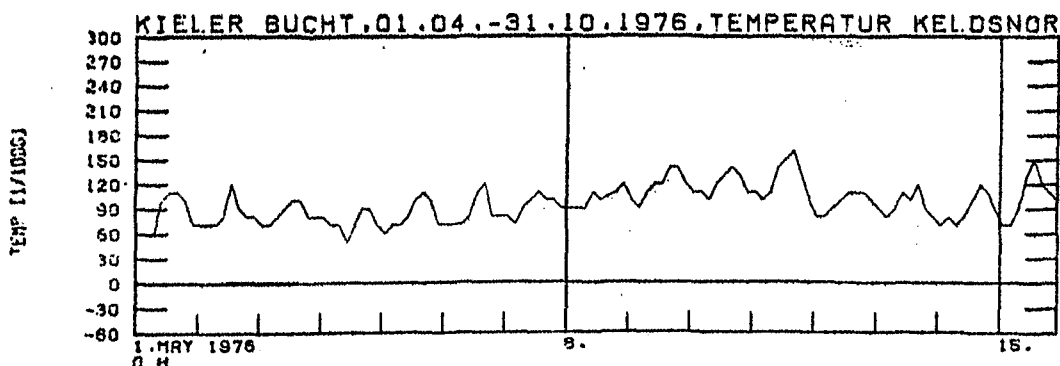
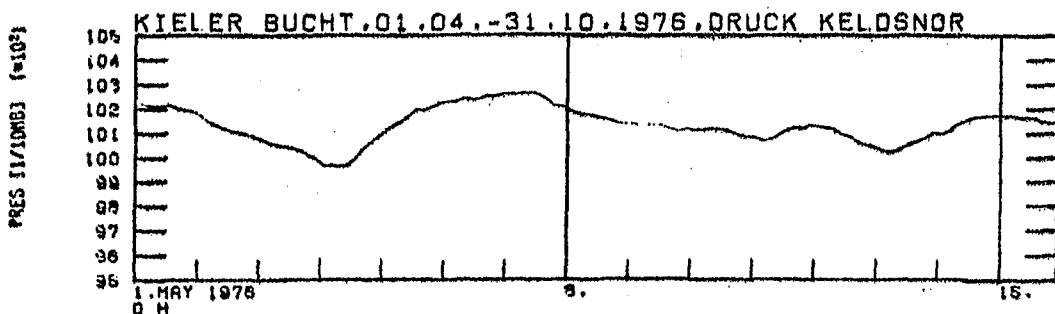
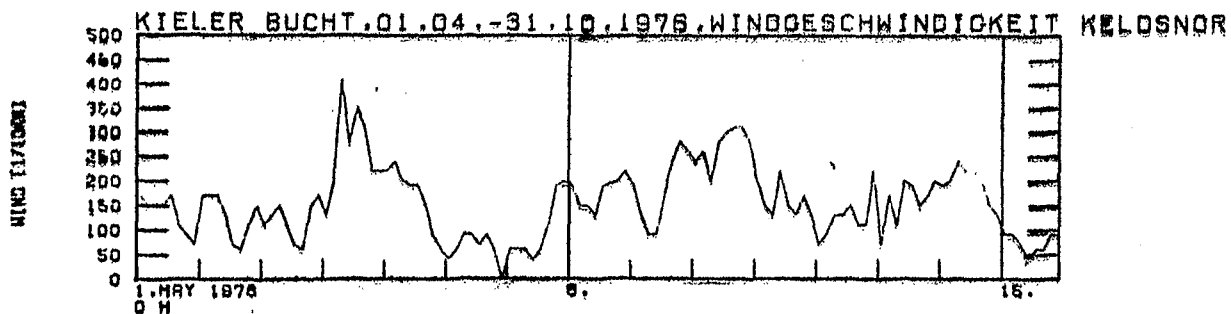
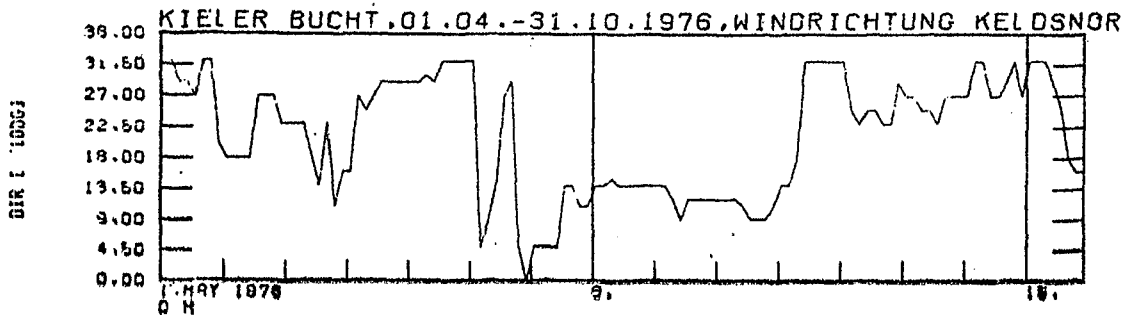


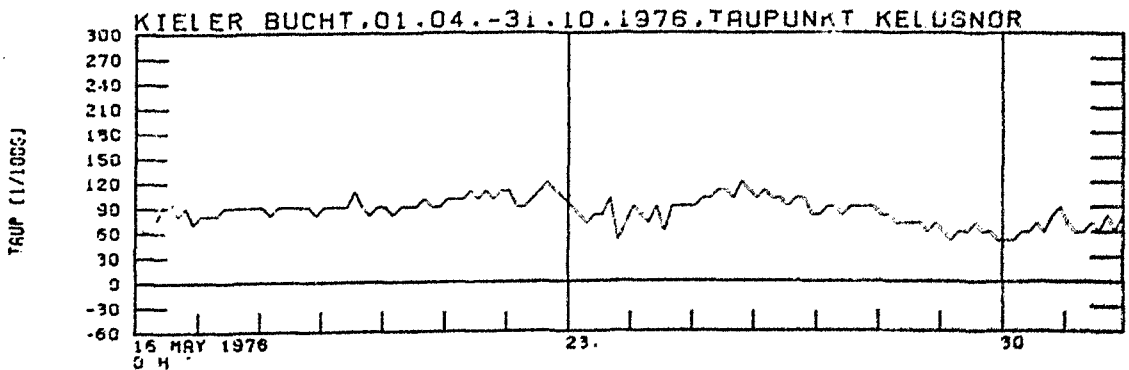
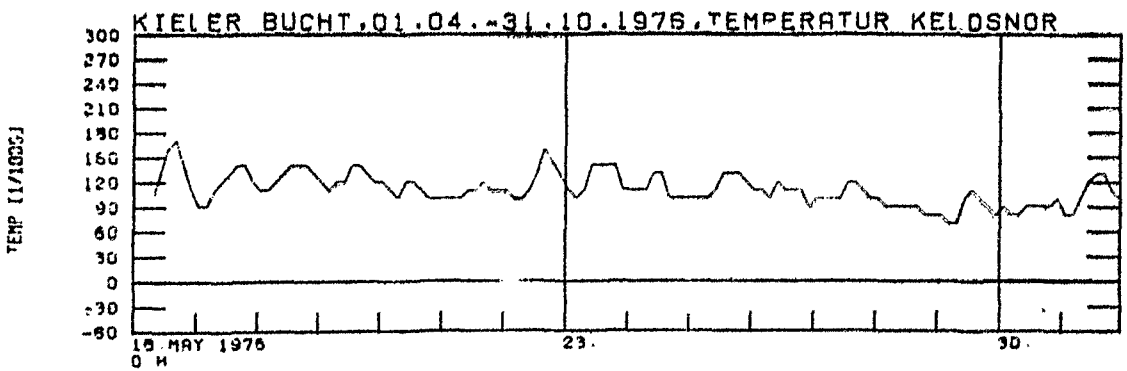
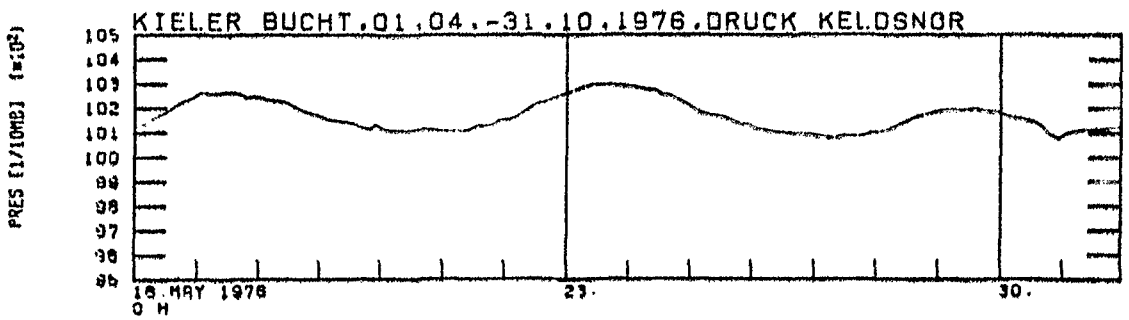
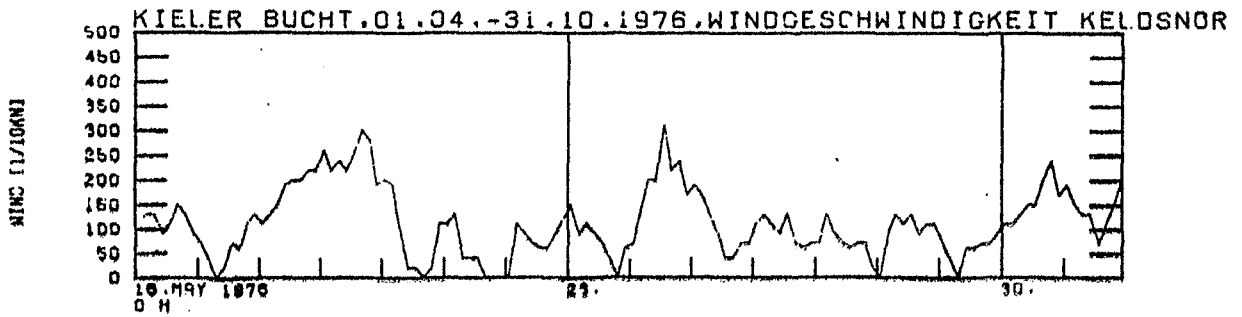
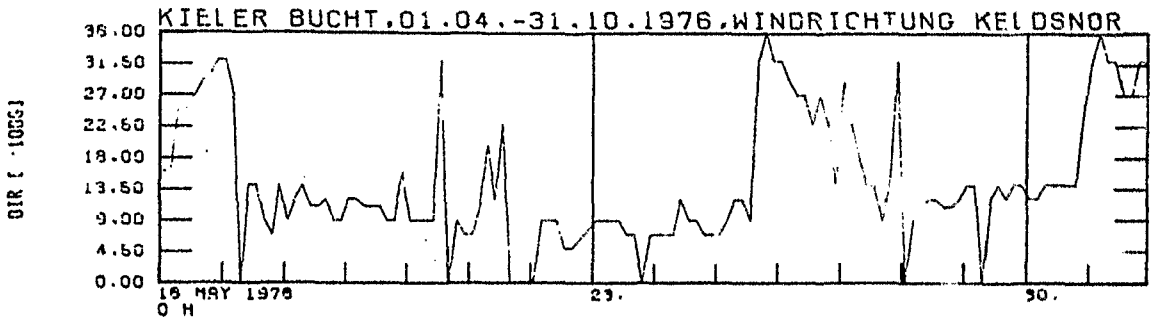
TEMP [1/1000]



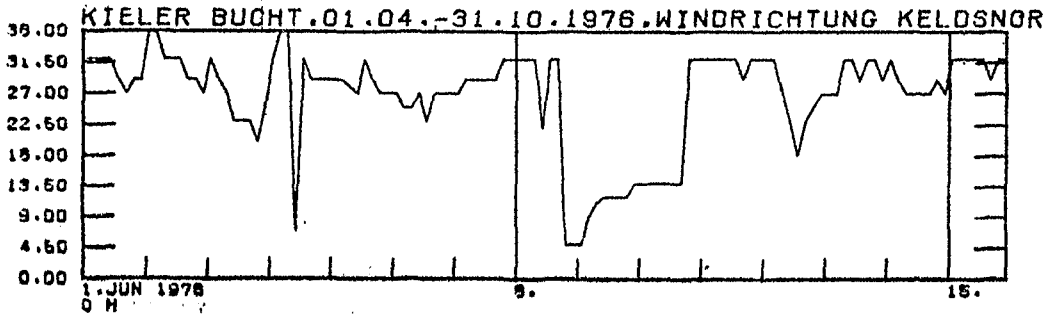
TAUP [1/1000]



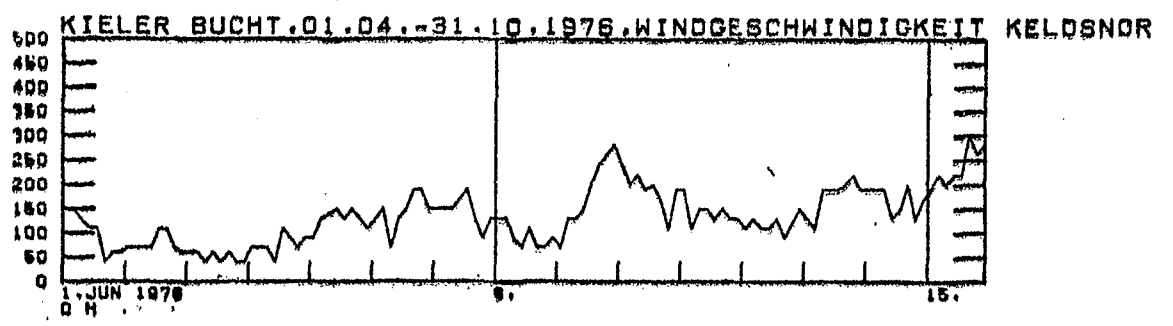




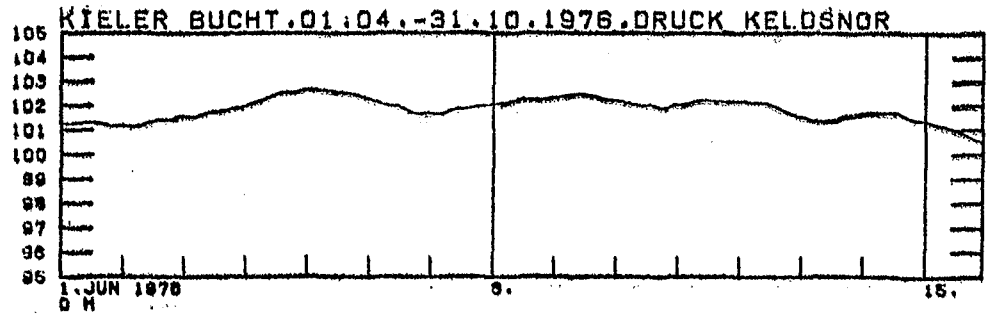
DIR [1/100G]



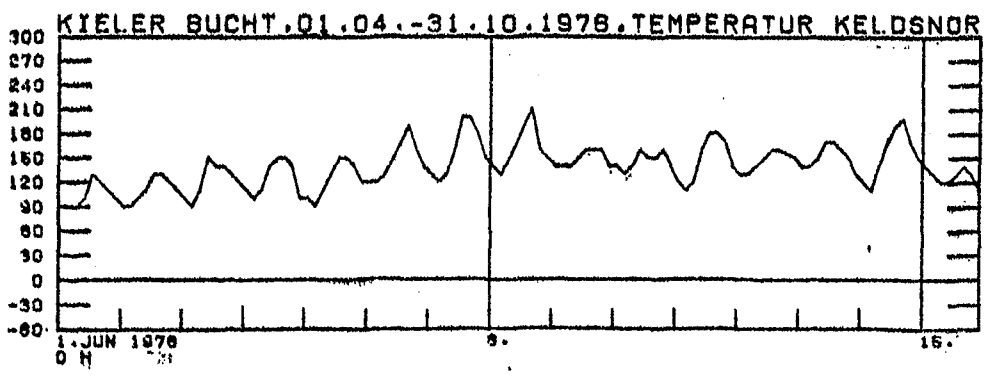
WIND [1/100M]



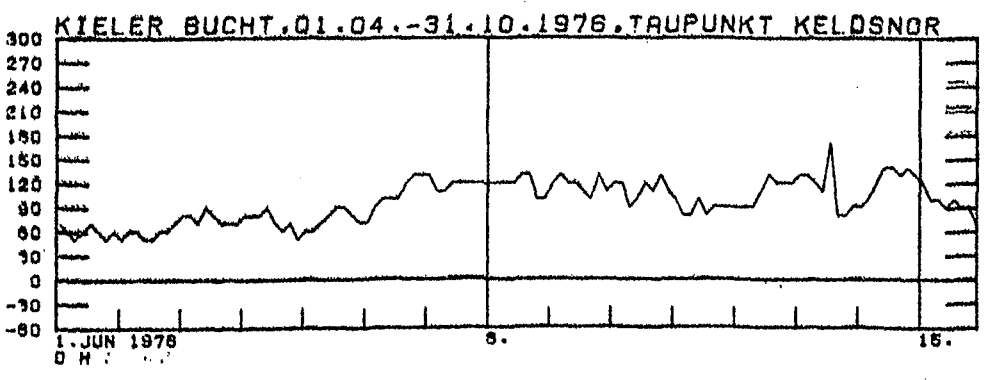
PRES [1/100G] [m10]



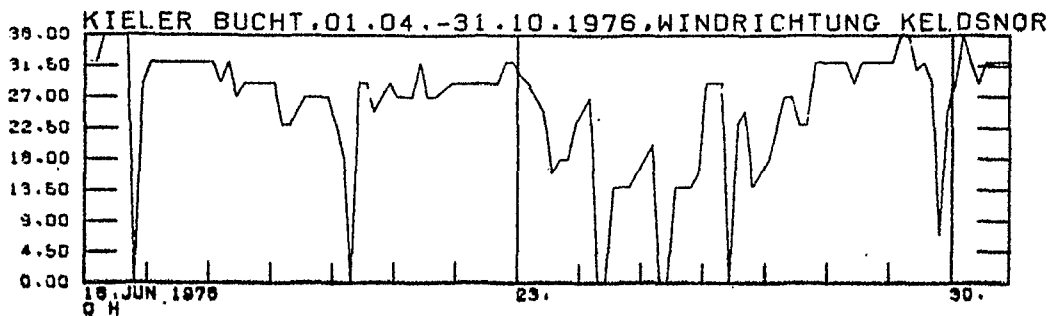
TEMP [1/100G]



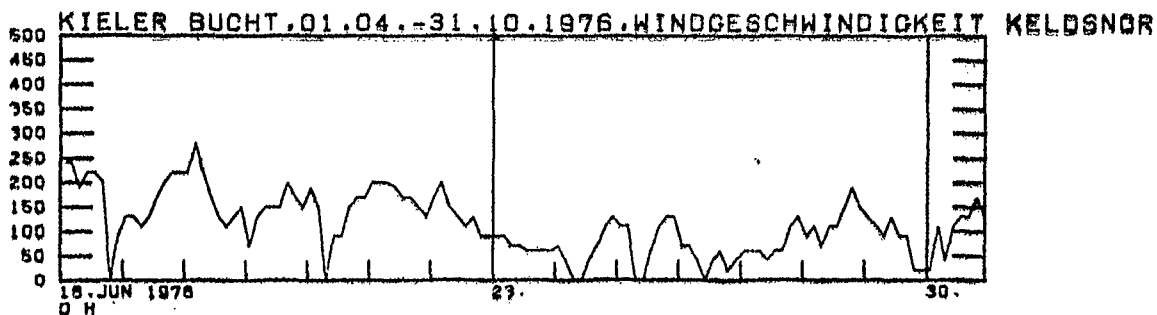
TRUP [1/100G]



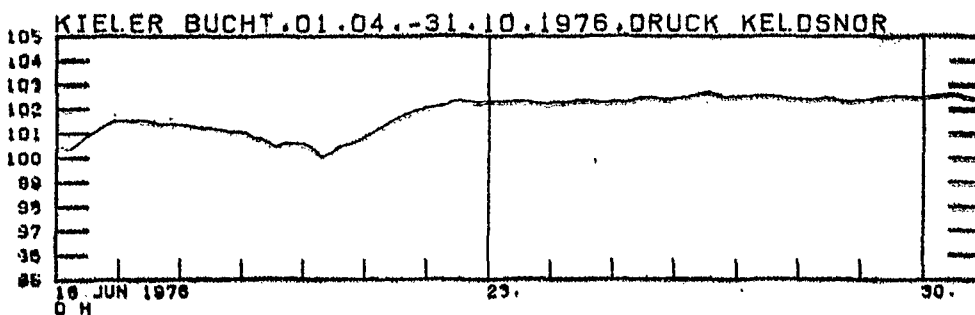
DIR [100G]



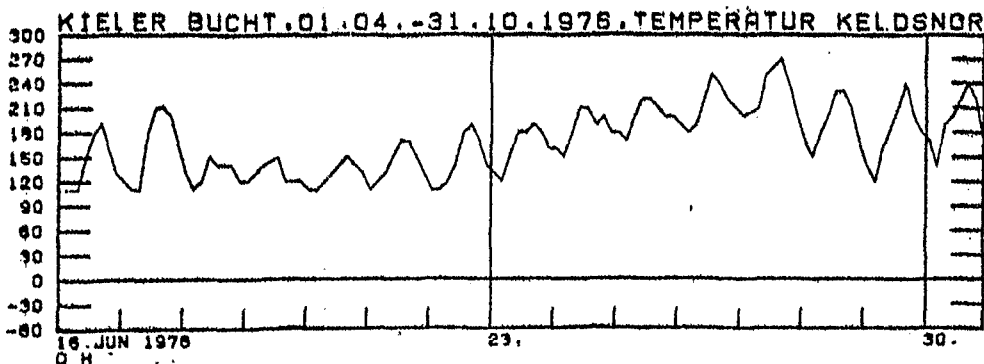
WIND [1/100M]



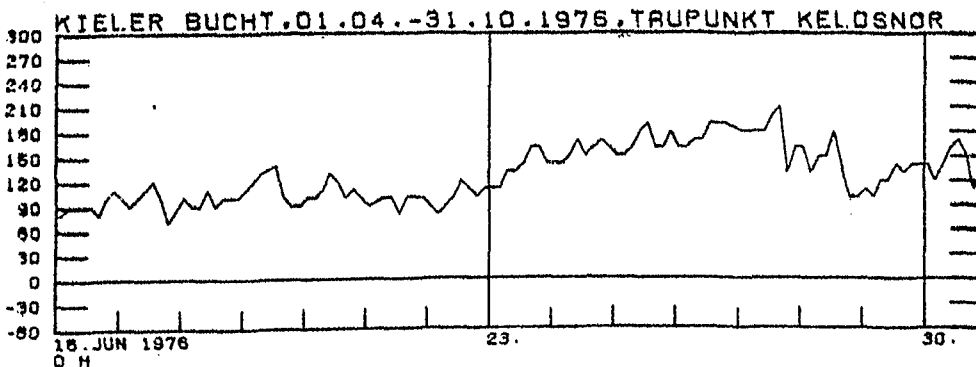
PRES [1/10MB] [10⁻²]

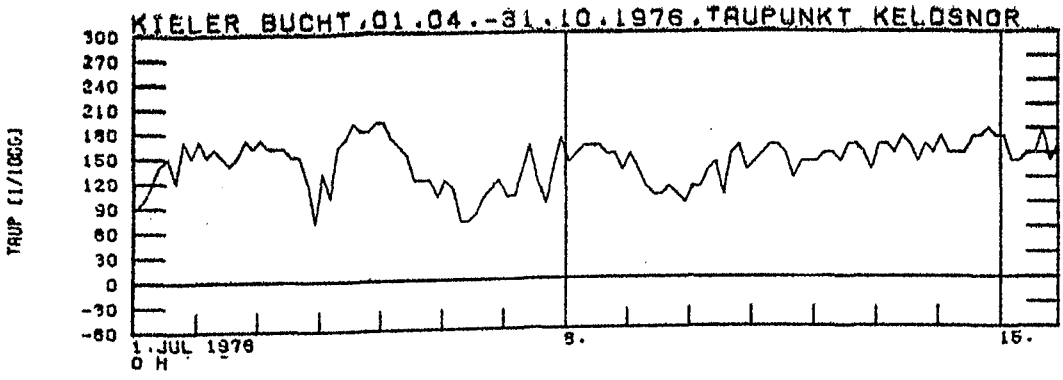
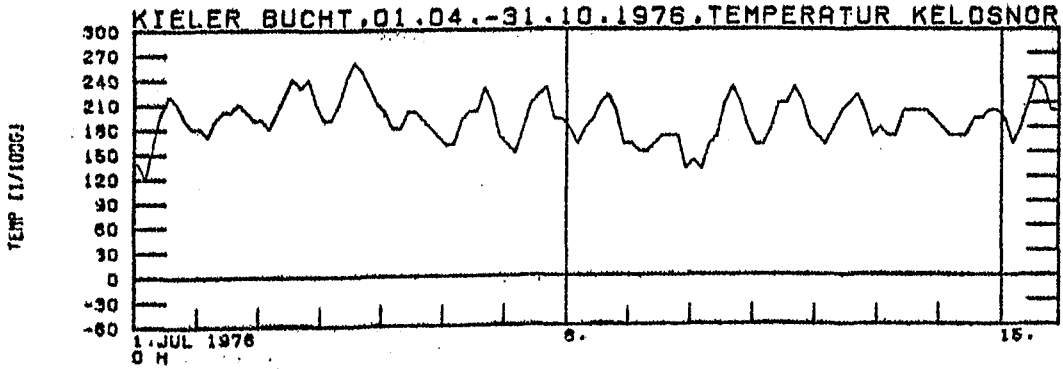
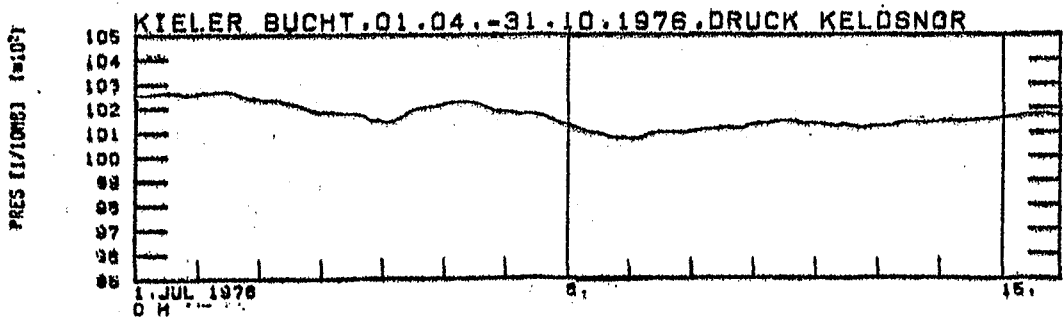
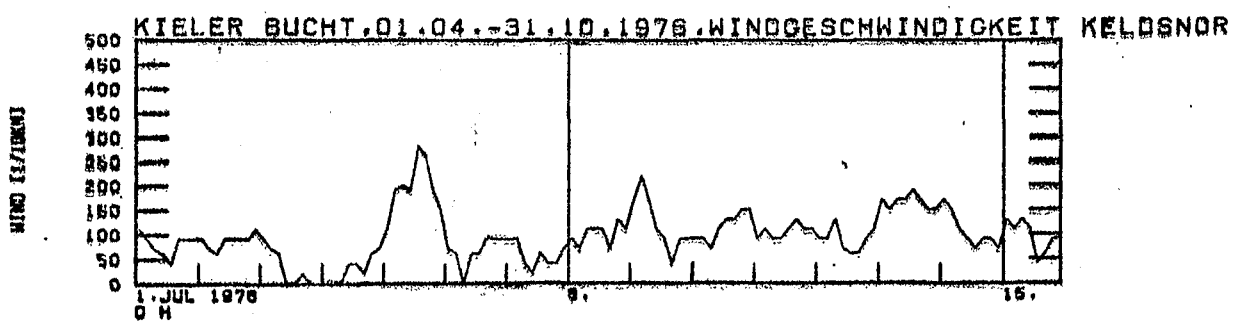
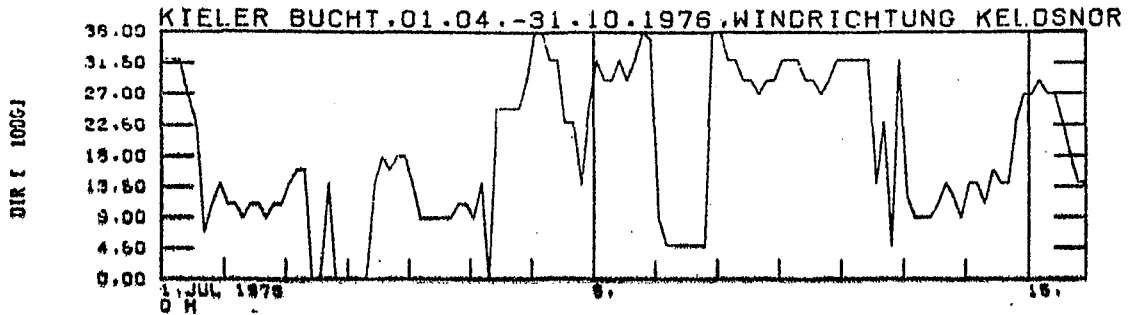


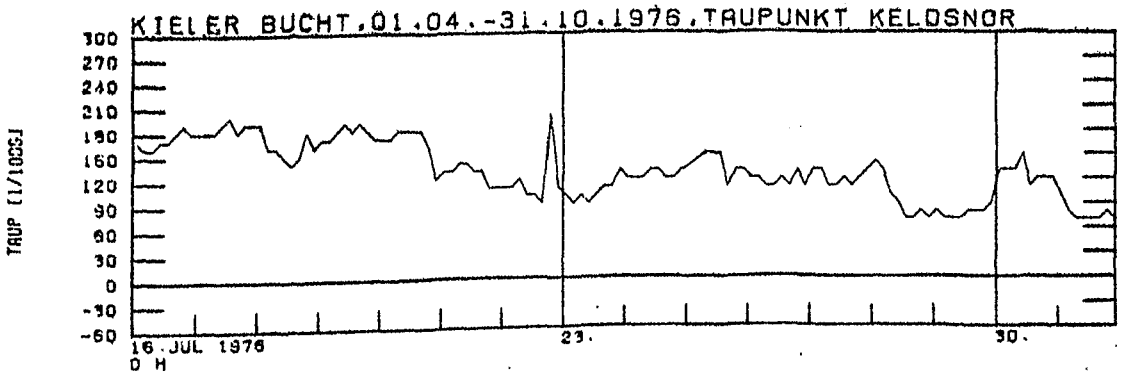
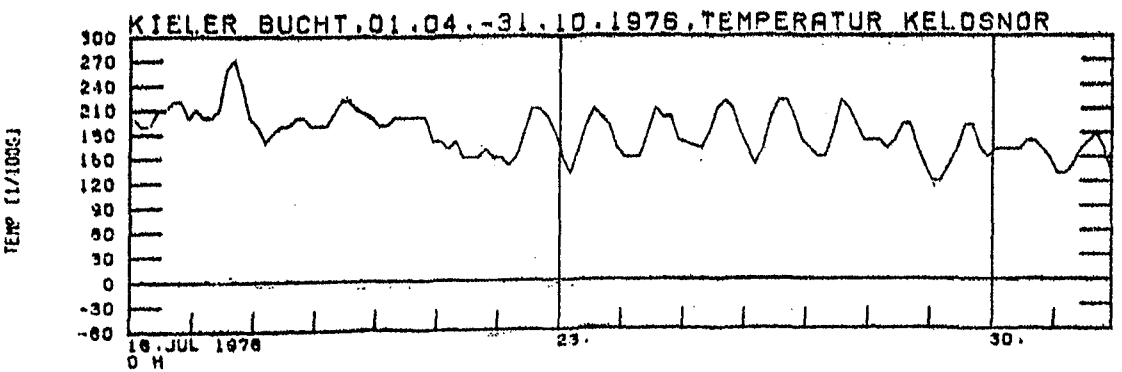
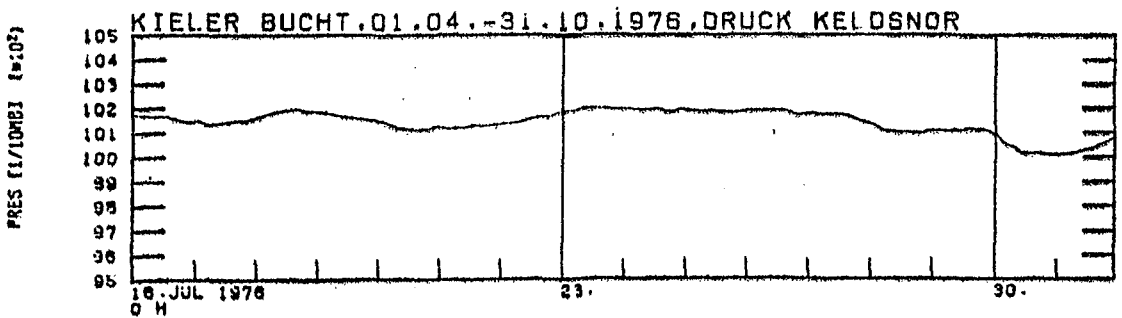
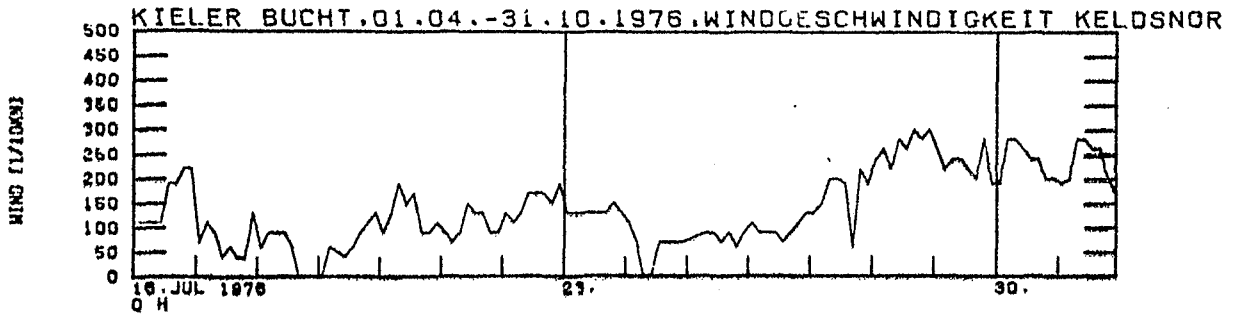
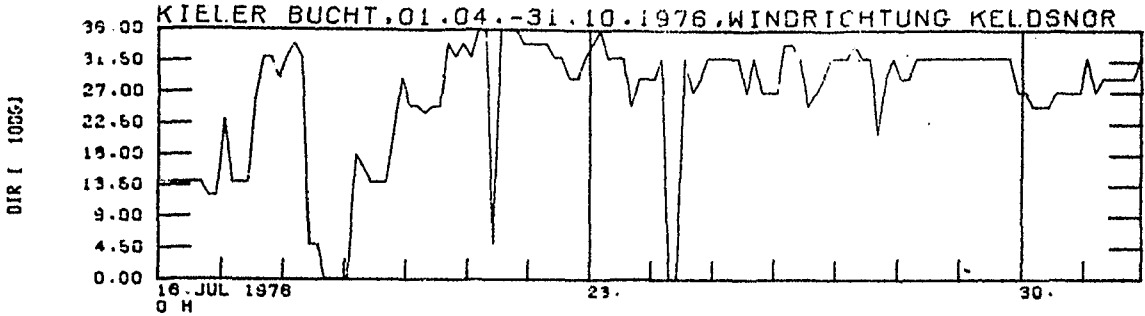
TEMP [1/100G]

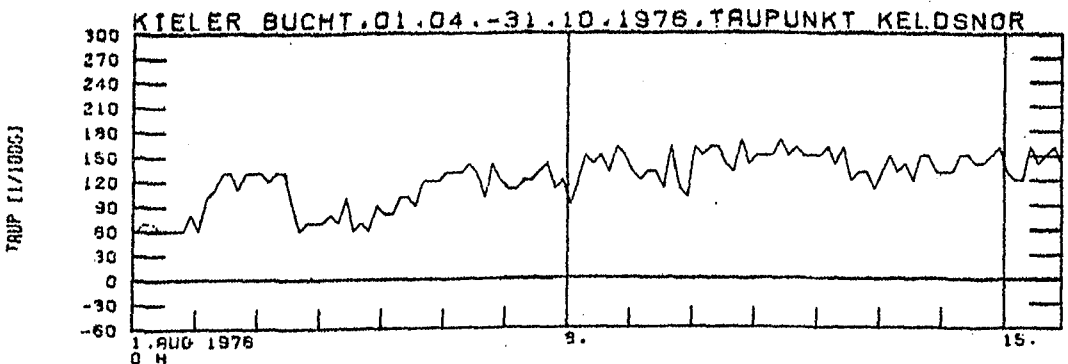
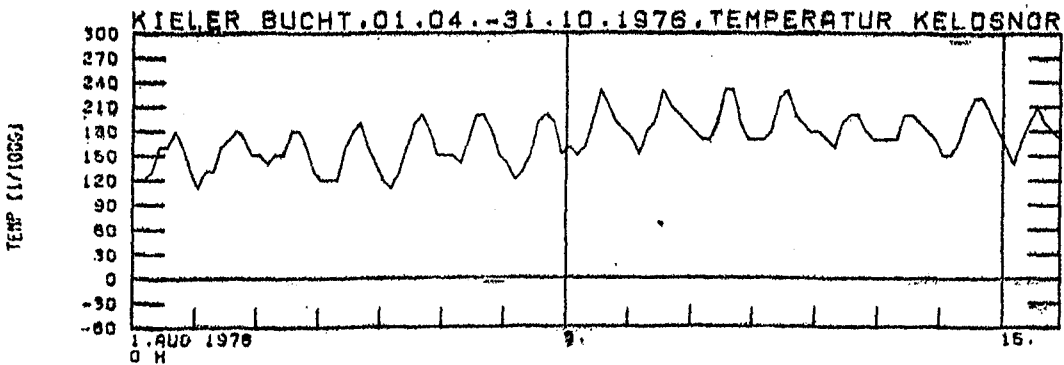
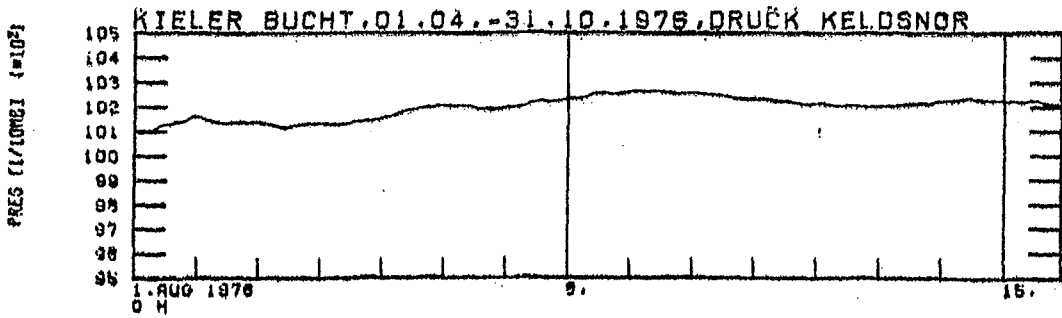
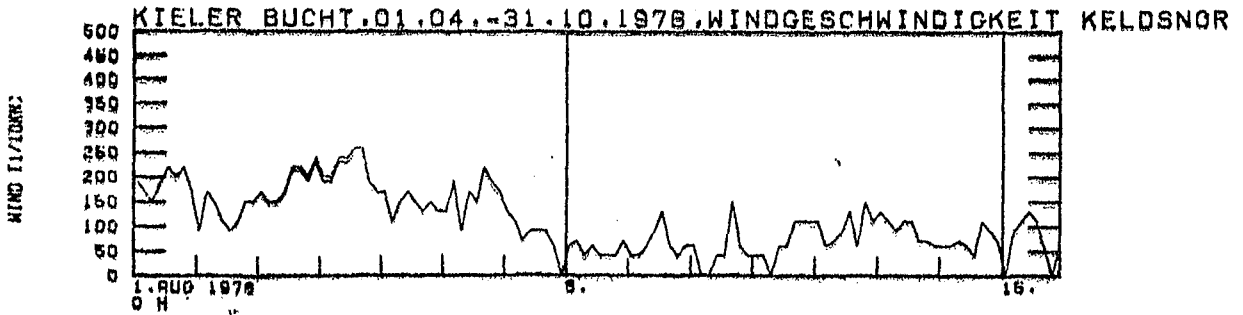
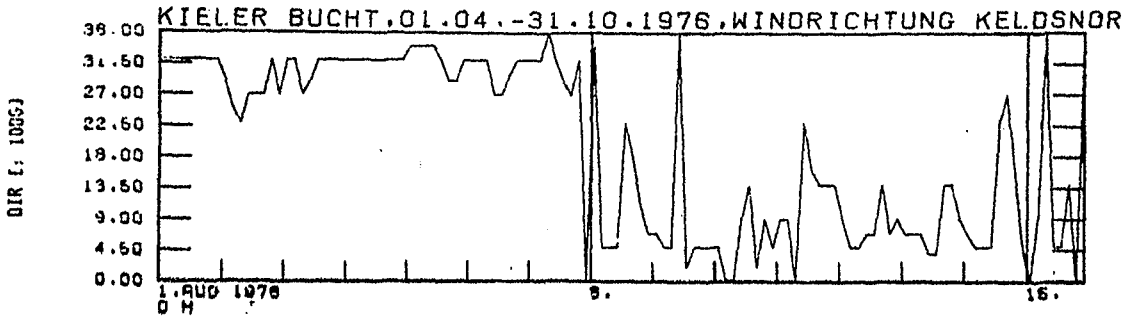


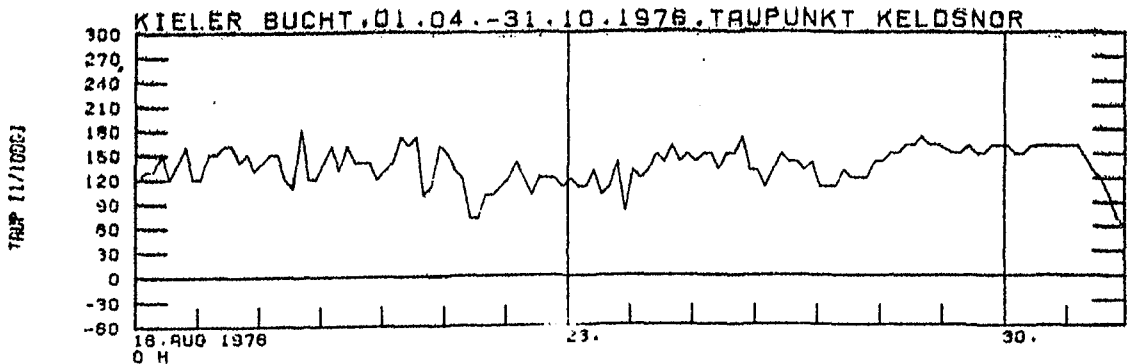
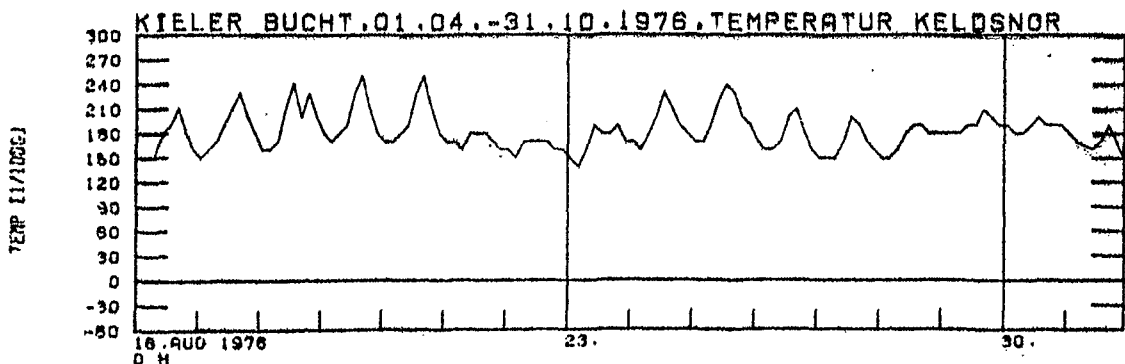
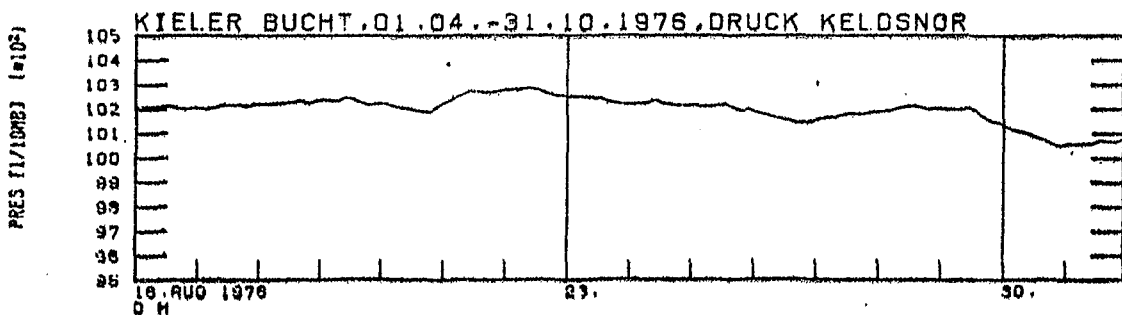
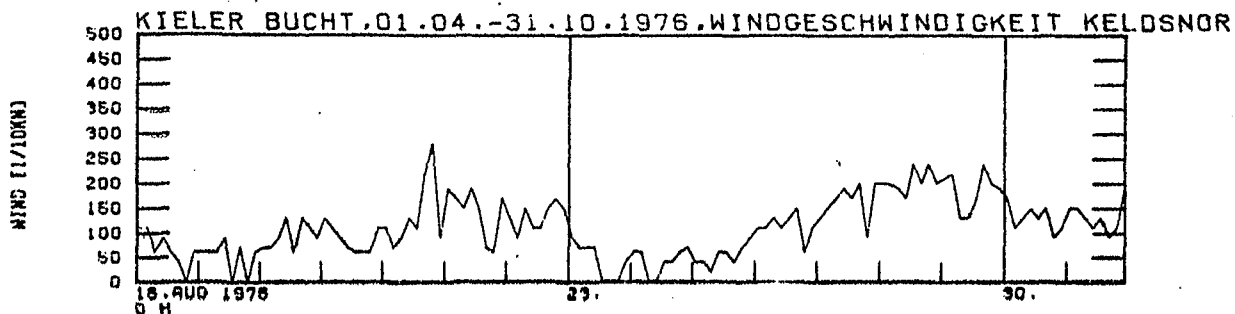
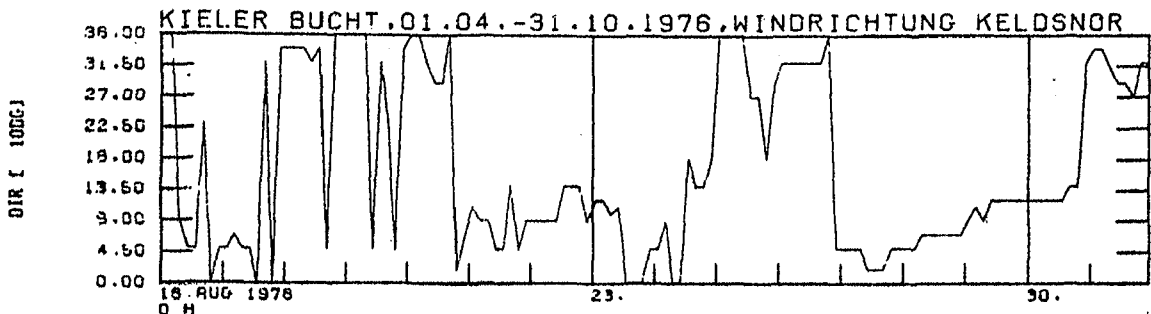
TAUP [1/100G]



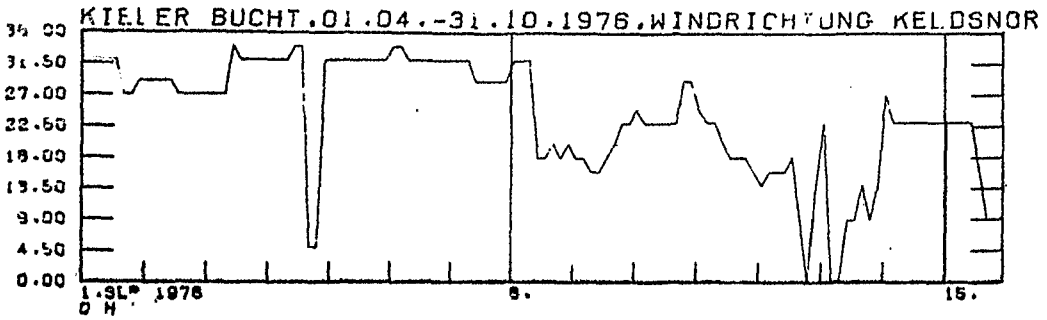




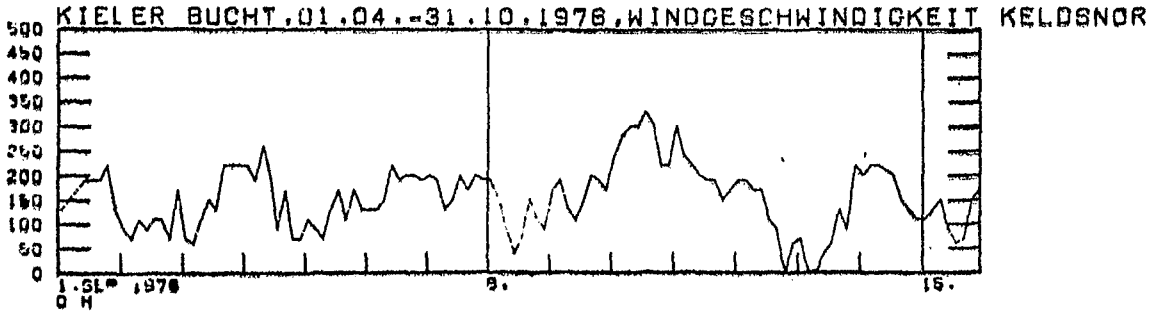




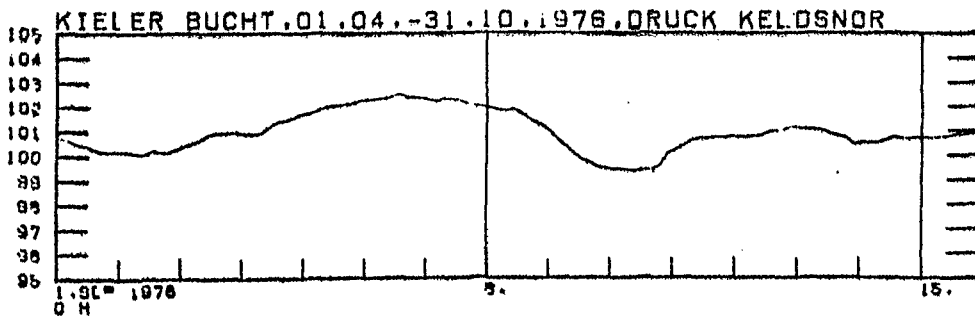
DIR [1055]



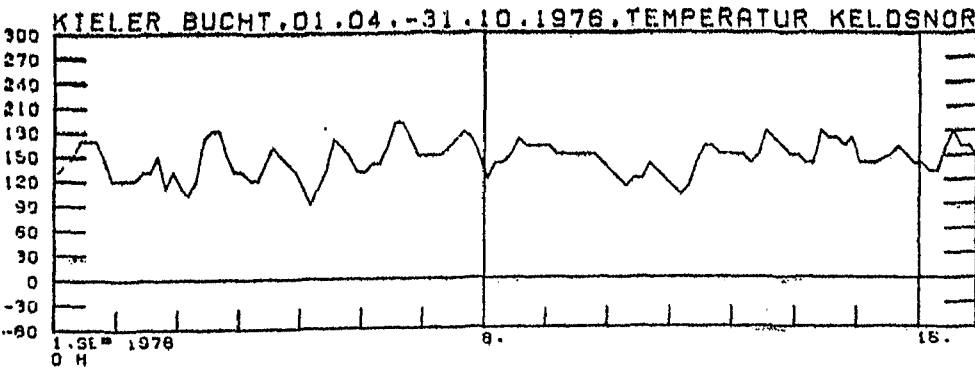
WIND [1/10KN]



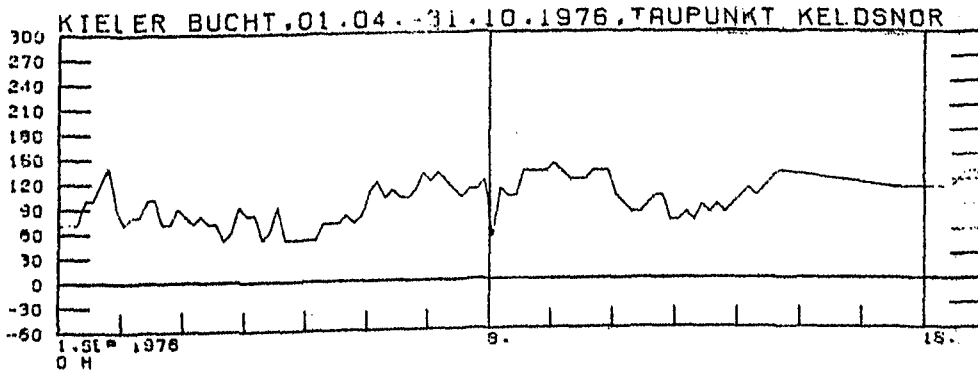
PRES [1/10MB] [105]

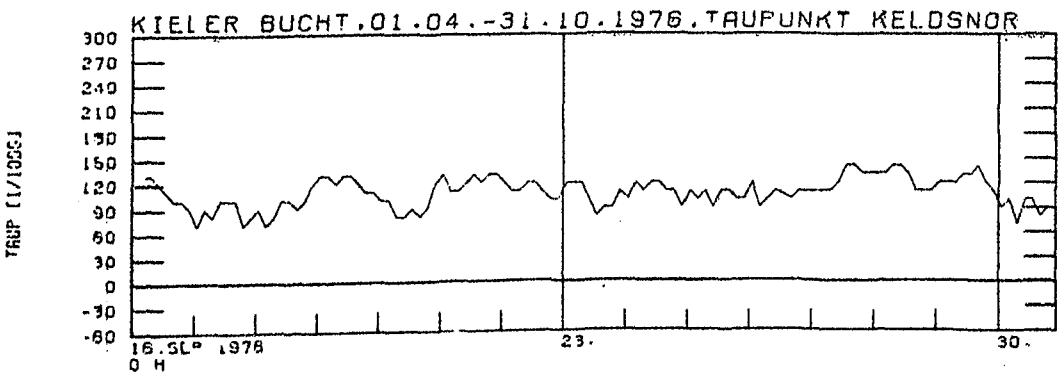
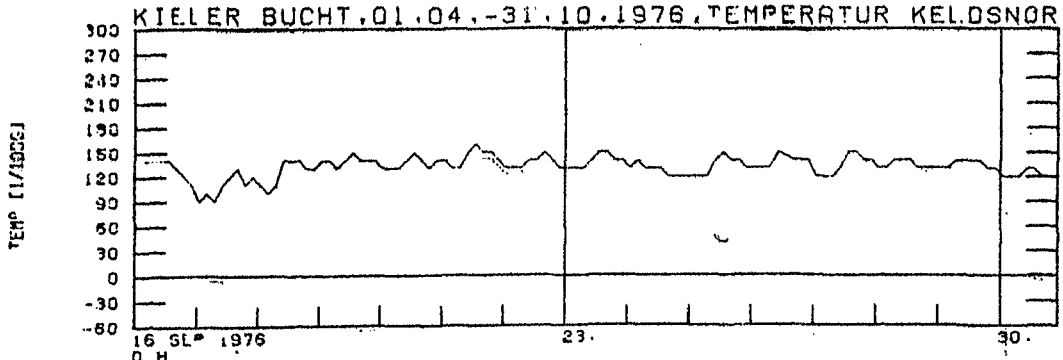
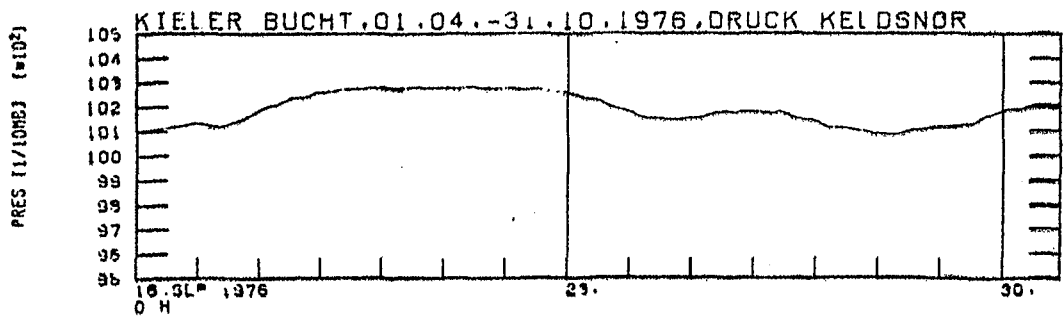
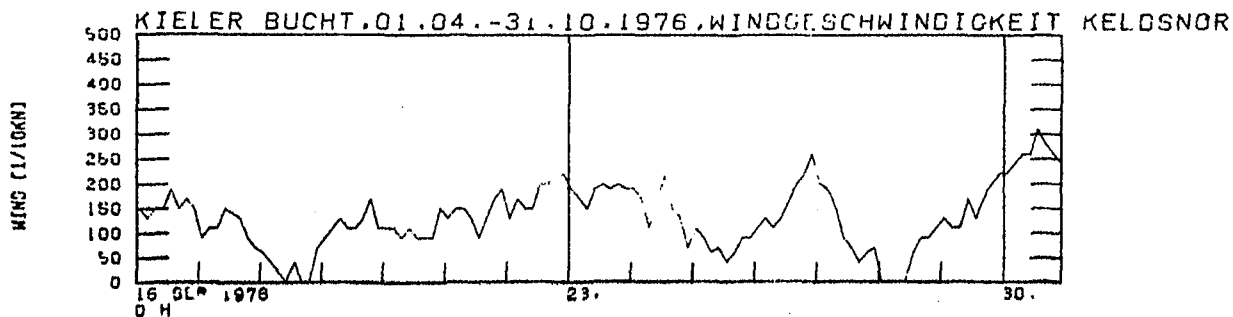
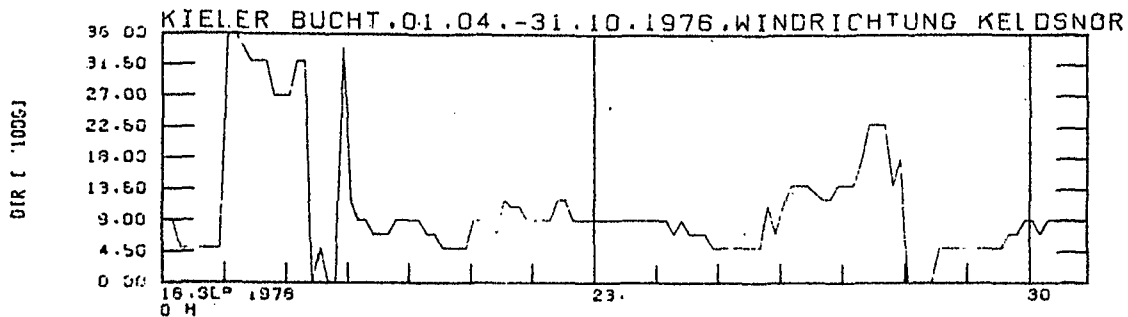


TEMP [1/1055]

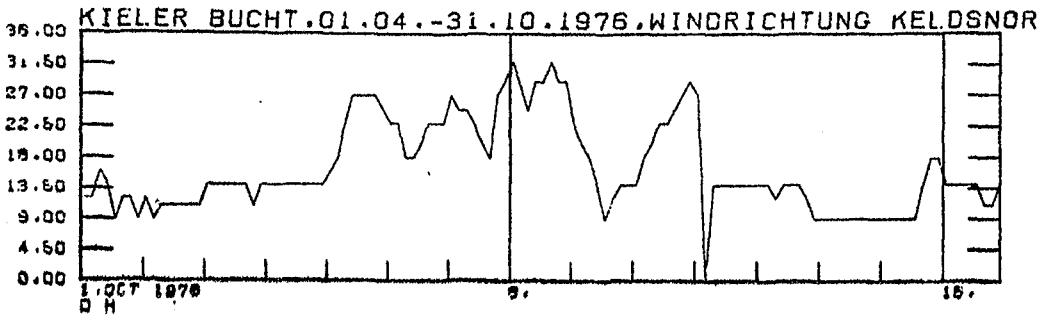


TAUP [1/1055]

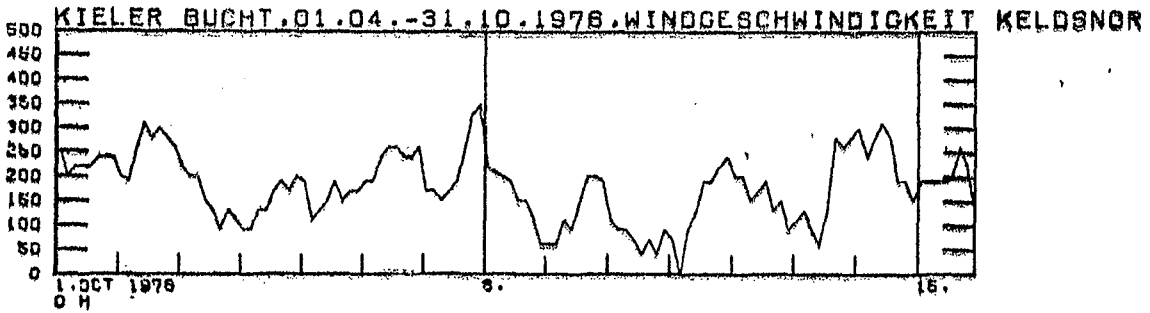




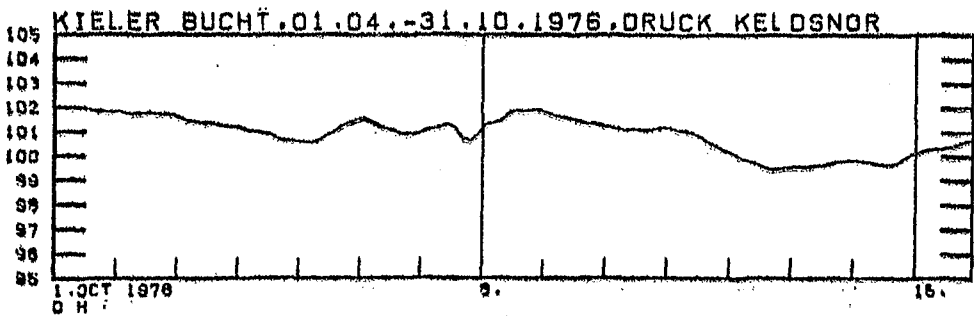
DIR [100G]



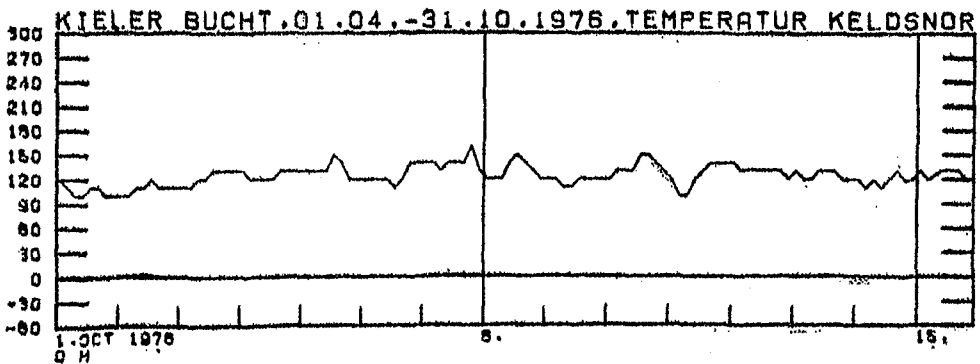
WIND [100G]



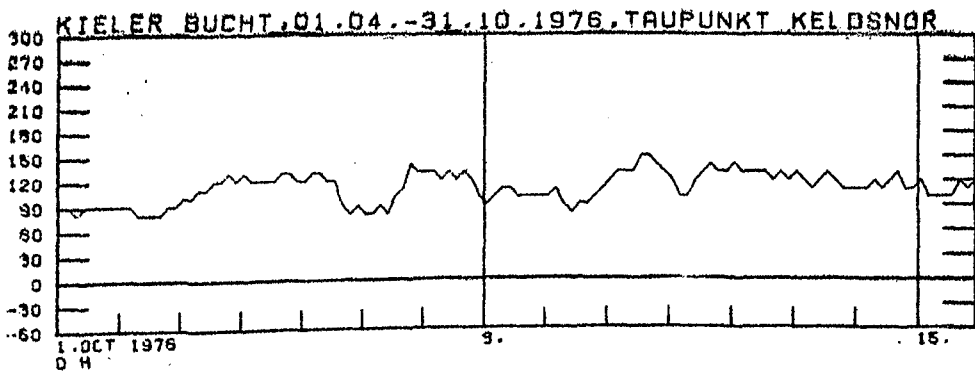
PRES [100G]

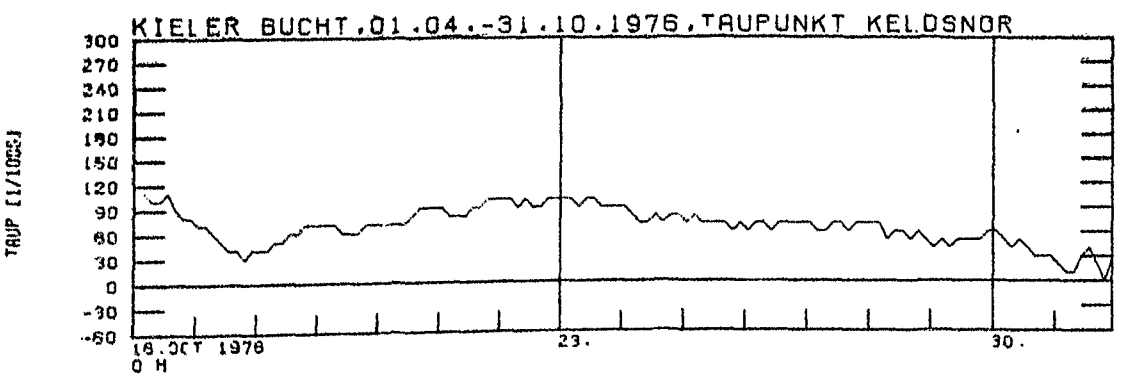
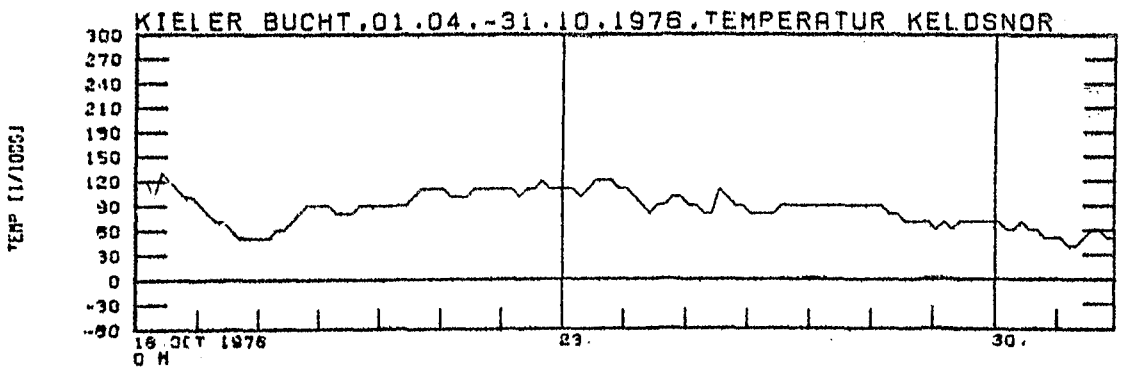
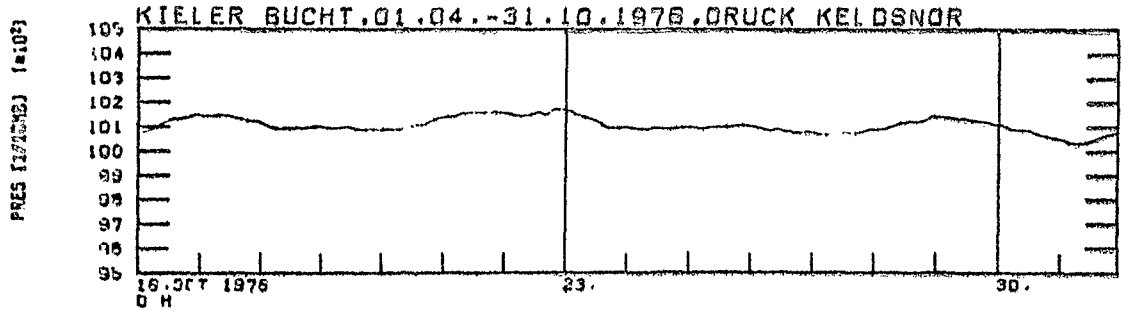
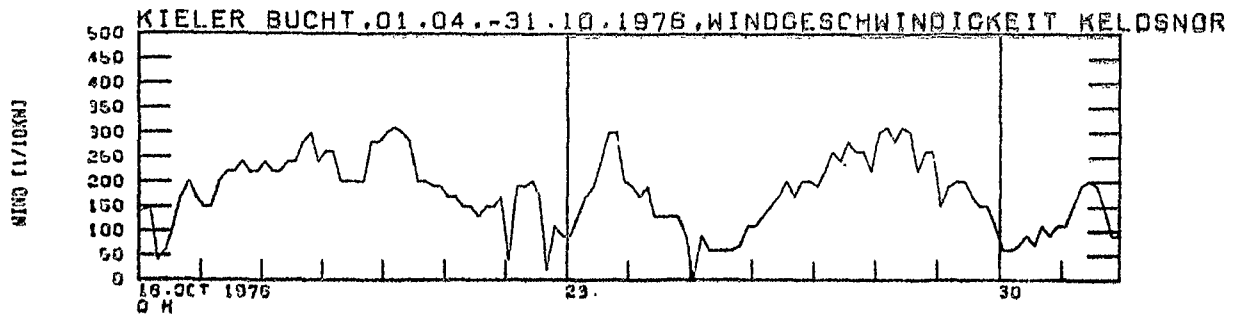
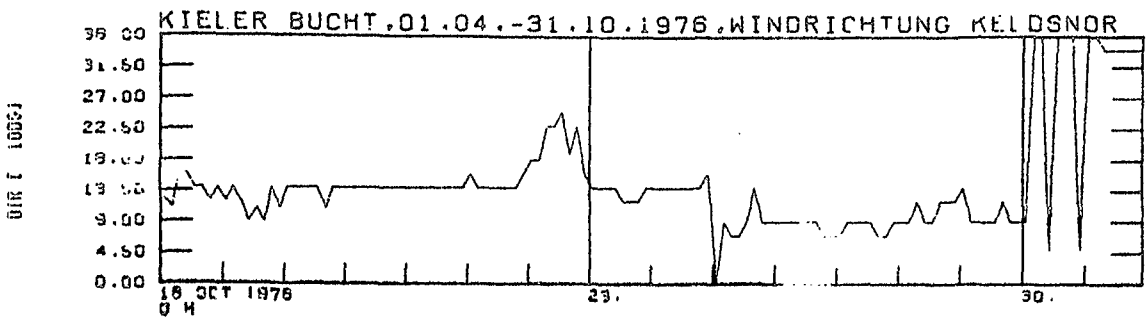


TEMP [100G]



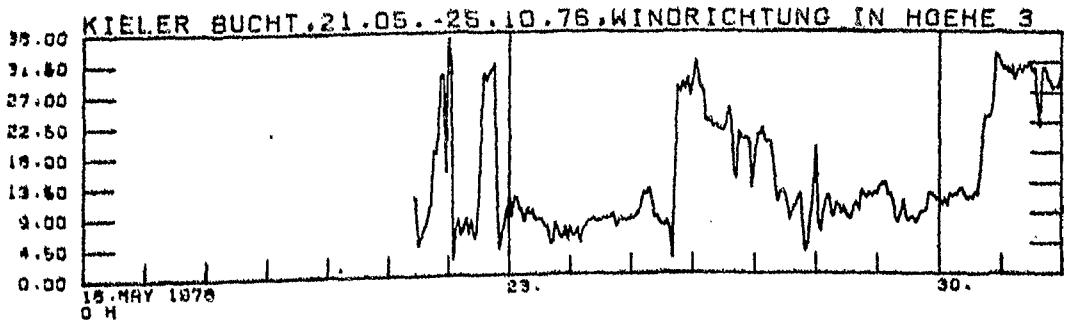
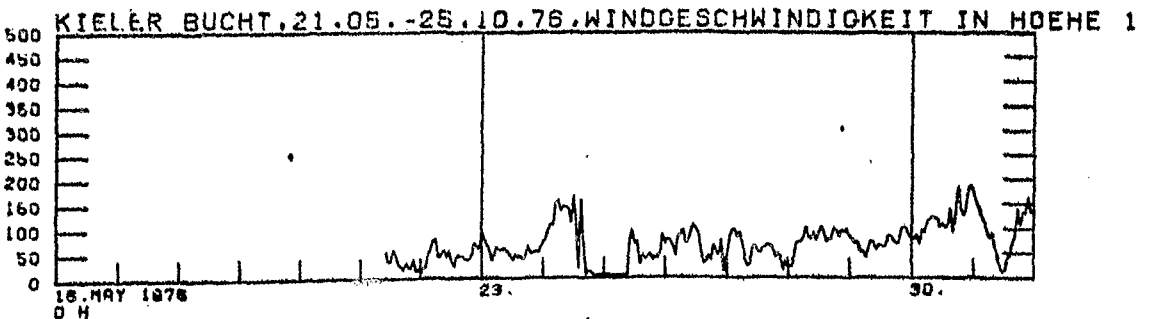
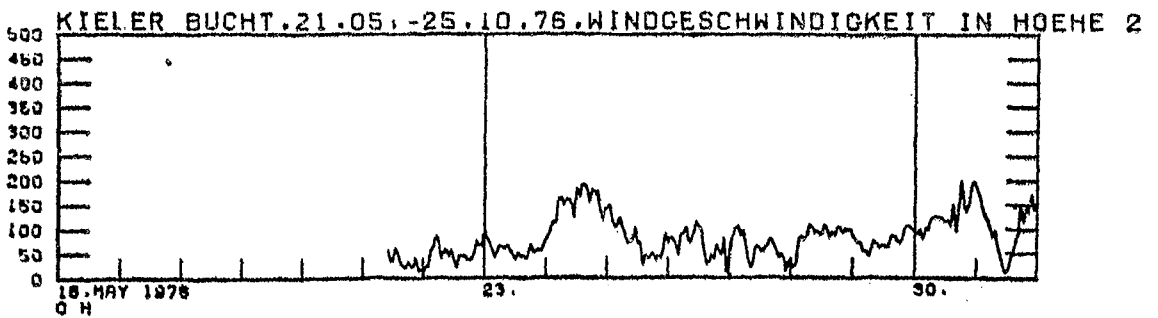
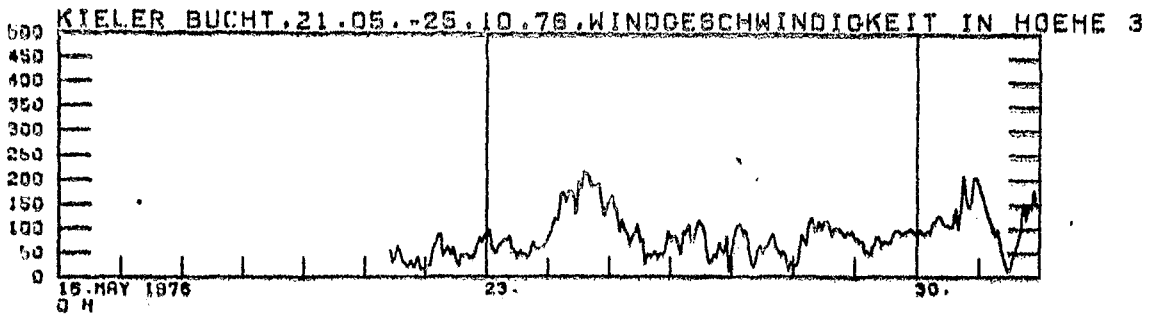
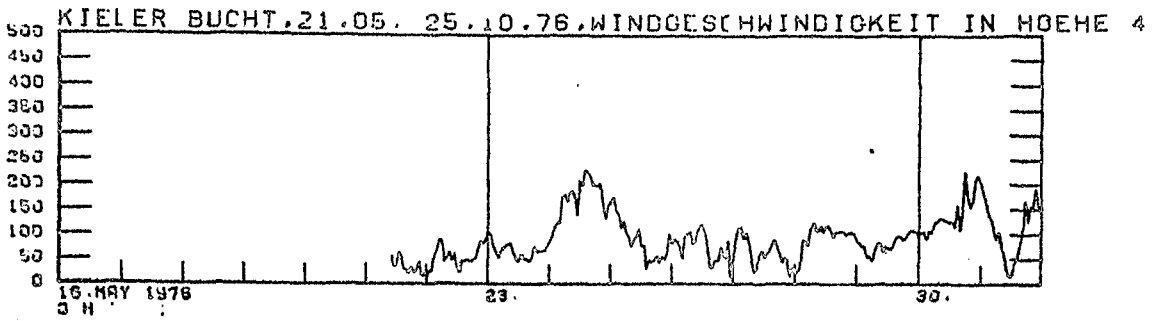
TRUP [100G]



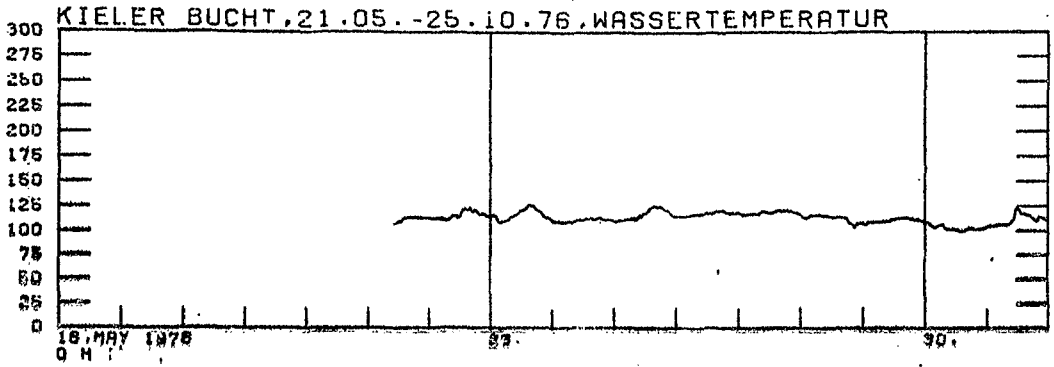


A N H A N G

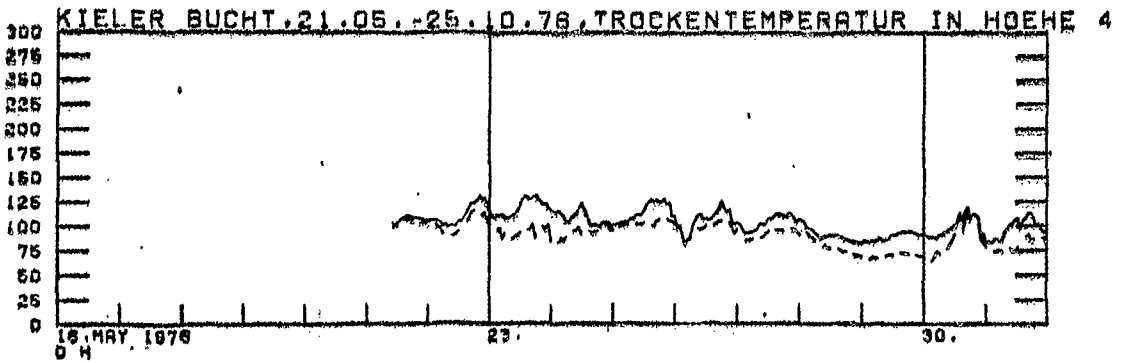
TEIL 2 ZEITREIHEN DER WIND- UND TEMPERATUR-
 PROFILE DES MESSMASTES



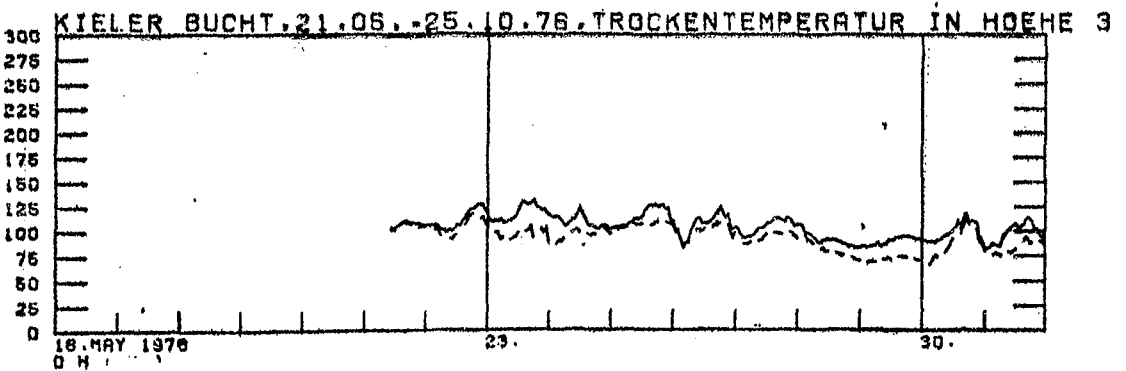
WT [1/1000]



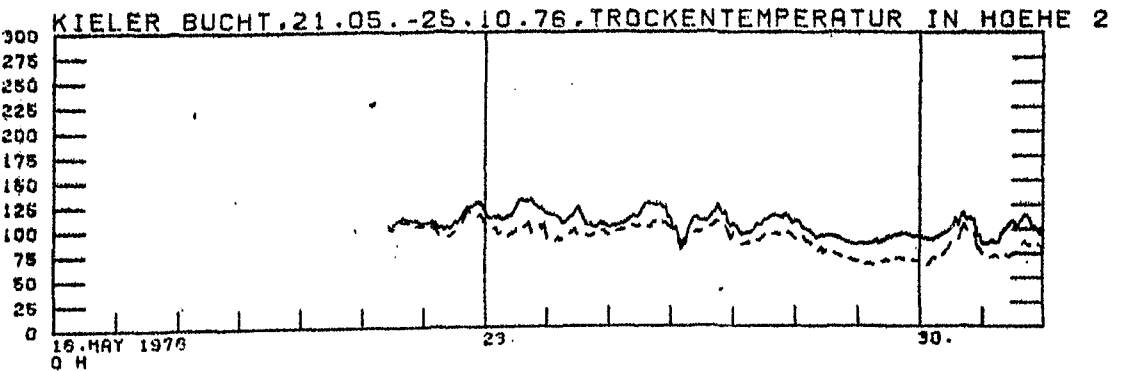
PST4 [1/1000]



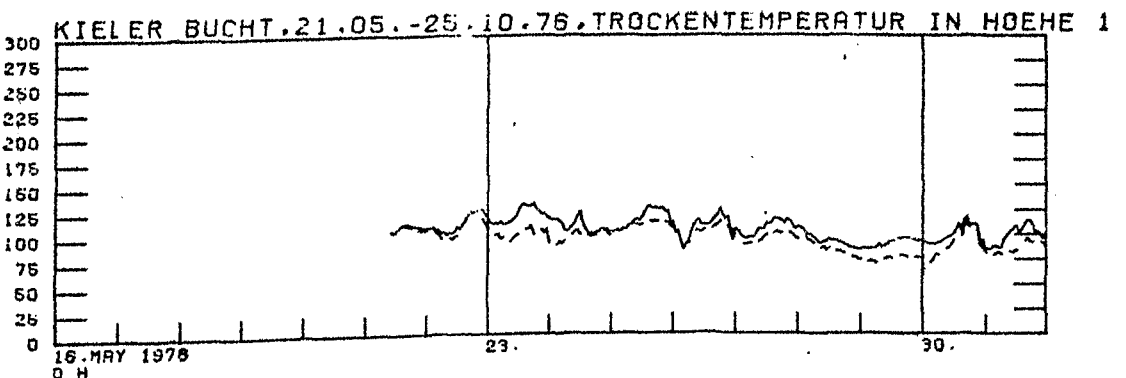
PST3 [1/1000]

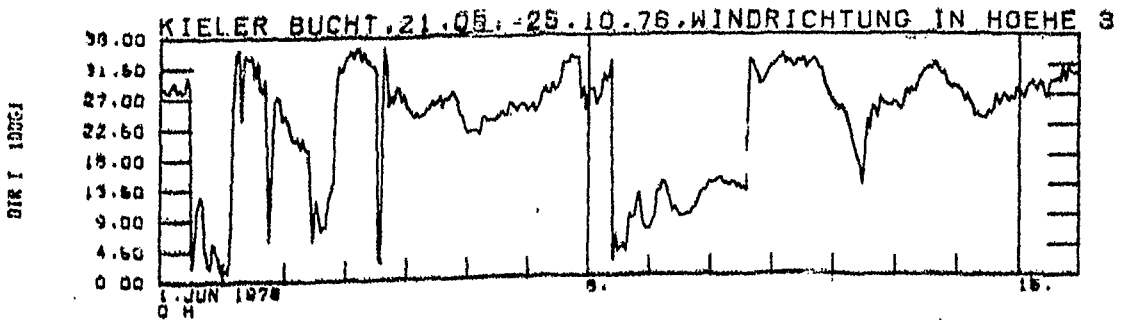
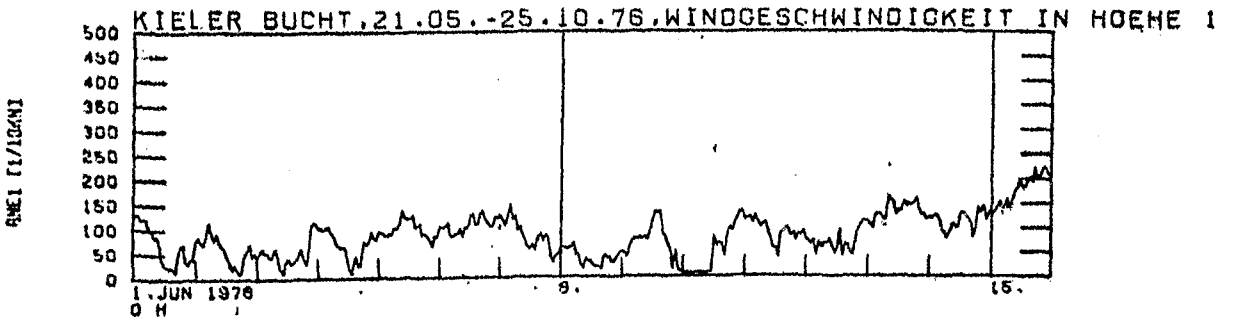
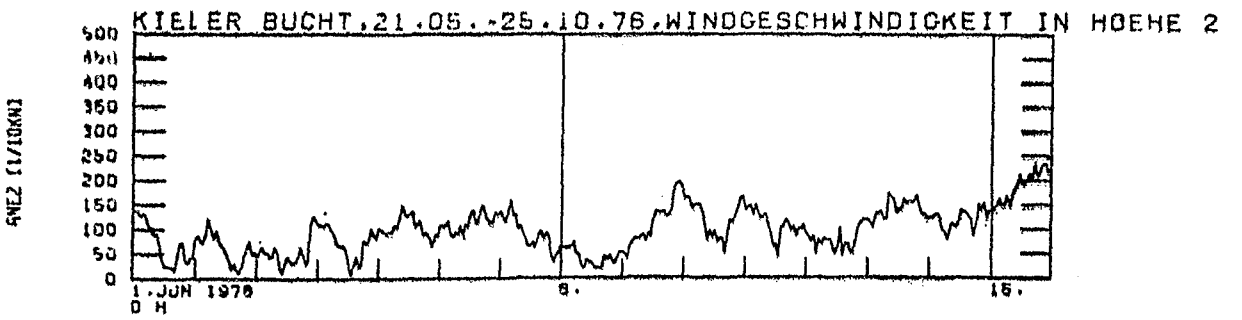
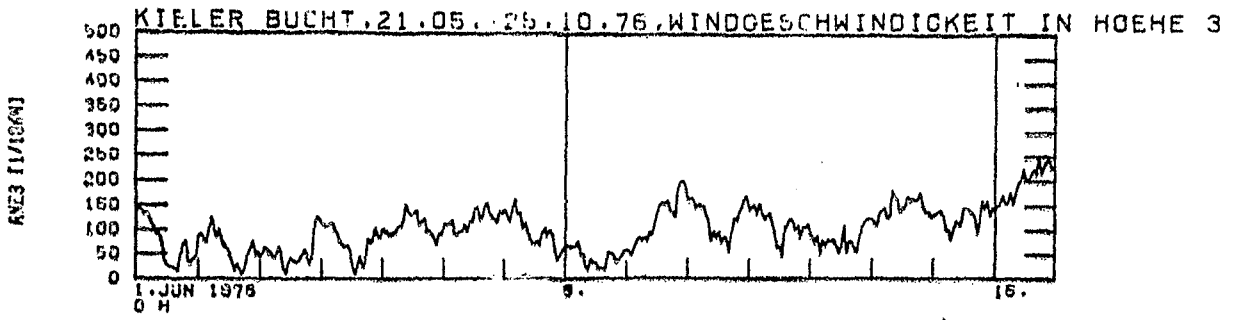
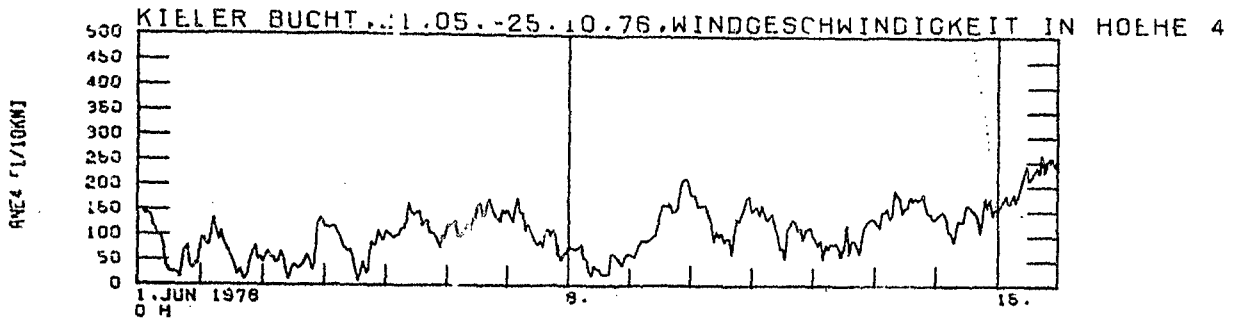


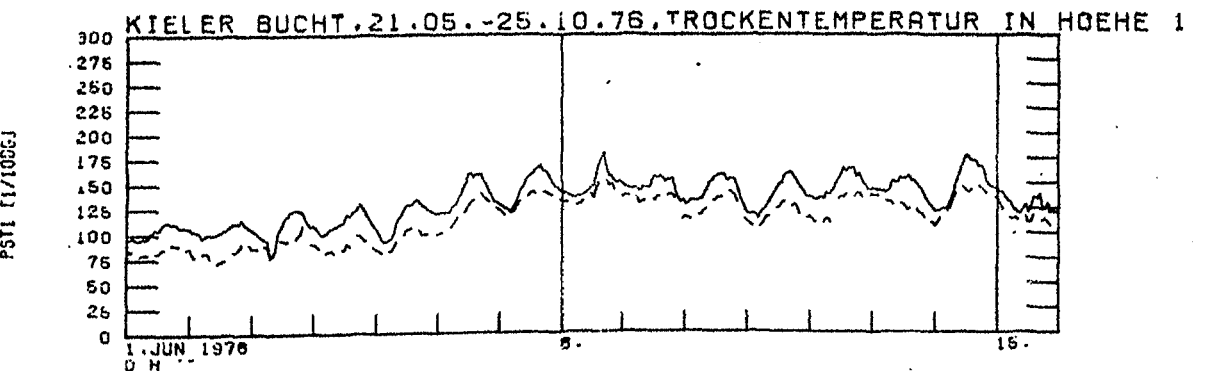
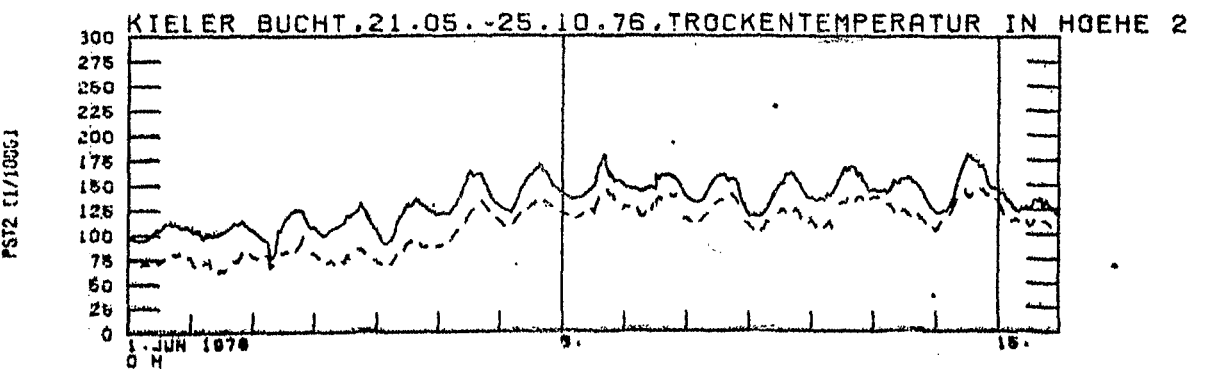
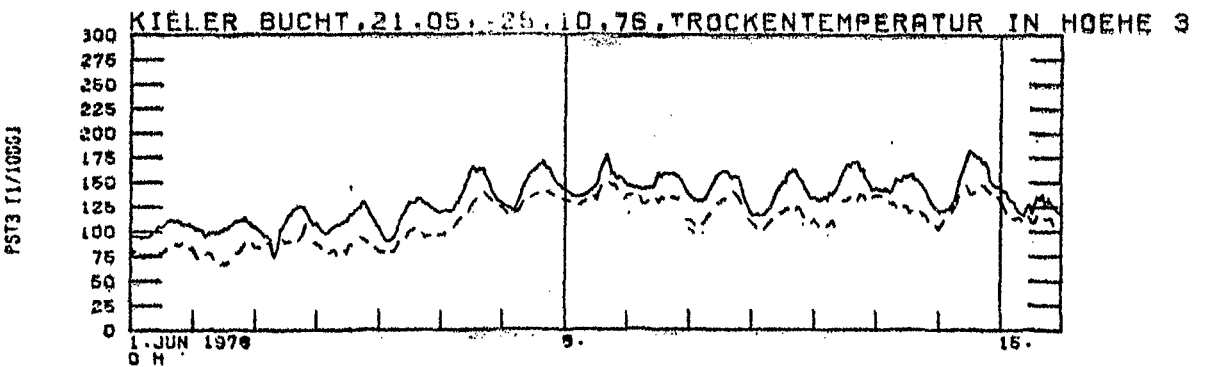
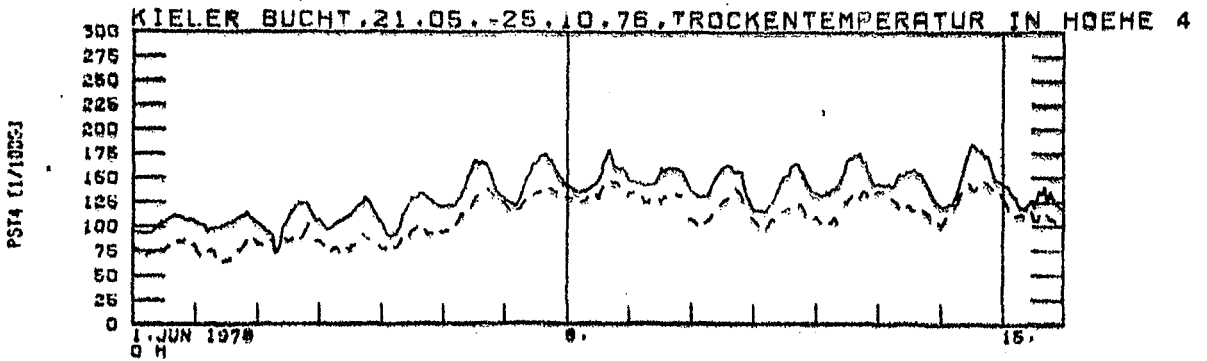
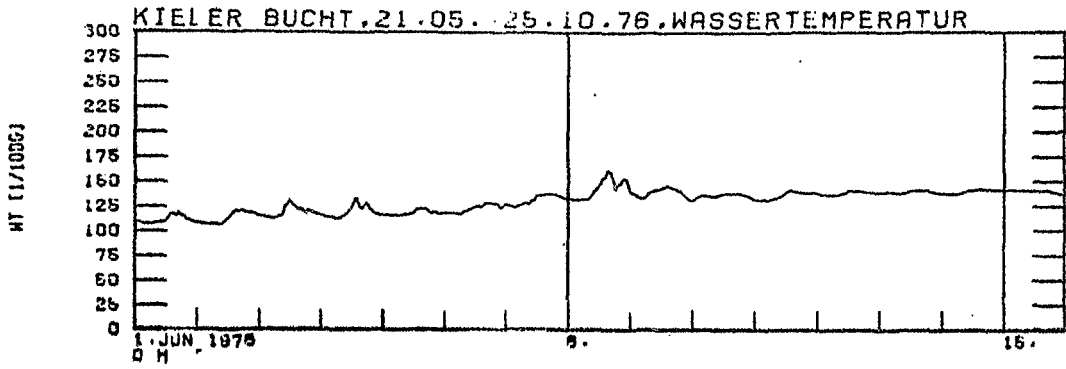
PST2 [1/1000]

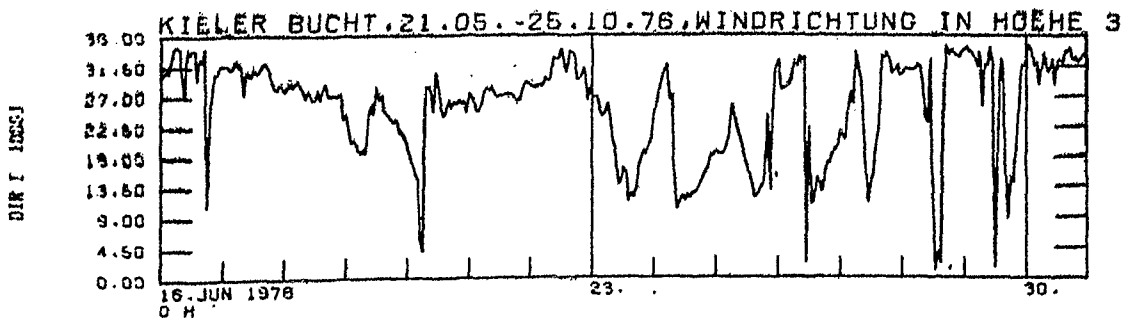
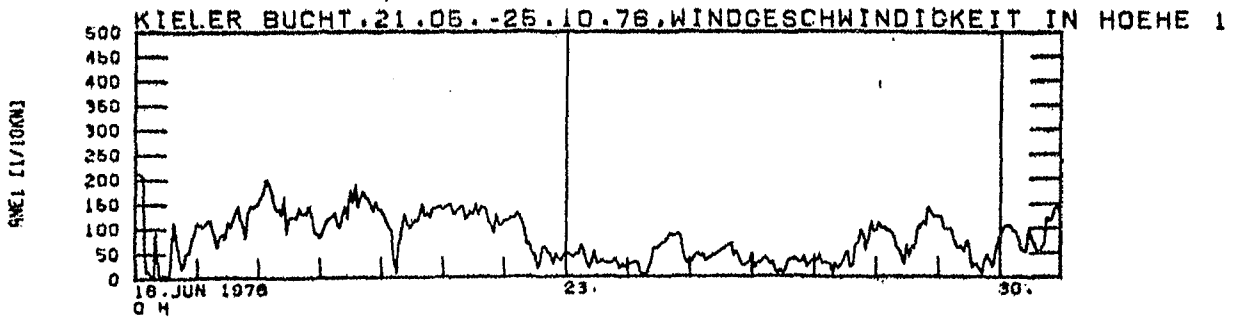
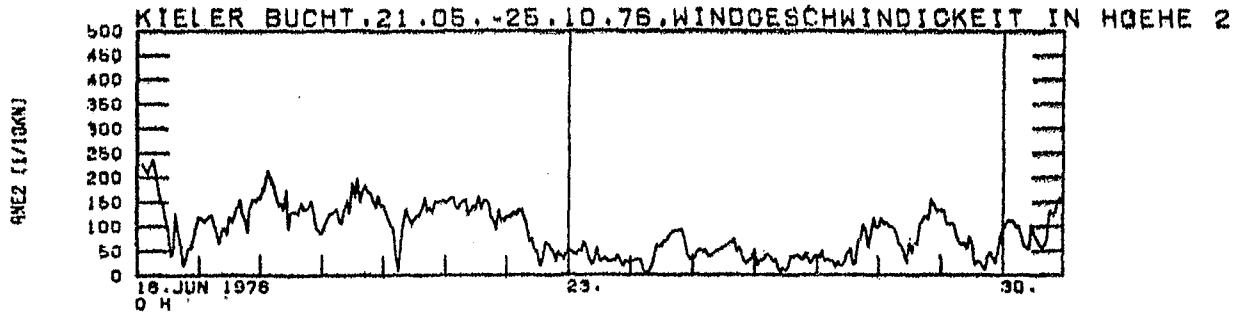
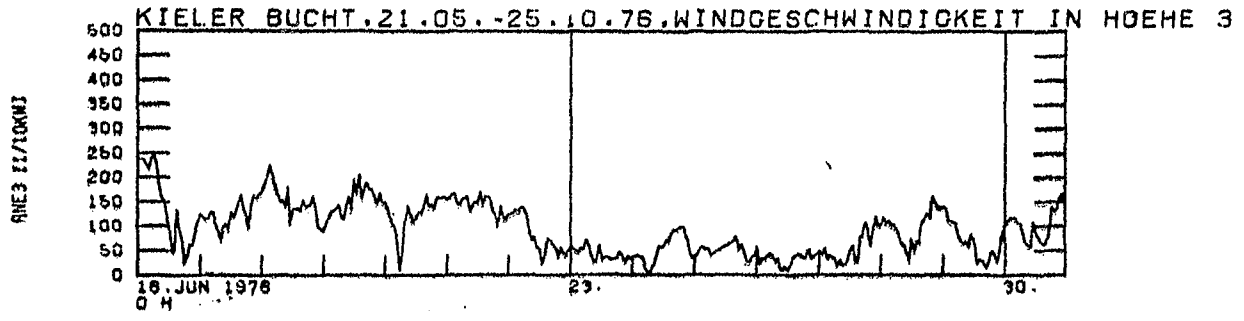
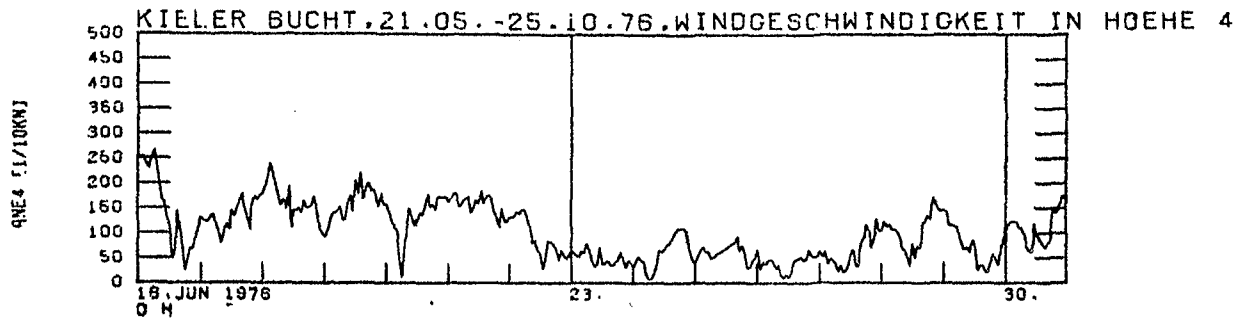


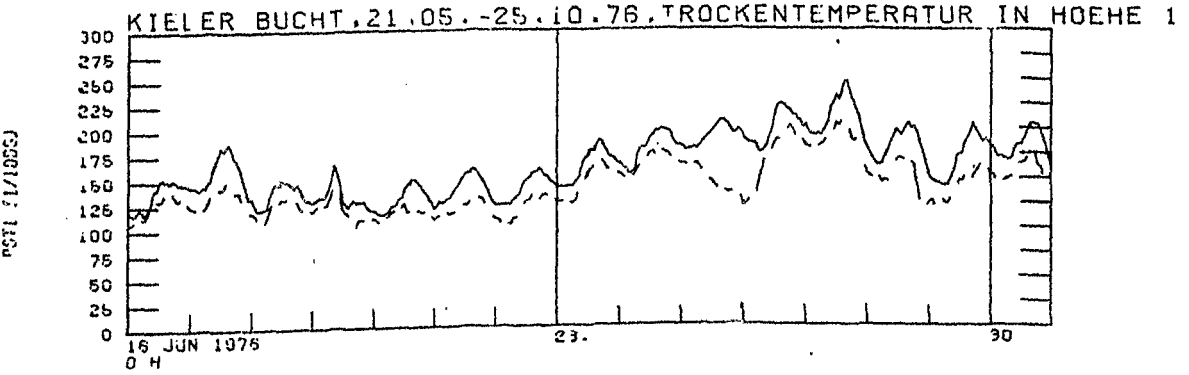
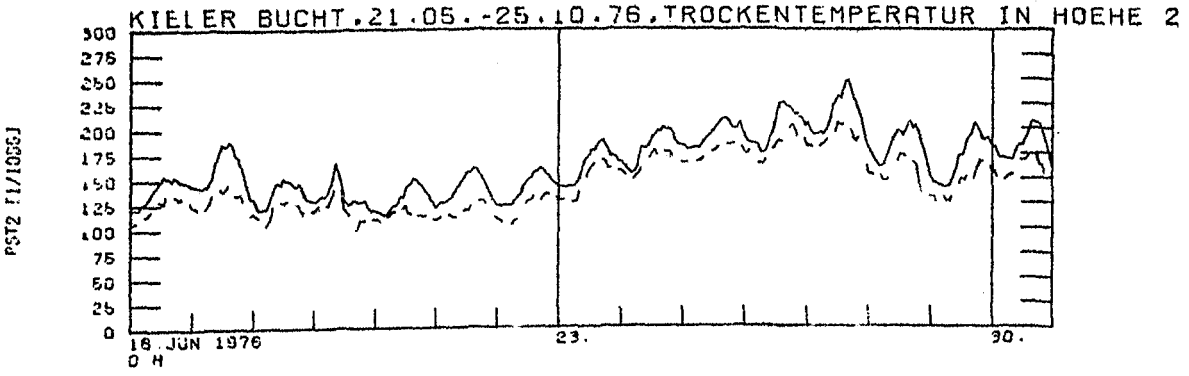
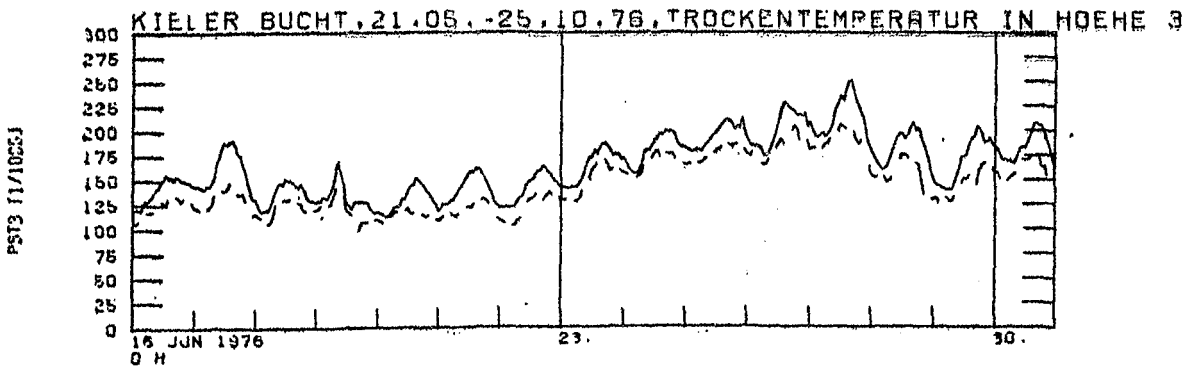
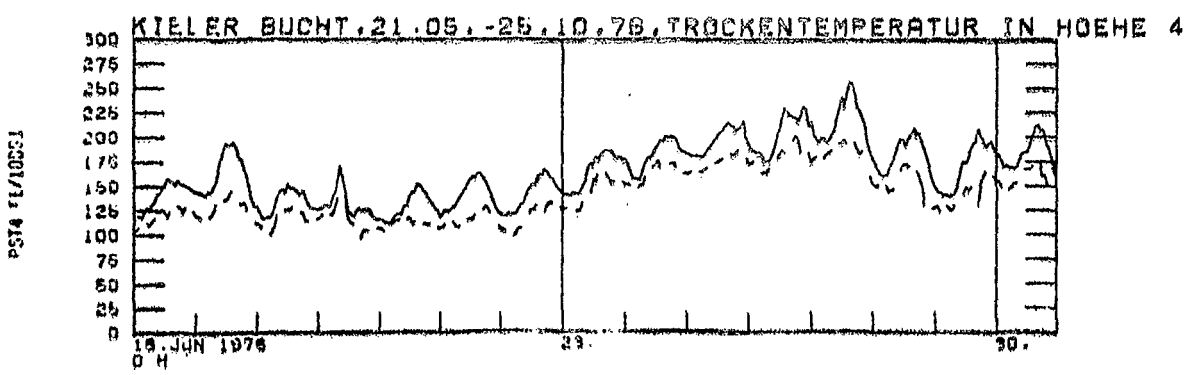
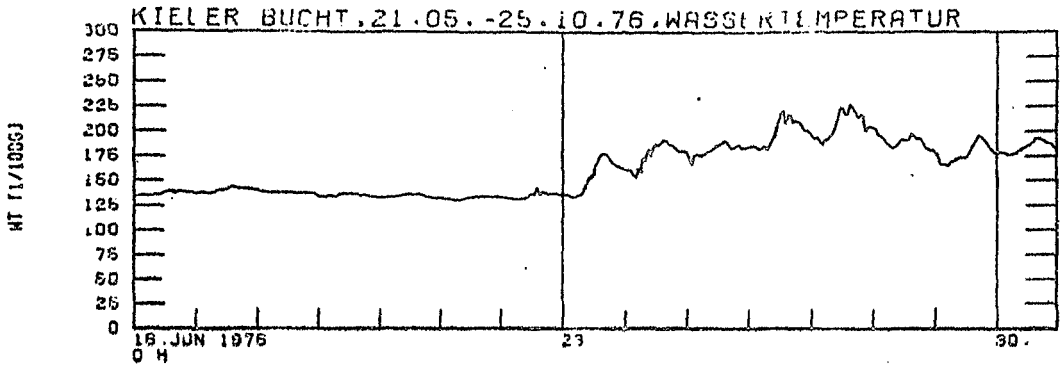
PST1 [1/1000]

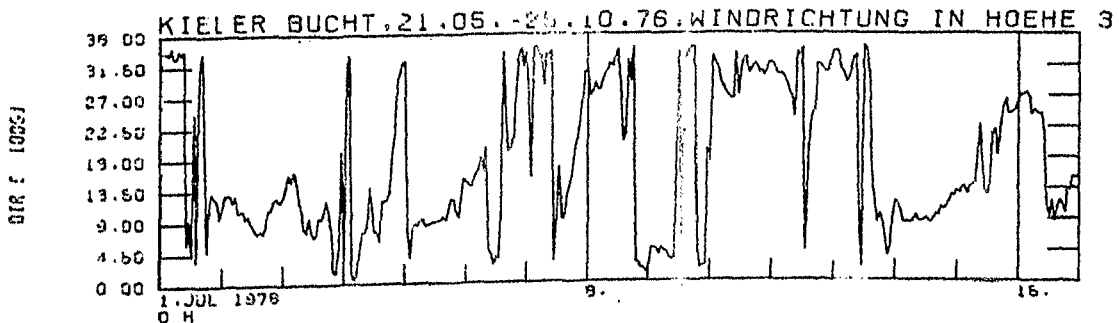
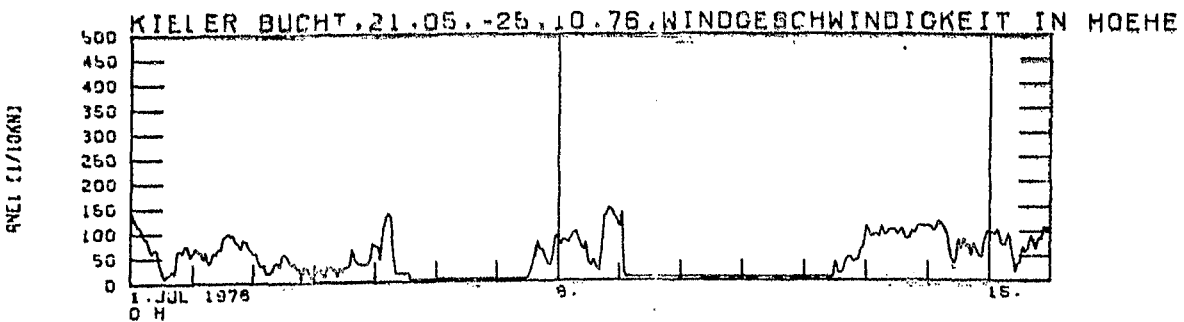
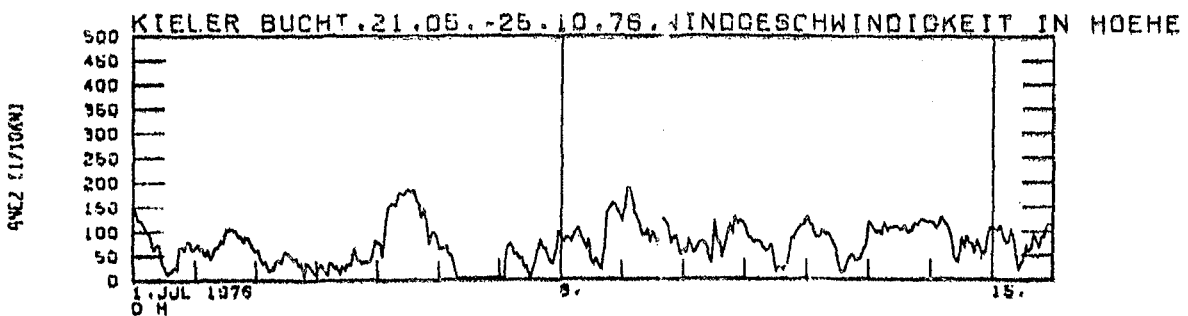
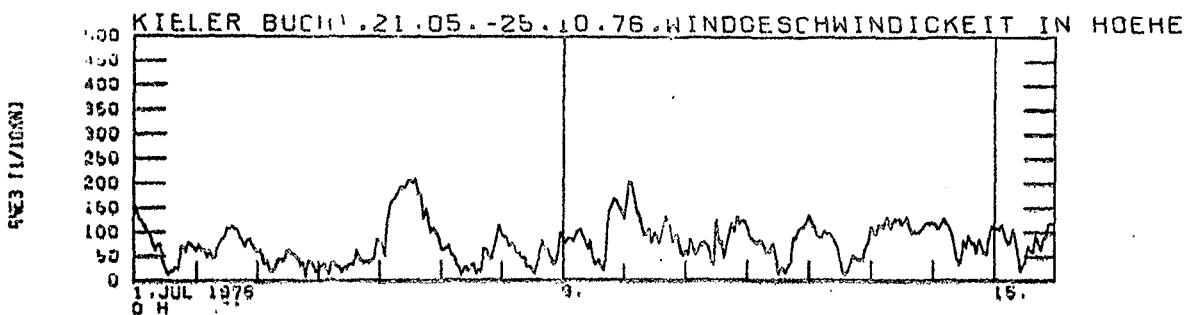
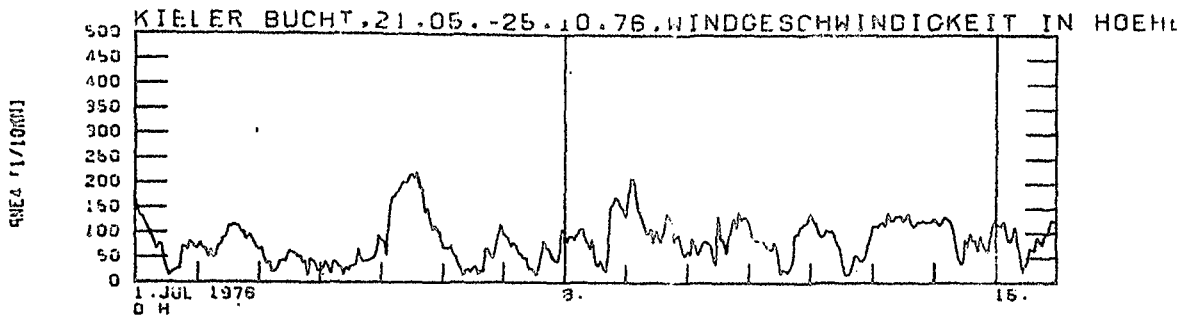




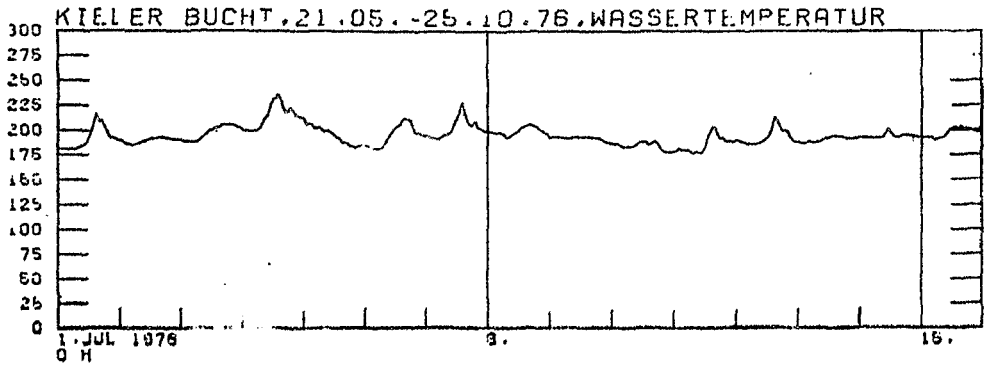




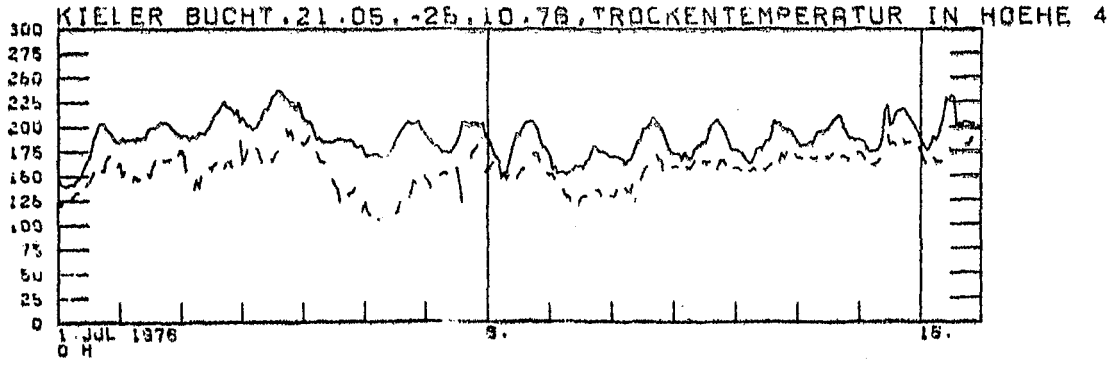




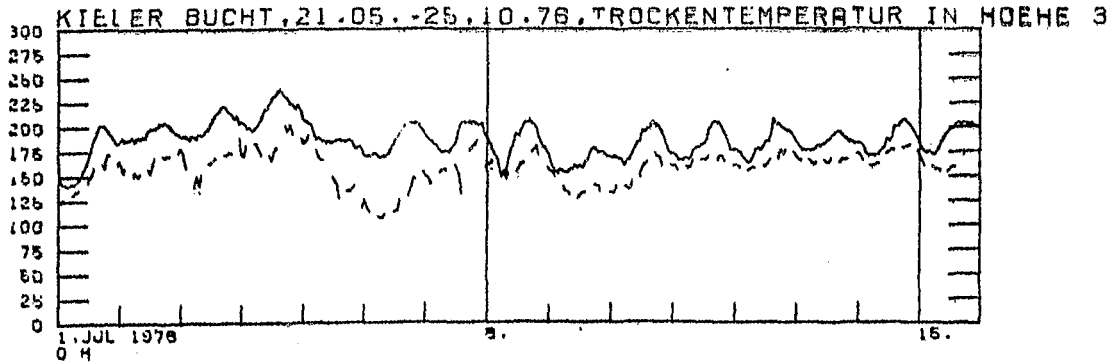
NT 1/1053



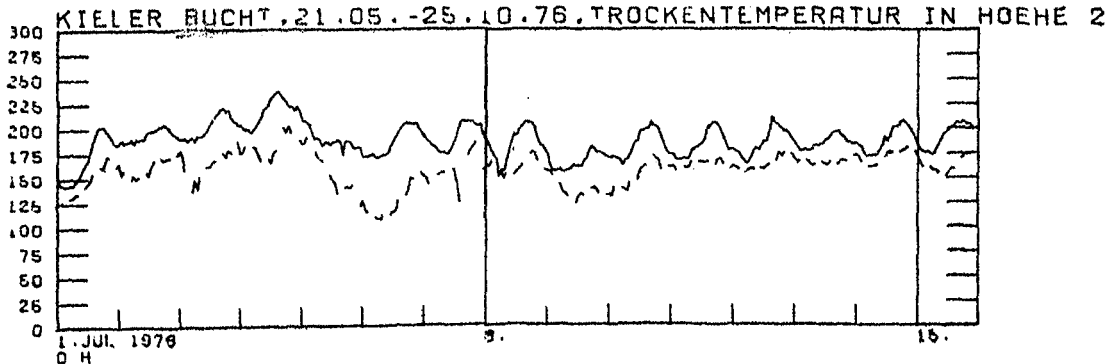
PST4 1/1053



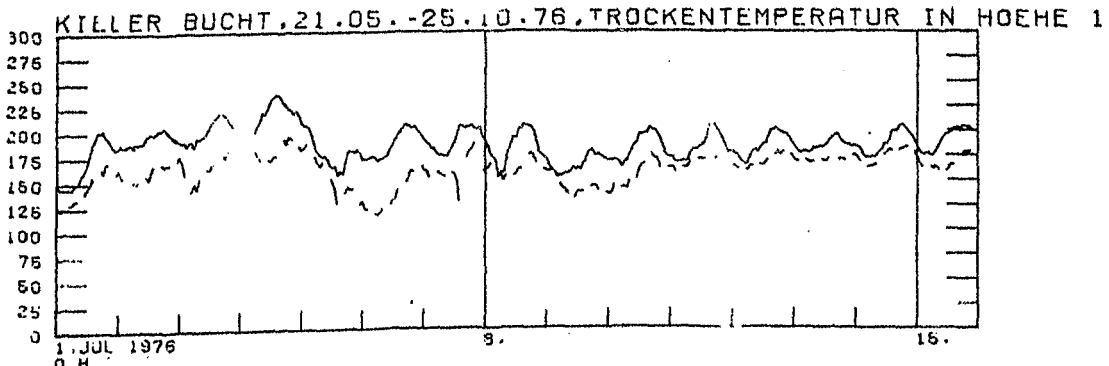
PST3 1/1053

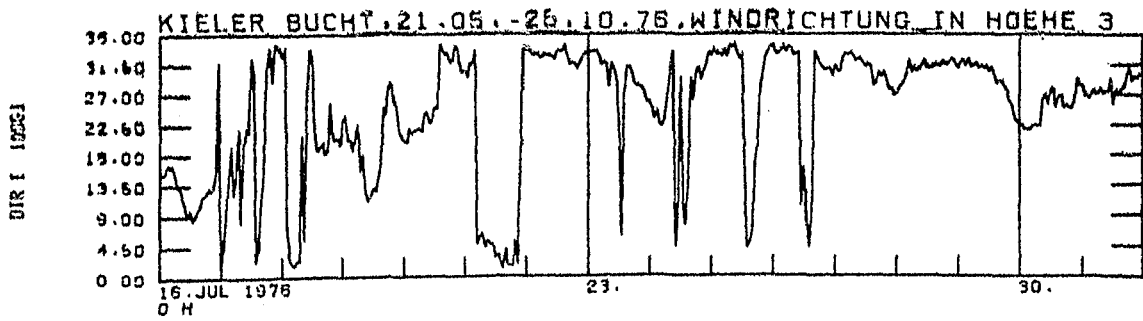
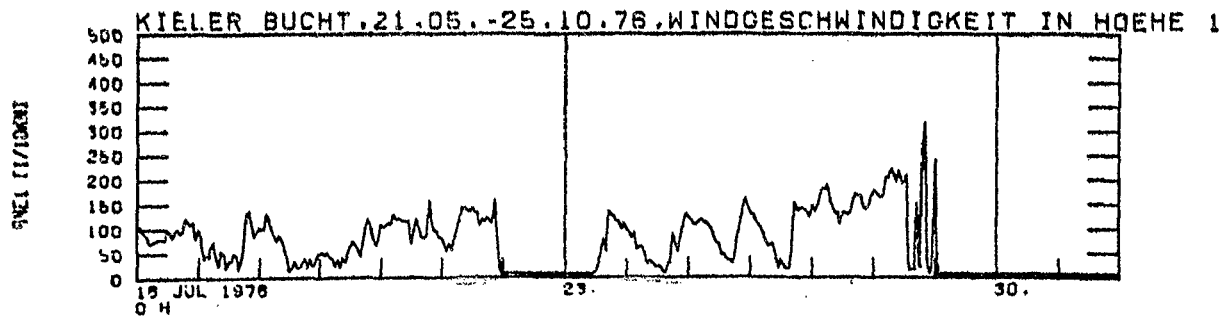
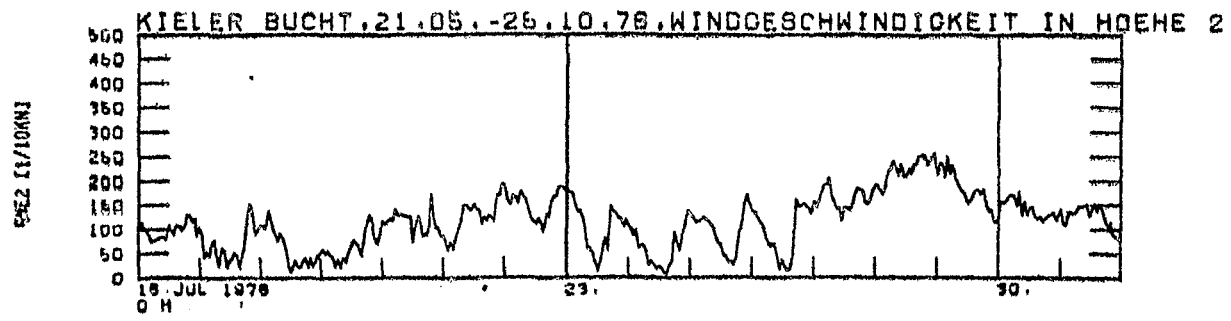
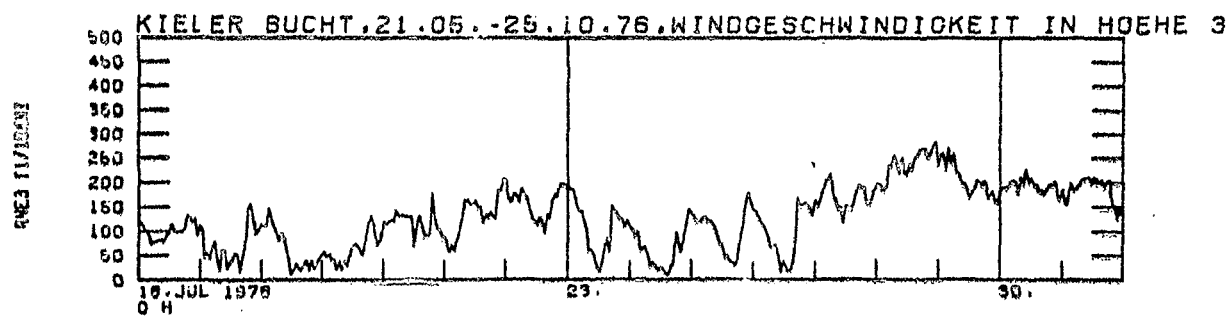
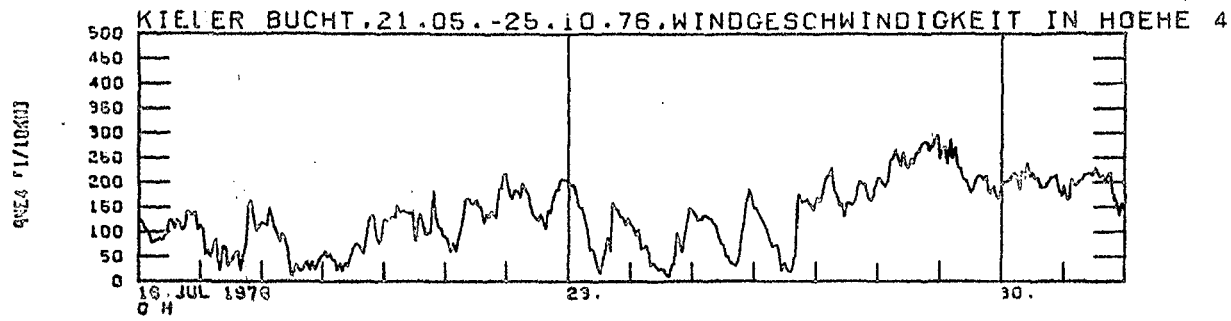


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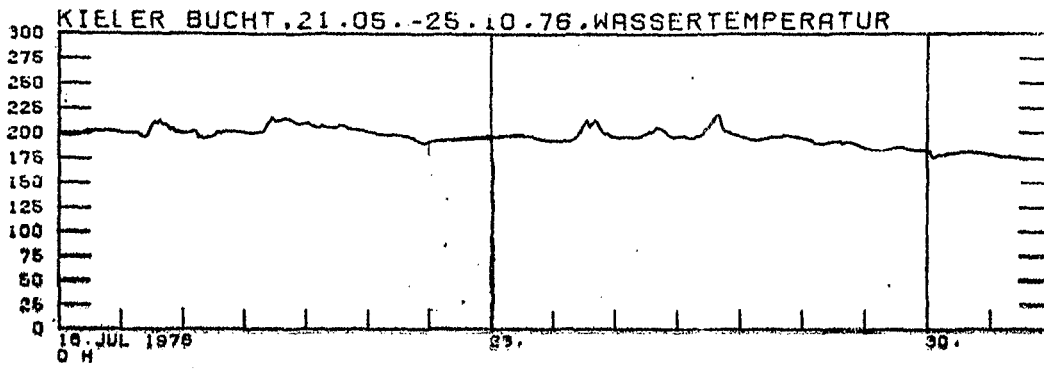


PST1 1/1053

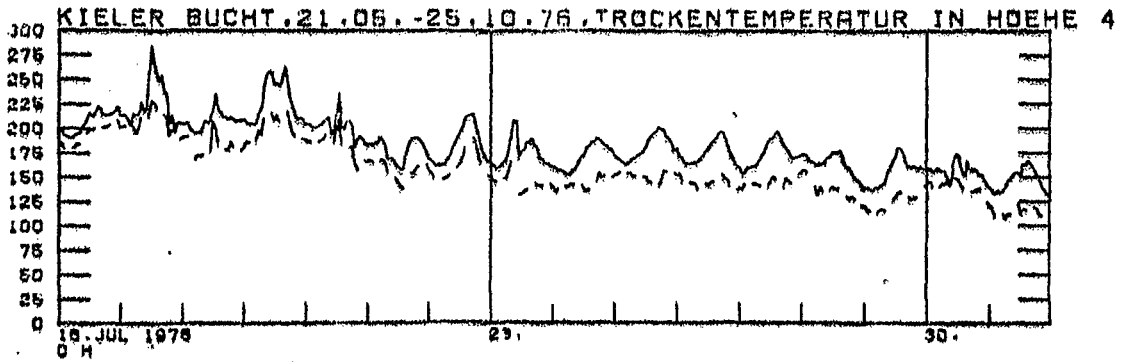




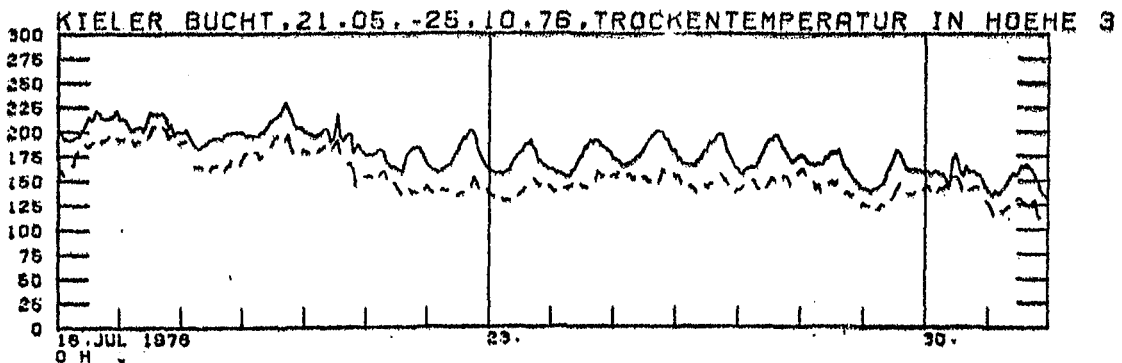
MT [1/100G]



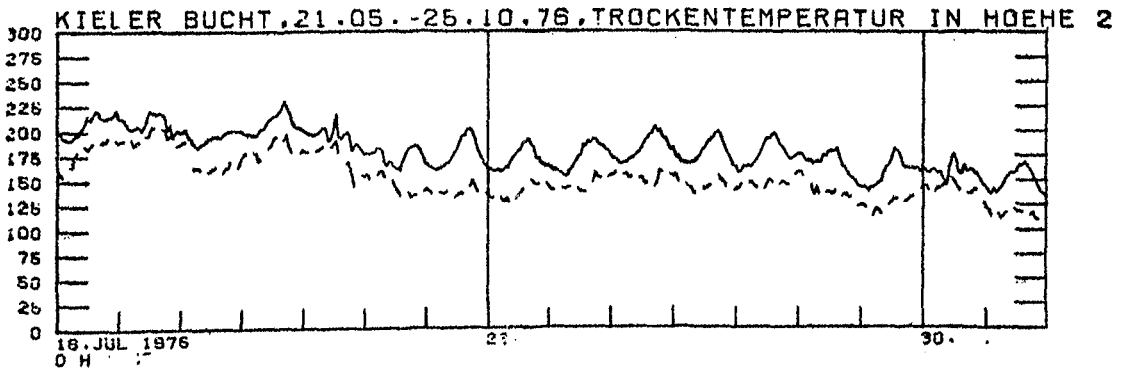
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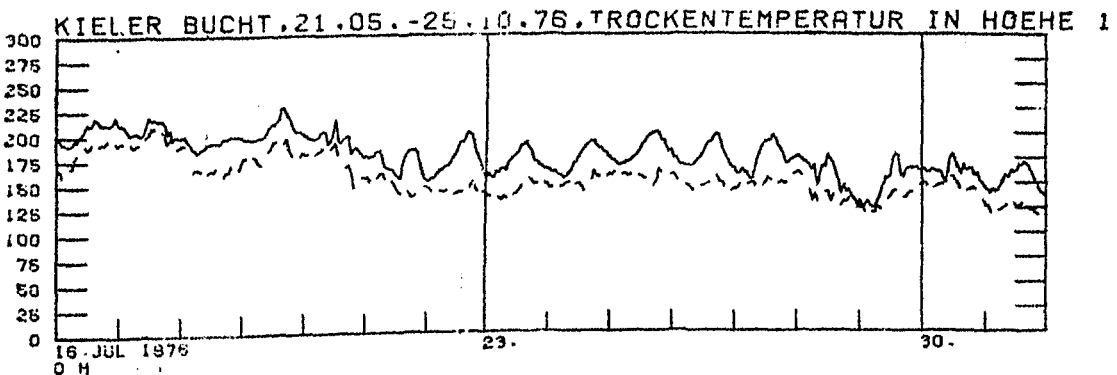
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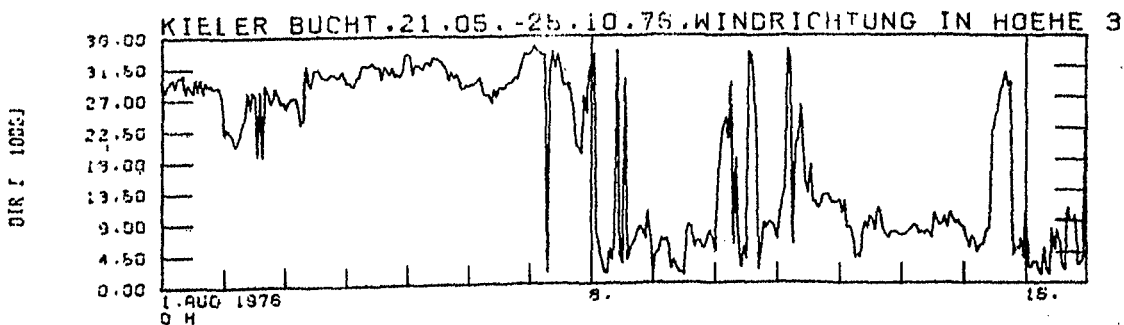
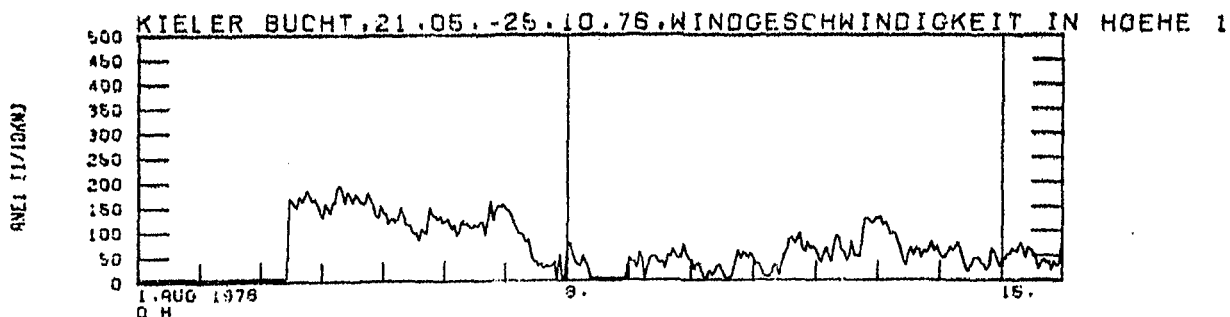
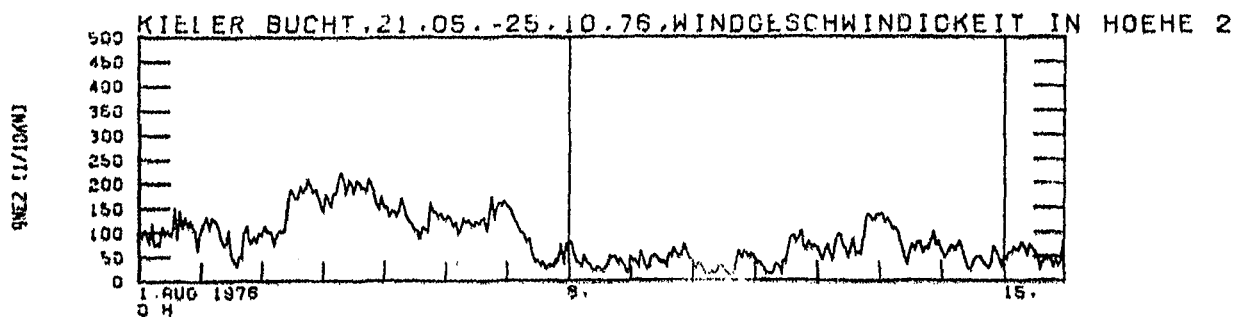
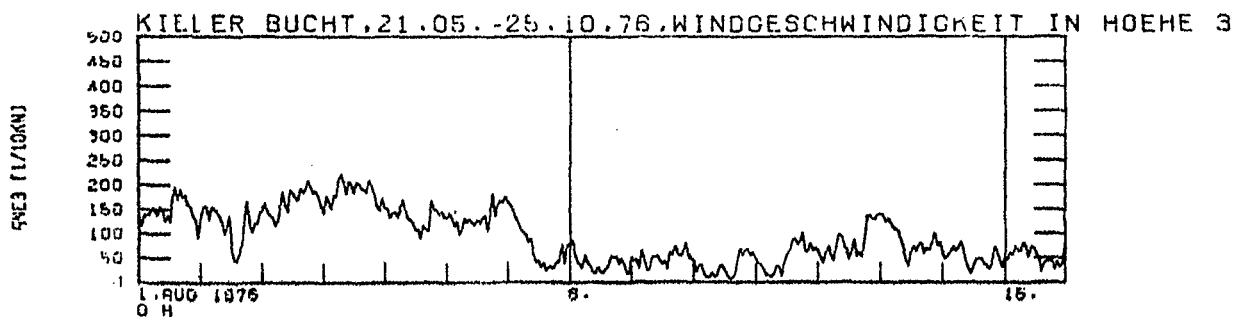
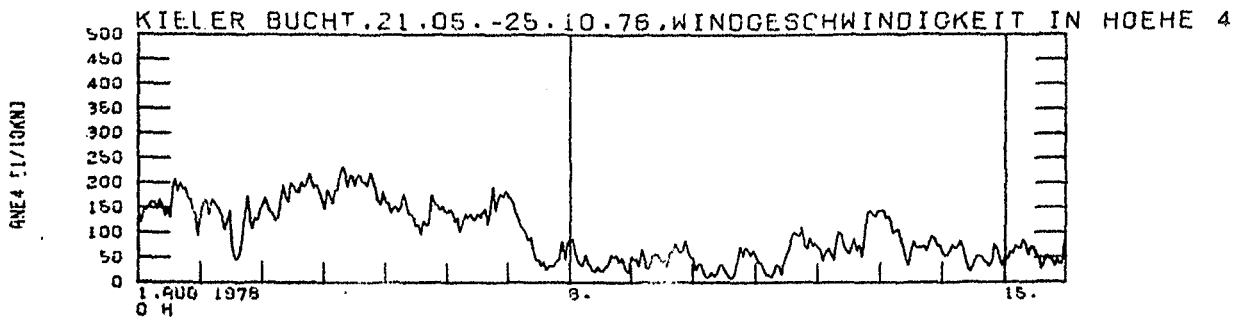


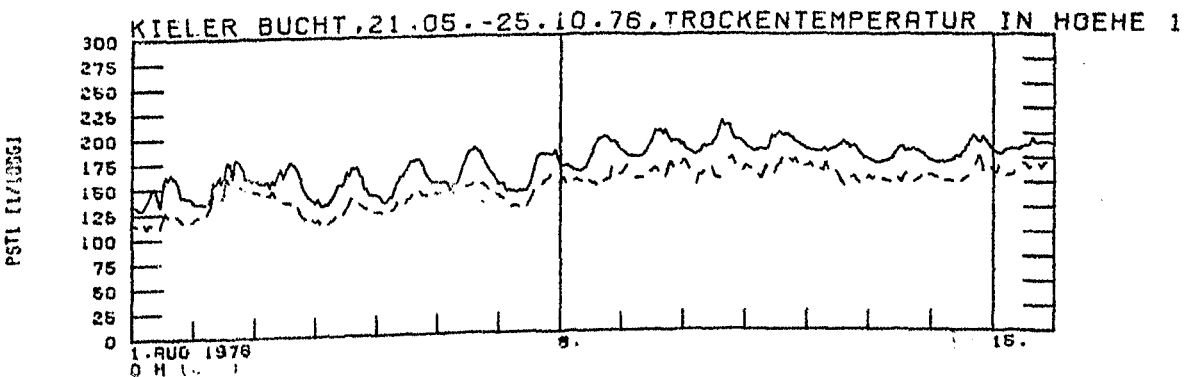
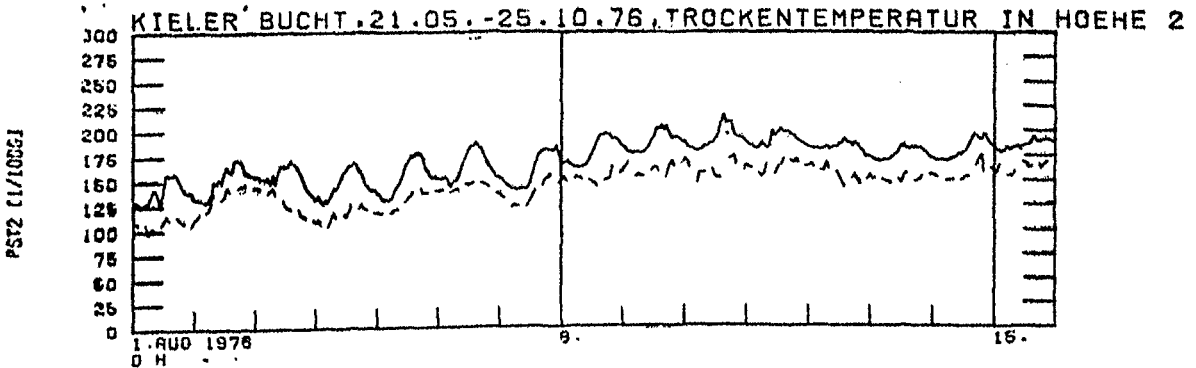
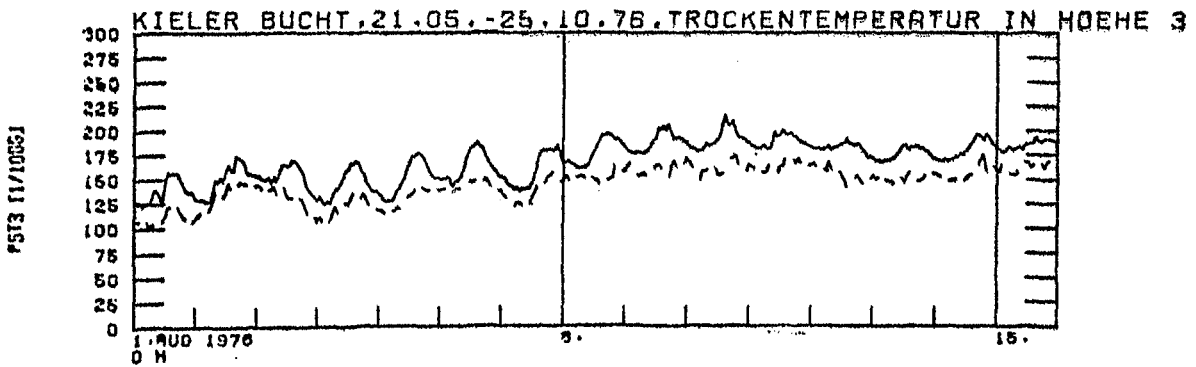
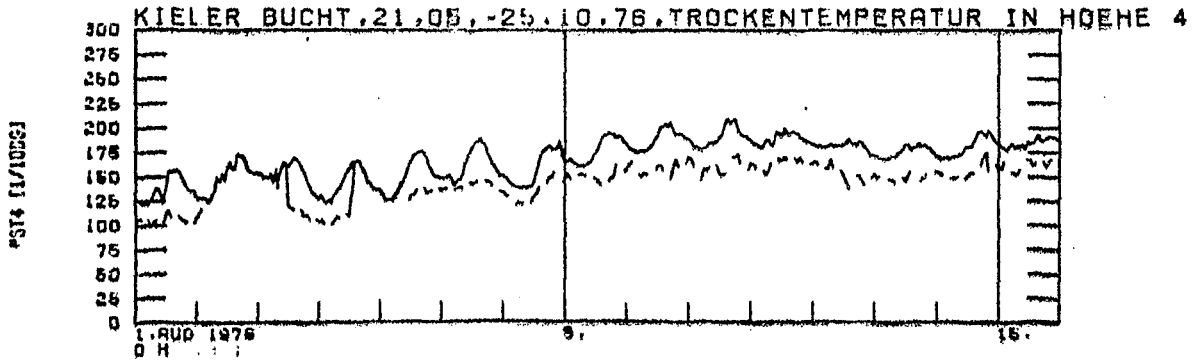
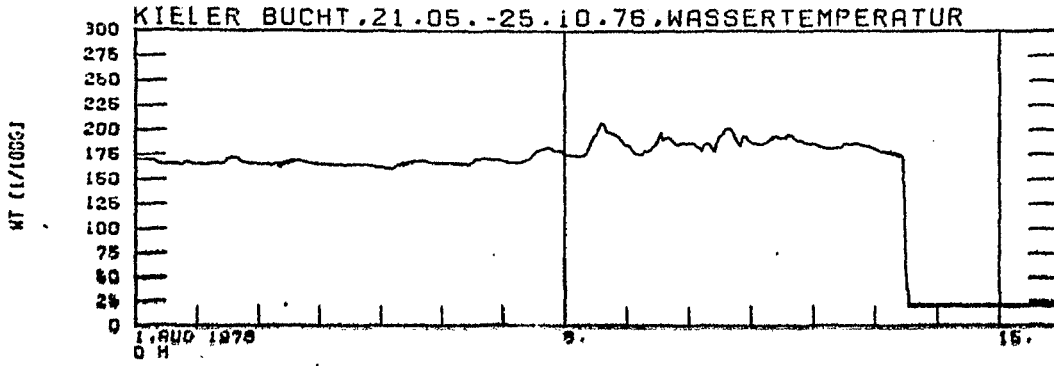
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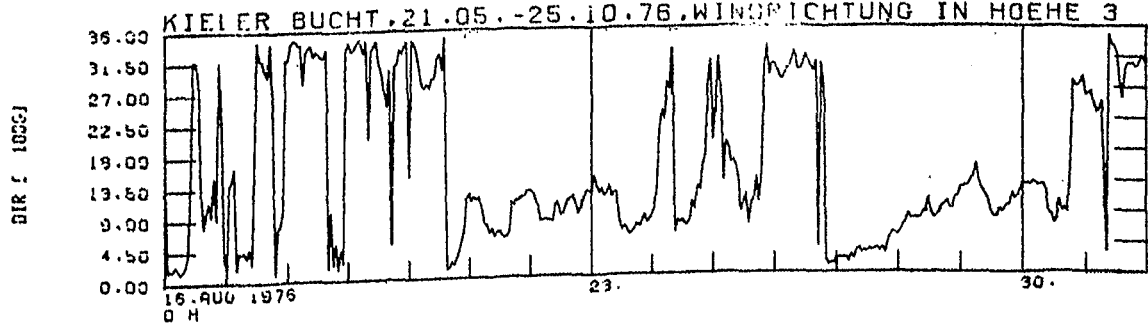
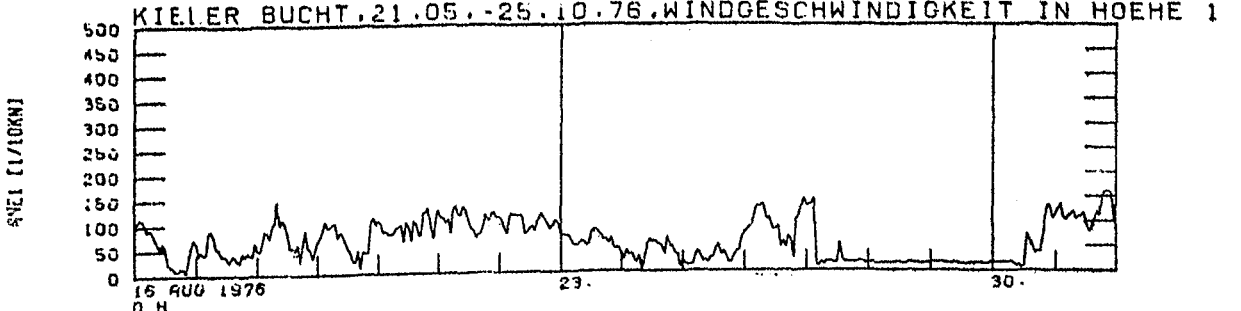
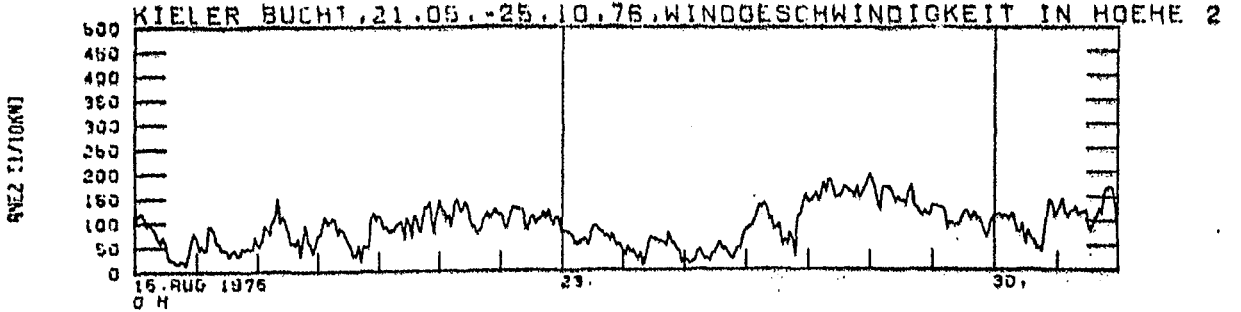
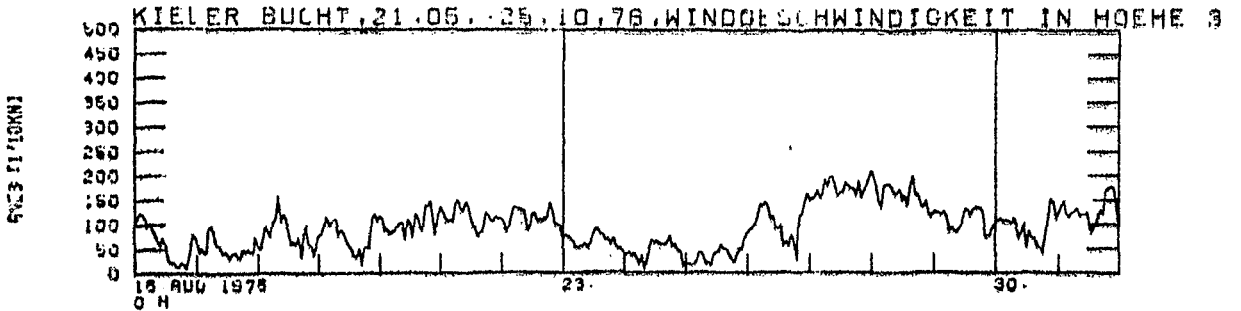
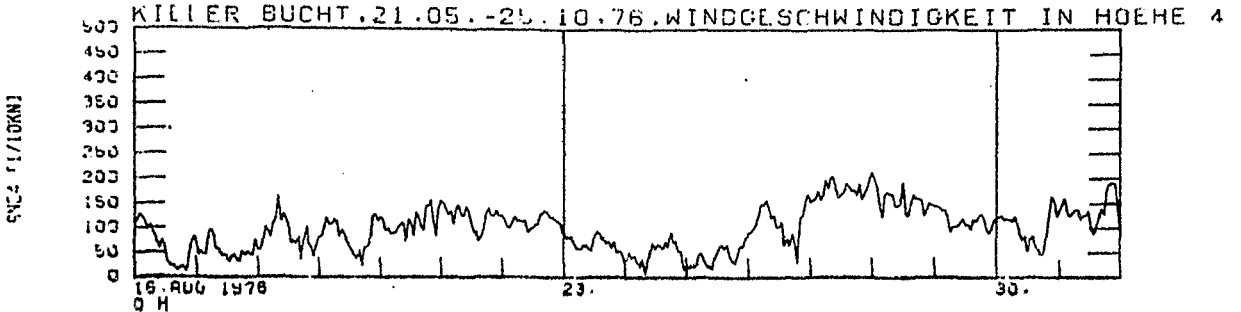


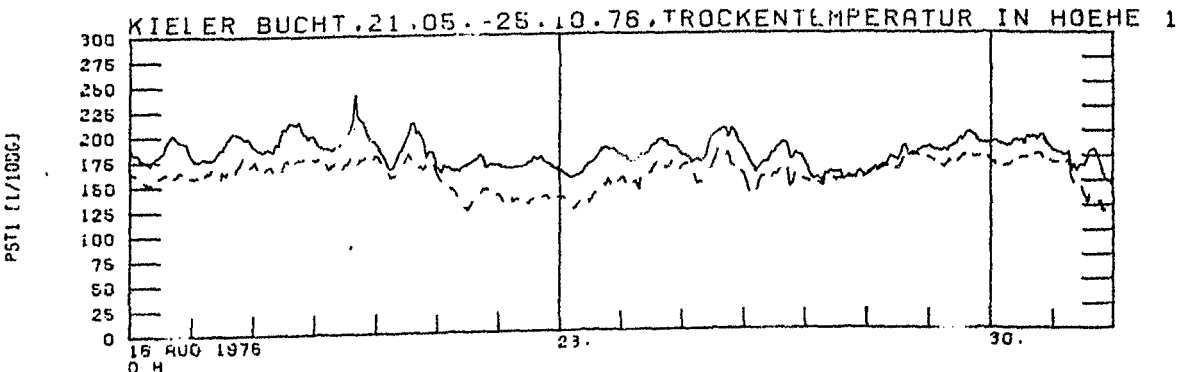
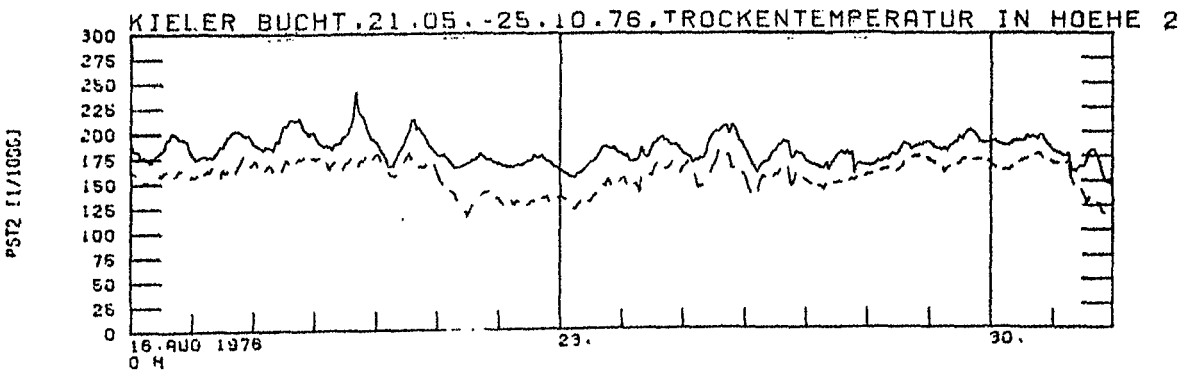
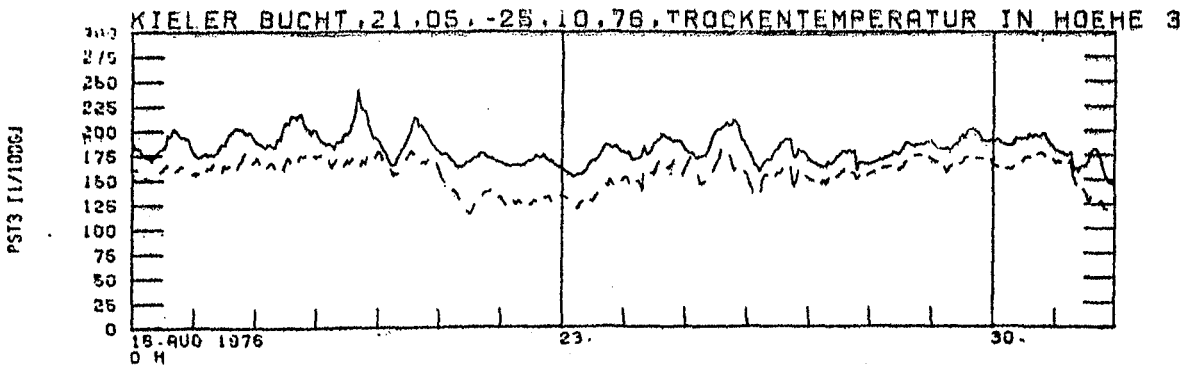
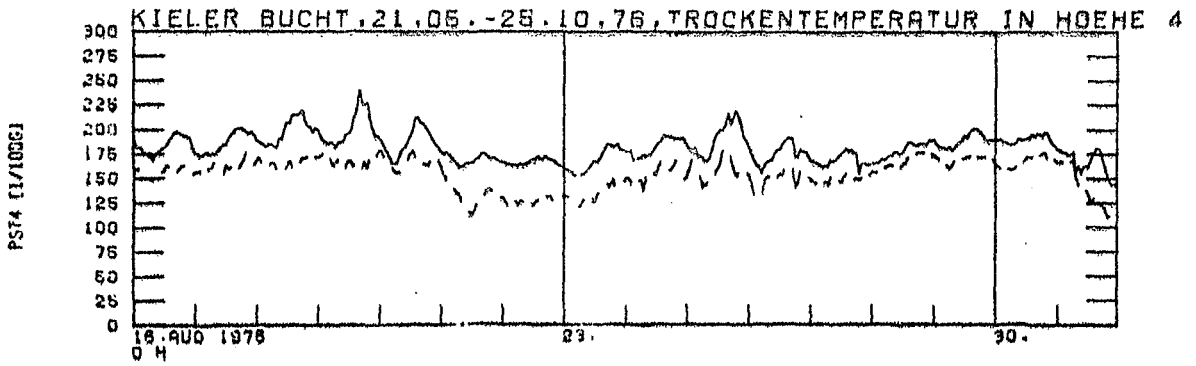
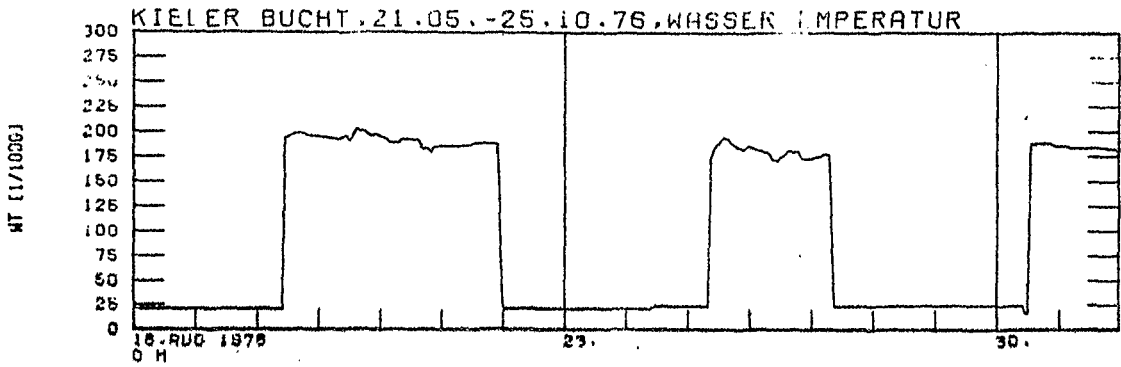
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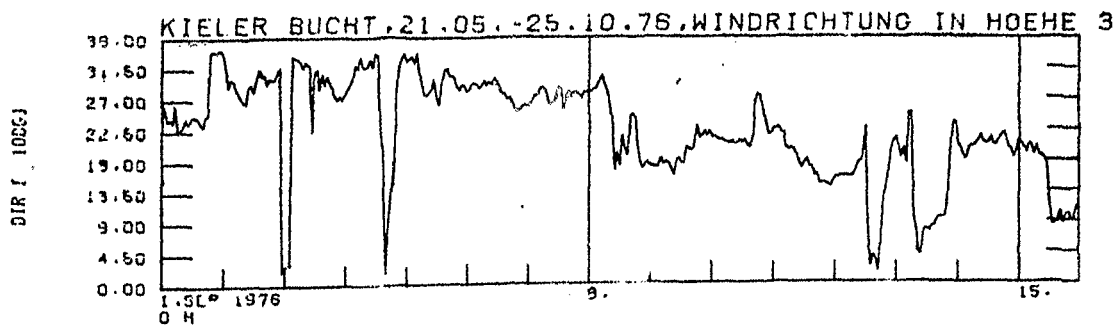
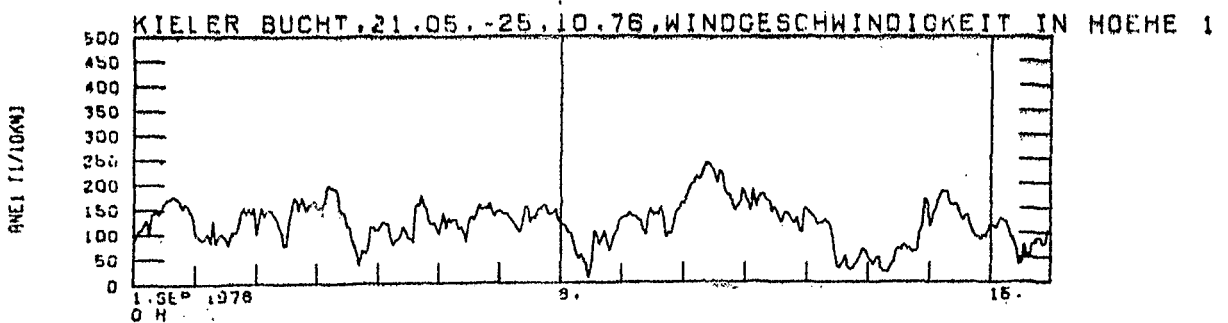
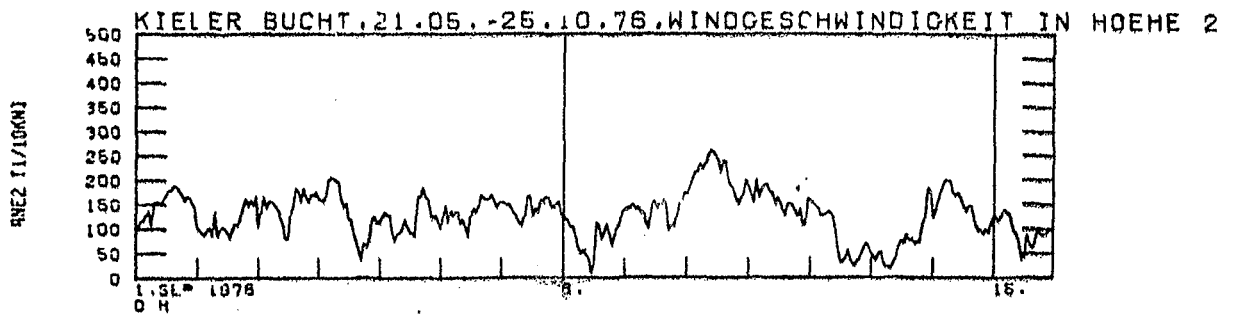
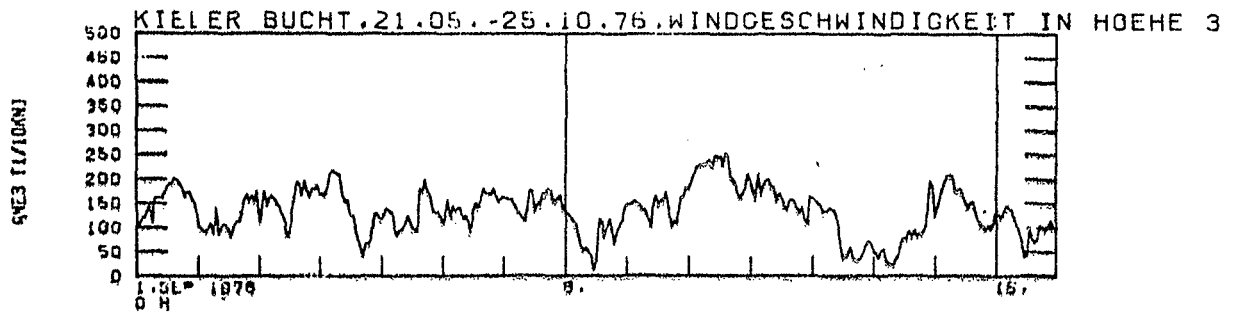
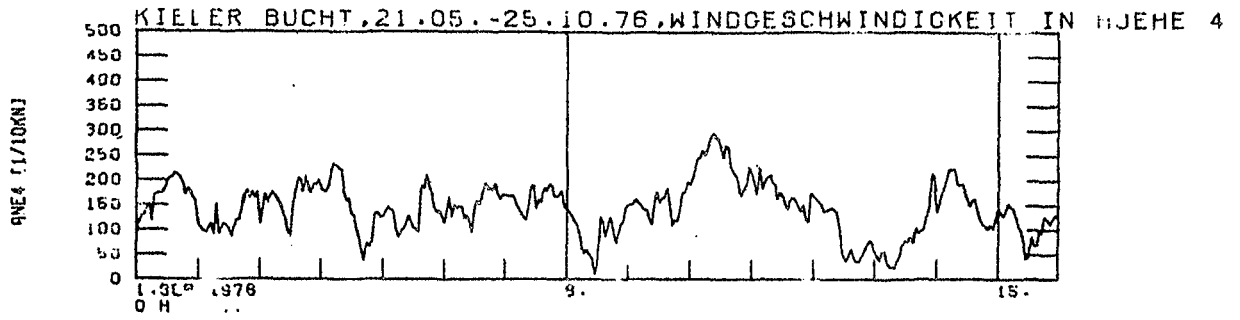




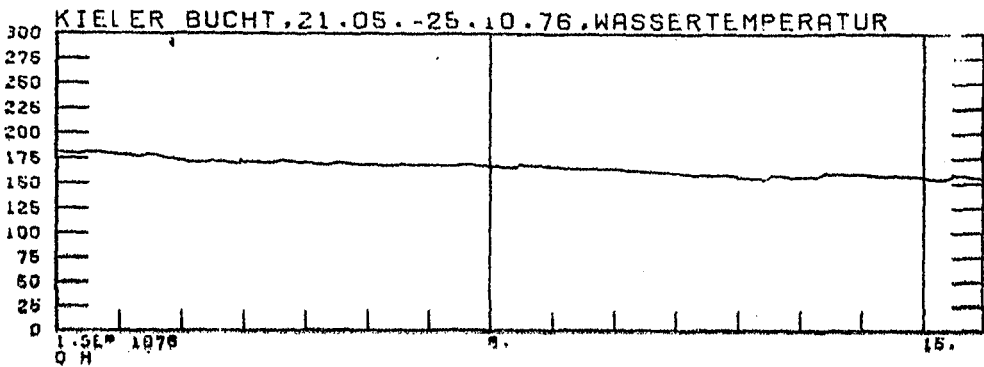




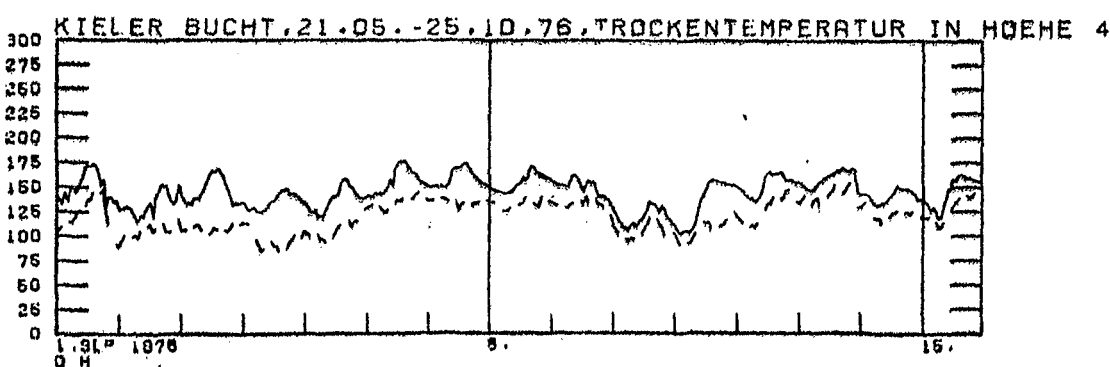




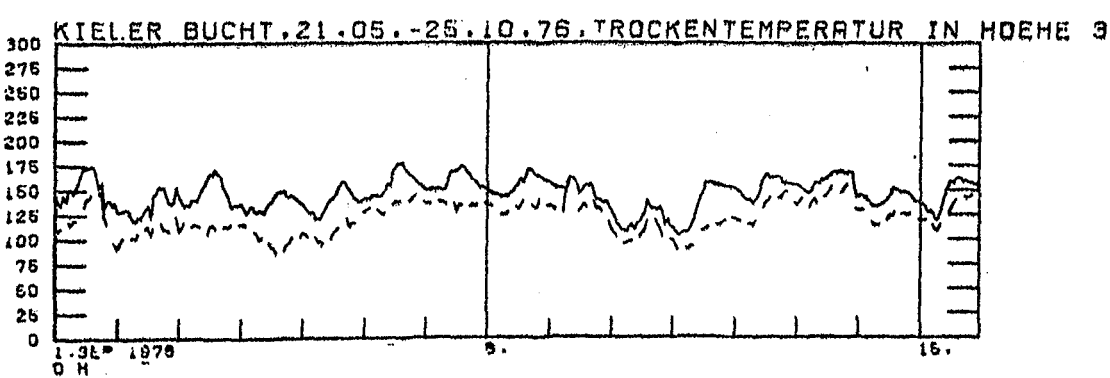
WT 11/106GJ



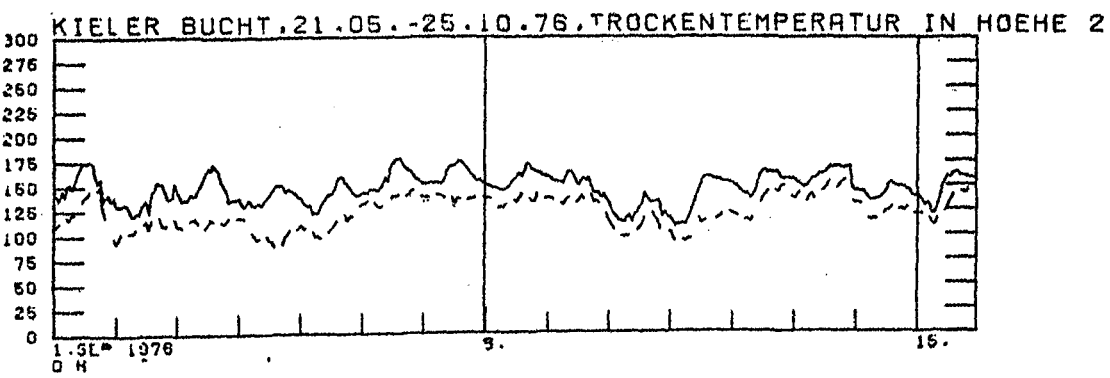
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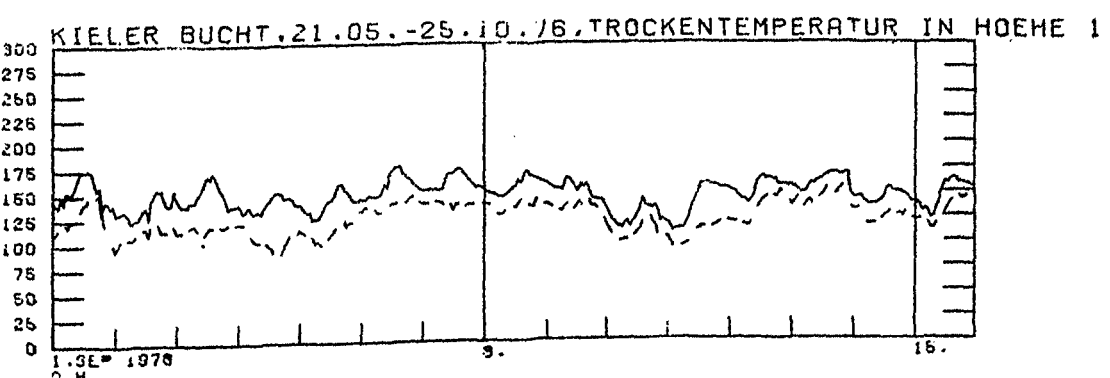
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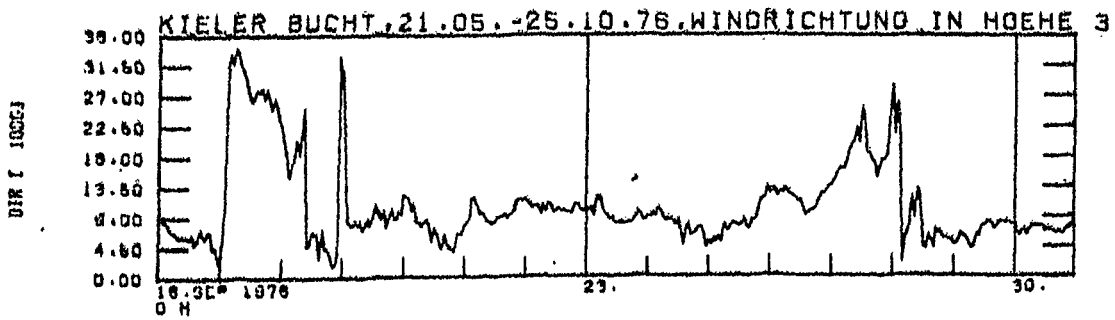
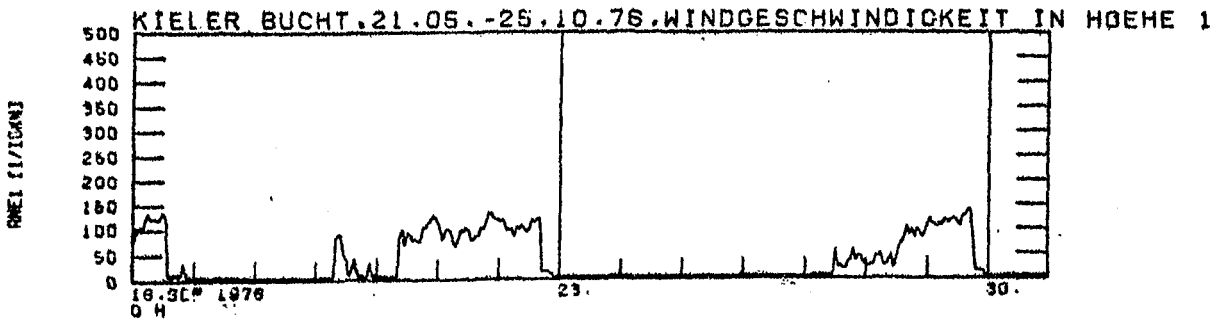
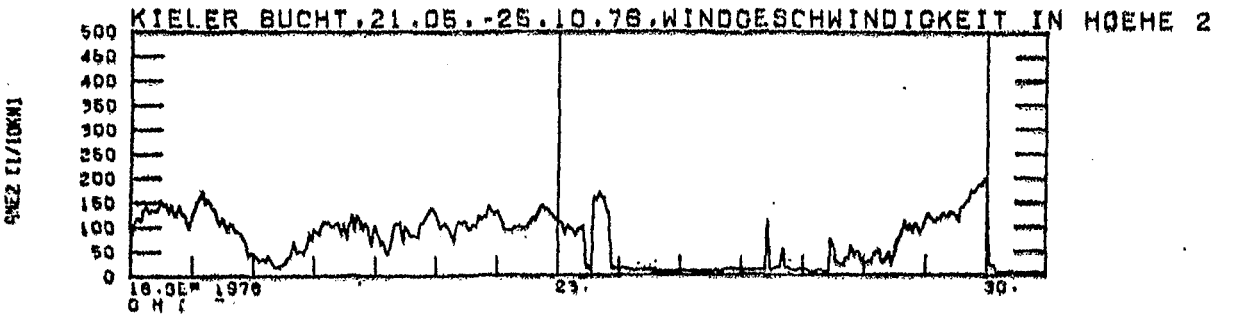
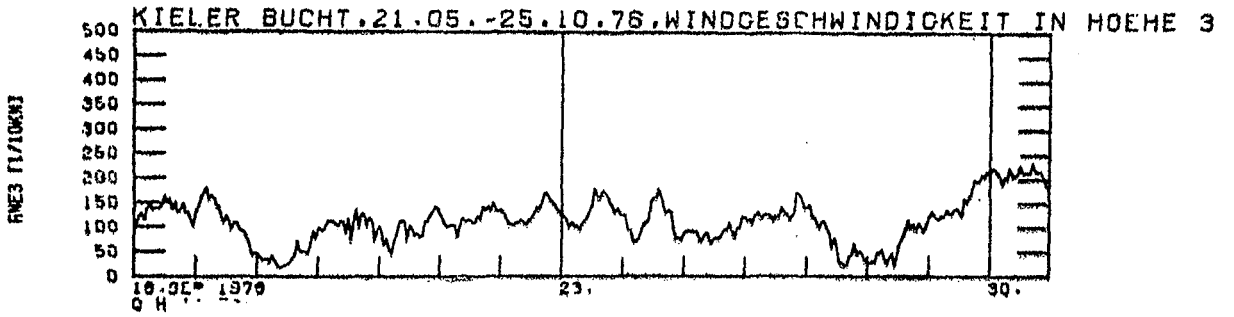
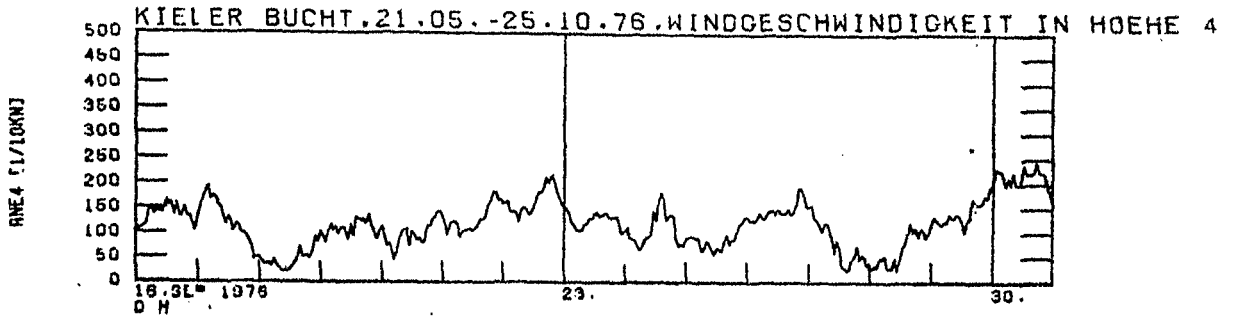


PST2 11/106GJ

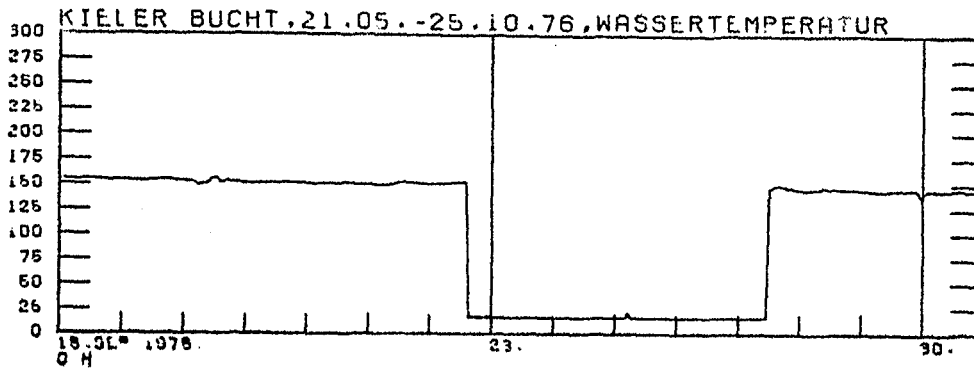


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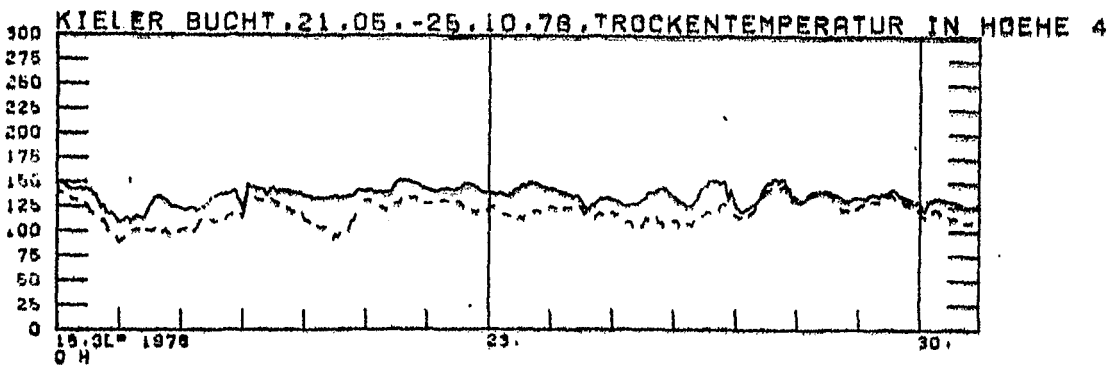




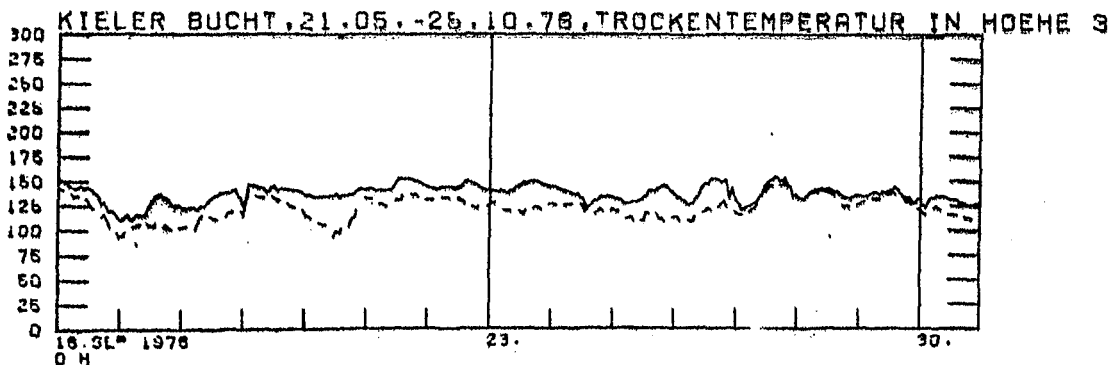
NT. 11/1066J



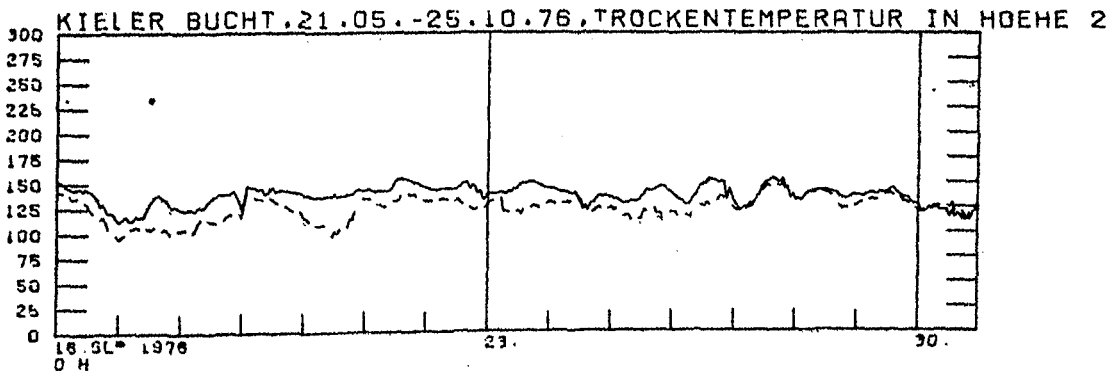
PST4 11/1066J



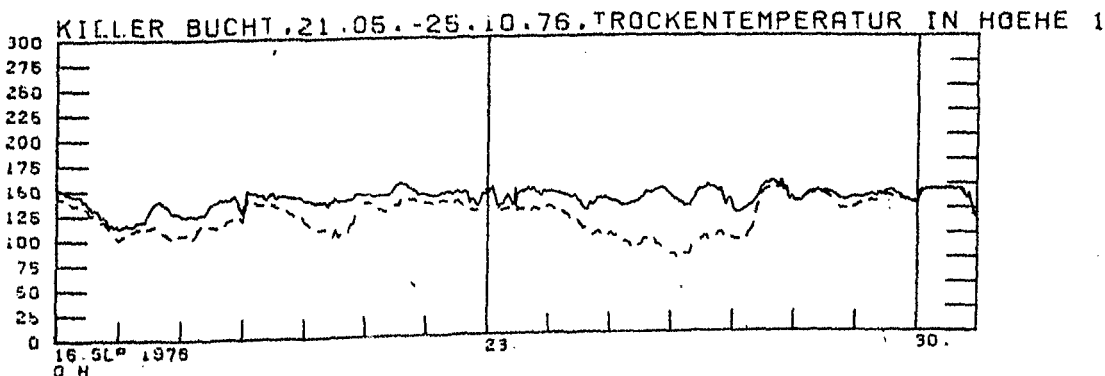
PST3 11/1066J

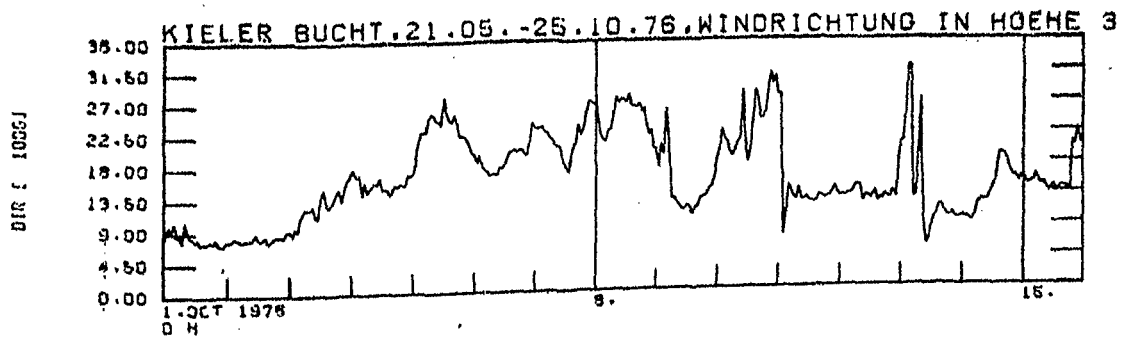
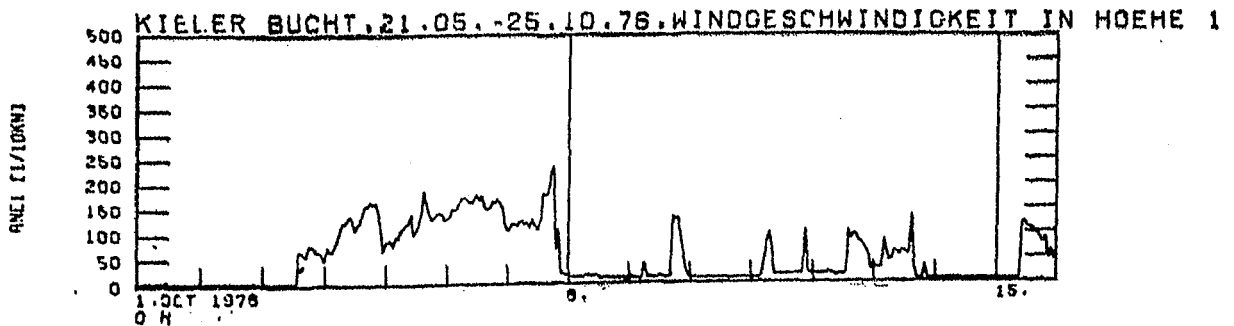
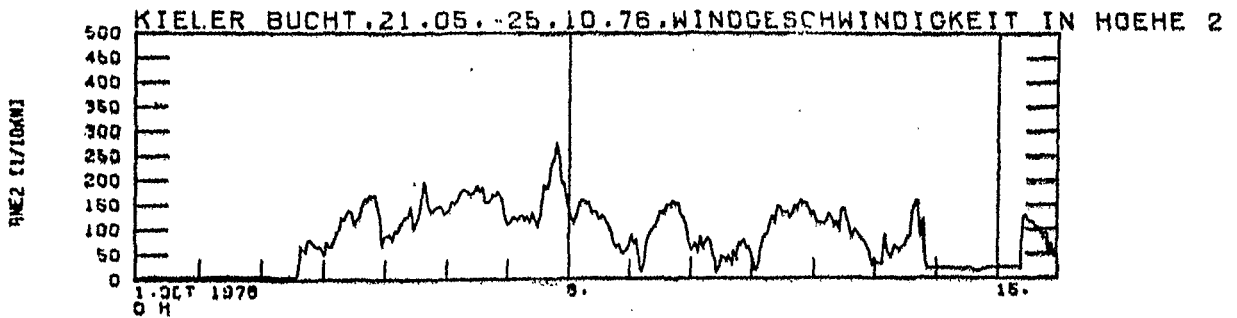
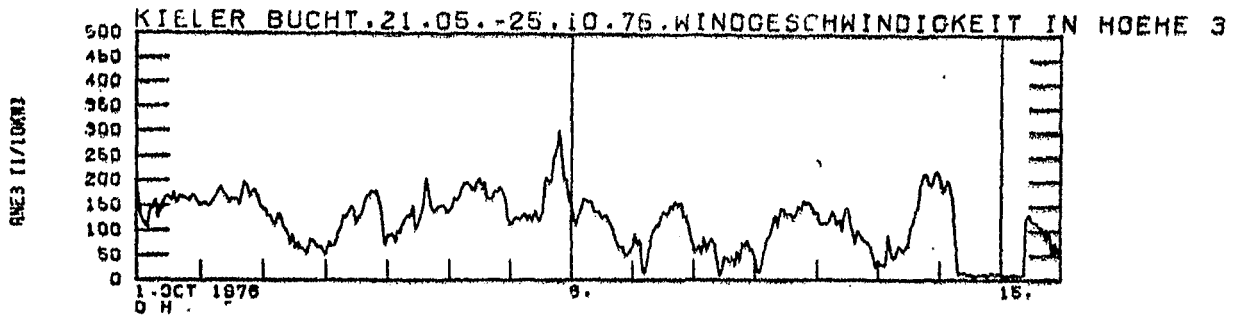
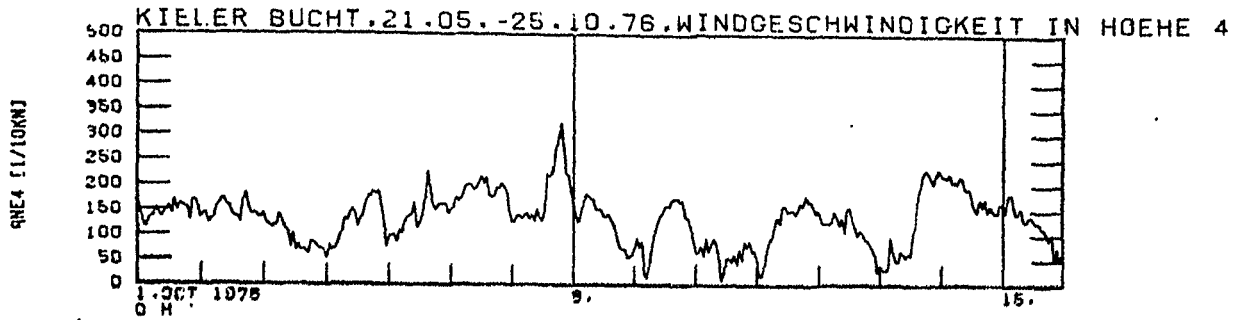


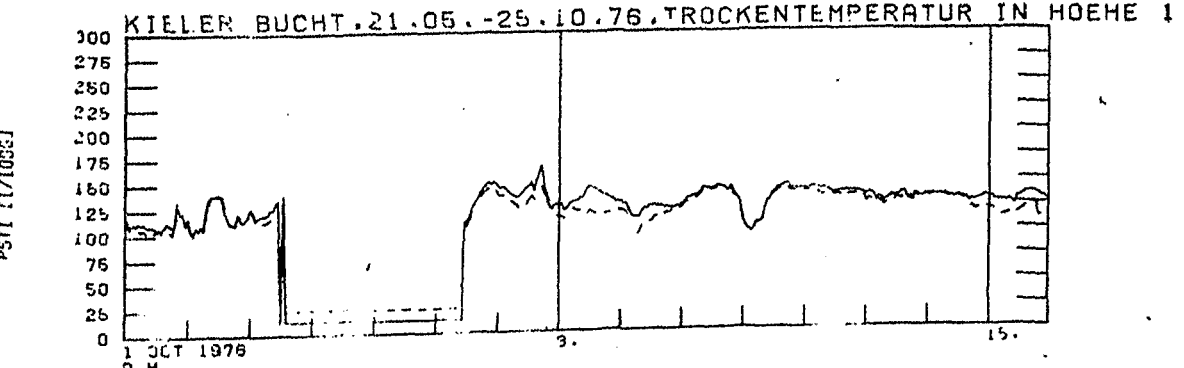
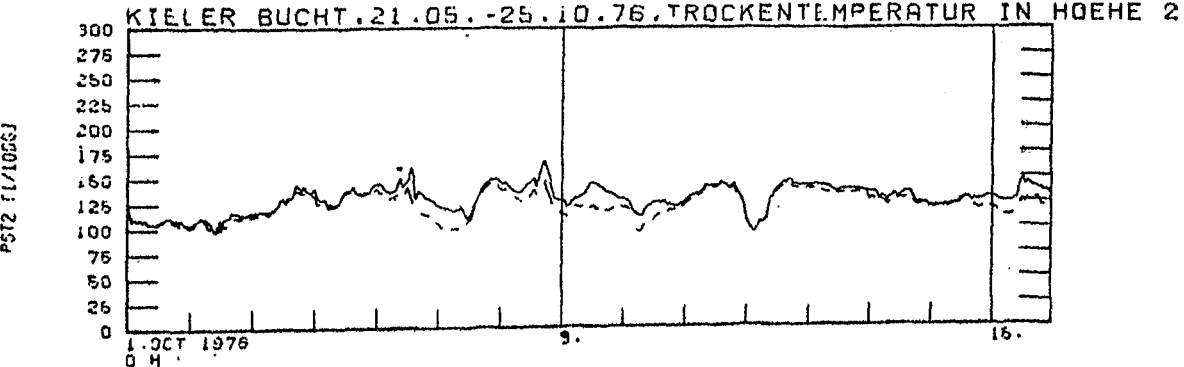
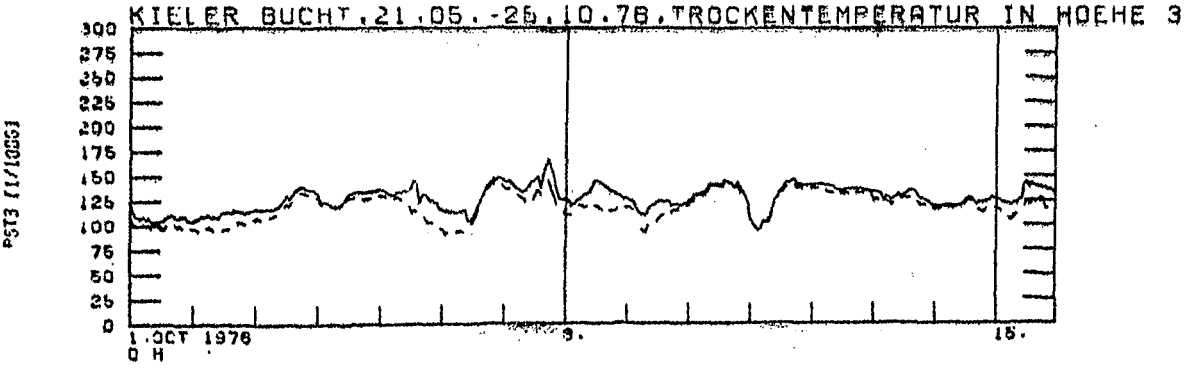
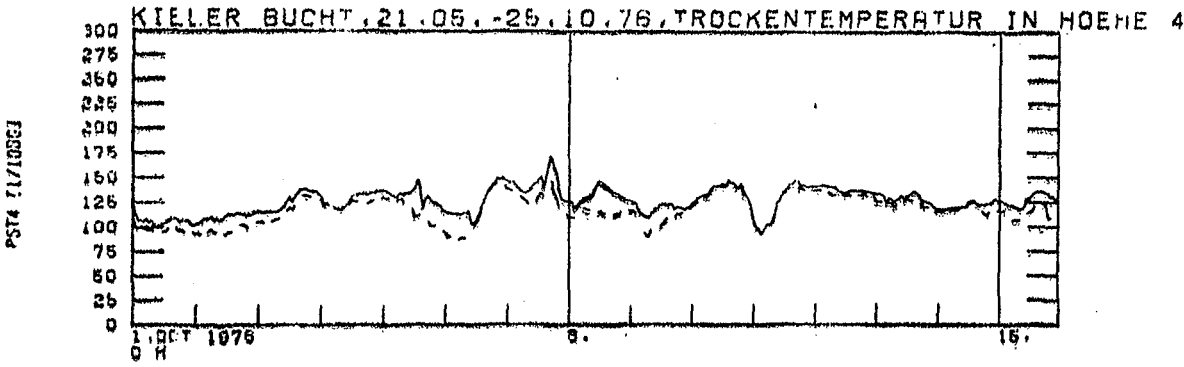
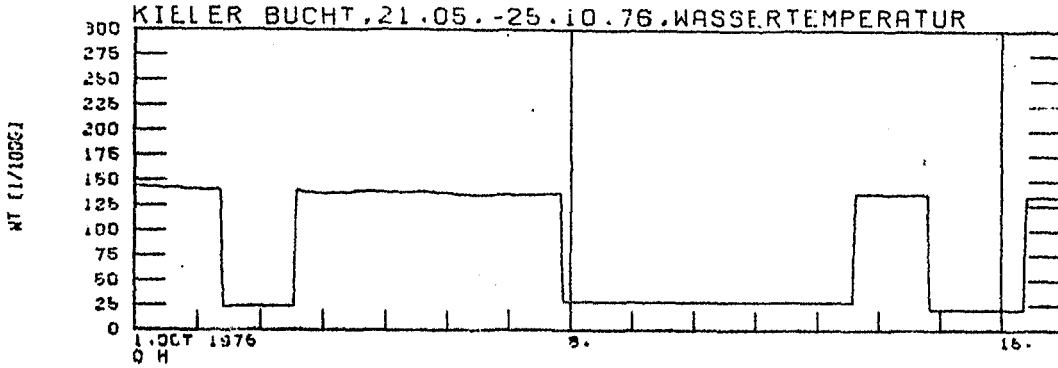
PST2 11/1066J

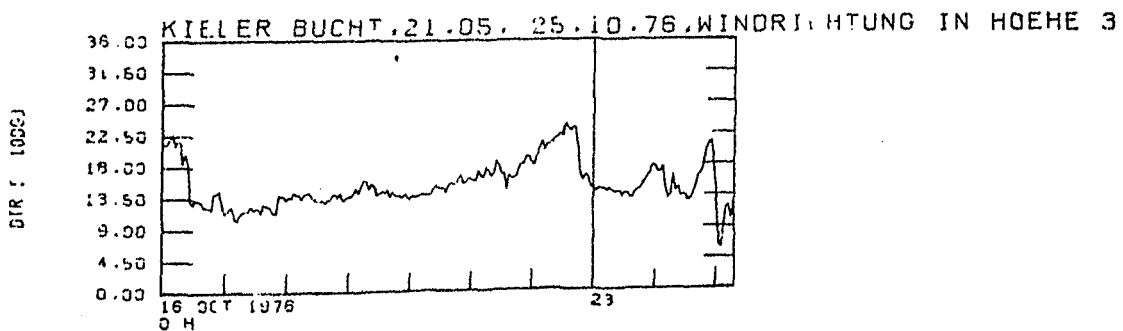
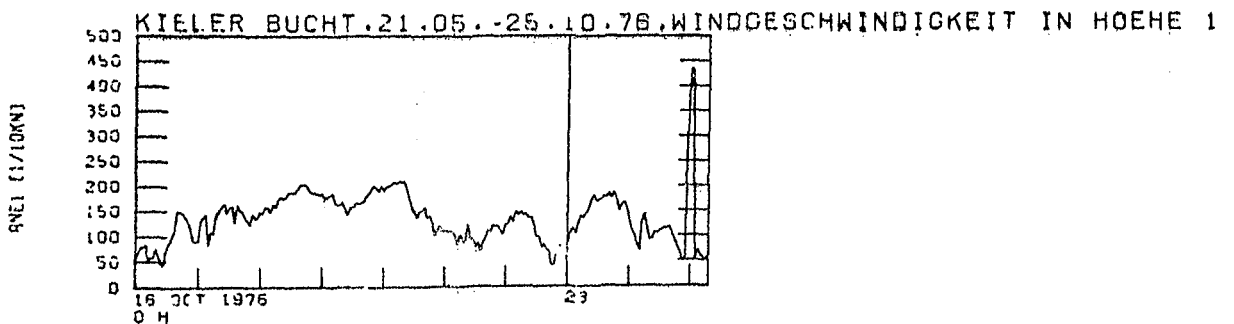
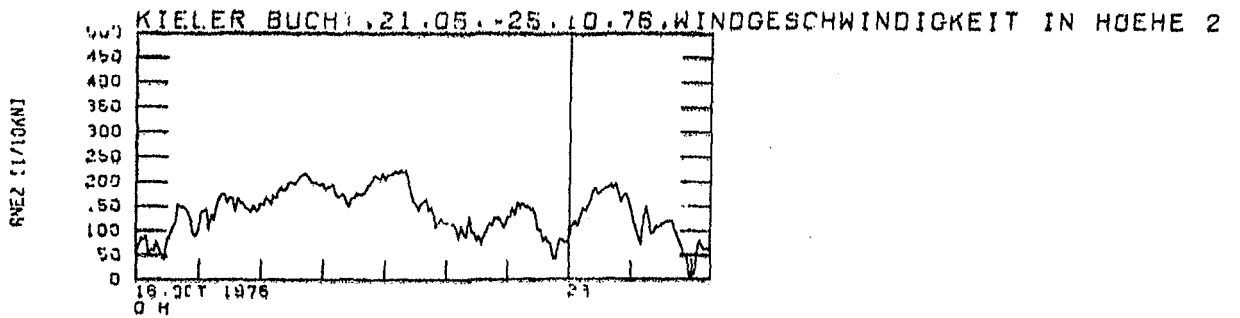
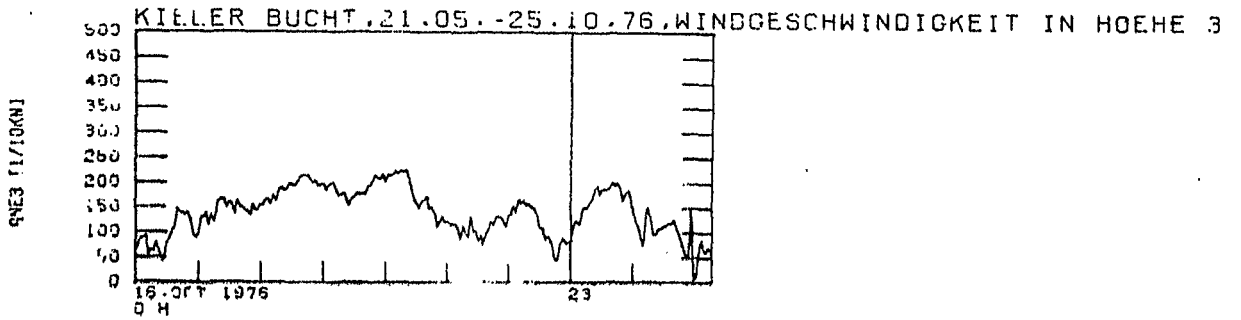
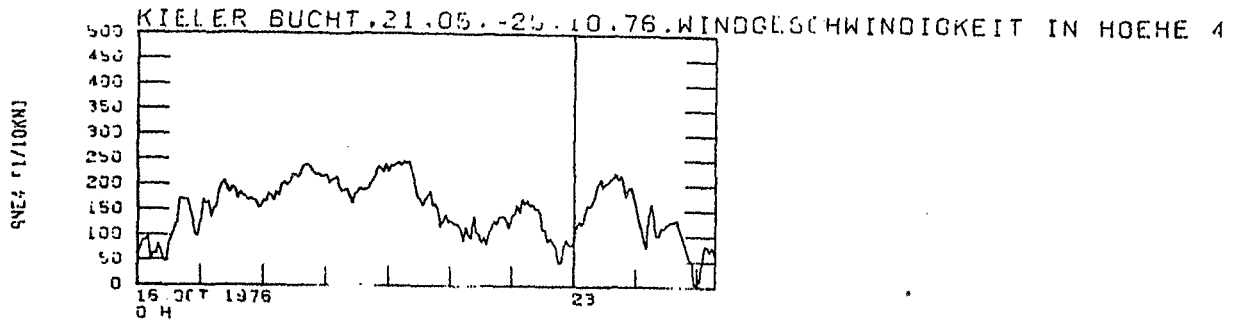


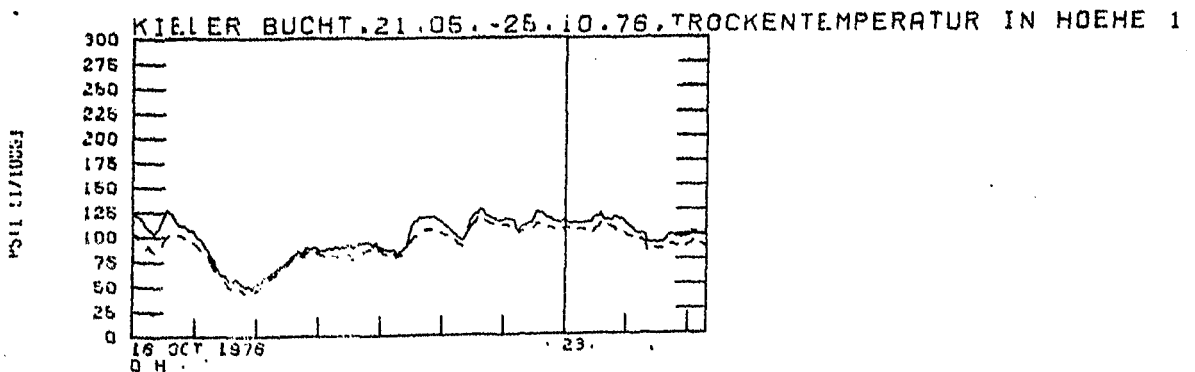
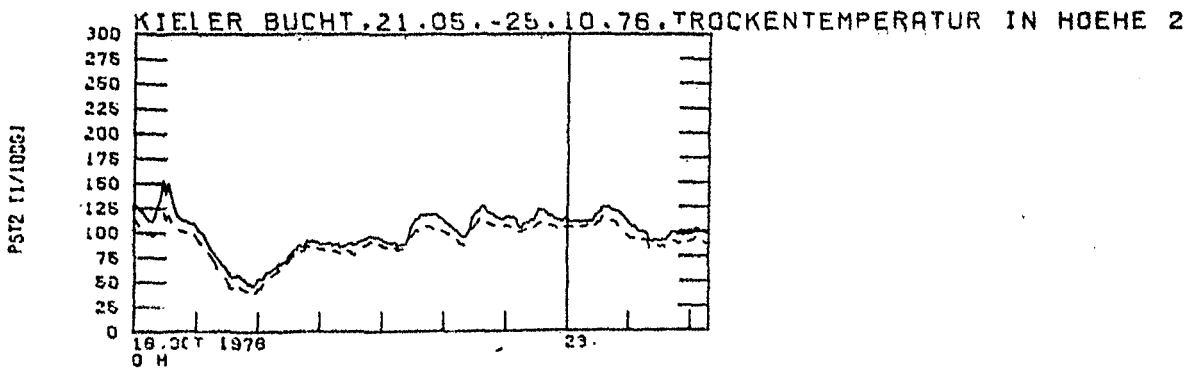
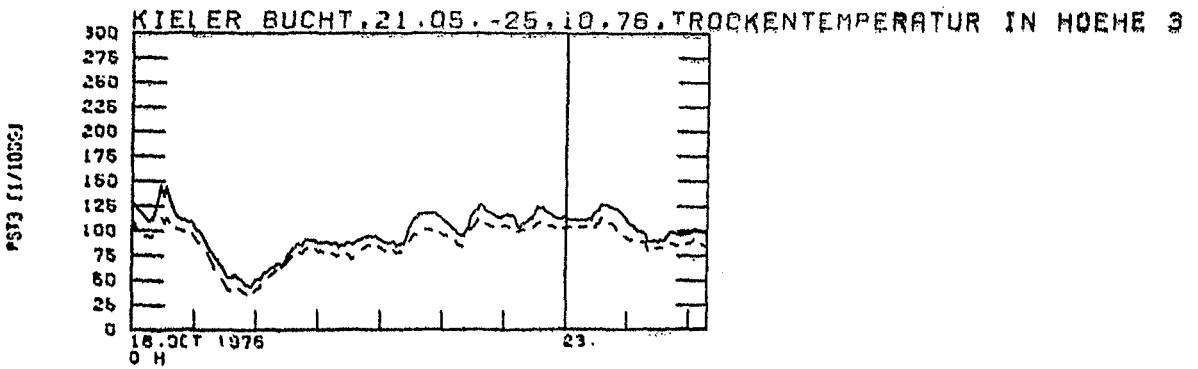
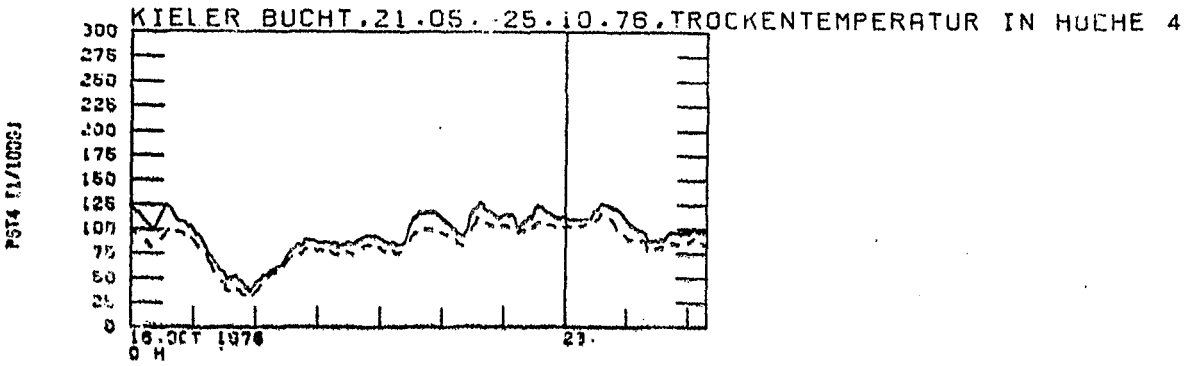
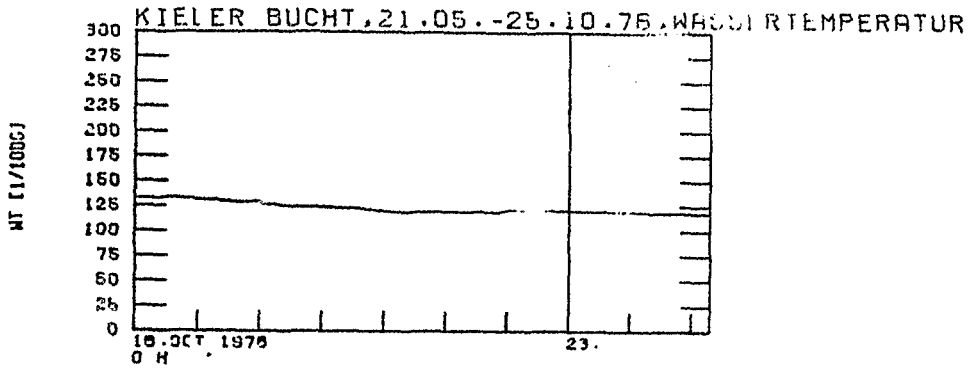
PST1 11/1066J











A N H A N G

TEIL 3 ZEITREIHEN DER KURZWELLIGEN STRAHLUNG
UND DES PEGELS AM MESSMAST

