# Basic Data analysis with ODV

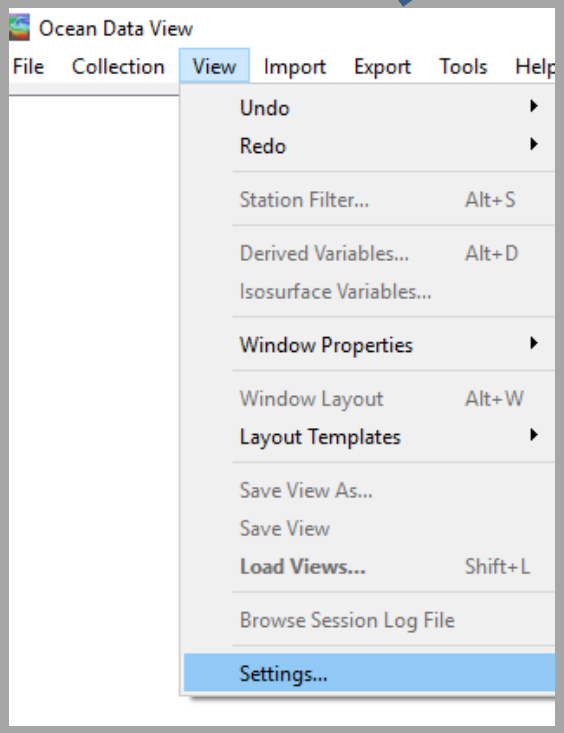
- Save the OSD file in Documents\ODV\DATA with the filename osd_wod.gz.
- Similarly save the CTD and PFL files this folder.

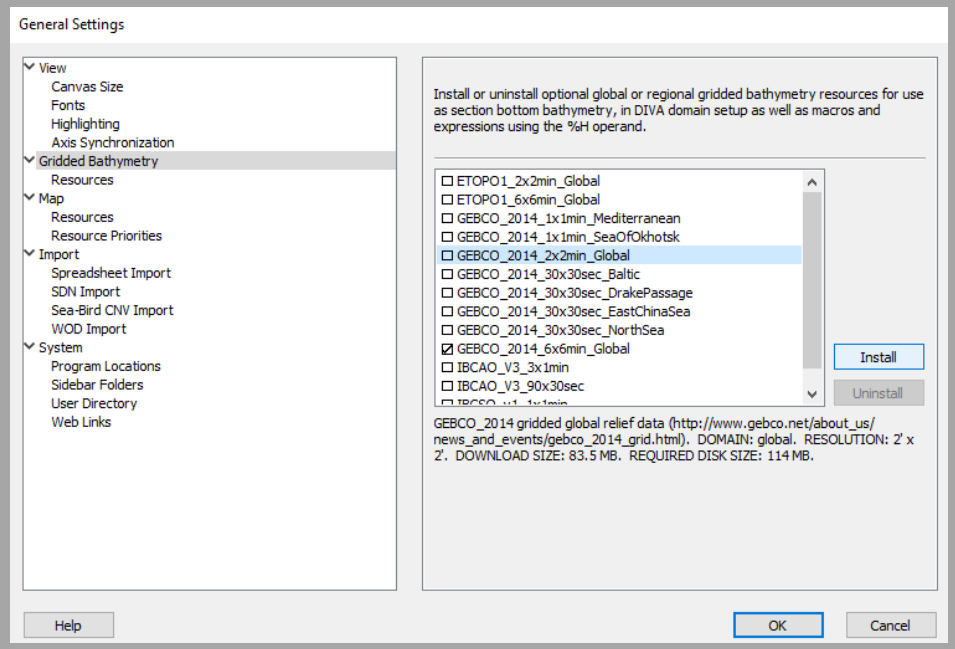
- Please copy all the data provided, to the folder **User\Documents\ODV\Data** for ease of handling/importing during this training session

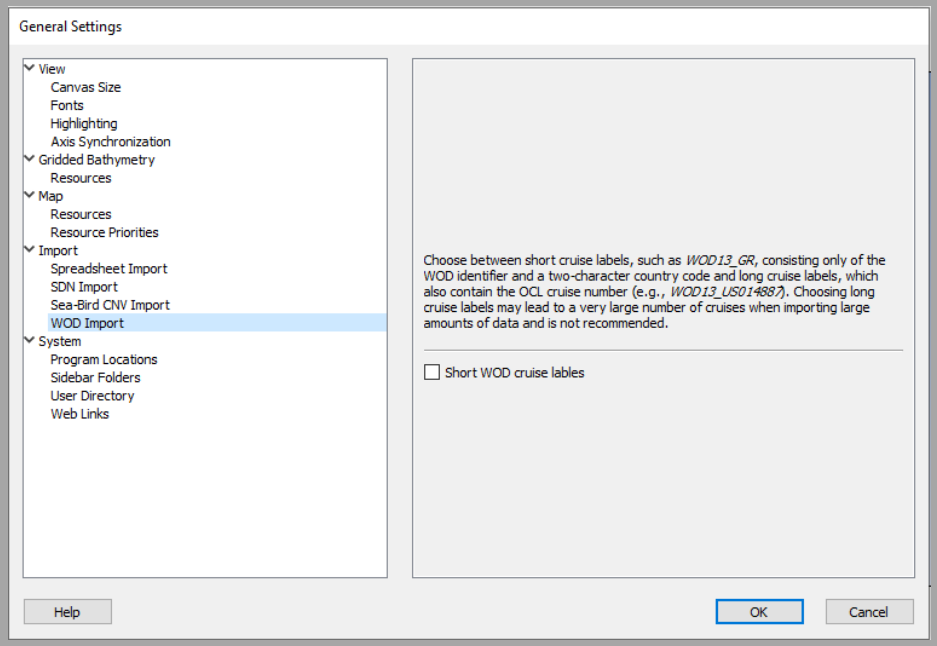
# Create ODV Collection from WOD

## 1. Setup:

- To begin, you will need to customize ODV general settings such as the graphics and text fonts, the size of the canvas, etc.
- Select View > Settings display the General Settings window
- Gridded Bathymetry > GEBCO_2014_2x2min_Global > Install (requires Internet)
- Sidebar Folder. Select the folder where datasets are located

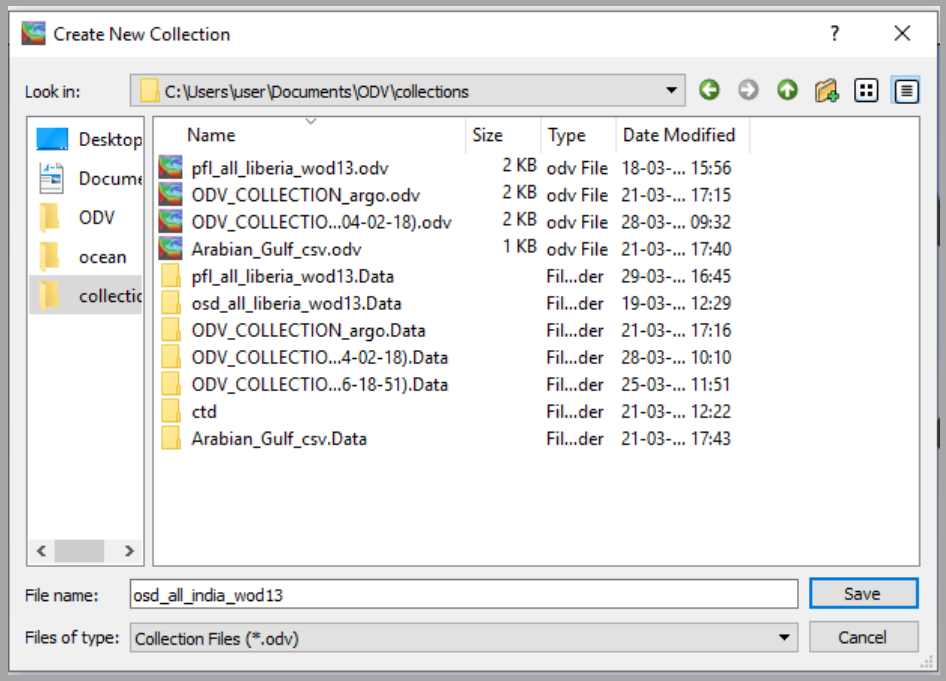

Ocean Data View
File
Collection
View
Import
Export
Tools
Help
Undo
Redo
Station Filter... Alt+S
Derived Variables... Alt+D
Isosurface Variables...
Window Properties
Window Layout Alt+W
Layout Templates
Save View As...
Save View
Load Views... Shift+L
Browse Session Log File
Settings...


General Settings
View
Canvas Size
Fonts
Highlighting
Axis Synchronization
Gridded Bathymetry
Resources
Map
Resources
Resource Priorities
Import
Spreadsheet Import
SDN Import
Sea-Bird CNV Import
WOD Import
System
Program Locations
Sidebar Folders
User Directory
Web Links
Install or uninstall optional global or regional gridded bathymetry resources for use as section bottom bathymetry, in DIVA domain setup as well as macros and expressions using the %H operand.
ETOPO1_2x2min_Global
ETOPO1_6x6min_Global
GEBCO_2014_1x1min_Mediterranean
GEBCO_2014_1x1min_SeaOfOkhotsk
GEBCO_2014_2x2min_Global
GEBCO_2014_30x30sec_Baltic
GEBCO_2014_30x30sec_DrakePassage
GEBCO_2014_30x30sec_EastChinaSea
GEBCO_2014_30x30sec_NorthSea
GEBCO_2014_6x6min_Global
IBCAO_V3_3x1min
IBCAO_V3_90x30sec
Install
Uninstall
GEBCO_2014 gridded global relief data (http://www.gebco.net/about_us/news_and_events/gebco_2014_grid.html). DOMAIN: global. RESOLUTION: 2' x 2'. DOWNLOAD SIZE: 83.5 MB. REQUIRED DISK SIZE: 114 MB.
Help
OK
Cancel

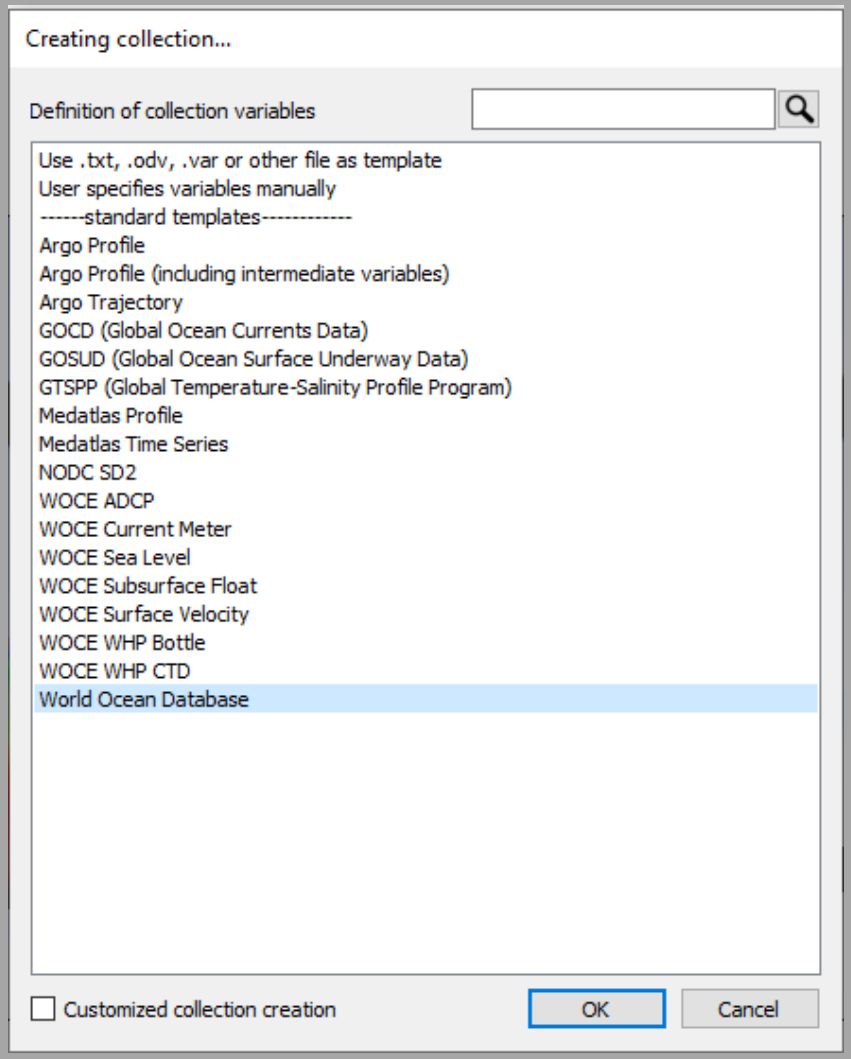

General Settings
View
Canvas Size
Fonts
Highlighting
Axis Synchronization
Gridded Bathymetry
Resources
Map
Resources
Resource Priorities
Import
Spreadsheet Import
SDN Import
Sea-Bird CNV Import
WOD Import
System
Program Locations
Sidebar Folders
User Directory
Web Links
Choose between short cruise labels, such as WOD13_GR, consisting only of the WOD identifier and a two-character country code and long cruise labels, which also contain the OCL cruise number (e.g., WOD13_US014887). Choosing long cruise labels may lead to a very large number of cruises when importing large amounts of data and is not recommended.
Short WOD cruise lables
Help
OK
Cancel

## 2. Create new collection

- To start a new collection for the ocean station data, select File > New.
- Navigate to the folder ODV > Collections and enter the collection name wod_india

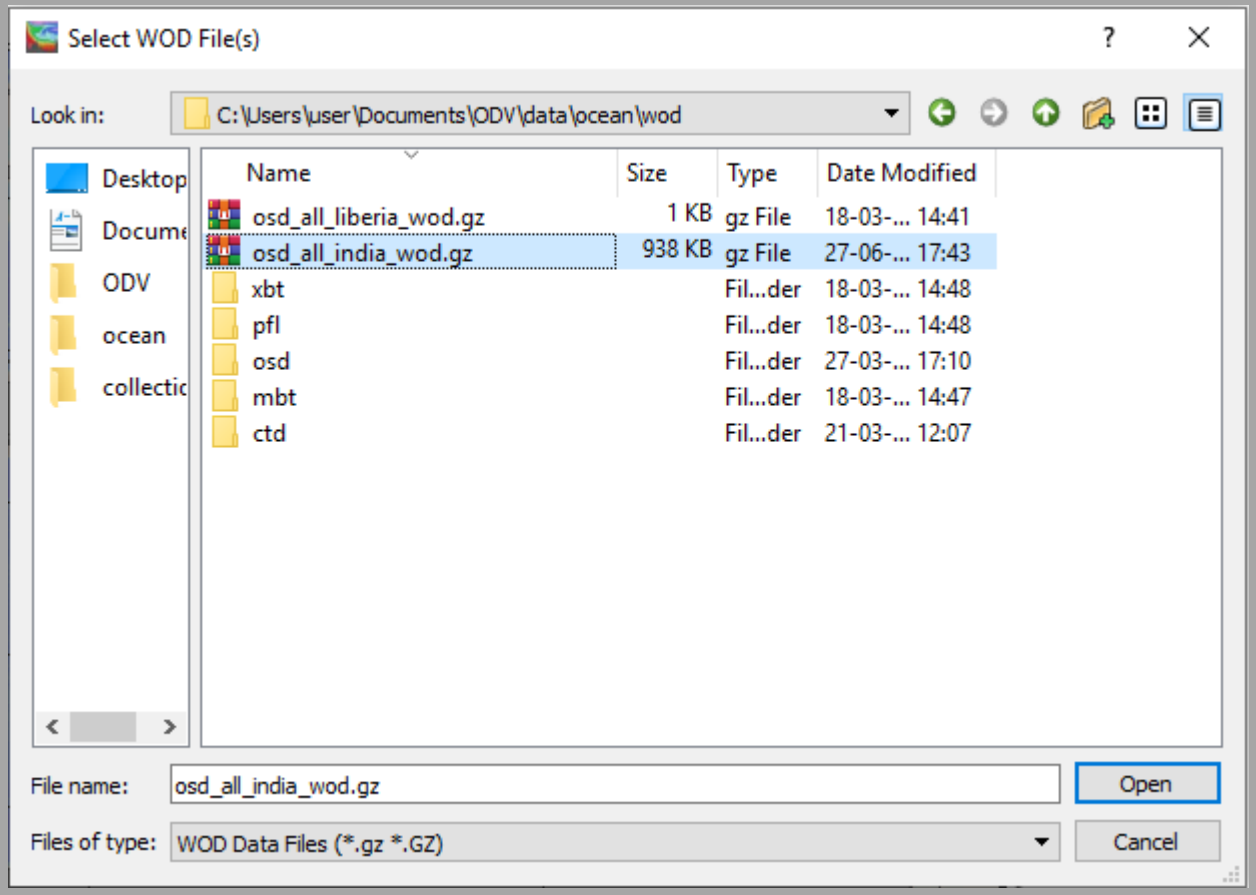


- Select the option World Ocean Database from the Creating collection window. A global map opens indicating the new collection has been created

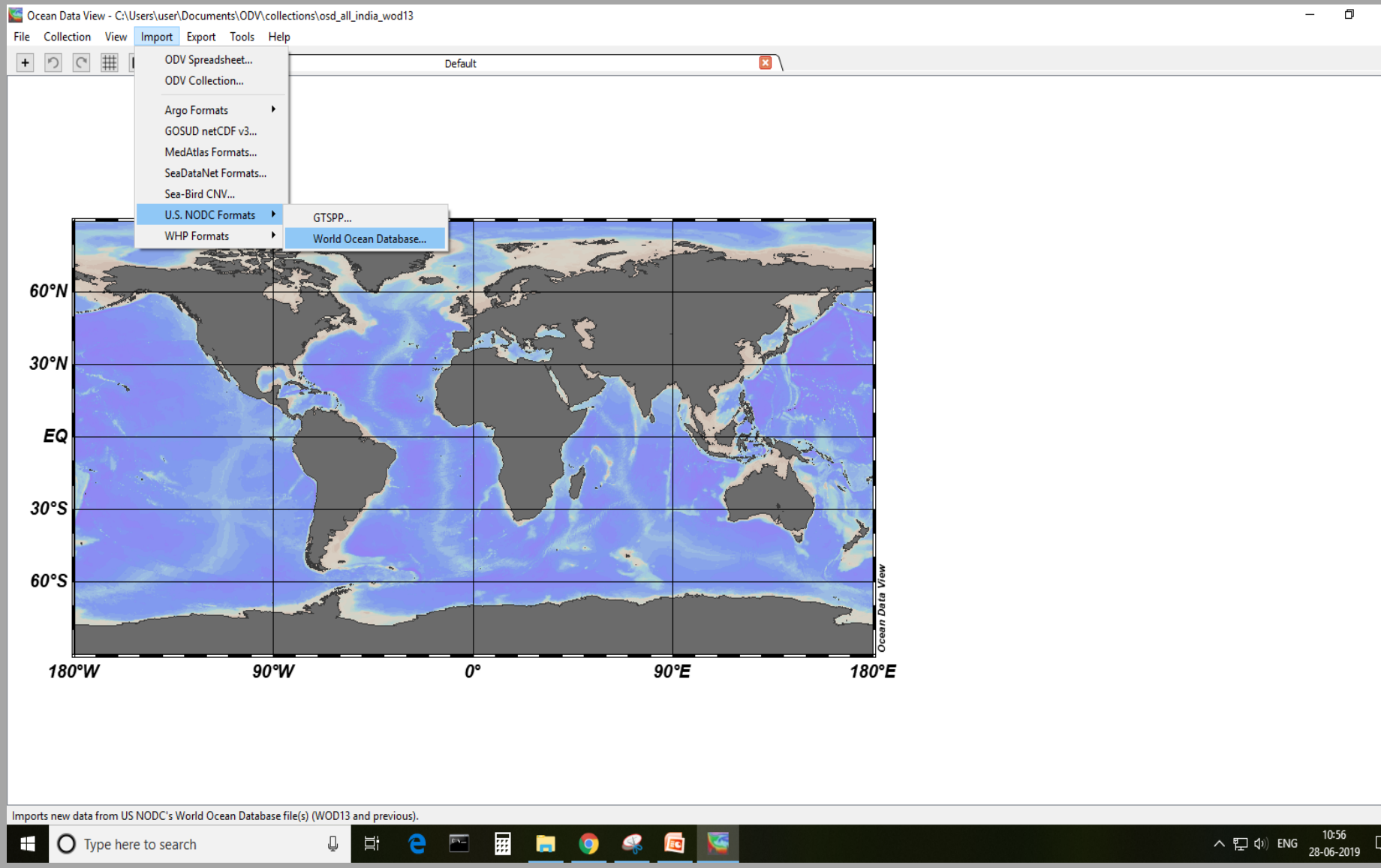


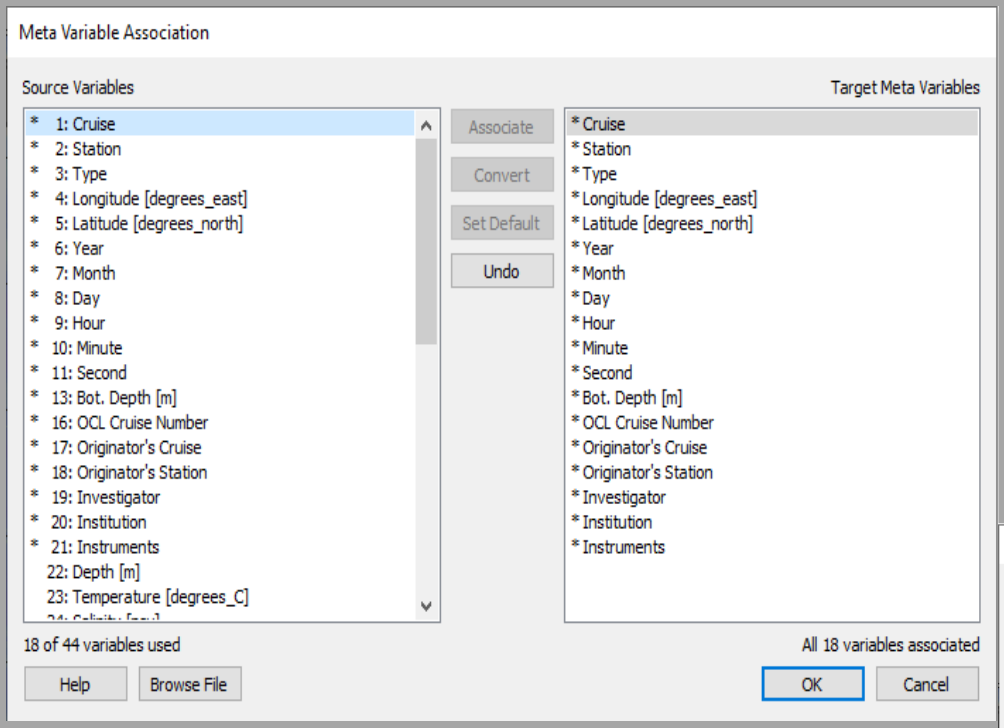
# 3. Import data

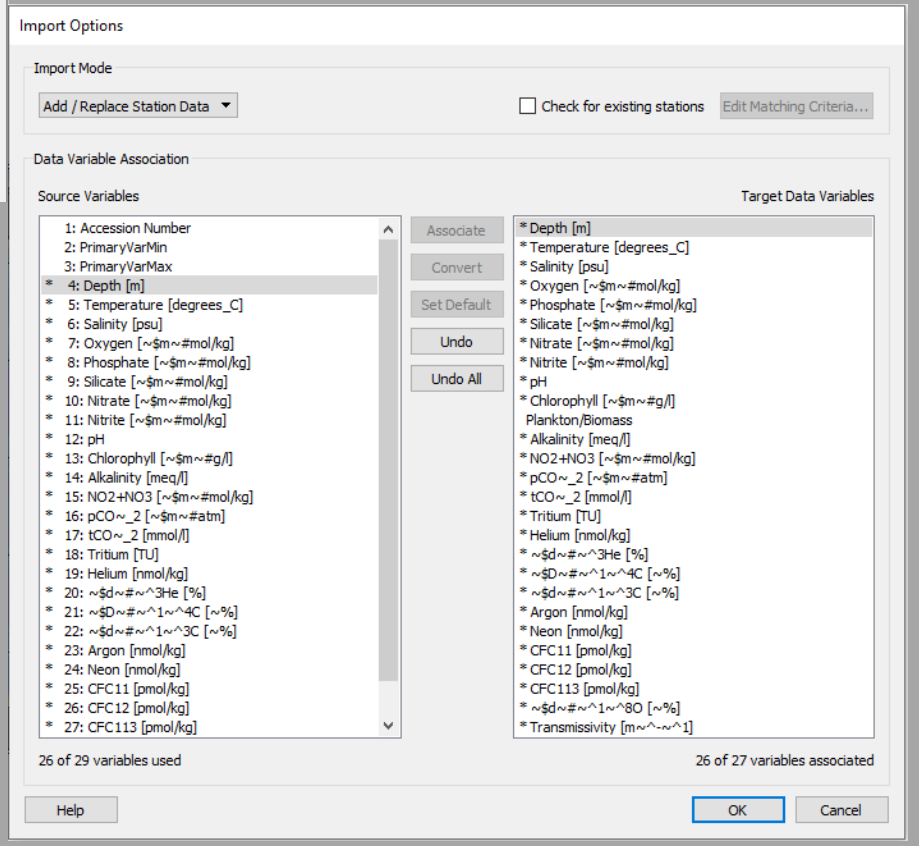
- To add data to the collection select Import > US NODC Formats > World Ocean Database



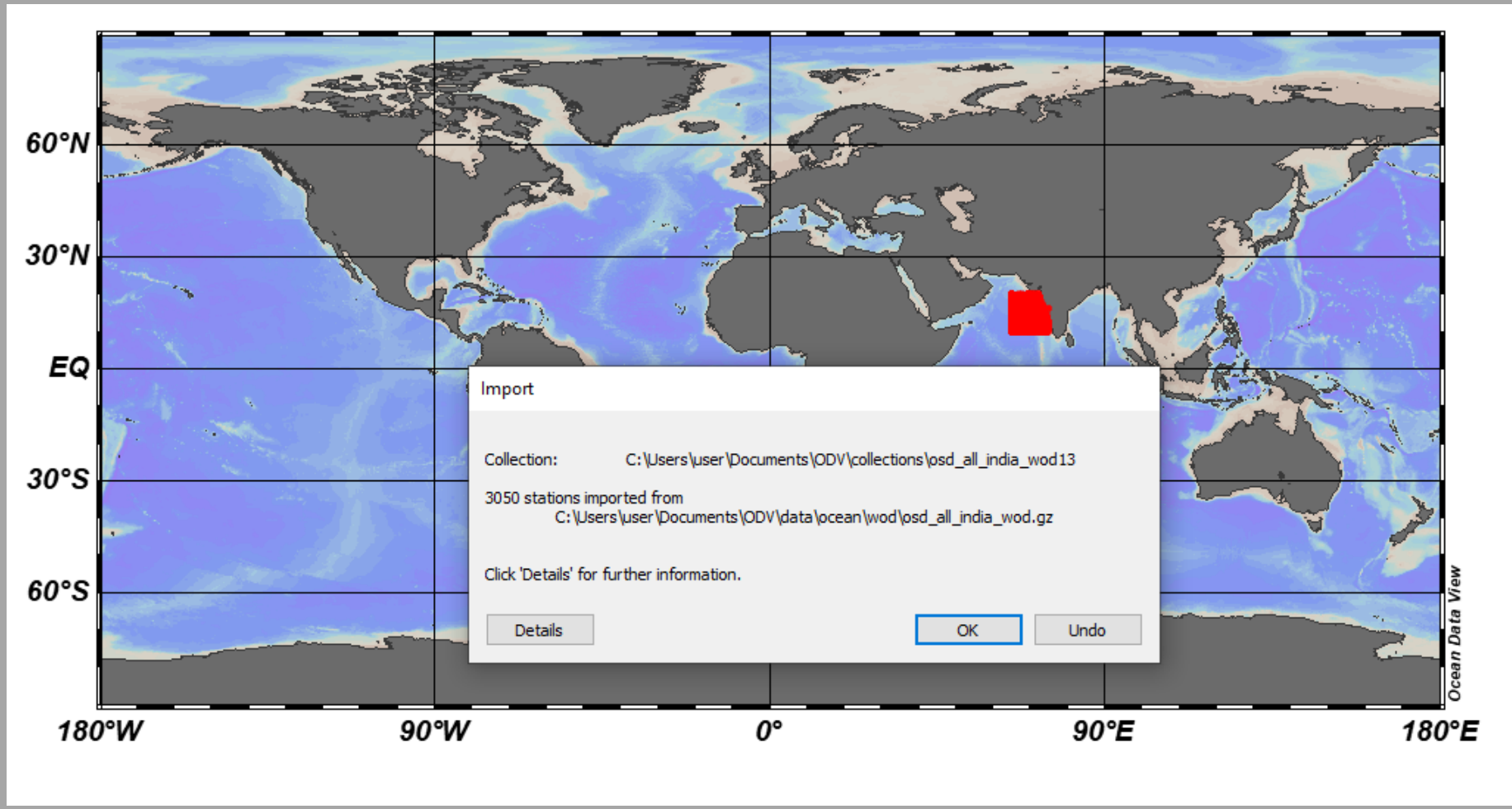

- Then navigate to the Documents > Data folder and select the OSD data osd_all_india_wod.gz


Ocean Data View - C:\Users\user\Documents\ODV\collections\osd_all_india_wod13
File
Collection
View
Import
Export
Tools
Help
ODV Spreadsheet...
ODV Collection...
Argo Formats
GOSUD netCDF v3...
MedAtlas Formats...
SeaDataNet Formats...
Sea-Bird CNV...
U.S. NODC Formats
WHP Formats
GTSPP...
World Ocean Database...
Default
60°N
30°N
EQ
30°S
60°S
180°W
90°W
0°
90°E
180°E
Ocean Data View
Imports new data from US NODC's World Ocean Database file(s) (WOD13 and previous).
Type here to search
ENG
10:56
28-06-2019




- Using the Import Options dialog box you can associate the variables of the imported data with the variables already defined in the collection.


60°N
30°N
EQ
30°S
60°S
180°W
90°W
0°
90°E
180°E
Ocean Data View
Import
Collection: C:\Users\user\Documents\ODV\collections\osd_all_india_wod13
3050 stations imported from
C:\Users\user\Documents\ODV\data\ocean\wod\osd_all_india_wod.gz
Click 'Details' for further information.
Details
OK
Undo

## Options:

- To view the full screen map, select View > Layout Templates > Full Screen Map.
- To save the current view, select View > Save View As and name the view station_map.
- To save the distribution map as an image, right-click on the map and select Save Map As then specify the file name and select the file type.

## Other Options:

- Change Projection
- Zoom to desired
- Add graphic objects
- Explore menu options

## Keep in mind:

- Save views and plots frequently, whenever needed
- Undo options are limited

## Task:

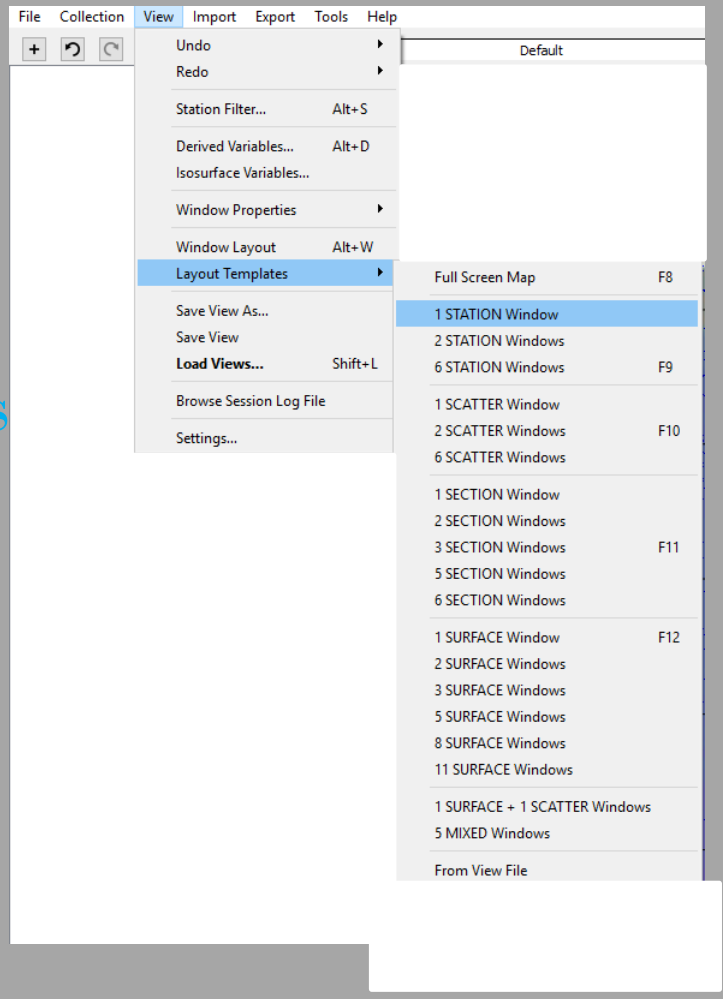
- Import the other WOD datasets (CTD, PFL) into the existing collection.

# Basic plotting using ODV

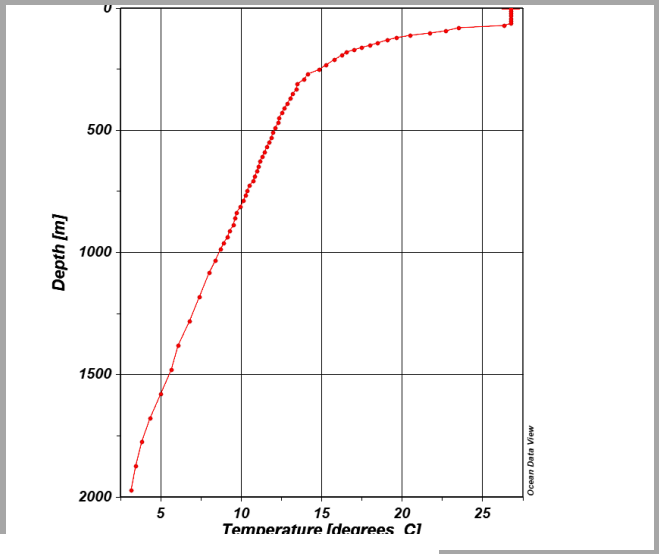
# Part 1:
# Station plot

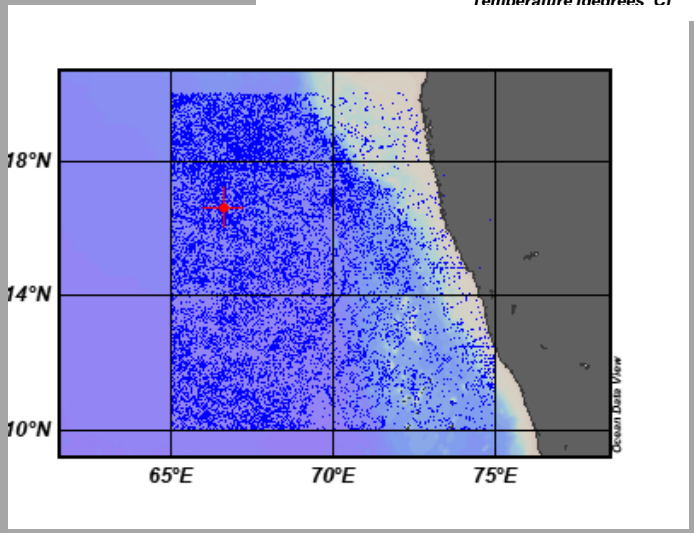
# 1. Draw a station plot:

- Open the OSD collection previously created.
- Select View > Layout Templates to show a list of predefined window layout templates.
- Select 1 STATION Window.



- Press Enter to plot the default station indicated by the small red cross on the map.
- Select other stations on the map to plot their profiles, temporarily, on the graph.
- Double-click on any station to make it appear permanently on the plot.

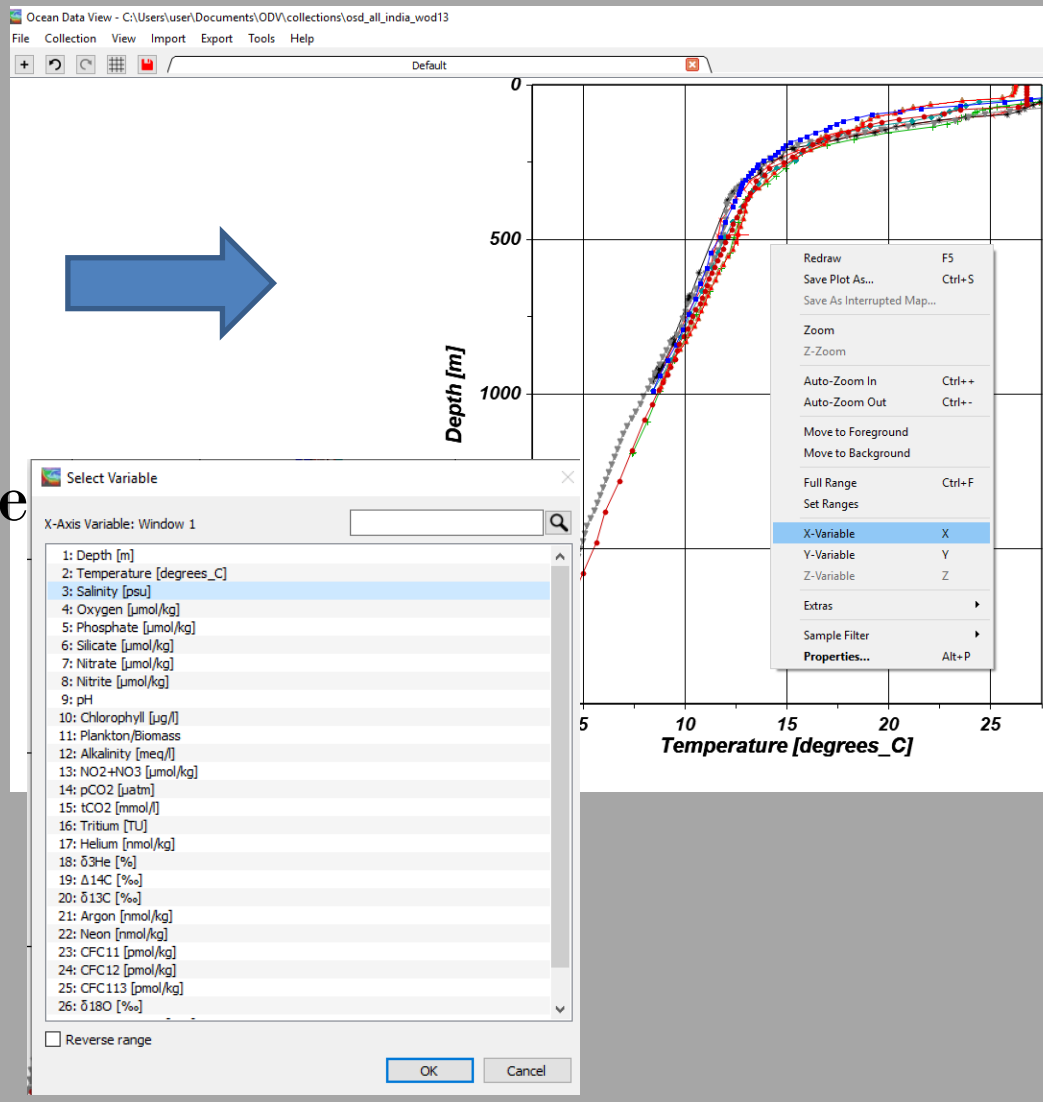


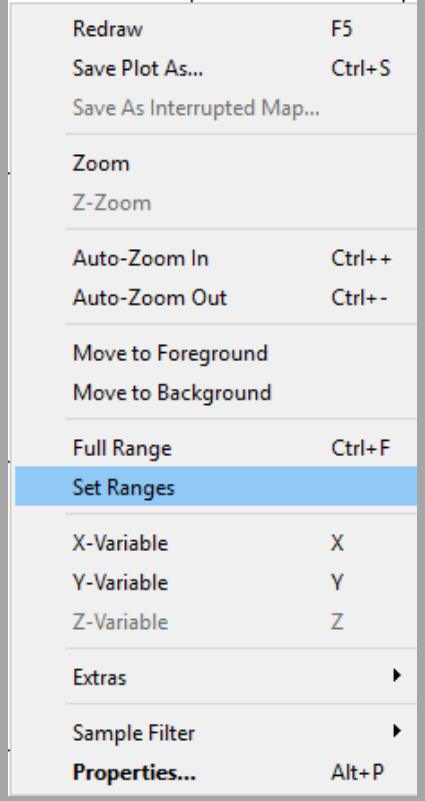
# 2. Adjust the variable in a station plot:

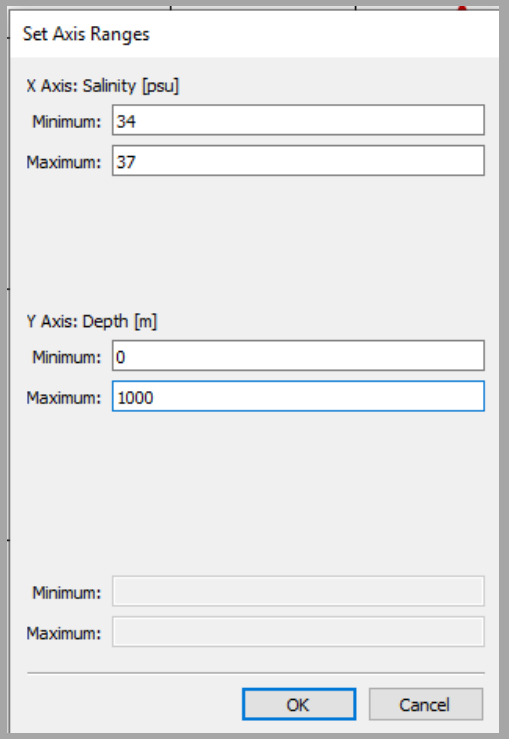
- To change the x or y variables in the station plot, right click on the station plot and choose X-Variable or Y-Variable

- For example, select X-Variable and choose Salinity to display the salinity profile.



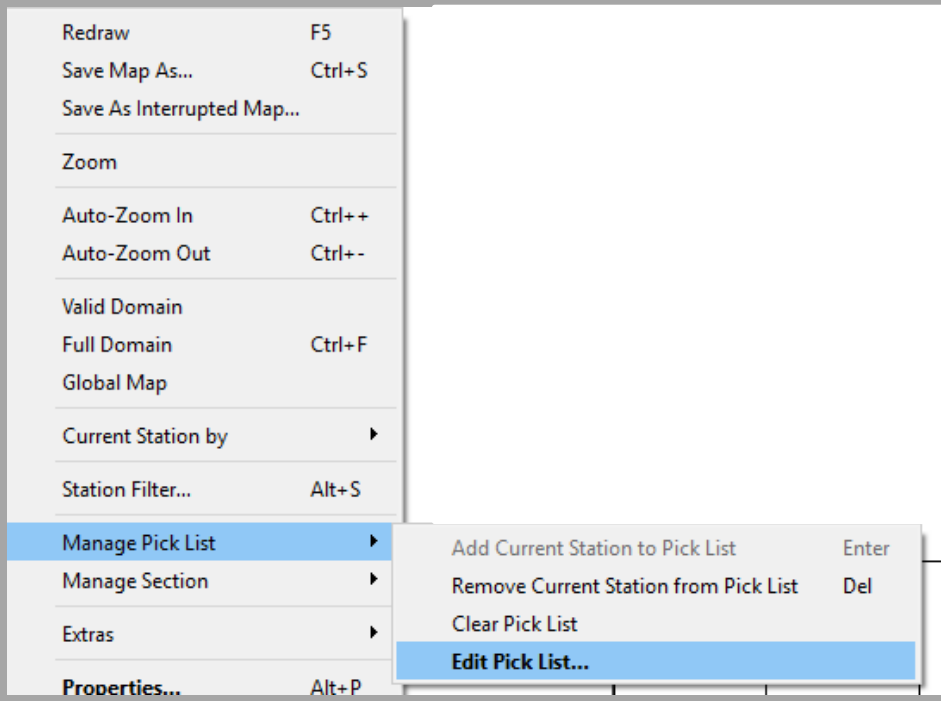
- Right click on the plot and choose Set Ranges then set the range for the X and Y variables.
- For example, set the depth range to 0 - 1000m or the salinity range to 34 to 37 psu.
- Right click and select Full Range to set the full range of the values.

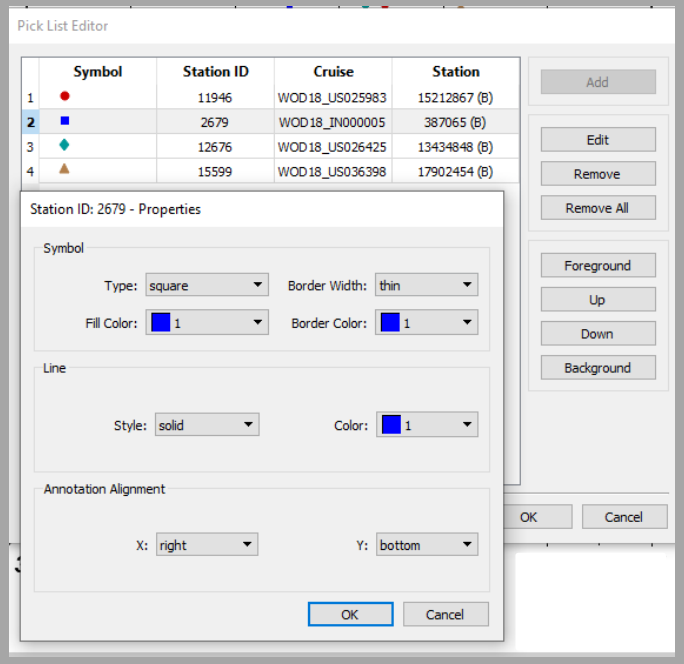


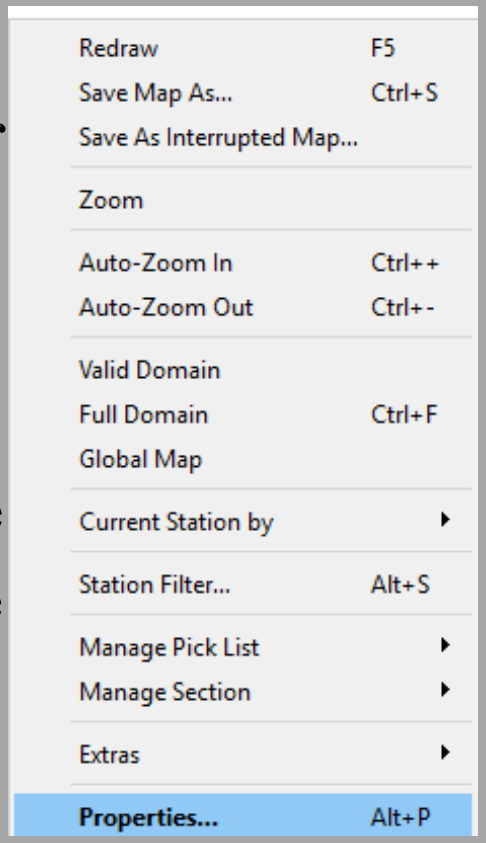
# 3. Edit station plot properties :

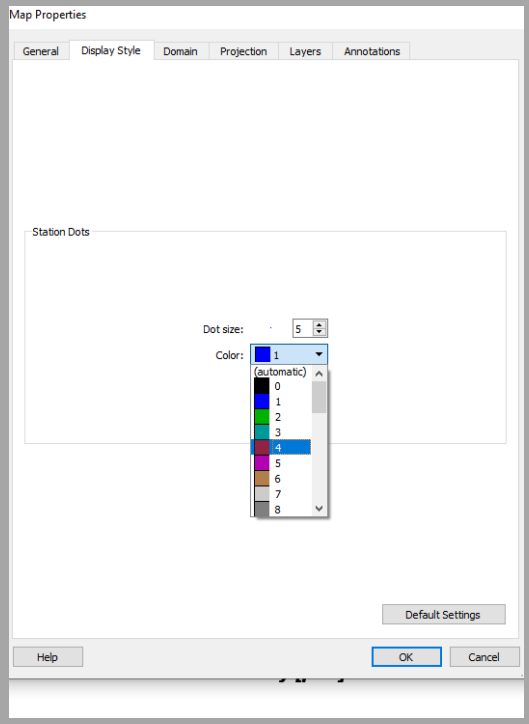
- To change the figure properties, select the station on the map then right click the map window and choose Manage Pick List > Edit Pick List to change the symbol type and colour and the line.



- To change the symbols of the stations on the map, right click on the map and select Properties > Display Style and change the colour and size of the symbol.




- Under Annotations you can add annotations about the cruise and station labels to the stations on the map window.

## Other Options:

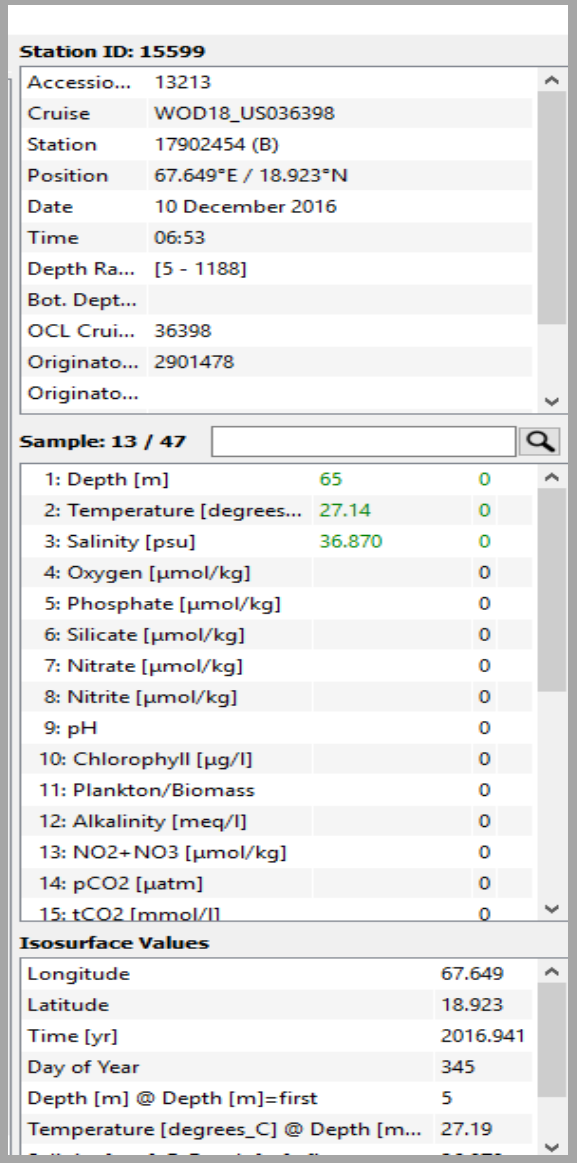
- Add graphic objects to station plot
    - Text (Annotation)
    - Symbol
    - Polygon

## Task:

- Make station plot with oxygen on X-axis (oxygen profile with depth)

# 4. Station metadata and data

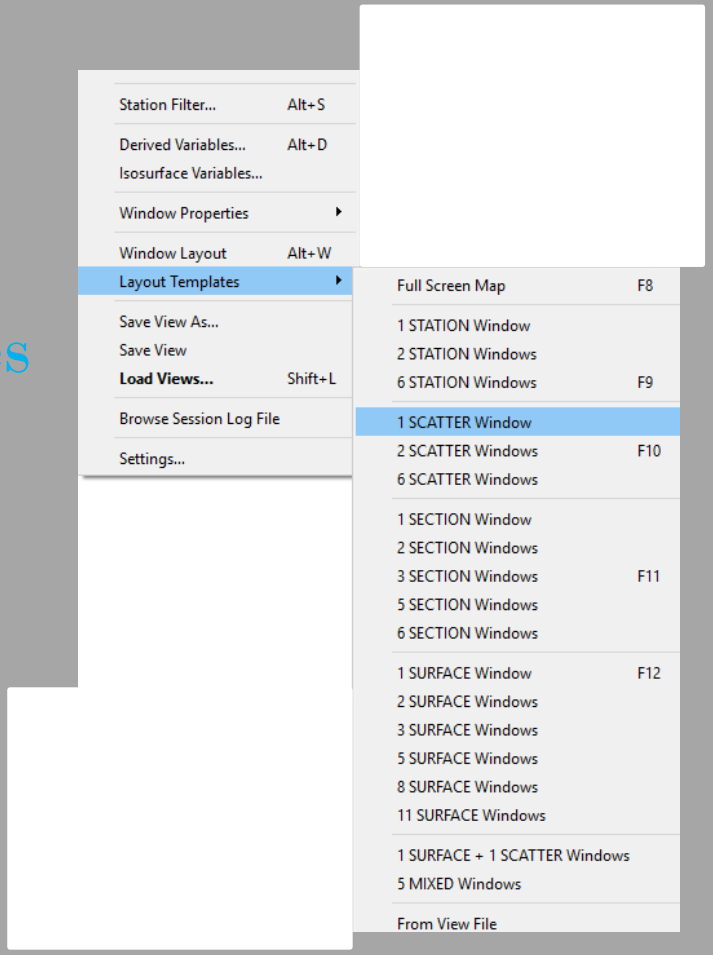
- The top panel (Station ID) contains the metadata about the cruise.
- The metadata includes the Accession No, cruise, station, position, data and time.
- The second panel (Sample) lists the depth and values of each variable measured at the station.



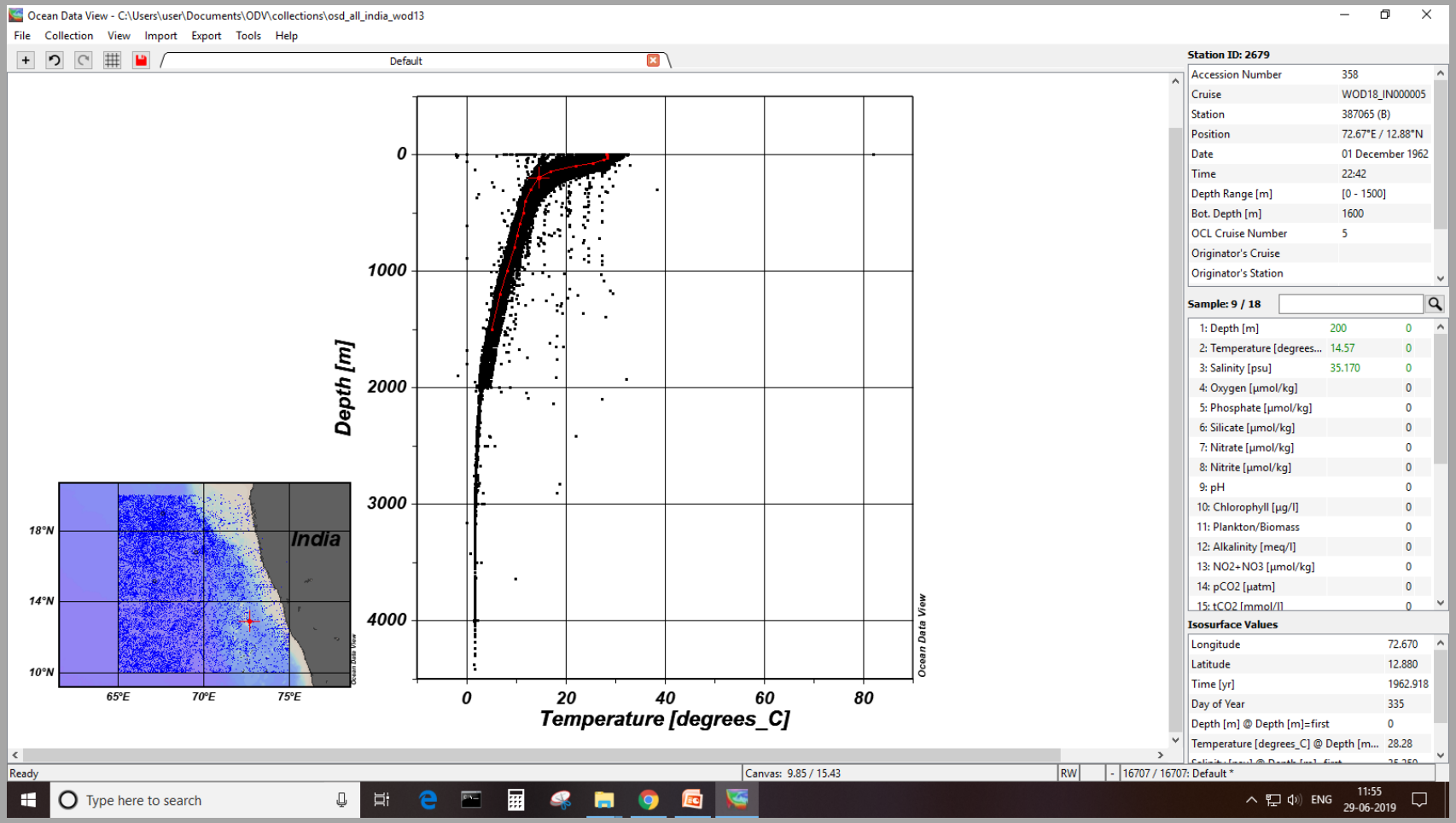
# Part 2:
# Scatter plot

# 1. Draw a scatter plot:

- Select View > Layout Templates to show a list of predefined window layout templates.
- Select 1 SCATTER Window.

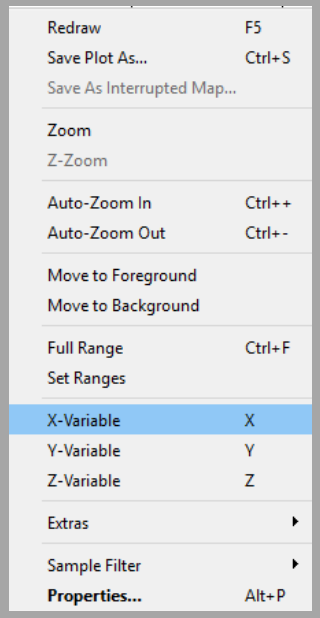


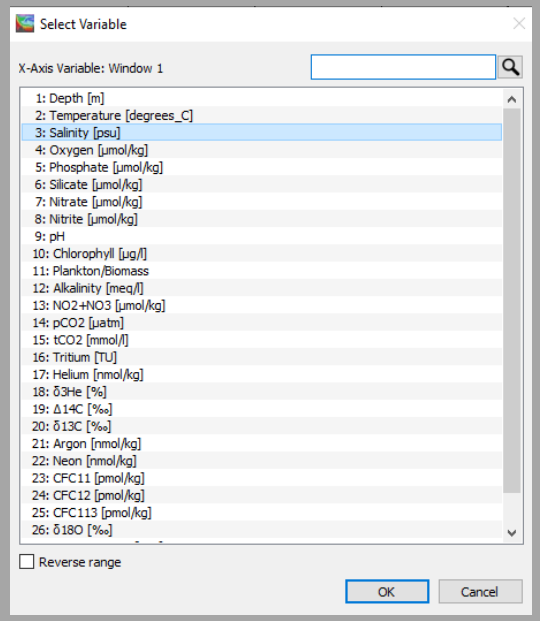
# Scatter plot:

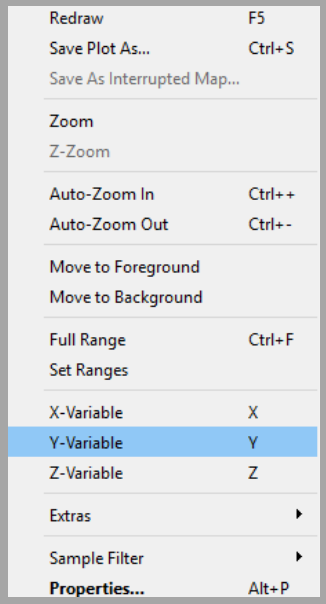


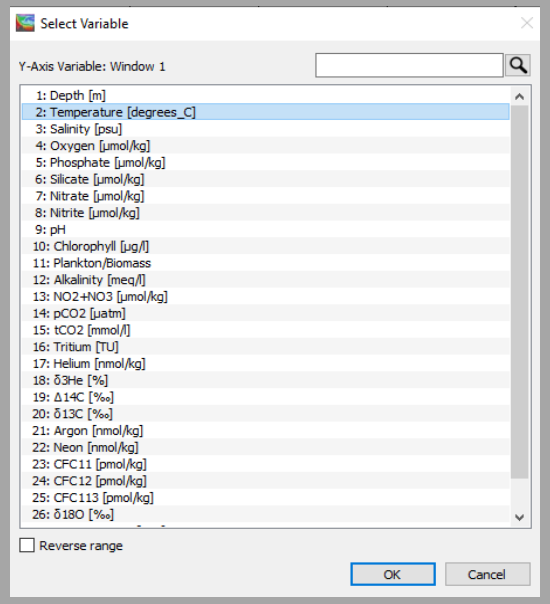
## 2. Plot a Temperature-salinity scatter

- Right click on the scatter diagram
- Change the X-Variable to Salinity
- Then change the Y-variable to Temperature



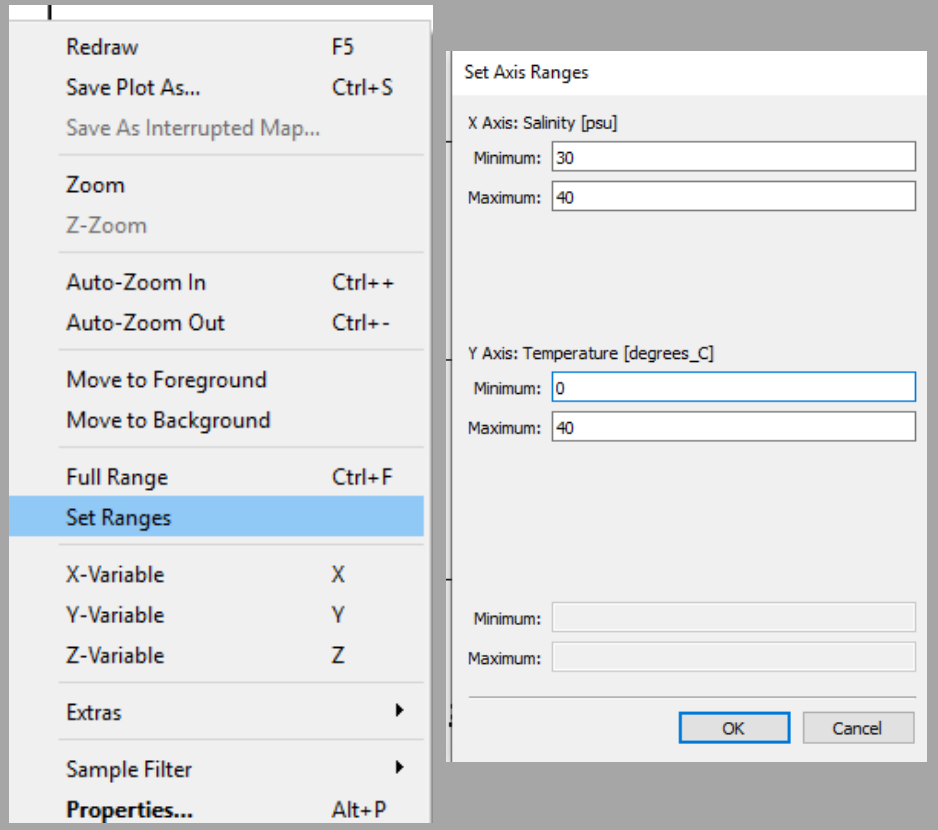



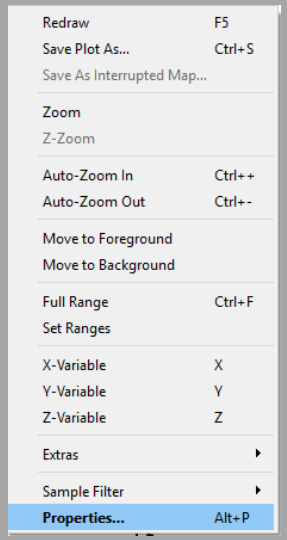
# 3. Set axis limits

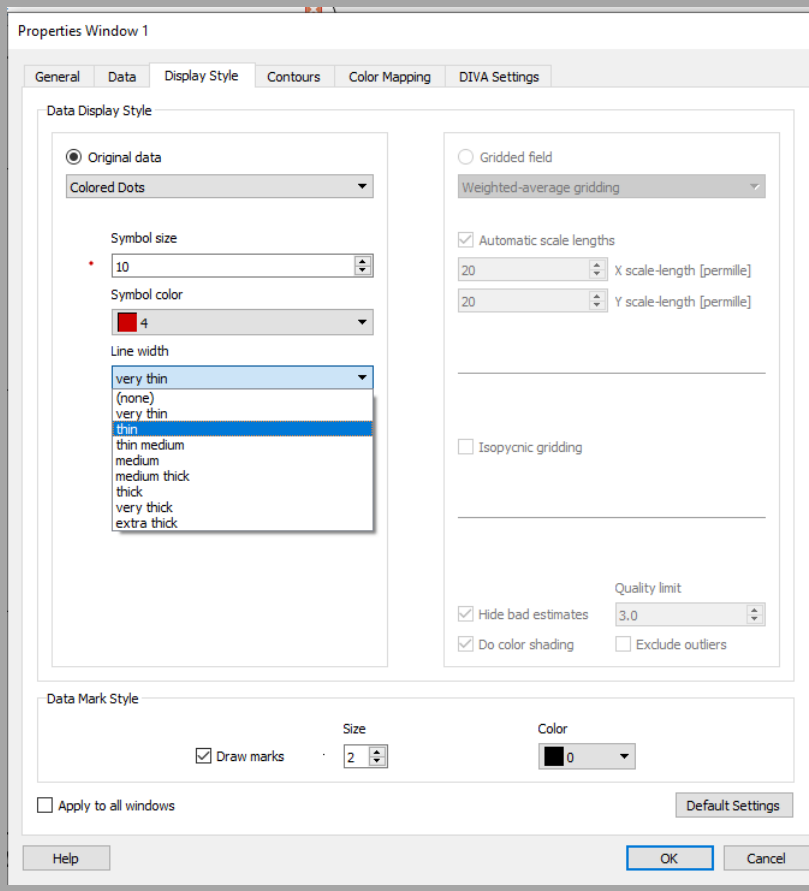
- Right click on the scatter diagram > Set ranges
- Set temperature range to 0-35 and salinity range to 30-40 to ignore the outliers/ bad data



# 4. Change display properties

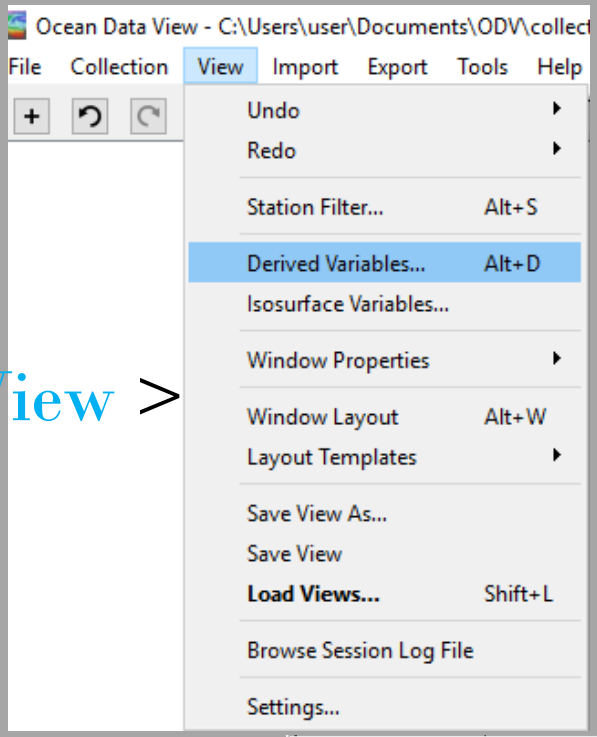
- Right click on the scatter diagram > Properties > Display Style
- Change the Symbol size, Symbol color, and Line width

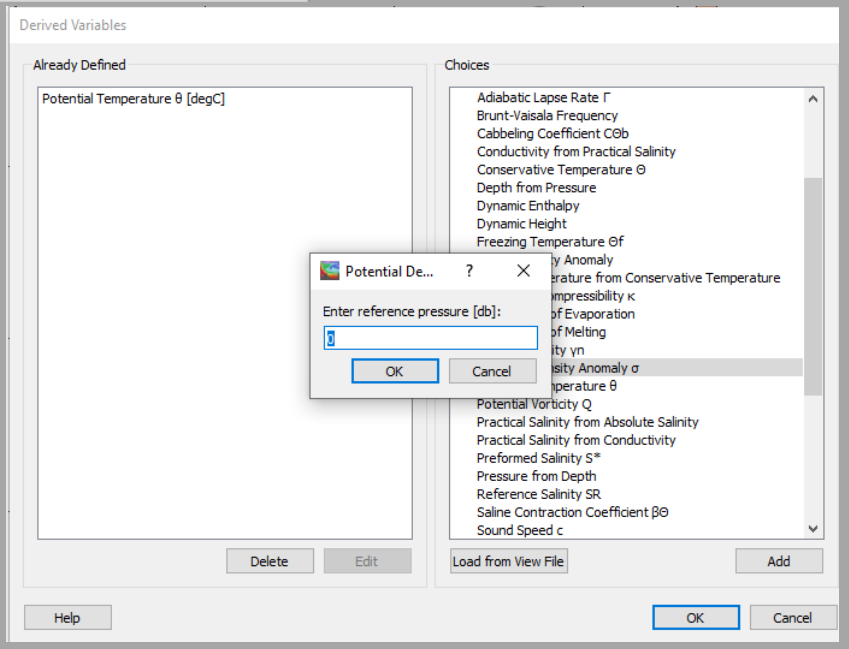


# 5. Derived variables

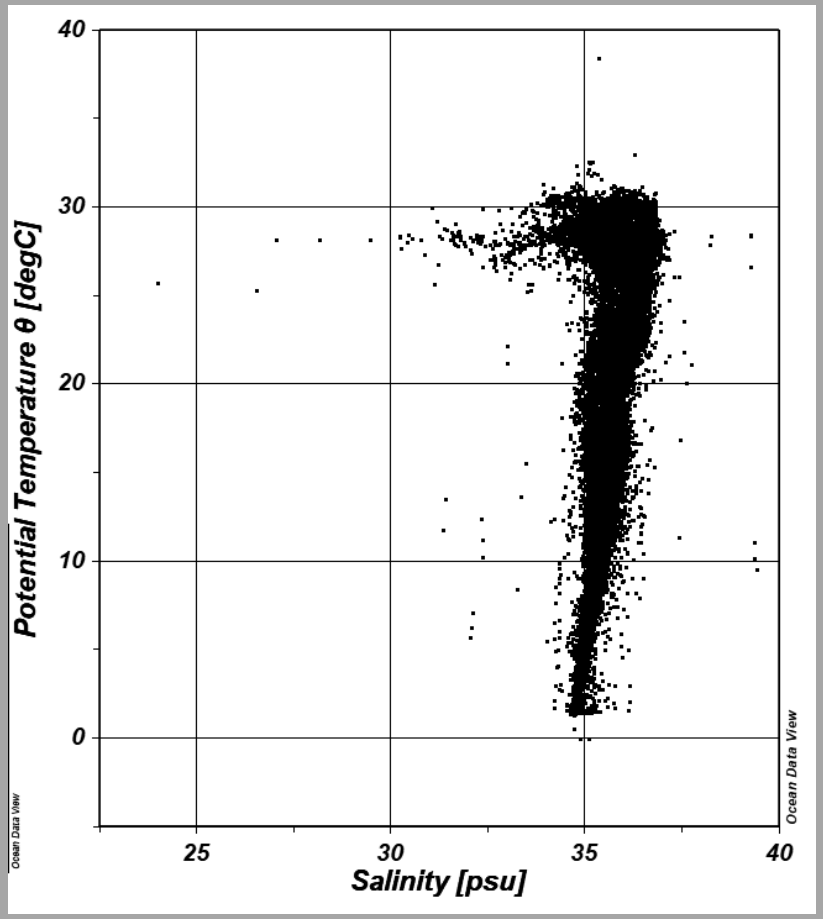
- Go to Top Menu > View > Derived variables
- Select Potential temperature and set reference pressure as 0 db. Then click Add > OK
- Similarly select and set potential density anomaly



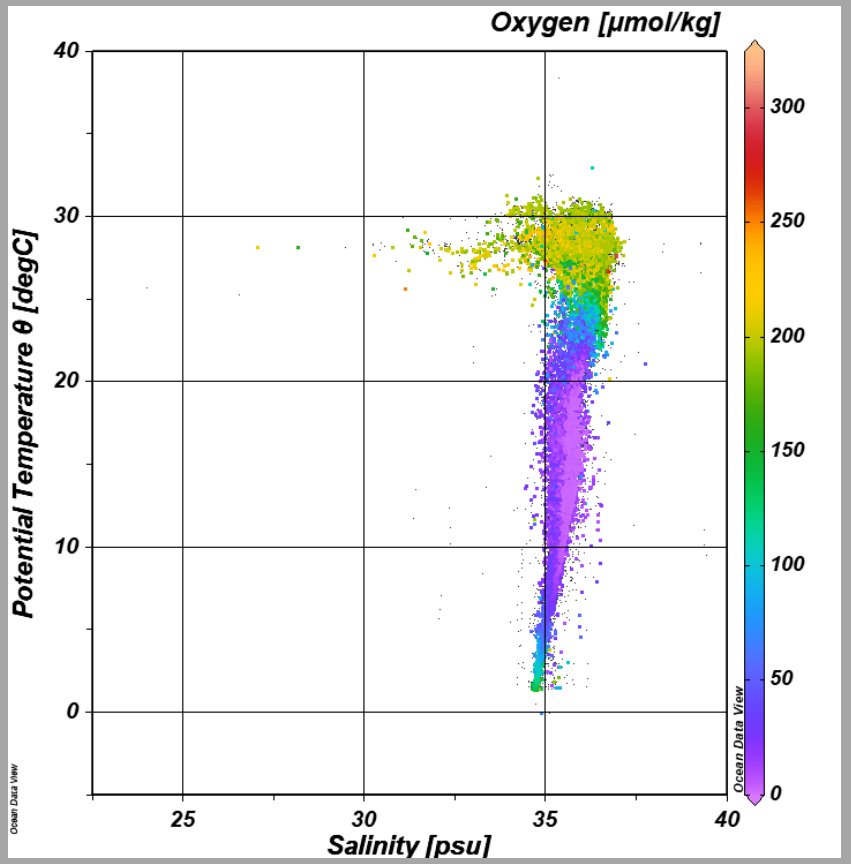
## 6. Plot Potential Temperature vs. salinity

- Right click on the scatter diagram
- Change the Y-Variable to drvd:potential temperature



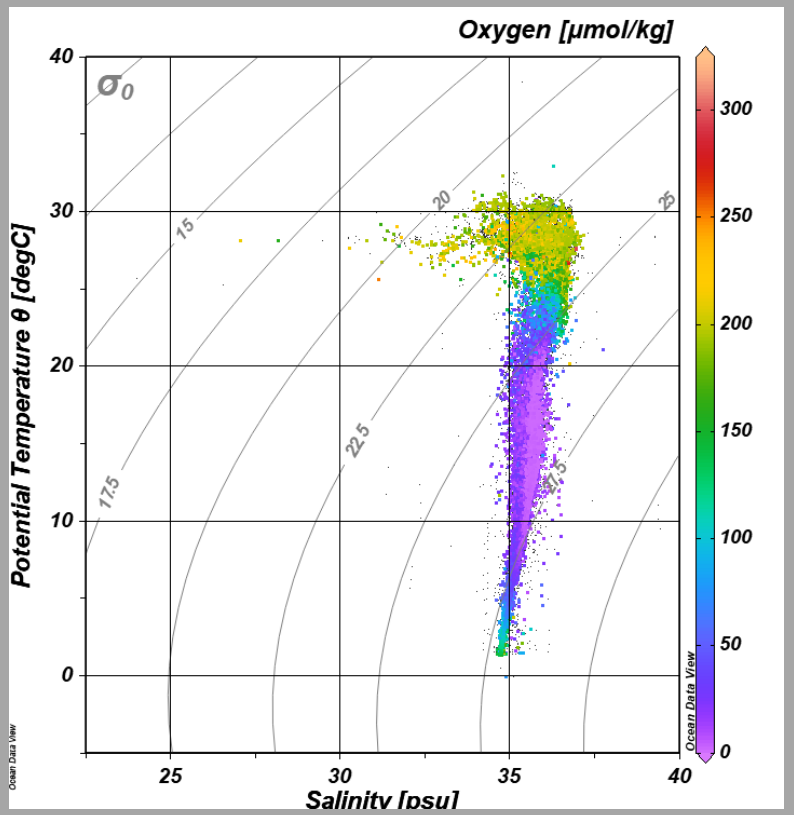
# 7. Overplot with another variable

- Right click on the scatter diagram
- Select Z-Variable as Oxygen



# Other Options:

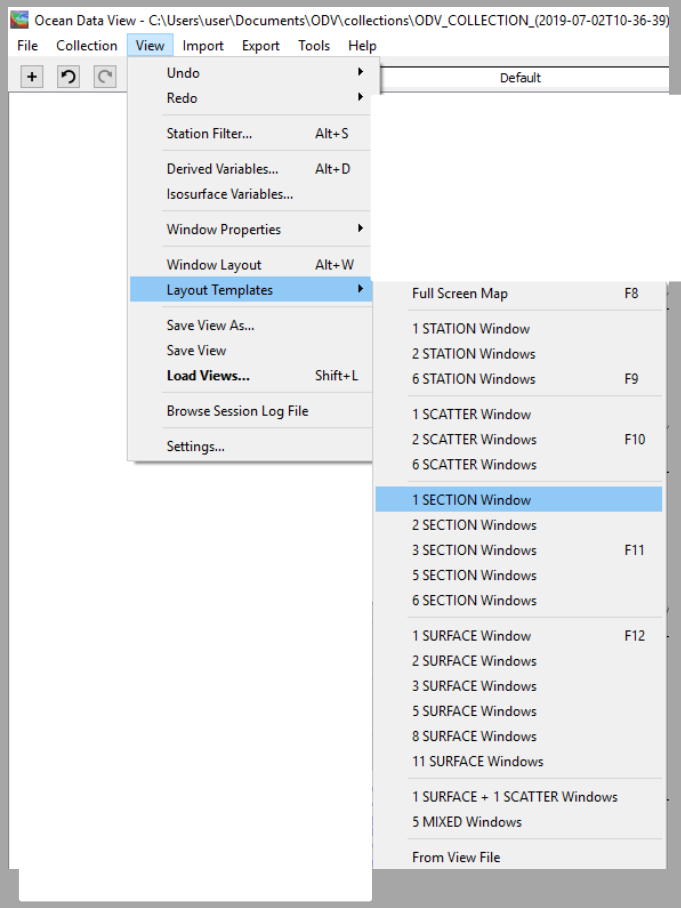
- Add isopycnals from Extras
- Save view from Menu > Save View As. Later Load this view from Menu > Load Views



# Part 3:
# Section plot

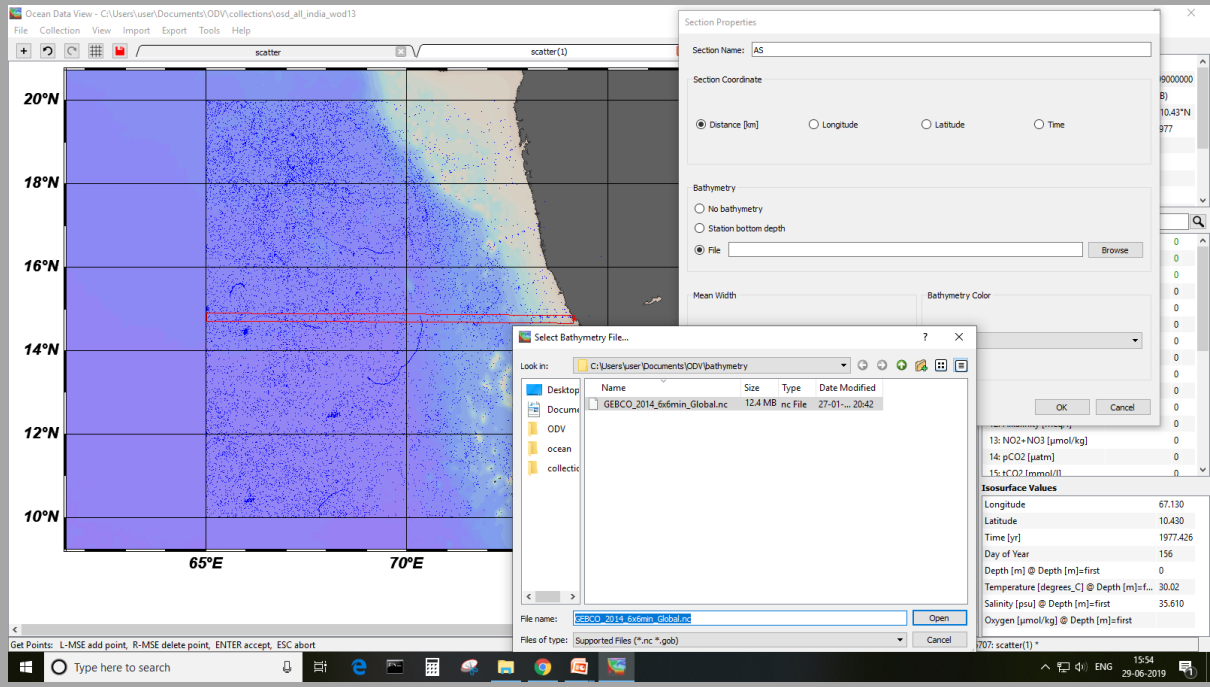
## Section plot:

- Select View > Layout Templates to show a list of predefined window layout templates.
- Select 1 SECTION Window.



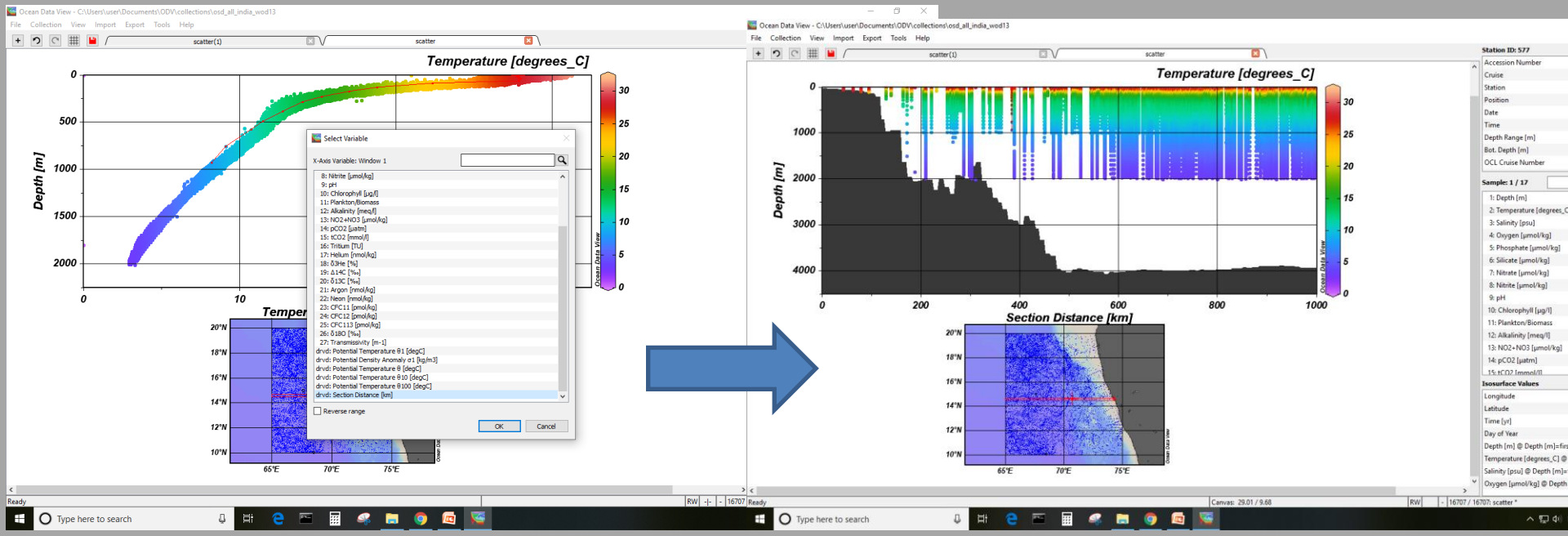
# 1. Define a geographic section:

- Right-click on the map, and select Manage Section > Define Section.
- Click on any point to start section. A red dot appears to mark the start point.
- Draw a line to the end point of the section and double click to end section.
- Provide Section name, choose bathymetry > File



# 2. Draw a Section Plot:

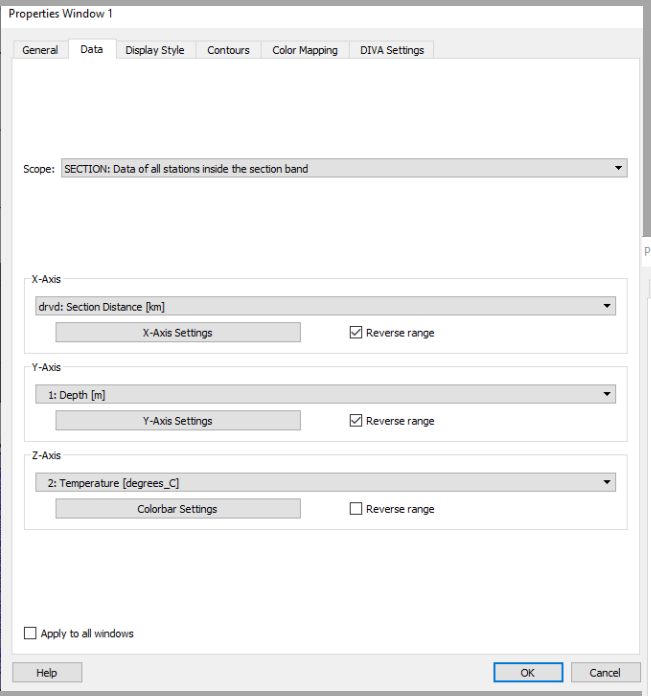
- Right click the section plot and select X-Variable > Section Distance. The section is displayed as coloured dots with the temperature scale bar on the right.
- Set range of X axis up to 4500 m to show the ocean floor.

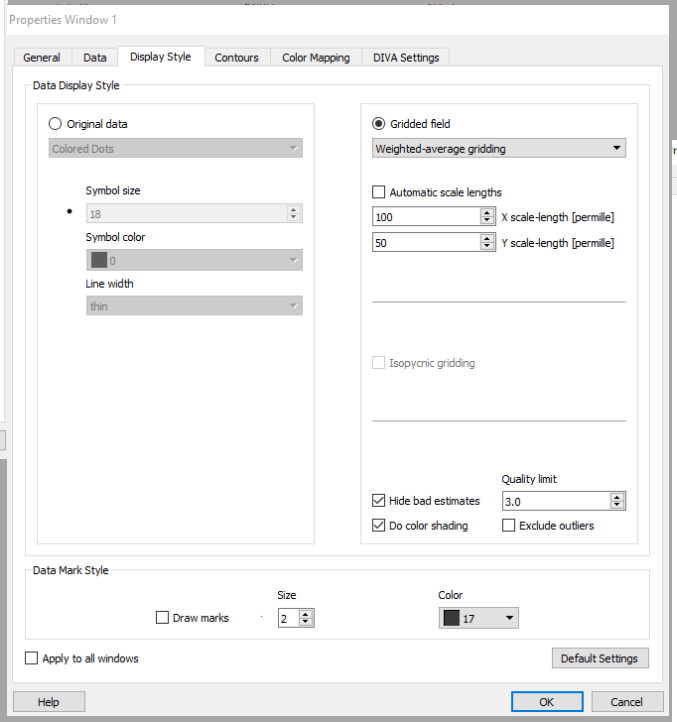


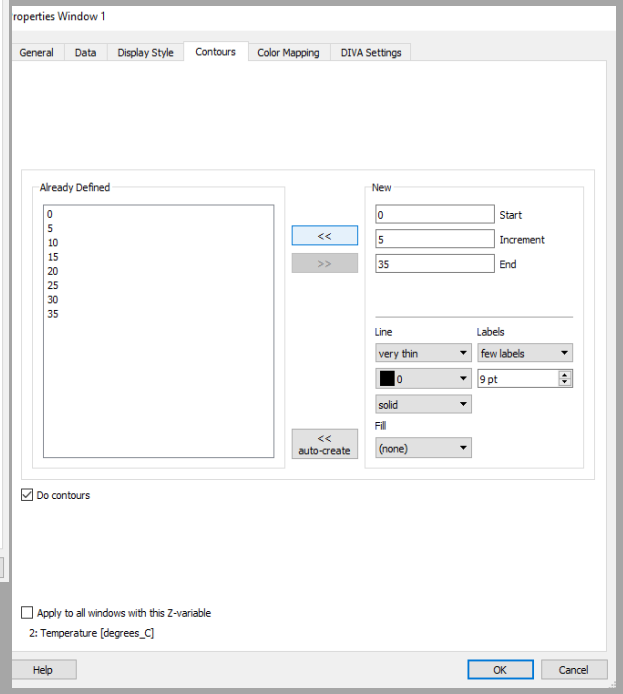
## 3. Data interpolation/Gridding:

- Right click the section plot and select Properties
- For Data, select Reverse Range X-Axis so the view is the same as the station map.
- In Display Style, use Weighted-average gridding, set X scale-length to 100 and Y scale-length to 50. Uncheck Draw Marks.
- Experiment with different length scales to get desired smoothness while preserving the data structure.
- In Contours, check Do Contours and click on the icon << to create contours for the z variable

# Weighted-Average Gridding for Data Interpolation



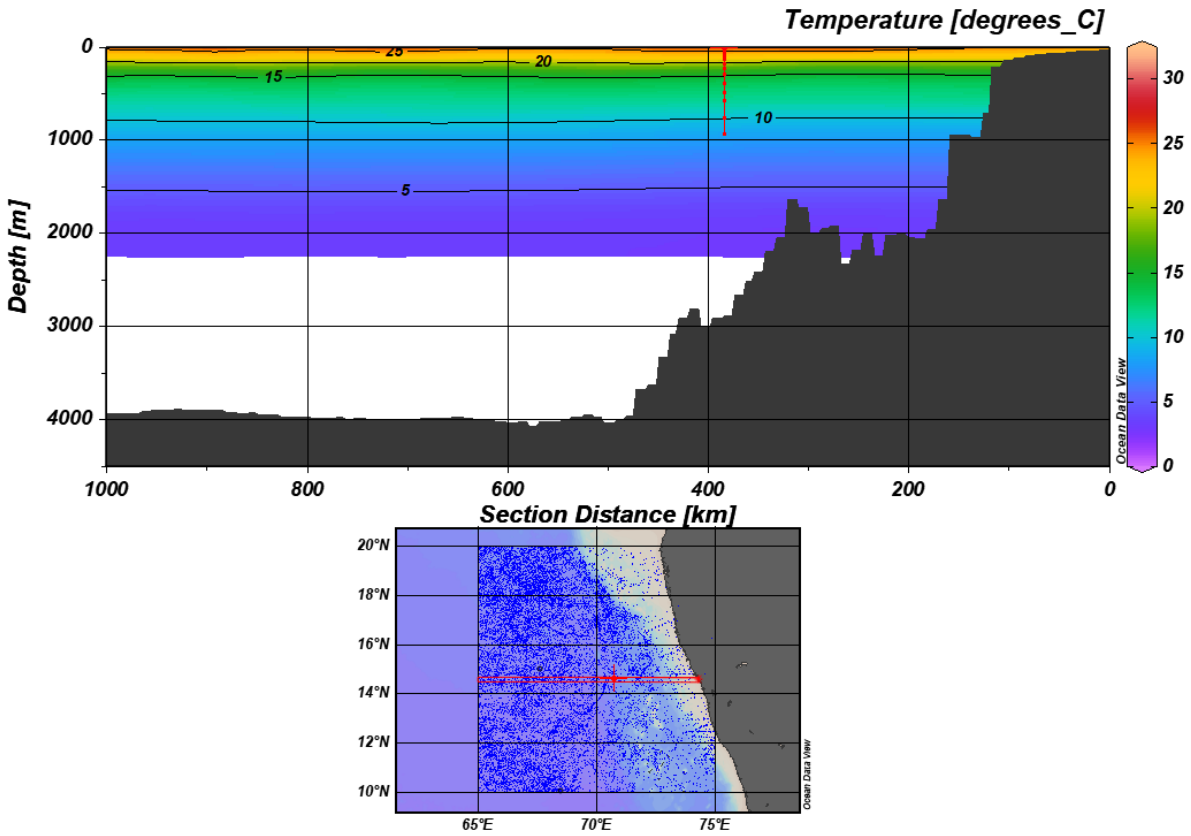



Ocean Data View - C:\Users\user\Documents\ODV\collections\osd_all_india_wod13

File Collection View Import Export Tools Help

scatter(1) scatter




**Station ID: 577**

| | |
|---|---|
| Accession Number | 1577 |
| Cruise | WOD18_99000451 |
| Station | 7219817 (B) |
| Position | 70.73°E / 14.63°N |
| Date | 24 July 1976 |
| Time | 19:00 |
| Depth Range [m] | [0 - 930] |
| Bot. Depth [m] | |
| OCL Cruise Number | 451 |

**Sample: 1 / 17**

| | | |
|---|---|---|
| 1: Depth [m] | 0 | 0 |
| 2: Temperature [degrees_C] | 27.82 | 0 |
| 3: Salinity [psu] | 36.890 | 0 |
| 4: Oxygen [µmol/kg] | | 0 |
| 5: Phosphate [µmol/kg] | | 0 |
| 6: Silicate [µmol/kg] | | 0 |
| 7: Nitrate [µmol/kg] | | 0 |
| 8: Nitrite [µmol/kg] | | 0 |
| 9: pH | | 0 |
| 10: Chlorophyll [µg/l] | | 0 |
| 11: Plankton/Biomass | | 0 |
| 12: Alkalinity [meq/l] | | 0 |
| 13: NO2+NO3 [µmol/kg] | | 0 |
| 14: pCO2 [µatm] | | 0 |
| 15: tCO2 [mmol/l] | | 0 |

**Isosurface Values**

| | |
|---|---|
| Longitude | 70.730 |
| Latitude | 14.630 |
| Time [yr] | 1976.562 |
| Day of Year | 206 |
| Depth [m] @ Depth [m]=first | 0 |
| Temperature [degrees_C] @ Depth [m]=f... | 27.82 |
| Salinity [psu] @ Depth [m]=first | 36.890 |
| Oxygen [µmol/kg] @ Depth [m]=first | |

Ready | Window 1: 413.2 / 4179 | RW | -|- | - | 16707 / 16707: scatter *

Type here to search

ENG 16:47 29-06-2019

- To save the settings for the section, right-click on the station map and select Manage Section > Save Section As. Accept the location and filename extension and enter the name AS_offshore_southwest. (for access later)
- To save the view of the data, select View > Save View As with the name India_southwest_section.

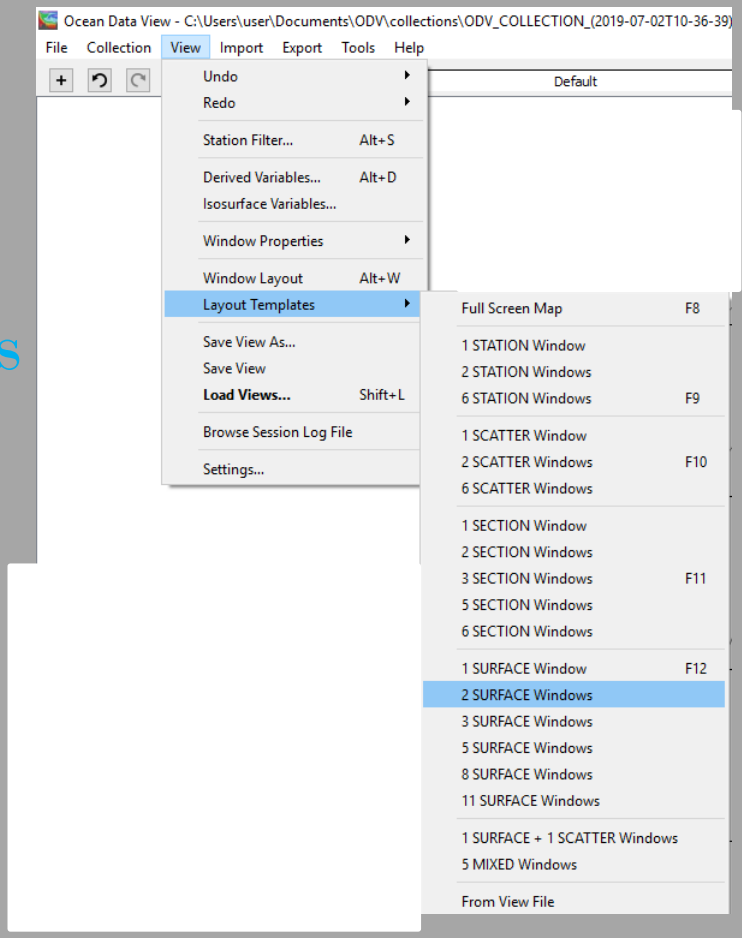
**Task:**

- Change the section variable to oxygen, and set ranges of the axis to view the continental shelf.

# Part 3:
# Surface plot

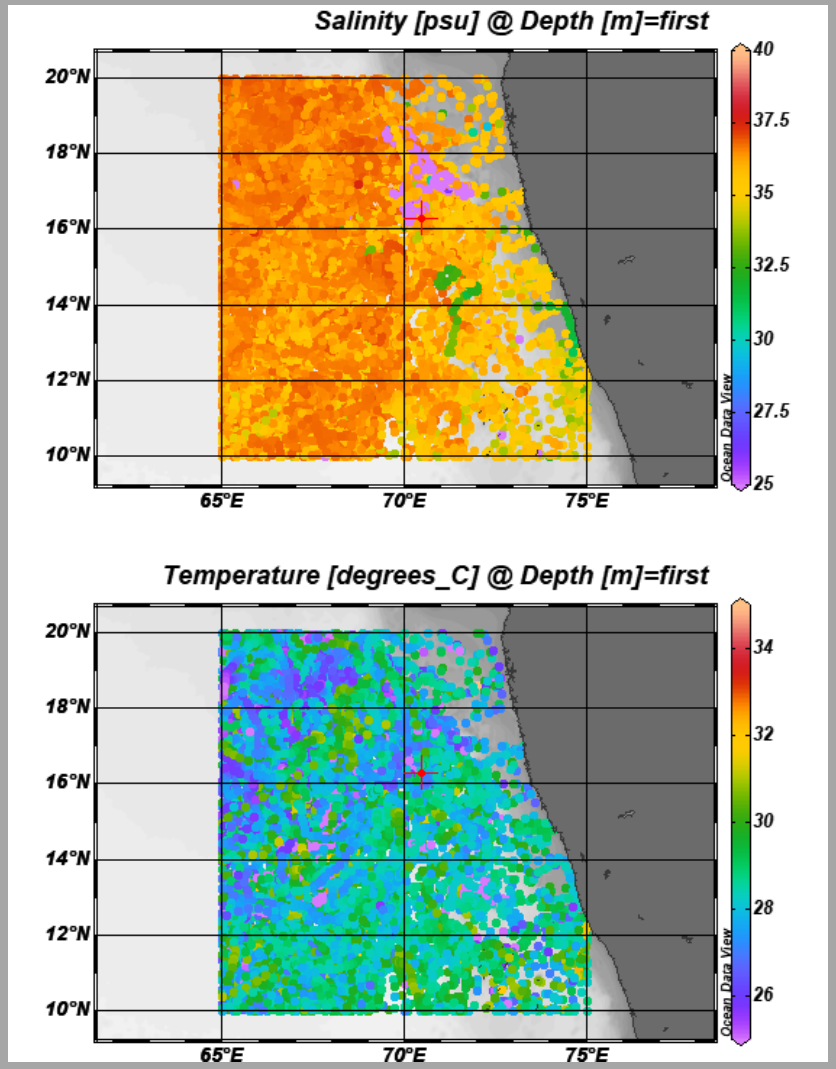
## Surface plots:

- Select View > Layout Templates to show a list of predefined window layout templates.
- Select 2 SURFACE Window.

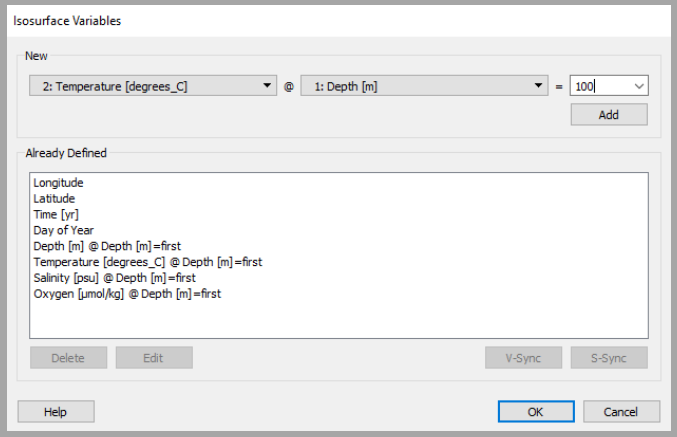


# 1. Draw Surface Plot:

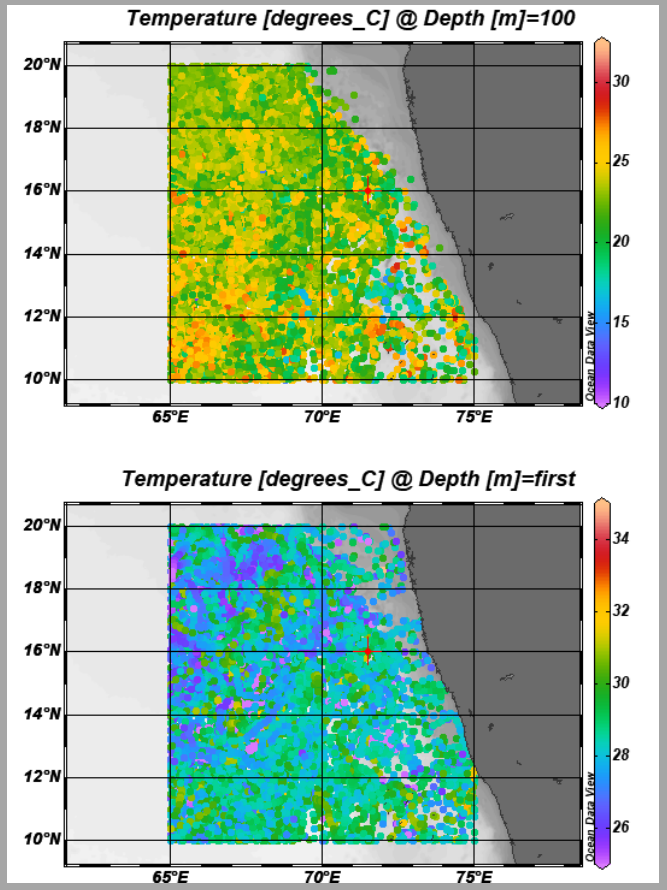
- Right click on one surface plot and select Z-Variable > Temperature.
- Right click on the other surface plot and select Z-Variable > Salinity.
- Set ranges of Z axis for temperature as 25 to 35 and salinity as 25 to 40.



# 2. Isosurface variables:

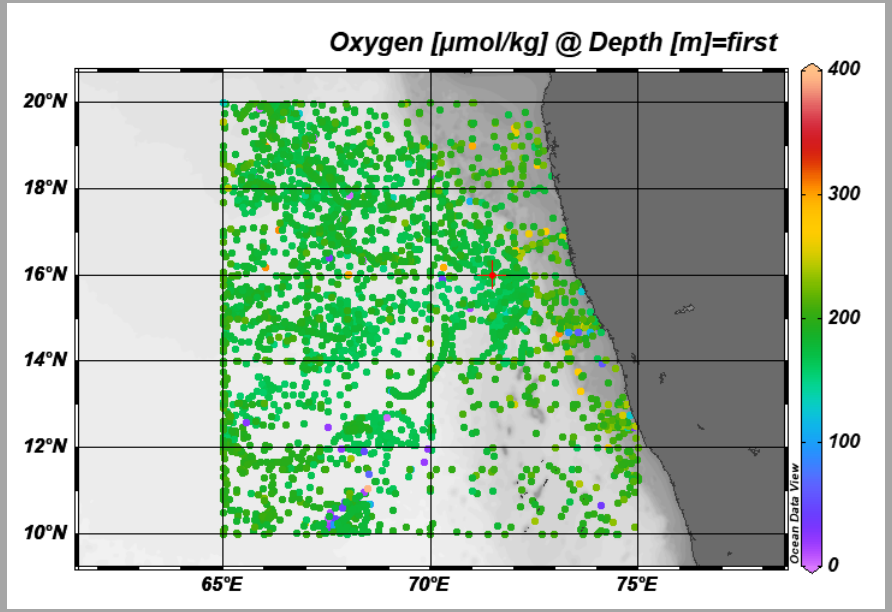


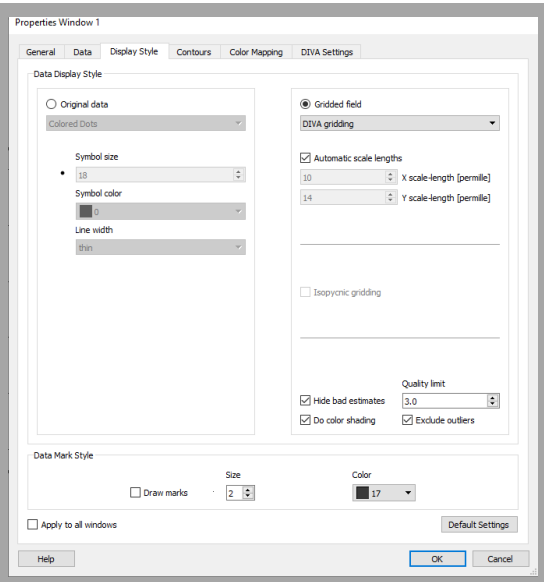

- Select View > Isosurface varaible
- Under New, select Temperature @ Depth = enter 100 m. Click Add, Ok
- Right click the salinity surface plot, select Z-variable and select Temperature at depth=100
- Set ranges as same limits for both the plots, for easier comparison.



# 3. Data interpolation

- Again go to View > Layout Templates, select 1 SURFACE Window.
- Right click on the figure and select Z-variable as Oxygen. Set Ranges as per data variability.
- Again, click properties by right clicking, go to Display Style, select DIVA gridding.
- Uncheck Draw Marks. Check Hide Bad Estimates, Do color shading and Exclude outliers.

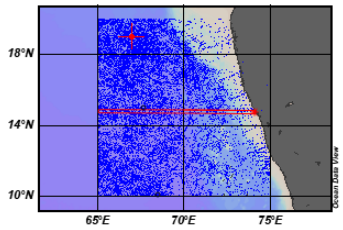


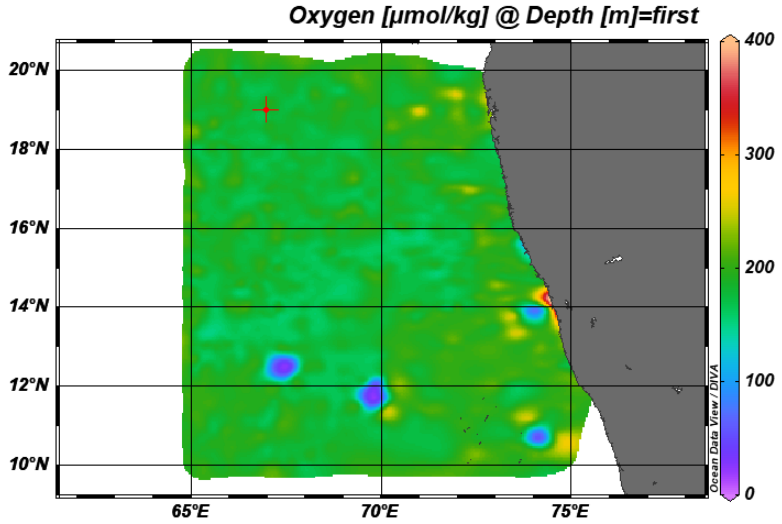



Ocean Data View - C:\Users\user\Documents\ODV\collections\osd_all_india_wod13

File Collection View Import Export Tools Help

section scatter




**Station ID: 11283**

| | |
|---|---|
| Accession... | 2819 |
| Cruise | WOD18_US013995 |
| Station | 9290420 (B) |
| Position | 66.993°E / 19.005°N |
| Date | 02 October 1994 |
| Time | 15:16 |
| Depth Ra... | [3 - 252] |
| Bot. Dept... | |
| OCL Cruis... | 13995 |

**Sample: 1 / 7**

| | | |
|---|---|---|
| 1: Depth [m] | 3 | 0 |
| 2: Temperature [degrees_C] | 27.56 | 0 |
| 3: Salinity [psu] | | 0 |
| 4: Oxygen [µmol/kg] | | 0 |
| 5: Phosphate [µmol/kg] | | 0 |
| 6: Silicate [µmol/kg] | | 0 |
| 7: Nitrate [µmol/kg] | | 0 |
| 8: Nitrite [µmol/kg] | | 0 |
| 9: pH | | 0 |
| 10: Chlorophyll [µg/l] | | 0 |
| 11: Plankton/Biomass | | 0 |
| 12: Alkalinity [meq/l] | | 0 |
| 13: NO2+NO3 [µmol/kg] | | 0 |
| 14: pCO2 [µatm] | | 0 |
| 15: tCO2 [mmol/l] | | 0 |

**Isosurface Values**

| | |
|---|---|
| Longitude | 66.993 |
| Latitude | 19.005 |
| Time [yr] | 1994.752 |
| Day of Year | 275 |
| Depth [m] @ Depth [m]=first | 3 |
| Temperature [degrees_C] @ Depth [m]=f... | 27.56 |
| Salinity [psu] @ Depth [m]=first | 36.451 |
| Oxygen [µmol/kg] @ Depth [m]=first | 201.1 |

Ready Canvas: 27.56 / 2.43 RW - 16707 / 16707: section *

Type here to search ENG 18:18 29-06-2019

- To save the view of the data, select View > Save View As with the name india_surface_oxygen.
- To save the figure select Save Plot As by right clicking, and save into desired format (.png, .jpg, .ps, .tif etc)

**Task:**

- Add another isosurface variable 'oxygen at depth=200 m' to see the Arabian Sea oxygen minimum zone.