

RV Mtafiti training workshop
Mombasa, April 2016

CTD data storage and processing

Klaas Deneudt, Harrison Ong'anda, Andre
Cattrijsse, Francisco Hernandez



CTD

- Most used oceanographic instrument
- Conductivity (>salinity)
- Temperature
- Depth (<pressure)
- Data logger
- Extra inputs



Data Center VLIZ , KMFRRI



Mtafiti training
workshop

CTD profiles

- Vertical profile
- Oceanographic cable & winch
- Computer, GPS,...
- Power on
- **Soak for 1 min**
- Sampling rate 2-24Hz
- Winch speed $> 1\text{m/s}$
- Rosette



Data Center VLIZ , KMFRI



Mtafiti training
workshop

CTD Parameters

- Conductivity
- Temperature
- Depth
- Derived:
 - Salinity
 - Speed of sound
 - Density
- Additional:
 - PAR
 - OBS
 - Altitude
 - O2
 - Ph
 - CHla



Data Center VLIZ , KMFRI



Mtafiti training
workshop

Primary CTD data processing

Raw ctd data

- HEX values stored in data logger memory
 - Organised per cast
 - Not readable
 - Downloaded over RS332
- Configuration file describes sensors & calibration parameters
 - Changes when sensors are added/removed
 - Changes per calibration
 - Pre- post cruise calibration



Primary Seabird ctd data processing

HEX file

```
07D87516C0EF0806954D4C0878CD74
07D8D716C08308064F4D4C0861C61E
07D97116BD720805A64D4D0837A43F
07D90716BD6E0805084D4B0802A502
07D8B516BD420805244D4E082DB134
07D87516BCAE0805D24D4D0835CAD9
07D85A16C0680806894D4B084ECE0E
07D93D16C2A90806CA4D4B084BCD1F
```

Configuration file

```
4930
0.0 0.00000000e+000 0.00000000e+000 0.00000000e+000 0.00000000e+000 -9.57000000e-008
2000.0000 0.0000 1.00000000 0.00000 1

0.000 0.00000000e+000 0.00000000e+000 0.00000000e+000 0.00000000e+000 1.00000000 0.0000 1

0.0 0.00000000e+000 0.00000000e+000 0.00000000e+000 0.00000000e+000 0.00000000e+000 0.00000000e+000
2000.0000 0.0000 1.00000000 0.00000 1

0.000 0.00000000e+000 0.00000000e+000 0.00000000e+000 0.00000000e+000 0.00000000e+000 0.00000000e+000
0.000000e+000 0.000000e+000 0.000000e+000 0.000000e+000 0.000000e+000 0.000000e+000 0.000000e+000
0.000000e+000 0.000000e+000 0.000000e+000 1.00000000
```

Processed file

```
* Sea-Bird SBE 19plus Data File:
* FileName = C:\SeaBird\Casts\061219_120.hex
* Software Version Seasave win32 V 5.37c
* Temperature SN = 4126
* Conductivity SN = 4126
* System UpLoad Time = Dec 19 2006 08:50:26
** Ship: zeeleeuw
** Cruise:
** Station: 120
** Latitude:
** Longitude:
# nquan = 9
# nvalues = 19
# units = specified
# name 0 = prdM: Pressure, Strain Gauge [db]
# name 1 = tv290C: Temperature [ITS-90, deg C]
# name 2 = c0mS/cm: Conductivity [mS/cm]
# name 3 = obs: OBS, Backscatterance (D & A) [NTU]
# name 4 = depSM: Depth [salt water, m]
# name 5 = nbin: number of scans per bin
# name 6 = density00: Density [density, Kg/m^3]
# name 7 = sal00: Salinity [psu]
```

Data Center VLIZ ,



Seabird ctd data processing

- Software: SBE SeaSoft
 - Real-time data acquisition: Seasave
 - Data processing and plotting: SBE data processing
 - (<http://www.seabird.com/software/software>)



Seabird SBE data processing

- Steps required
 - Convert to real values
 - Filter (*removes digital noise*)
 - Align sensors (*time alignment for T & C sensors*)
 - Loop edit (*remove too slow ascend/descend or travelling backwards due to ship roll*)
 - Bin average (*average data into desired Pressure or Depth bins*)
 - Derive (*Compute salinity, density, ..*)
 - Ascii .cnv output



Data Center VLIZ , KMFRI



Mtafiti training
workshop

Seabird ctd data processing

- Results: Before - after



Francisco Hernandez, Data Center

VLIZ



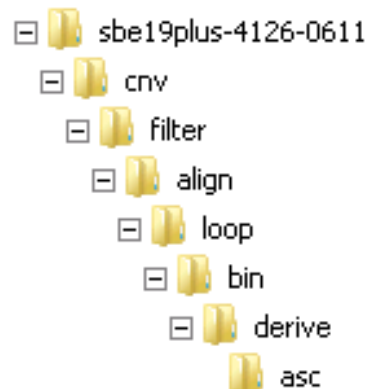
Marine Data Management

11/10

CTD data storage

File storage

- Hex & con file stored together
- Filename HEX file : 4126_070122_ZG02.hex
- Filename CON file : 4126_0611.con
- Processed file names:
4126_070122_ZG02_CFALBD.cnv



Archival

= Preservation of physical integrity of files

What you want:

- Preventing data loss
- Long term
- Allowing future re-use of data, but not necessarily open

What you need:

- Fixed procedures & secure system
- Crucial link with technical/use metadata
- Possible link with discovery metadata



Secondary CTD data processing and analysis

Secondary CTD data processing and analysis

- 1) Installing ODV
- 2) Import collected Mtafiti CTD data
- 3) Retrieve additional data from WOD
- 4) Combine data
- 5) QC, visualization and analysis



1. Installing ODV

Installing ODV

<http://odv.awi.de>



The header of the Ocean Data View website features a large banner with a world map background. On the left, there is a small inset image showing a colorful oceanographic data visualization. The text "Ocean Data View" is prominently displayed in the center of the banner. To the right, the AWI logo is visible, accompanied by links for "Sitemap" and "Imprint".

Home Data **Software** Documentation Links Contact ODV Forum

Search

[Download](#) [Known Issues](#)

Ocean Data View > Software > Download

Software Download Login

Registered ODV users may download any of the available ODV software versions and optional packages. If you are not a member of the ODV users group yet, please [register now](#). Thank you.

Note that cookies must be enabled.

User login

Enter your username and password here in order to log in on the website:

Username:

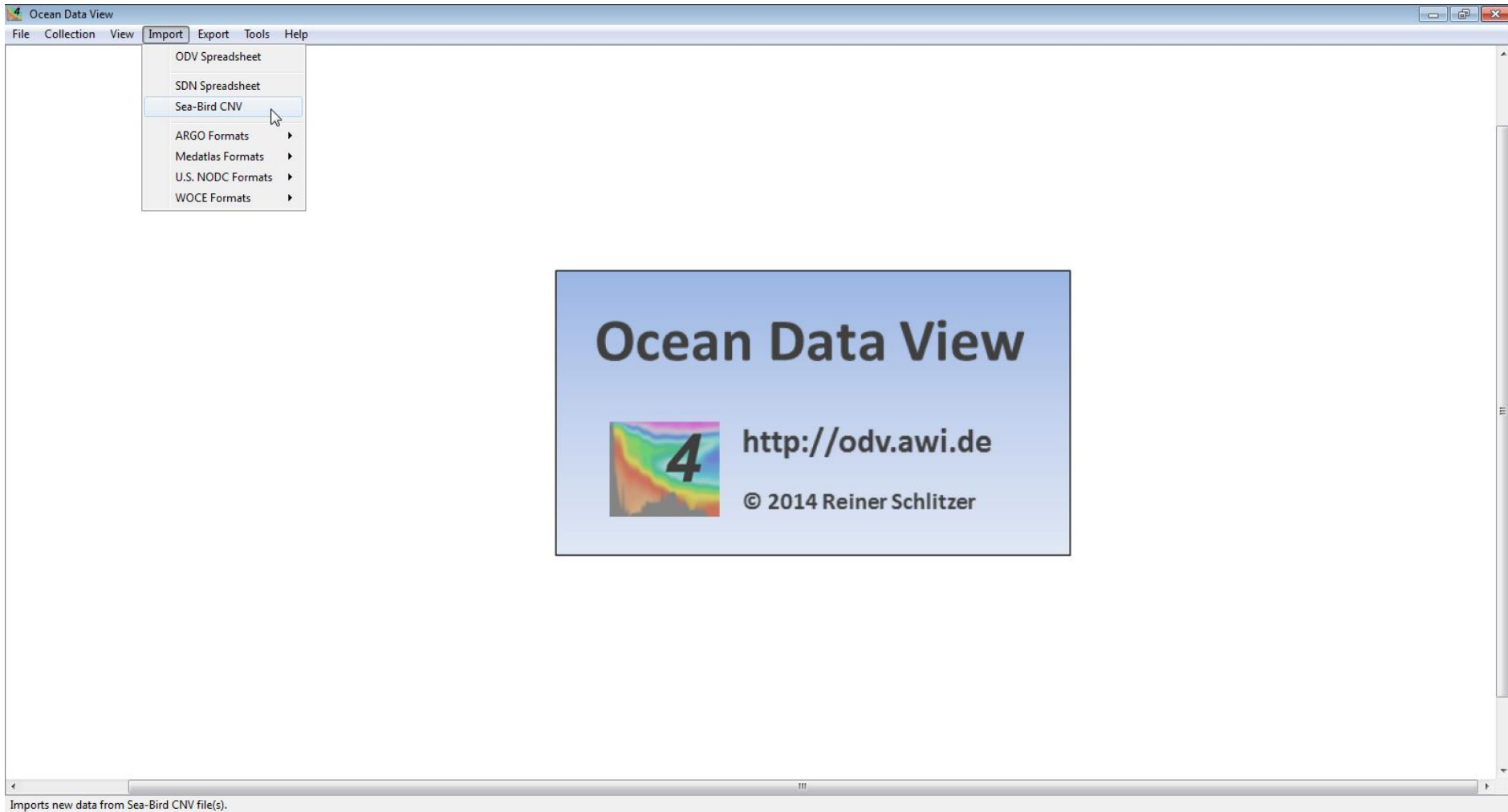
Password:

[Forgot your password?](#)

Sitemap Imprint

2. Import collected Mtafiti CTD data

Import collected CTD data



Exercises

1) Create scatter plot of all collected CTD data

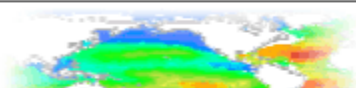


Data Center VLIZ , KMFRI



Mtafiti training workshop

3. Retrieve additional data from WOD



WORLD OCEAN DATABASE SELECT AND SEARCH

Note: new data added after the release of the WOD13 have not gone through the full set of quality control procedures and should be considered preliminary.

The WODselect retrieval system allows a user to search *World Ocean Database 2013* and *World Ocean Database 2013* since its release using a user-specified search criteria. A distribution map and cast count criteria will give the user the option to have the data extracted and placed on the NODC *WOD13* native, 'csv', and netCDF data formats. *QC Errata: Details at [WOD webpage](#).

* Note: [standard depths](#) were extended in WOD13. The WOD native ASCII format has been altered to reflect the changes to the standard depths. The Ocean Data View 4.5.7 has been updated to read the amended files. Please use the latest ODV version (more information about [downloading and reading the data files](#)).

Build a Data Retrieval Request Based on Your Choice of Criteria:

- To build a user defined search query:
1. Place check mark in front of any number.
 2. Press the "Build a query" button.

(If any criteria below are not checked, the default will apply).

SEARCH CRITERIA: (definitions)	DEFAULT:
☐ GEOGRAPHIC COORDINATES	- whole world
☐ OBSERVATION DATES - e.g., Year(s), Month(s), Day(s)	- all years/months/days
☐ DATASET - e.g., OSD, CTD, XBT	- all datasets
☐ MEASURED VARIABLES - e.g., Temperature, Salinity, Nutrients	- all available variables
☐ BIOLOGY - e.g., Phytoplankton, Zooplankton	- all available plankton
☐ DEEPEST MEASUREMENT	- all depths
☐ COUNTRY	- all countries
☐ SHIP/PLATFORM	- all ships/platforms



formerly the National Oceanographic Data Center (NODC)... [more on NCEI](#)

NOAA Satellite and Information Service

You are here: [Home](#) > [Ocean Climate Laboratory](#) > [OCL Products](#) > World Ocean Database Search and Select



GEOGRAPHIC COORDINATES:

(Use A or B below, then continue) [HELP](#)

A. Manually input coordinates

Northern edge

Western edge

Southern edge

Eastern edge

B. Rubberband selection coordinates

[Draw Map](#)

DATASET:

Plankton data are only present in the OSD dataset.

Nutrient and chlorophyll data are only present in the OSD and SUR datasets.

[*Important note about BT bias corrections in WOD13](#)

- ☒ Ocean Station Data (OSD) [Bottle, low resolution CTD/XCTD, plankton data]
- ☒ High Resolution CTD/XCTD (CTD)
- ☒ Expendable Bathythermograph (XBT)
- ☒ Mechanical Bathythermographs (MBT) [includes Digital Bathythermograph, μ BT]
- ☒ Profiling Floats (PFL)
- ☒ Drifting Buoys (DRB)
- ☒ Moored Buoys (MRB) [TAO, PIRATA, others]
- ☒ Autonomous Pinniped Bathythermographs (APB)
- ☒ Undulating Oceanographic Recorder (UOR) [Towed CTD]
- ☒ Surface-Only (SUR) [Bucket, Thermosalinograph]
- ☒ Glider data (GLD)



formerly the National Oceanographic Data Center (NODC)... [more on NCEI](#)

NOAA Satellite and Information Service

You are here: [Home](#) > [Ocean Climate Laboratory](#) > [OCL Products](#) > [WODselect](#) > query results

 **BACK TO BUILD** a new query

Mon Apr 18 13:07:33 2016

COPY OF YOUR DATABASE SEARCH CRITERIA:

GEOGRAPHIC COORDINATES: **Longitude** from 39.0000 to 46.0000; **Latitude** from -1.60
DATASET: OSD,CTD,XBT,MBT,PFL,DRB,MRB,APB,UOR,SUR,GLD
MEASURED VARIABLES (extract): all variables

QUERY RESULTS:

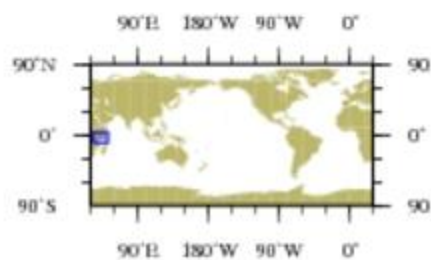
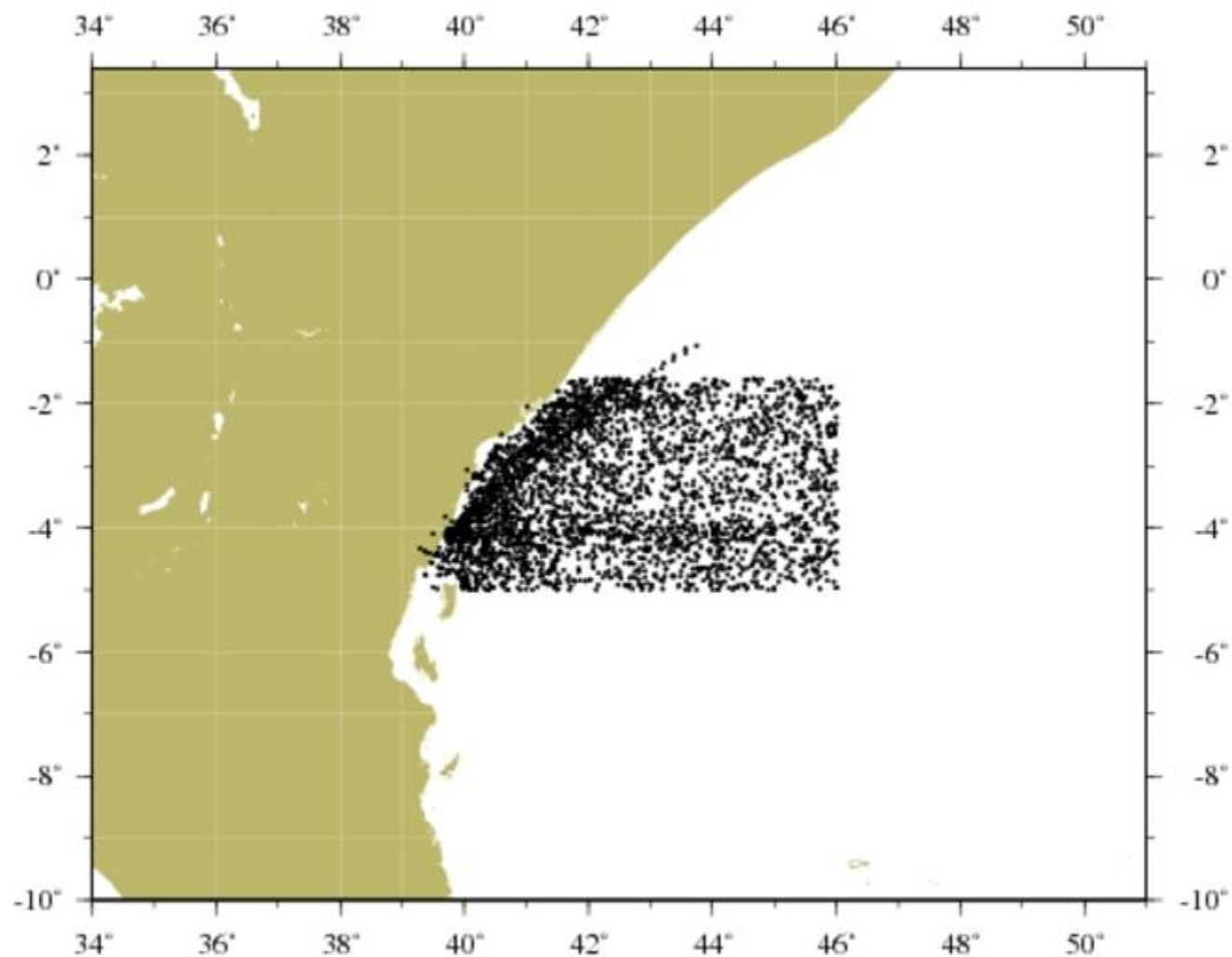
Please, **CLICK ONLY ONCE**, it may take a while before results are shown.

The cast count for your request is:

382	OSD casts
170	CTD casts
1412	XBT casts
971	MBT casts
507	PFL casts
0	DRB casts
0	MRB casts
0	APB casts
0	UOR casts
2	SUR cruises
0	GLD casts
3444	TOTAL casts

Full (expanded) file size estimate (7.4 MB)

Gzipped file size estimate (1.8 MB)



Geographic distribution of casts

Number of casts = 3444

NOAA NODC Ocean Climate Laboratory

<http://www.nodc.noaa.gov/OCL/>

Index of /woa/WOD/SELECT

Name	Last modified	Size	Description
 Parent Directory		-	
 ocldb1460982987.15392.CTD.gz	18-Apr-2016 12:39	1.2M	
 ocldb1460983020.15526.gz	18-Apr-2016 12:37	239K	
 ocldb1460981820.10350.gz	18-Apr-2016 12:18	239K	
 ocldb1460980621.6957.gz	18-Apr-2016 11:57	239K	
 ocldb1460979420.4085.gz	18-Apr-2016 11:37	239K	
 ocldb1460978220.938.gz	18-Apr-2016 11:17	239K	
 ocldb1460976925.30060.GLD.csv.gz	18-Apr-2016 11:09	1.2M	
 ocldb1460976925.30060.SUR.csv.gz	18-Apr-2016 11:08	16K	
 ocldb1460976925.30060.PFL.csv.gz	18-Apr-2016 11:08	4.0M	
 ocldb1460976925.30060.DRB.csv.gz	18-Apr-2016 11:08	12K	
 ocldb1460976925.30060.MBT.csv.gz	18-Apr-2016 11:07	2.7M	
 ocldb1460976925.30060.XBT.csv.gz	18-Apr-2016 11:06	21M	
 ocldb1460976925.30060.CTD.csv.gz	18-Apr-2016 11:01	12M	
 ocldb1460976925.30060.OSD.csv.gz	18-Apr-2016 10:59	939K	
 ocldb1460977020.30256.gz	18-Apr-2016 10:57	239K	
 ocldb1460975820.27651.gz	18-Apr-2016 10:37	239K	
 ocldb1460975457.26843.PFL.tar.gz	18-Apr-2016 10:32	292K	
 ocldb1460975457.26843.CTD.tar.gz	18-Apr-2016 10:32	33K	
 ocldb1460974620.24571.gz	18-Apr-2016 10:18	239K	
 ocldb1460973846.21746.GLD.gz	18-Apr-2016 10:06	848K	
 ocldb1460973846.21746.PFL.gz	18-Apr-2016 10:06	9.6M	
 ocldb1460973846.21746.OSD.gz	18-Apr-2016 10:06	6.3K	
 ocldb1460973846.21746.CTD.gz	18-Apr-2016 10:06	2.0M	

File Home Insert Page Layout Formulas Data Review View Developer

Cut Copy Paste Format Painter Clipboard

Calibri 11 A A

B I U Font

Alignment

Wrap Text Merge & Center

	A1								
	A	B	C	D	E	F	G	H	I
1	#-----								
2	CAST	„	8088427,WOD Unique Cast Number,WOD code,						
3	NODC Cruise ID	„SU-12773	„						
4	Originators Station ID	„	2165.0000,,,real,						
5	Originators Cruise ID	„19	„						
6	Latitude	„	-3.217,decimal degrees,,						
7	Longitude	„	42.850,decimal degrees,,						
8	Year	„	1979,,,						
9	Month	„	1,,,						
10	Day	„	14,,,						
11	Time	„	6.22,decimal hours (UT),,						
12	METADATA,								
13	Country	„	SU,NODC code,SOVIET UNION						
14	Accession Number	„	278.,NODC code,,						
15	Platform	built 1968	renamed IMO6726929,						
16	Institute	(SEVASTO	UKRAINE),						
17	probe_type	„	4.,OCL_code,CTD,						
18	Instrument	,Temperature,	4.,WOD code,CTD: TYPE UNKNOWN,						
19	Instrument	,Salinity,	4.,WOD code,CTD: TYPE UNKNOWN,						
20	VARIABLES	,Depth	,F,O,Temperatur,F,O,Salinity ,F,O,,						
21	UNITS	,m	,,,degrees C,,,PSS	,,,					
22	Prof-Flag	,0,,	,0,,	,0,,					
23	1,	1.2,0,,	27.451,0,,	35.406,0,,					
24	2,	2.6,0,,	27.410,0,,	35.407,0,,					
25	3,	4.3,0,,	27.397,0,,	35.406,0,,					
26	4,	5.7,0,,	27.394,0,,	35.408,0,,					
27	5,	7.0,0,,	27.391,0,,	35.409,0,,					
28	6,	10.4,0,,	27.379,0,,	35.411,0,,					
29	7,	12.5,0,,	27.376,0,,	35.410,0,,					
30	8,	14.7,0,,	27.372,0,,	35.418,0,,					
31	9,	16.8,0,,	27.372,0,,	35.411,0,,					
32	10,	18.8,0,,	27.372,0,,	35.413,0,,					

4. Combine data



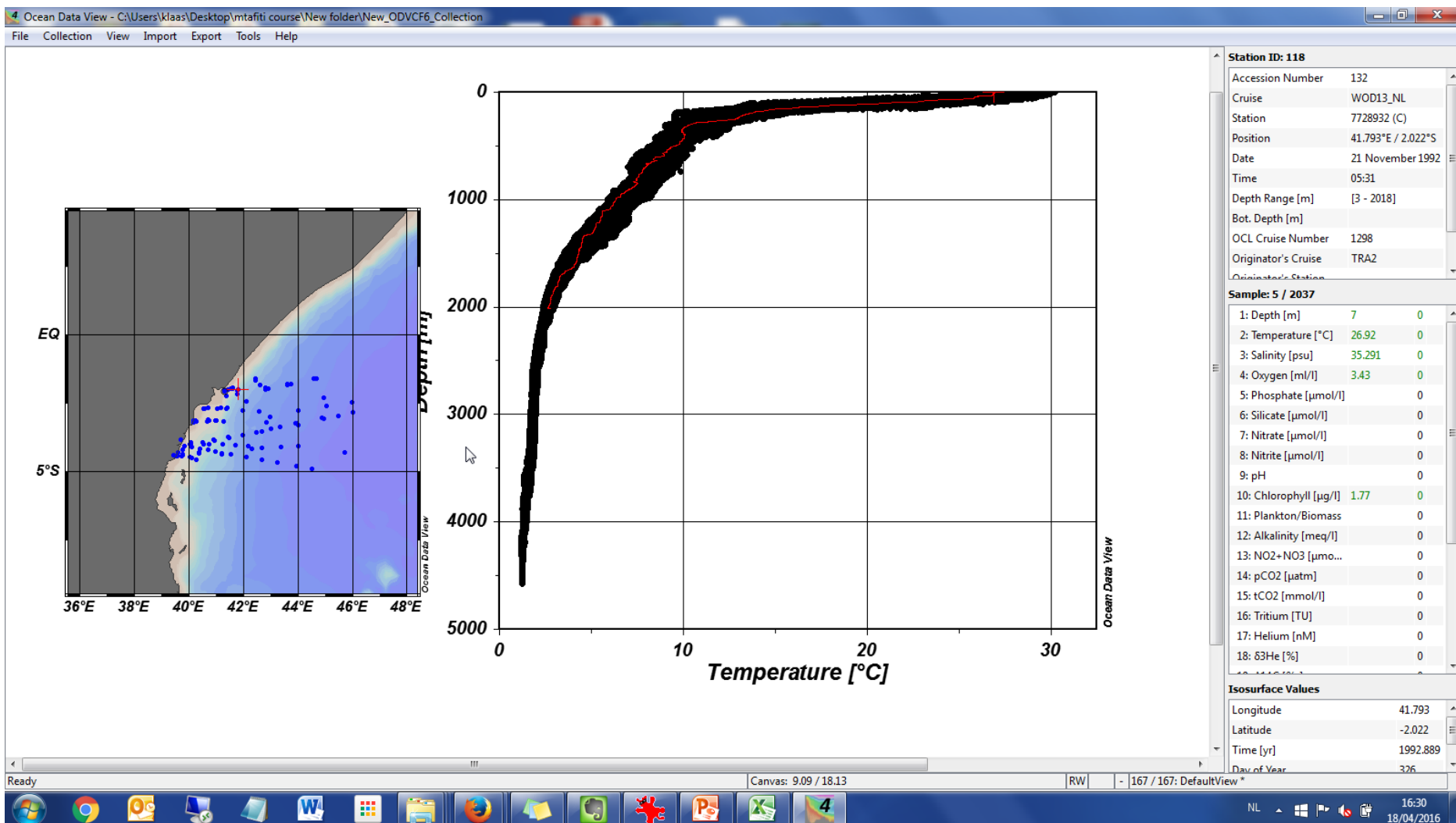
4. QC, analysis and visualisation

Exercises

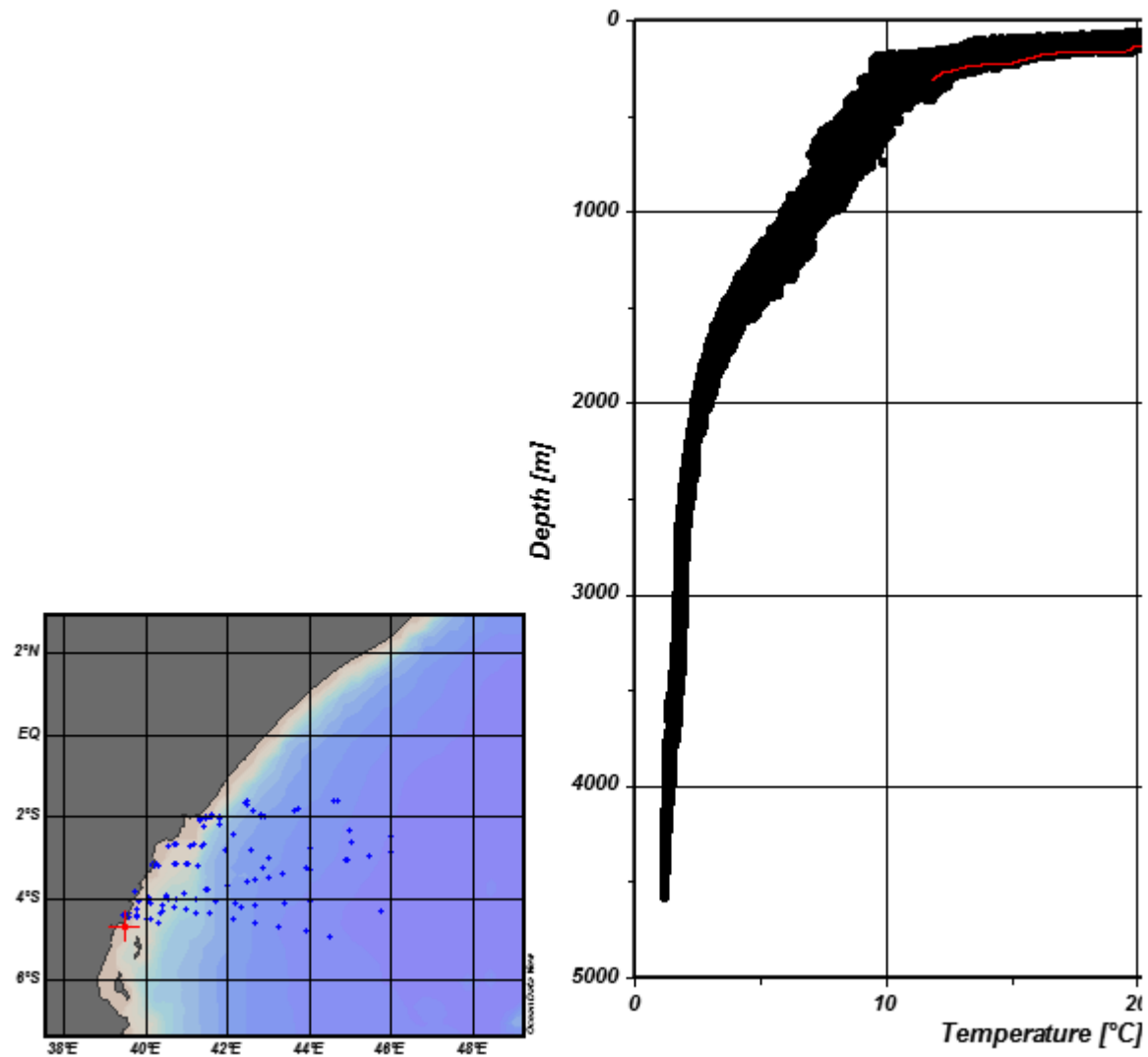
- 1) Create scatter plot of all wod CTD data in the extended Kenian EEZ
- 2) Create scatter plot of all wod CTD data + collected mtafiti CTD data in the extended Kenian EEZ
- 3) Create surface map of temperature at 3m based on WOD CTD data
- 4) Create a gridded map bathymetry map based on WOD CTD (inaccurate)



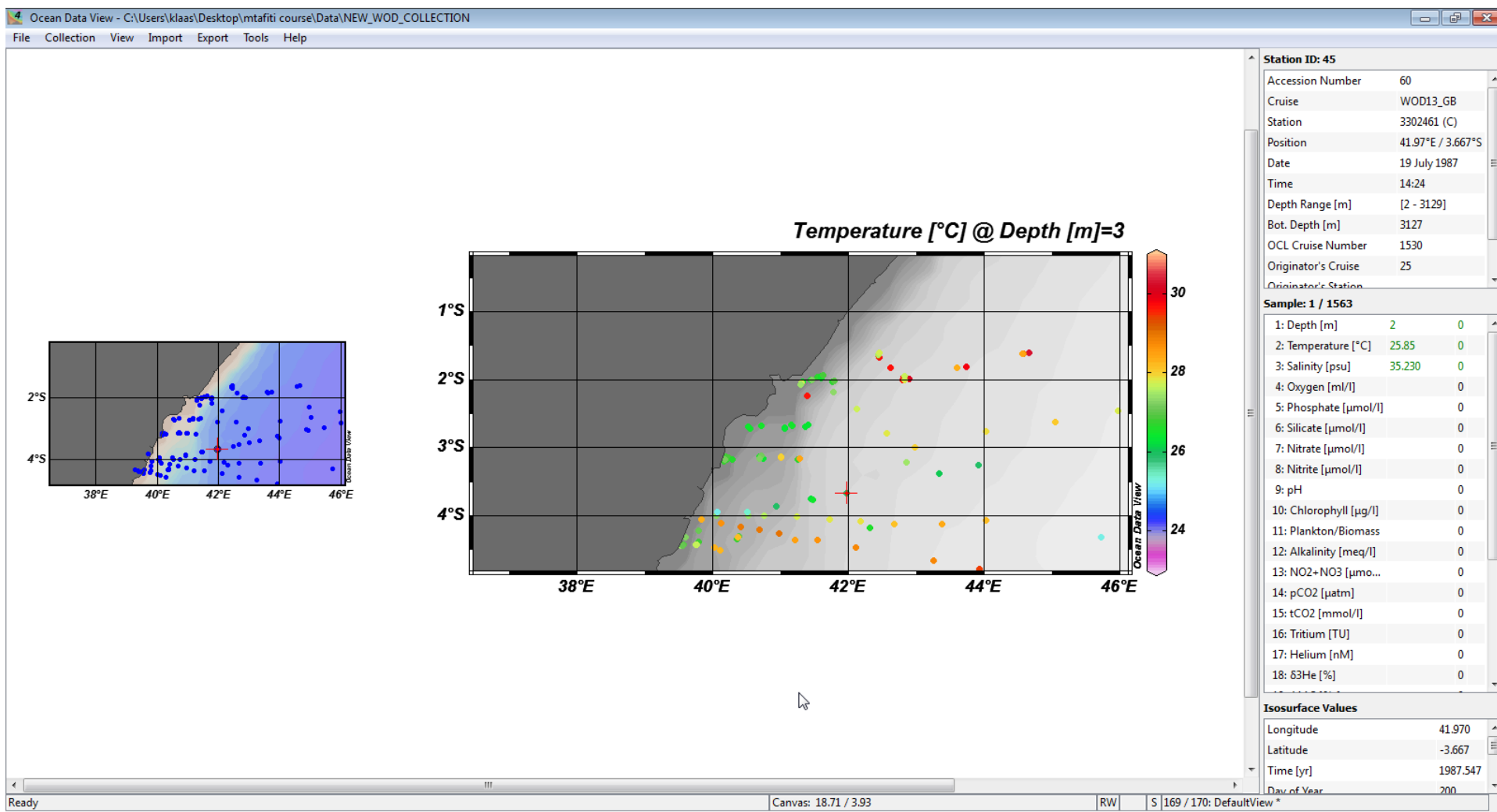
Exercise 1



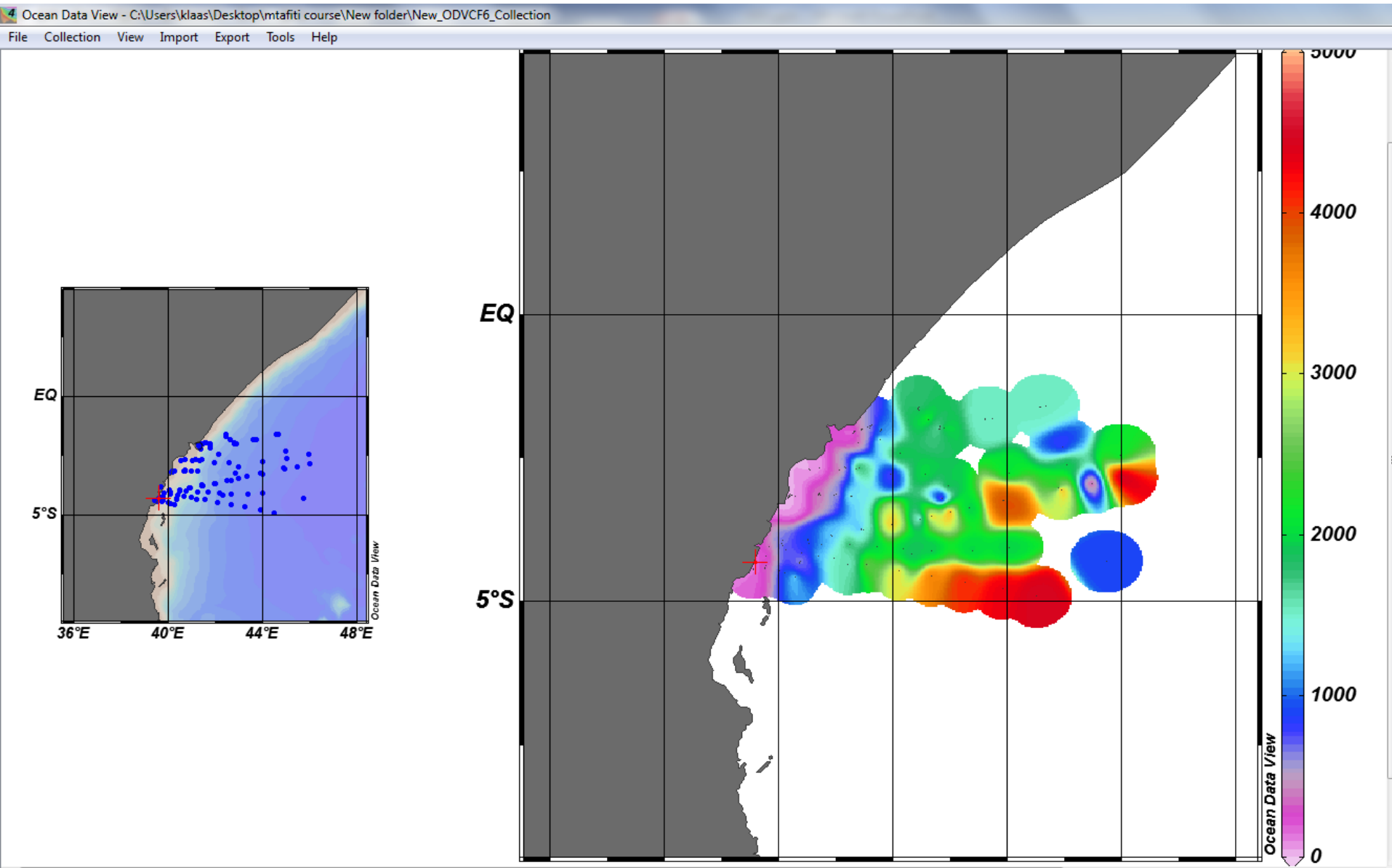
Exercise 2



Exercise 3



Exercise 4



Group exercises

- 1) Compare and collected CTD data and WOD CTD data
- 2) Compare the collected CTD data and UW data at the stations
- 3) Discuss some remarkable phenomena that appear from the data