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<b>Deliverable number</b>	D2.6
<b>Deliverable title</b>	GO-Ship software and manuals
<b>Description</b>	Software packages and best practice manuals and knowledge transfer for sustained quality control of hydrographic sections in the Atlantic
<b>Work Package number</b>	2
<b>Work Package title</b>	Enhancement of ship-based observing networks
<b>Lead beneficiary</b>	CSIC
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<b>Comments</b>	Software development was hit by delay in having a production release of the main library used in the program (bokeh), allowing offline display of maps, and some other minor issues as having installers for macOS and Linux. The software, with a working Windows version, was released to a public repository ( <a href="https://github.com/ocean-data-qc/ocean-data-qc">https://github.com/ocean-data-qc/ocean-data-qc</a> ) in 2019-12-14.



This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement n° 633211.

**Stakeholder engagement relating to this task\***

<b>WHO are your most important stakeholders?</b>	<input type="checkbox"/> Private company If yes, is it an SME <input type="checkbox"/> or a large company <input type="checkbox"/> ? <input checked="" type="checkbox"/> National governmental body <input type="checkbox"/> International organization <input type="checkbox"/> NGO <input type="checkbox"/> others Please give the name(s) of the stakeholder(s): ...
<b>WHERE is/are the company(ies) or organization(s) from?</b>	<input checked="" type="checkbox"/> Your own country <input type="checkbox"/> Another country in the EU <input type="checkbox"/> Another country outside the EU Please name the country(ies): ...
<b>Is this deliverable a success story? If yes, why? If not, why?</b>	<input checked="" type="checkbox"/> Yes. This was a very, very hard task. Developing an open source desktop application compatible with the three main platforms (Windows, Linux and macOS) and using bleeding-edge technologies is a huge task, so this is a full success history. The developed software, already published to the community, will be very helpful for having a consistent first level of Quality Control on hydrographic sections  <input type="checkbox"/> No, because .....
<b>Will this deliverable be used? If yes, who will use it? If not, why will it not be used?</b>	<input checked="" type="checkbox"/> Yes, by marine biogeochemists and any people who make or use biogeochemical profiling data in the ocean  <input type="checkbox"/> No, because .....

**NOTE: This information is being collected for the following purposes:**

1. To make a list of all companies/organizations with which AtlantOS partners have had contact. This is important to demonstrate the extent of industry and public-sector collaboration in the obs community. Please note that we will only publish one aggregated list of companies and not mention specific partnerships.
2. To better report success stories from the AtlantOS community on how observing delivers concrete value to society.

\*For ideas about relations with stakeholders you are invited to consult [D10.5](#) Best Practices in Stakeholder Engagement, Data Dissemination and Exploitation.

## Summary:

This software is an interactive tool for making the primary Quality Control (1<sup>st</sup> QC, QC1) on Hydrographic Cruise Data, such as from the GO-SHIP program. The purpose for the software is to support scientist to conduct primary QC control, i.e. a tool to detect outliers in data sets and to ensure adequate precision of the data. The tool aims for biogeochemical data from water samples collected during oceanographic cruises. The tool is built in Python, Node, JavaScript, HTML5 and related technologies.

The deliverable is contained in the free software (and code) and the software manual that can be found here: <https://github.com/ocean-data-qc/ocean-data-qc> and as appendix to this document.

## Acknowledgements

The development of this software was funded by [Atlantos-H2020](#) EU Project, under [WP2 Enhancement of ship-based observing networks](#), and [Task 2.1 GO-SHIP](#) as task

**D2.6 GO-SHIP Software and Manuals (CSIC)**: Software packages and best practice manuals and knowledge transfer for sustained quality control of hydrographic sections in the Atlantic.

The software was developed using fully open source technologies and code was released to a public repository (<https://github.com/ocean-data-qc/ocean-data-qc>) on 14/dec/2018 with the release 0.8. That repository will hold the most up to date code, releases, as well of serving as bug-tracking system for reporting issues and ask for enhancements. This address will host any future updates.

Core team developers are Jesus Cacabelos <[jcacabelos@iim.csic.es](mailto:jcacabelos@iim.csic.es)> and Anton Velo <[avelo@iim.csic.es](mailto:avelo@iim.csic.es)>. Coordinator of the development is Anton Velo <[avelo@iim.csic.es](mailto:avelo@iim.csic.es)>. D2.6 was lead by Fiz F. Perez <[fiz.perez@iim.csic.es](mailto:fiz.perez@iim.csic.es)>. Task 2.1 is lead by Toste Tanhua <[ttanhua@geomar.de](mailto:ttanhua@geomar.de)>. Contributors on the development of the application are Fiz F. Perez <[fiz.perez@iim.csic.es](mailto:fiz.perez@iim.csic.es)>, Toste Tanhua <[ttanhua@geomar.de](mailto:ttanhua@geomar.de)> and Nico Lange <[nlange@geomar.de](mailto:nlange@geomar.de)>

This document refers to the software manual (Guide to Best Practices on Ocean Data QC: Software packages and best practice manuals and knowledge transfer for sustained quality control of hydrographic sections in the Atlantic) as the main deliverable. The Manual is provided as an annex to this deliverable documentation, and the software itself can be downloaded from the link indicated above.

# Guide to Best Practices on Ocean Data QC

**AtlantOS-H2020 D2.6 GO-SHIP Software and Manuals:** Software packages and best practice manuals and knowledge transfer for sustained quality control of hydrographic sections in the Atlantic.

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# Introduction

This software is an interactive tool for making the primary Quality Control (1<sup>st</sup> QC, QC1) on Hydrographic Cruise Data, such as from the GO-SHIP program. It is designed to detect outliers in data sets and to ensure adequate precision of the data. The tool aims for biogeochemical data from water samples collected during oceanographic cruises. The tool is built in Python, Node, JavaScript, HTML5 and related technologies.

## Acknowledgements

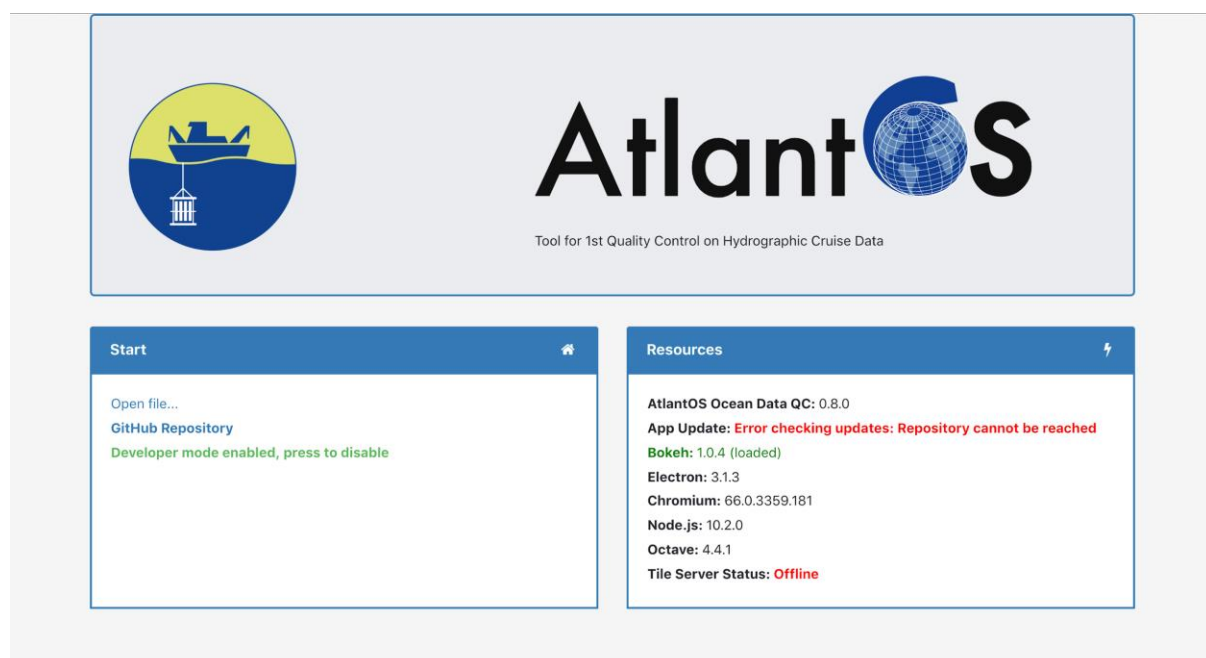
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## Technologies



The above image is the welcome screen where there is a section informing about the actual version of the different applications and frameworks used by the application. A detection of these versions is done when launching the application and warnings will appear for notifying problems

- **[Bokeh](#)**. Bokeh is an interactive visualization library that targets modern web browsers for presentation. Its goal is to provide elegant, concise construction of versatile graphics, and to extend this capability with high-performance interactivity over very large or streaming datasets. Bokeh is the main library for the application, as deals with graphic presentation and interaction (Bokeh Development Team (2014). Python library for interactive visualization. <http://www.bokeh.pydata.org>)
- **[Electron](#)**. Electron is an open source library developed by GitHub for building cross-platform desktop applications with HTML, CSS, and JavaScript. Electron accomplishes this by combining Chromium and Node.js into a single runtime and apps can be packaged for Mac, Windows, and Linux. The application uses Electron to embed in an application the bokeh plots and drive the user interaction with interface, providing also all the menus and interfaces.
- **[GNU Octave](#)**. GNU Octave is a high-level interpreted language, primarily intended for numerical computations. It provides capabilities for the numerical solution of linear and nonlinear problems, and for performing other numerical experiments. It also provides extensive graphics capabilities for data visualization and manipulation. The GNU Octave language is quite similar to Matlab™ so that most programs are easily portable. The application uses GNU Octave to drive main oceanographic calculations, as it's the main used language in that field of work, and most typical Matlab™ open source oceanographic libraries were built in Matlab™. Running these calculations directly in GNU Octave allows to easy integrating code from researchers.

The application can actually work without Octave installed. Despite that most Calculated Parameters need it for their calculation, if GNU Octave is not present, the application will run with the parameters present in the data files.

- **[Python](#)**. Python version 3 is the main language in the application. Most processing on data and files are performed through Pandas and/or NumPy libraries in python, and sent to Bokeh, which is also built on python and has an own javascript library for displaying and interacting. Python source code is presented in ocean\_data\_qc folder in the application.
- **[JavaScript](#)**. Electron is built on node, that is built with JavaScript. All code for menus, screens, and interacting elements on the application are made with Javascript. Some of the functionality are provided directly by Electron and some other by Bokeh, but the code to merge all these things were built with JavaScript. JavaScript source code is presented in ocean\_data\_qc\_js folder in the application.

# Installing the application

There are two main ways for installing the software:

1. Using the installer from releases. Verified releases for main systems will be published in <https://github.com/ocean-data-qc/ocean-data-qc/releases>. The two main advantages of installing by official releases are:
  - a. The ease of the install process, performed by just pressing next button several times.
  - b. The possibility of updating the application automatically when new releases are published, as the application check the repository periodically
2. By using source code repository <https://github.com/ocean-data-qc/ocean-data-qc>. In the README.md detailed steps are provided for installing the app. It's not a trivial process as it currently implies to have **python**, **node**, and a node package manager as **yarn** or **npm** installed before, but just following the recipe would work.

Once the application is installed, it's highly encouraged to have GNU Octave installed and in the default installation path, as it's the only way that it would be detected and used.

# Running the application

Once installed, the application can be started by using the shortcuts generated by the installers of the different platforms. That shortcuts will be placed in the typical locations for launching the applications, Start Menu in Windows, Applications in macOS, and Dash or equivalent in GNU/Linux

If the application where installed by source from code repository, the README.md provides detailed instructions on how to proceed

# Best Practices for QC Ocean Data

The main objective of this application is to ease the first level of QC on oceanographic cruises by providing a tool for helping the user to take decisions about the data quality of the samples. The tool supports the generation of outputs for data centers with appropriate documentation for both the data file itself and on the performed QC.

As the de-facto standard format for reporting oceanographic data from cruise sections is the *WHP exchange bottle* format (<https://github.com/cchdo/exchange/>) used and recommended by GO-SHIP and the data centre of the network, CCHDO, we will use it for defining the name of parameters and the quality flags of the application. A full description of these names and quality flags can be found in the cited repository.

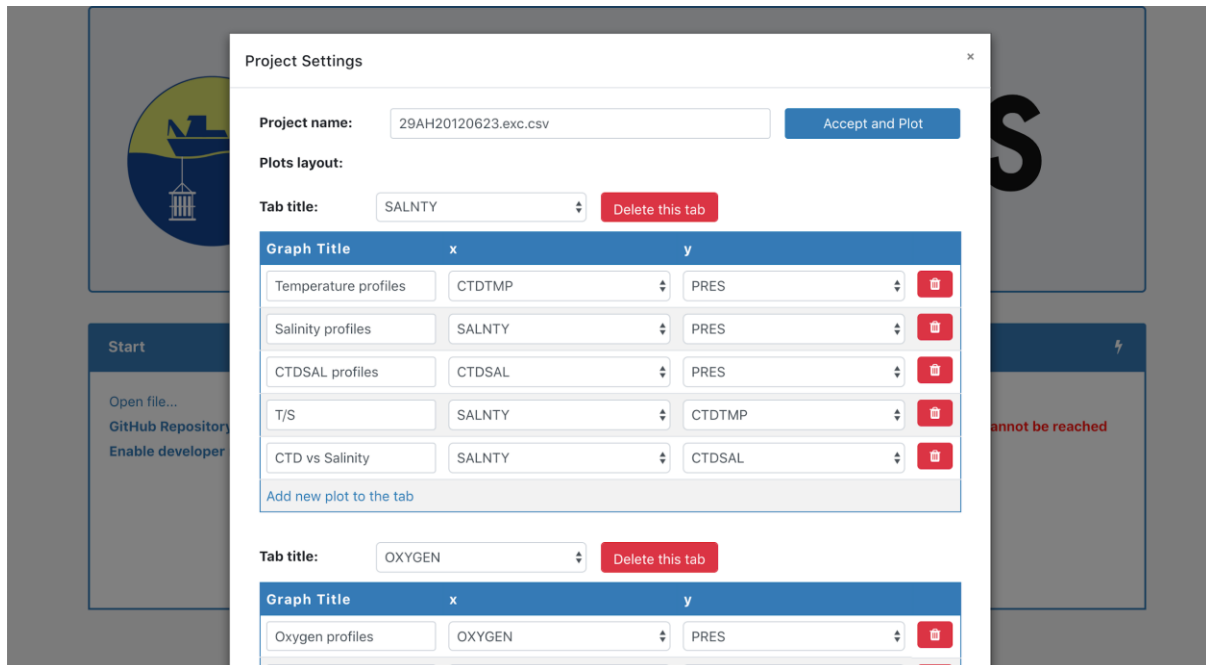
Even when the application internally uses these *WHP exchange bottle* names, it has been designed to try to translate some other common naming schemes to their WHP equivalent, facilitating the usage of the application. When exporting to WHP format, the *WHP exchange*



*bottle* names will be used, thus allowing the user to convert some common names to their WHP equivalent.

## Workflow

The first step is to open a data file. Both formats, common CSV and WHP Exchange Bottle will be recognized and parsed. If the file is processed correctly, a Project Settings form will appear, otherwise, error messages will be presented



The project settings form allow to set the default options for the new project. These default field can be changed in the “Set default layout...” option.

The application provides a predefined default layout directed to ease the Quality Control of numerous parameters. The plots included by default in each tab have proven to be useful for detecting outliers for that tab parameter. It includes not only profiles but property-property plots against the most relevant sources of variability for that parameters. Many calculations of derived parameters are done by default, producing more information for the 1<sup>st</sup>QC task, and avoiding typical errors when manually computing these values. Additionally, neural network approaches have been including for a number of parameters, generating approximated values that, even when they should be considered carefully, can be very helpful for detecting outliers.

Let's describe the elements that are showed in the Project Settings form:

- **Project name.** The file name that is being opening will be the project name by default. When saving the project, a .aqc (Atlantos Quality Control) file will be created and saved. That file stores the data as well as all the relevant information on the QC task.

- **Tabs.** The application will generate tabs for the parameters to QC that recognizes in the data file. Under each tab, the predefined property-property plots with available data will be presented, allowing the user to add, modify or delete any of them.

Once the user agrees with the settings, Accept and Plot button should be pressed. The application will then process the layout and present the main interface. The details of this interface are detailed in [Main Layout](#) section of this document.

## Saving the project

Once a data file is open, the user is encouraged to save the project in the .aqc format of this application. The .aqc is a zip compressed file that stores the original data file, track the QC process, and allows to update the data set with newer or updated data (ex: when new stations are performed during a cruise, or when new parameter data are received or updated)

## Performing the QC task

The QC task consist on assigning quality flags to the data, where we consider the values are good, questionable or bad, i.e. following the WOCE standards. The layout provided and the capabilities of the software to calculate a variety of helper parameters, were designed to give support to the user in taking the right decisions. Thus, both the layout and the calculated parameters can be easily customized to fit each one needs. Also, changing the visibility of some flags would be convenient for readability.

To assign a quality flag to a value, just:

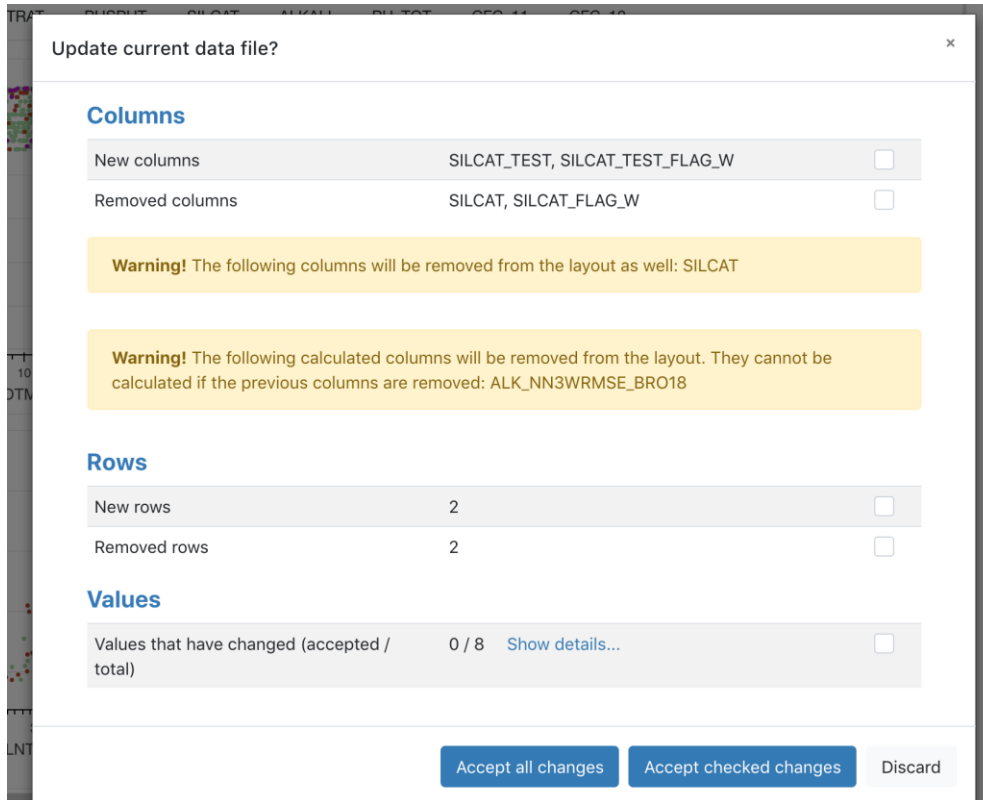
1. Go to the tab for that parameter or select the parameter in the top right drop-down menu
2. Select the sample in any of the plots
3. Press the Flag icon for the value we want to assign. Alternatively, flag value can be changed directly in the data table, by double-clicking over its number. Typical flagging schema is:

QC Value	Description
2	Good Data
3	Questionable Data
4	Bad Data
6	Mean of replicate measurement
9	Not sampled

4. A message should appear indicating that flag have been updated for the samples.

## Updating with new data

One of our main efforts when designing the application, was the capability of merging data with newer ones. This way, the [Data > Update from CSV](#) Menu, presents an interface to guide the user in the task of adding or deleting columns and rows, and updating values or their flags.



The objective is to prevent the user from having to redo work already done when new data is received or processed. Specifically, the application was designed to help the user when new rows of data are included in the data file due to the advance of a cruise for example (new stations), and allows the user to decide whether to keep or reject the QC performed previously for a parameter. The Show details link under the Values section will show the details about the changes, proposing actions to the user but allowing to decide. There is a number of different scenarios here that we've analyzed to develop the section, for example when parameter values change due to new calibration or re-analysis, maybe we want to keep most or all the previous flags, but maybe we want to re-start from zero the QC.

Update values by stations

Modified parameters: CTDDOXY

Station 1

CASTNO	BTLNBR	LATITUDE	LONGITUDE	CTDOXY		CTDOXY_FLAG_W	
				old value	new value <input checked="" type="checkbox"/>	old value	new value <input checked="" type="checkbox"/>
1	15	40.3326	-9.4594	248.1	249.1 <input checked="" type="checkbox"/>	2	2 <input checked="" type="checkbox"/>
1	11	40.3326	-9.4594	214.7	216.7 <input checked="" type="checkbox"/>	2	2 <input checked="" type="checkbox"/>

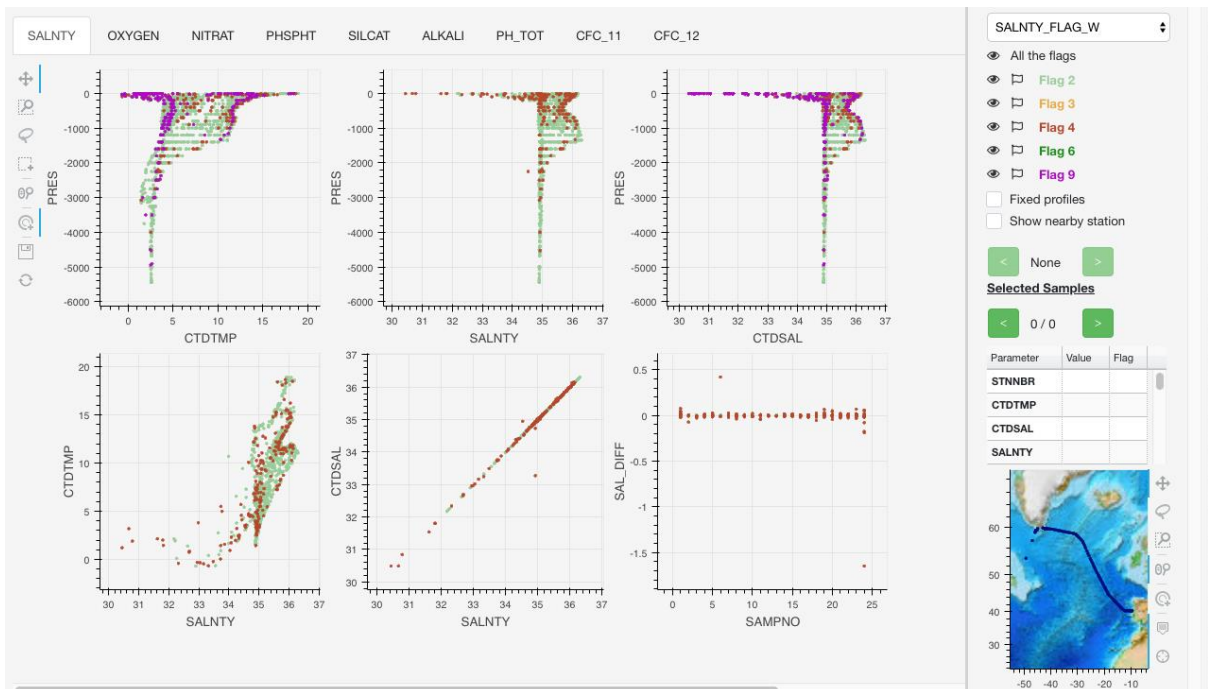
Station 2

Station 5

Accept all changes    Accept checked changes    Discard

## Main Layout

This is the main interface, it will appear once the selected layout and file are processed:



The main layout is composed by a tabbed layout of plots, defined for each parameter to do QC with, a left bar with a set of tools to interact with the plots, and a right sidebar with the information needed to do the QC, selection of parameters, visibility and flagging buttons, small table with the data for selected samples, and a bathymetric map. Detailing each section:

### Tabbed grid of plots:

The plots defined are linked when sharing a parameter in same axis, this way, if a zoom is performed in any of the plots for a parameter (ex: pres in y axis), all plots with that parameter in same axis are zoomed the same way (ex: all profiles with pres in Y axis). Furthermore, when samples are selected, they appear selected in all plots, and the profiles displayed appears also in all plots

### Plot tools:

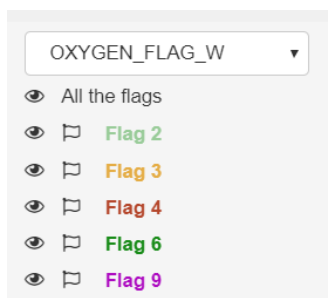


From top to bottom:

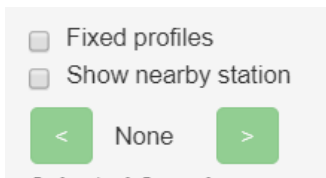
- Pan tool. It moves the plot content, the data along the axis.
- Box Zoom.
- Lasso select. It makes selections around the samples
- Box select.
- Wheel zoom. It zooms some plot or range of the plot.
- Tap. It gives the possibility to select one single sample with one click
- Save. It saves the current plot view to an image file
- Reset. All the plots ranges zoom and selections are reset to default values

### Sidebar:

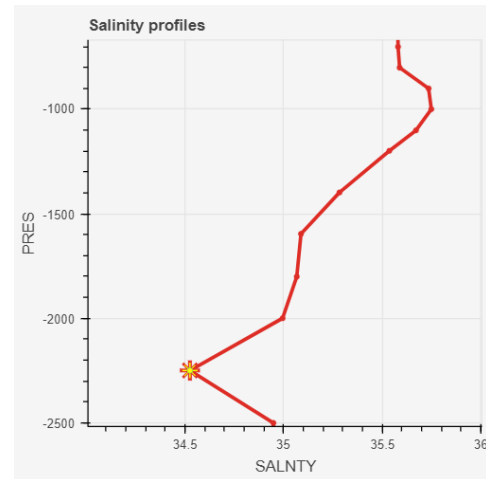
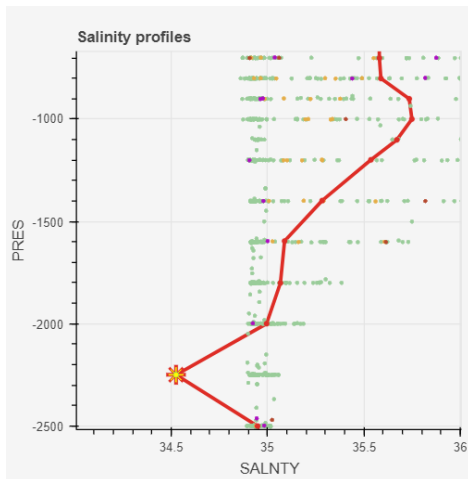
On the top of the bar, there is a drop-down menu where the user can choose the parameter to perform the QC on that is initially linked with the selected tab. Once the flag parameter is changed, all the colors of the plot samples on the current tab are updated with the flag colors for that parameter:



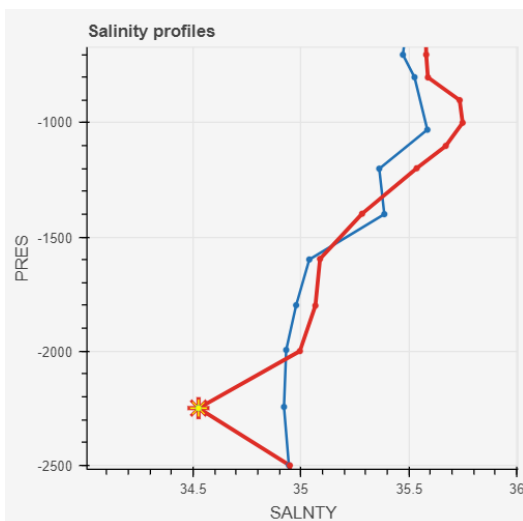
Below, there are some controls to perform the QC by updating the flag values on the selected samples. The flag itself is the button to perform the QC. The visibility of samples with any flag can be changed with the eyes icons.



The “Fixed profiles” checkbox means that the user will keep seeing the profiles even if the samples are invisible due to changed visibility for some flags in the upper section, as can be seen in following example, where the profile remains in the right panel even when no samples are shown by flags



If the “Show nearby station” is checked then a new profile will be visible in the plot, it will be located next to the current profile. If the arrow buttons are pressed, then that auxiliary profile will be updated with the profile of the following or previous station for the cruise.



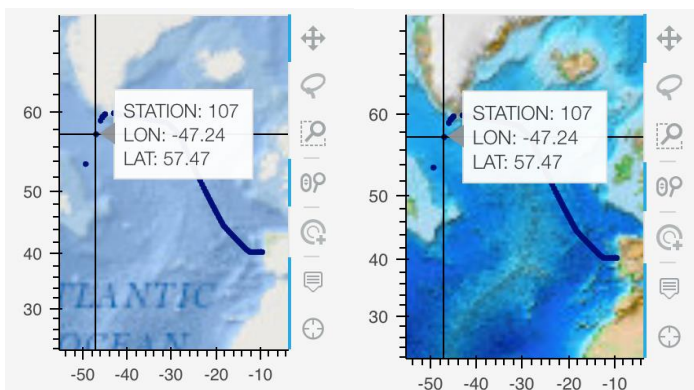
If more than one sample point is selected, the data of one of them (selected randomly) is reflected in the datatable. The user can iterate over all the selected items through the arrow buttons. The flag values for a single sample can also be updated directly in the data table by double-clicking over the Flag value. In the next example, CTDSAL flag have been double-clicked and value can be changed.

**Selected Samples**

< 1 / 2 >

Parameter	Value	Flag
STNNBR	27	-
CTDTMP	8.6964	2
CTDSAL	35.5834	2

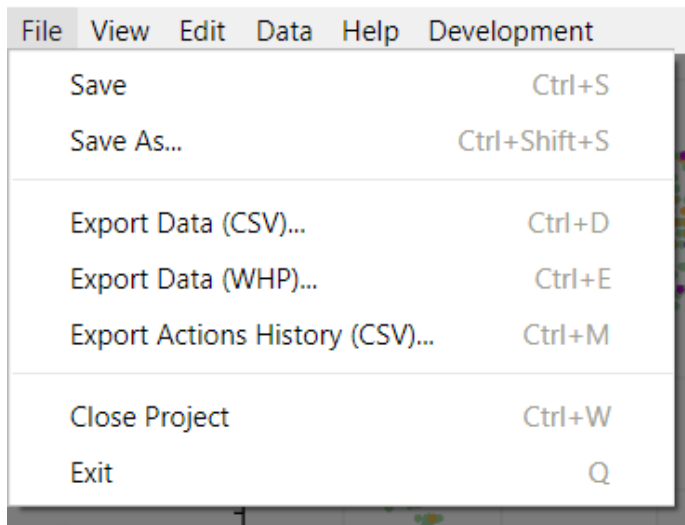
Finally, at the bottom of the sidebar, a bathymetric map is located. In the map, the stations can be hovered to show their details, or selected. If a station is selected, then all the samples that belong to that station are selected as well in the rest of the plots. In the following figures, left plot represents the online version of the map, shown when the computer has an online internet connection, and the one on the right is the offline map version, useful on not online situations, as some during some cruises. The different appearance of the map is due to different providers used. The left, lighter colors map, uses the World Ocean Base layer of the ArcGis tile server service, based on GEBCO<sup>1</sup> which allows full online available resolution. The right plot shows an internal offline map based on ETOPO1 (doi:10.7289/V5C8276M), which can be zoomed up to a limited resolution to save storage space in local computer.



<sup>1</sup> [https://services.arcgisonline.com/ArcGIS/rest/services/Ocean/World\\_Ocean\\_Base/MapServer](https://services.arcgisonline.com/ArcGIS/rest/services/Ocean/World_Ocean_Base/MapServer)

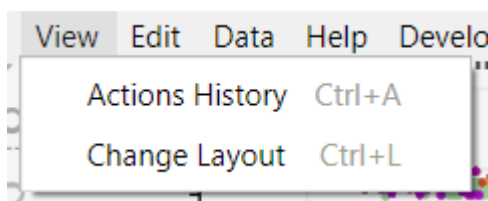
# Menus

## File or application menu



- Save and Save As... This options saves the project as an \*.aqc file
- Export Data (CSV). It exports the current data, no metadata is included in the file and the names of columns are kept from original imported file.
- Export Data (WHP). It exports the current data together with the metadata following the *WHP Exchange Bottle* format, and with recognized parameter names converted to WHP format ones.
- Export Actions History. It exports all the steps that the user made in the application, this includes flagging samples and updates from other files.
- Close Project. The app will come back to the Welcome Window. If the project is not saved the user will be prompted
- Exit. The app will be closed

## View menu



### Actions History

This option shows the steps that the user made, for instance: flag values updated, details about updates with other CSV file...



Actions history <span style="float: right;">×</span>			
#	Date	Action	Description
0	2018-11-22 19:47:58	QC Update	OXYGEN_FLAG_W flag was updated to 4, in [station 85, cast number 1, bottle 24, latitude 59.8085, longitude -42.2354]
1	2018-11-22 19:47:58	QC Update	OXYGEN_FLAG_W flag was updated to 4, in [station 104, cast number 1, bottle 21, latitude 59.4634, longitude -45.649]
2	2018-11-22 19:47:58	QC Update	OXYGEN_FLAG_W flag was updated to 4, in [station 108, cast number 1, bottle 22, latitude 53.6917, longitude -49.4339]
3	2018-11-22 19:47:58	QC Update	OXYGEN_FLAG_W flag was updated to 4, in [station 108, cast number 1, bottle 23, latitude 53.6917, longitude -49.4339]
4	2018-11-22 19:47:58	QC Update	OXYGEN_FLAG_W flag was updated to 4, in [station 85, cast number 1, bottle 22, latitude 59.8085, longitude -42.2354]
5	2018-11-22 19:47:58	QC Update	OXYGEN_FLAG_W flag was updated to 4, in [station 93, cast number 1, bottle 1, latitude 59.8765, longitude -42.7956]
6	2018-11-22 19:47:58	QC Update	OXYGEN_FLAG_W flag was updated to 4, in [station 93, cast number 1, bottle 5, latitude 59.8765, longitude -42.7956]

## Change Layout

The “Project Setting Form” appears again in order to change the layout only for the current open project. This layout is also saved if the project is saved as an aqc file. This menu is used to design your own QC environment, which is particularly useful for non-standard variables where it is not pre-defined which relations are useful for the QC process.

Project Settings x

**Project name:**  Accept and Plot

**Plots layout:**

**Tab title:**  Delete this tab

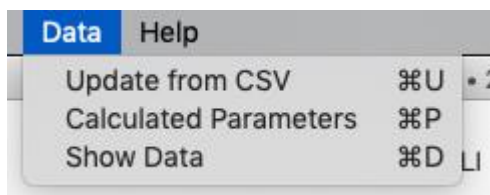
Graph Title	x	y	
<input type="text" value="Temperature profiles"/>	<input type="text" value="CTDTMP"/>	<input type="text" value="PRES"/>	<span style="background-color: #c00; color: white; padding: 2px 5px; border-radius: 3px;">🗑</span>
<input type="text" value="Salinity profiles"/>	<input type="text" value="SALNTY"/>	<input type="text" value="PRES"/>	<span style="background-color: #c00; color: white; padding: 2px 5px; border-radius: 3px;">🗑</span>
<input type="text" value="CTDSAL profiles"/>	<input type="text" value="CTDSAL"/>	<input type="text" value="PRES"/>	<span style="background-color: #c00; color: white; padding: 2px 5px; border-radius: 3px;">🗑</span>
<input type="text" value="T/S"/>	<input type="text" value="SALNTY"/>	<input type="text" value="CTDTMP"/>	<span style="background-color: #c00; color: white; padding: 2px 5px; border-radius: 3px;">🗑</span>
<input type="text" value="CTD vs Salinity"/>	<input type="text" value="SALNTY"/>	<input type="text" value="CTDSAL"/>	<span style="background-color: #c00; color: white; padding: 2px 5px; border-radius: 3px;">🗑</span>
<input type="text" value="SAL_DIFF vs PRES"/>	<input type="text" value="SAMPNO"/>	<input type="text" value="SAL_DIFF"/>	<span style="background-color: #c00; color: white; padding: 2px 5px; border-radius: 3px;">🗑</span>

[Add new plot to the tab](#)

**Tab title:**  Delete this tab

Graph Title	x	y
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## Data Menu



### Update from CSV

This option gives to the user the possibility to updating the current data with a new CSV or WHP file. A comparison of all the values is performed and the results are shown on this popup:

**Update current WHP?**

**Columns**

New columns	None	<input type="checkbox"/>
Removed columns	None	<input type="checkbox"/>

**Rows**

New rows	None	<input type="checkbox"/>
Removed rows	None	<input type="checkbox"/>

**Values**

Values that have changed (accepted / total)	0 / 9	<a href="#">Show details...</a>	<input type="checkbox"/>
---	-------	---------------------------------	--------------------------

Accept all changes    Accept checked changes    Discard

The user may or may not accept the changes. There could be different columns or rows. If some value on a row are updated then the link “Show details...” can be pressed in this following form and accept each value separately:

**Update values by stations**

Modified parameters: CTDOXY

- CTDOXY
- CTDSAL
- CTDTMP
- PHSPHT
- THETA

Station 1

Station 2

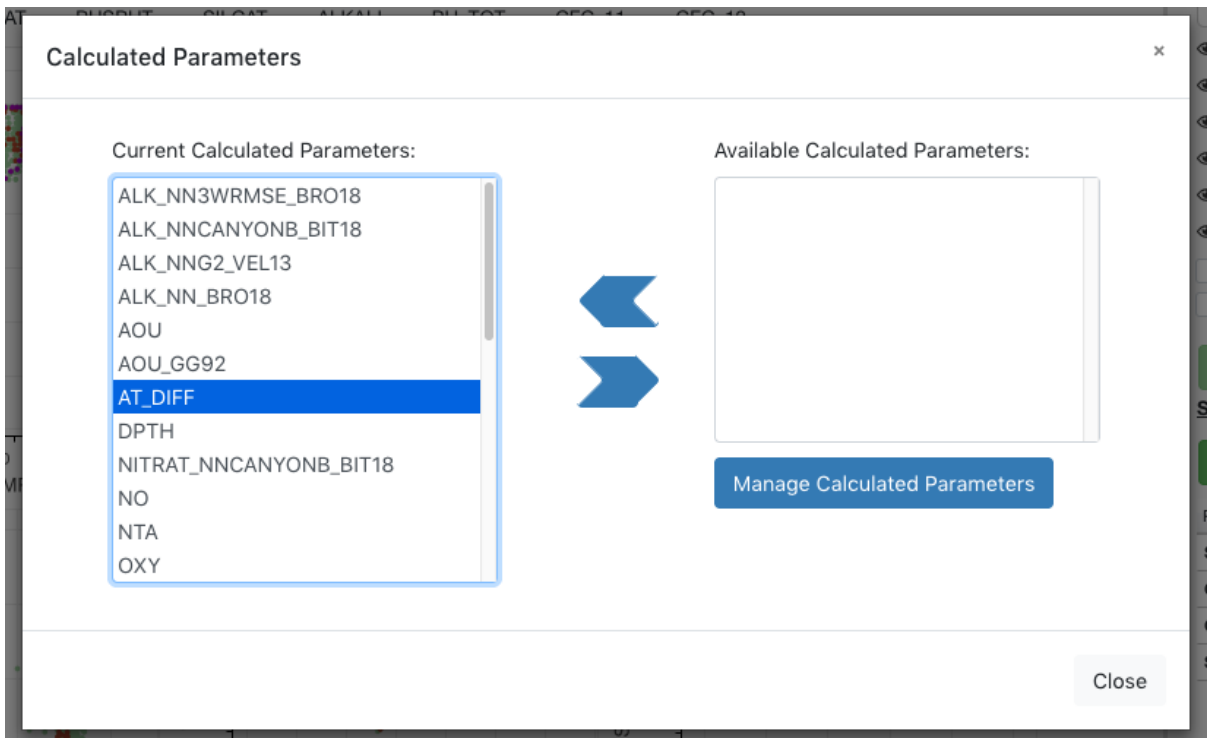
Station 5

CASTNO	BTLNBR	LATITUDE	LONGITUDE	CTDOXY			CTDOXY_FLAG_W		
				old value	new value	<input checked="" type="checkbox"/>	old value	new value	<input checked="" type="checkbox"/>
1	16	40.3307	-9.8769	183.8	173.8	<input checked="" type="checkbox"/>	2	2	<input checked="" type="checkbox"/>
1	15	40.3307	-9.8769	180.4	160.4	<input checked="" type="checkbox"/>	2	2	<input checked="" type="checkbox"/>

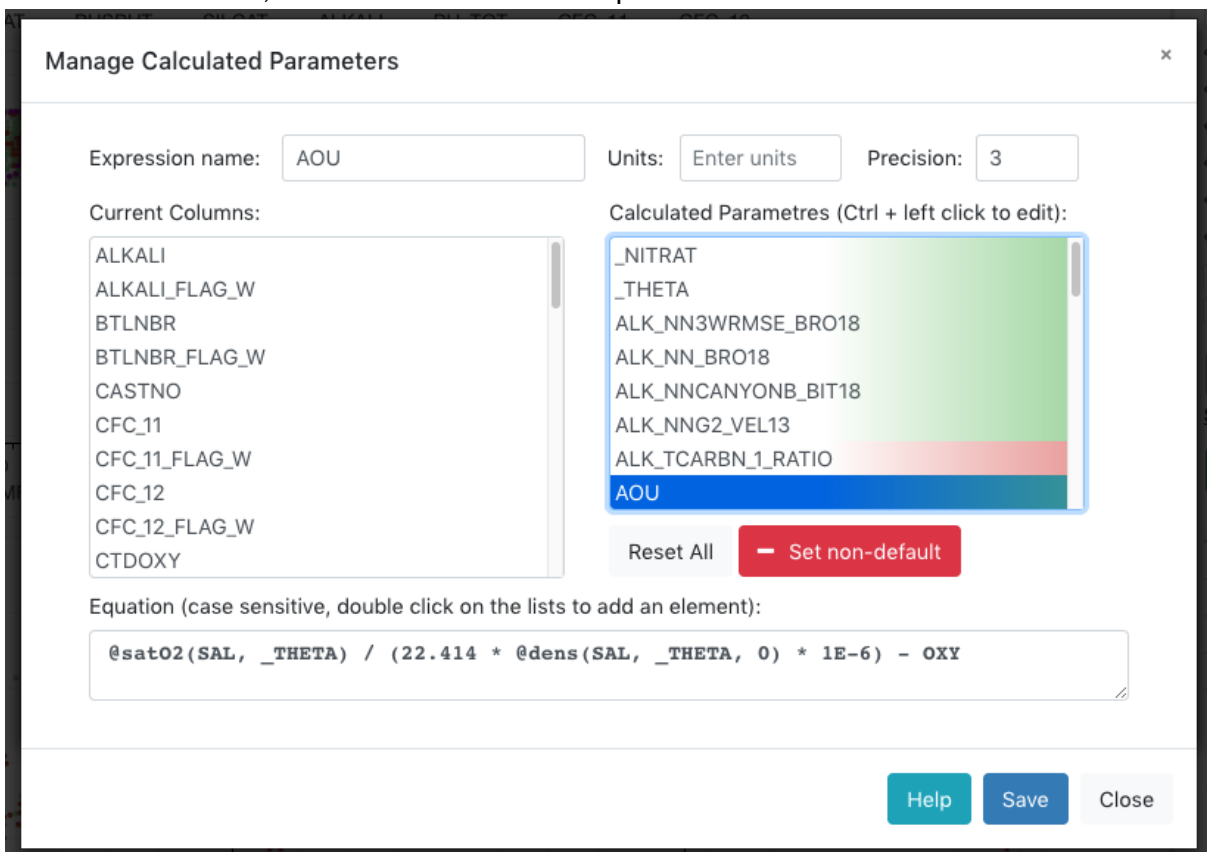
Accept all changes    Accept checked changes    Discard

## Calculated parameters

If this menu option is selected then this form will popup:



Two lists of calculated parameters appear in the screen. The list on the left are the parameters that can be used in the current layout. The list on the right are the parameters that can be added to make them available in the current project. If you need to create a parameter that is not in the list then press “Manage calculated Parameters”, this other form will show up:



New parameters can be created here. The parameters in red means that they use some dependencies that are not currently satisfied by the project data. If they are green then they were correctly computed and can be added to the current project layout, on top of that they will be available in other projects as well, because they are set as “default” parameters. This can be avoided by selecting the parameter and pressing on the “Set non-default” button.

There are some rules to know if we want to create a calculated parameter from scratch. The main keys are explained under the “Help” button menu. It gives you some hints about how to add columns, functions and parameters to the equations. Some extra functions can be used from the python Seawater library and Octave scripts can also be added to the application.

The screenshot shows a help menu with the following sections:

- A list of functions: `dpth(p, lat), g(lat, z=0), salt(r, t, p), fp(s, p), svel(s, t, p), pres(depth, lat), dens0(s, t), dens(s, t, p), pden(s, t, p, pr=0), cp(s, t, p), ptmp(s, t, p, pr=0), temp(s, pt, p, pr=0)`
- Seawater (geostropic functions):**
  - `bfrq(s, t, p, lat=None), svan(s, t, p=0), gpan(s, t, p), gvel(ga, lat, lon)`
- Seawater (extra functions):**
  - `dist(lat, lon, units='km'), f(lat), satAr(s, t), satN2(s, t), satO2(s, t), swvel(length, depth)`
- How to add functions to the equation?**
  - `@function_name`
- How to add available computed parameters to the equation? By double click on the list or:**
  - `${param_name}`
- Operators:**
  - `/ * ** + -`

A "Close" button is located at the bottom right of the menu.

## Show Data

This option will pop up a scrollable screen displaying a table with the full data frame in use. All columns, whether imported from the file or calculated by the application will appear there. It's selectable, so the user can copy it and paste in any spreadsheet application. It's useful for inspecting data.

• 29AH20120622.exc.csv - AtlantOS Ocean Data QC!

Close View

	EXPNOCODE	SECT_ID	STNUMB	CSTNO	BTUMBR	BTUMBR_FLAG_N	DATE	TIME	LATITUDE	LONGITUDE	DEPTH	CTDPRES	CTDTEMP	CTDSAL	CTDSTA_FLAG_N	SALINITY	SALINITY_FLAG_N	CTDDBY	CTDDBY_FLAG_N	OXYGEN	OXYGEN_FLAG_N	SILICAT	SILICAT_FLAG_N	NT
0	29AH20120622	OVIDE	1	1	1	2	20120623	0	40.3326	-9.4594	155	144.5	13.3207	35.9163	2	35.9188	2	201.2	2	201.1	2	4.25	2	9.29
1	29AH20120622	OVIDE	1	1	2	2	20120623	0	40.3326	-9.4594	155	144.5	13.3208	35.9161	2	35.9191	2	201.2	2	198.8	2	NaN	9	NaN
2	29AH20120622	OVIDE	1	1	3	2	20120623	0	40.3326	-9.4594	155	144.5	13.3206	35.9163	2	NaN	9	201.2	2	NaN	9	NaN	9	NaN
3	29AH20120622	OVIDE	1	1	4	2	20120623	0	40.3326	-9.4594	155	144.5	13.3211	35.9162	2	NaN	9	201.2	2	NaN	9	NaN	9	NaN
4	29AH20120622	OVIDE	1	1	5	2	20120623	0	40.3326	-9.4594	155	144.6	13.3207	35.9162	2	NaN	9	201.2	2	NaN	9	NaN	9	NaN
5	29AH20120622	OVIDE	1	1	6	2	20120623	0	40.3326	-9.4594	155	144.5	13.3203	35.9161	2	NaN	9	201.2	2	NaN	9	NaN	9	NaN
6	29AH20120622	OVIDE	1	1	7	2	20120623	0	40.3326	-9.4594	155	99.4	13.4866	35.9365	2	35.9393	2	214.7	2	214.0	2	3.12	2	7.82
7	29AH20120622	OVIDE	1	1	8	2	20120623	0	40.3326	-9.4594	155	99.4	13.4872	35.9365	2	35.9381	2	214.7	2	214.2	2	NaN	9	NaN
8	29AH20120622	OVIDE	1	1	9	2	20120623	0	40.3326	-9.4594	155	99.5	13.4880	35.9366	2	NaN	9	214.7	2	NaN	9	NaN	9	NaN
9	29AH20120622	OVIDE	1	1	10	2	20120623	0	40.3326	-9.4594	155	99.5	13.4884	35.9367	2	NaN	9	214.7	2	NaN	9	NaN	9	NaN
10	29AH20120622	OVIDE	1	1	11	2	20120623	0	40.3326	-9.4594	155	99.4	13.4887	35.9367	2	NaN	9	214.7	2	NaN	9	NaN	9	NaN
11	29AH20120622	OVIDE	1	1	12	2	20120623	0	40.3326	-9.4594	155	99.4	13.4885	35.9367	2	NaN	9	214.7	2	NaN	9	NaN	9	NaN
12	29AH20120622	OVIDE	1	1	13	2	20120623	0	40.3326	-9.4594	155	44.2	14.3075	35.9606	2	35.9615	2	248.1	2	240.2	3	1.45	2	1.67
13	29AH20120622	OVIDE	1	1	14	2	20120623	0	40.3326	-9.4594	155	44.1	14.3231	35.9612	2	35.9633	2	248.3	2	240.9	3	NaN	9	NaN
14	29AH20120622	OVIDE	1	1	15	2	20120623	0	40.3326	-9.4594	155	44.2	14.3465	35.9631	2	NaN	9	248.1	2	NaN	9	NaN	9	NaN
15	29AH20120622	OVIDE	1	1	16	2	20120623	0	40.3326	-9.4594	155	44.2	14.3580	35.9641	2	NaN	9	248.1	2	NaN	9	NaN	9	NaN
16	29AH20120622	OVIDE	1	1	17	2	20120623	0	40.3326	-9.4594	155	44.2	14.3533	35.9631	2	NaN	9	248.1	2	NaN	9	NaN	9	NaN
17	29AH20120622	OVIDE	1	1	18	2	20120623	0	40.3326	-9.4594	155	44.1	14.3505	35.9631	2	NaN	9	248.3	2	NaN	9	NaN	9	NaN
18	29AH20120622	OVIDE	1	1	19	2	20120623	0	40.3326	-9.4594	155	4.1	18.4173	35.6094	2	35.6123	2	243.2	2	241.0	2	1.01	2	0.06
19	29AH20120622	OVIDE	1	1	20	2	20120623	0	40.3326	-9.4594	155	4.1	18.4181	35.6096	2	35.6231	4	243.2	2	244.0	2	NaN	9	NaN
20	29AH20120622	OVIDE	1	1	21	2	20120623	0	40.3326	-9.4594	155	4.1	18.4178	35.6096	2	NaN	9	243.2	2	NaN	9	NaN	9	NaN
21	29AH20120622	OVIDE	1	1	22	2	20120623	0	40.3326	-9.4594	155	4.0	18.4167	35.6096	2	NaN	9	243.2	2	NaN	9	NaN	9	NaN
22	29AH20120622	OVIDE	1	1	23	2	20120623	0	40.3326	-9.4594	155	4.1	18.4131	35.6093	2	NaN	9	243.2	2	NaN	9	NaN	9	NaN
23	29AH20120622	OVIDE	1	1	24	2	20120623	0	40.3326	-9.4594	155	4.1	18.4046	35.6087	2	NaN	9	243.2	2	NaN	9	NaN	9	NaN
24	29AH20120622	OVIDE	2	1	1	2	20120623	0	40.3332	-9.6369	389	372.0	11.7874	35.7385	2	35.7411	2	198.4	2	NaN	9	5.78	2	13.58
25	29AH20120622	OVIDE	2	1	2	2	20120623	0	40.3332	-9.6369	389	372.0	11.7884	35.7386	2	35.7412	2	198.4	2	NaN	9	NaN	9	NaN
26	29AH20120622	OVIDE	2	1	3	2	20120623	0	40.3332	-9.6369	389	372.0	11.7922	35.7391	2	NaN	9	198.4	2	NaN	9	NaN	9	NaN
27	29AH20120622	OVIDE	2	1	4	2	20120623	0	40.3332	-9.6369	389	295.8	12.0608	35.7359	2	35.7377	2	205.5	2	205.5	2	4.74	2	12.30
28	29AH20120622	OVIDE	2	1	5	2	20120623	0	40.3332	-9.6369	389	295.8	12.0622	35.7360	2	NaN	9	203.5	2	NaN	9	NaN	9	NaN
29	29AH20120622	OVIDE	2	1	6	2	20120623	0	40.3332	-9.6369	389	295.8	12.0612	35.7361	2	NaN	9	203.5	2	NaN	9	NaN	9	NaN
30	29AH20120622	OVIDE	2	1	7	2	20120623	0	40.3332	-9.6369	389	200.3	12.7458	35.8071	2	35.8097	2	213.3	2	215.9	2	3.23	2	9.44