Data assembled for GlobCurrent and access

Objectives

Assembling on a common thematic platform all data and information relevant for ocean current estimation and assessment

Making these data easy to use and combine (homogenization)

Providing tools for reading, combining and assessing these data

Providing remotely accessible storage and processing capabilities to develop and evaluate GlobCurrent products

Format homogenization

- ✓ Unique file nomenclature
- ✓ NetCDF-4, compliant with CF convention
- ✓ Unique formatting for GlobCurrent products wrt pattern and observed quantity:
  - Trajectory : drifters, along-track altimetry,...
  - Swath
  - Grid
- ✓ Common set of metadata to describe precisely the source of observation, measured quantity, resolution, spatial and temporal scales of data
- ✓ Common convention for variable names, flags, quality levels

GlobCurrent product map

Current terms

geostrophic_velocity	Geostrophic currents correspond to a particular simplification of the equations governing the horizontal components of velocity. It is valid when the largest terms in the equations of motion reduce to the Coriolis force and the pressure gradient. This can generally apply in the deep ocean over large (> 50-100 km) spatial and long (>2-10 days) temporal scales	Provided generally at 0 or 15 meters **Typically estimated by** Altimeters or combination of altimeters and infrared radiometers (SST) through eSQG or MTF methodologies.
ekman_current_velocity	Ekman currents result from the balance between friction (induced by wind stress) and Coriolis forces. The wind stress is often parametrized as a function of the square of the wind speed and a drag coefficient. Under the assumptions of a steady, homogeneous, horizontal flow on a rotating Earth and an infinitely deep ocean, and considering a constant vertical eddy viscosity, the theoretical Ekman current at the surface flows at 45° to the right (left) of the wind direction in the northern (southern) hemisphere. Below the surface, the Ekman current speed decreases with depth, while the direction changes clockwise (anticlockwise) in the northern (southern) hemisphere. Both effects result in the so-called Ekman spiral.	Provided generally at significant wave height (hs), 0 or 15 meters **Typically estimated by** Filtered timeseries (e.g., 20-day bandpass) using multiple platforms (e.g., for ageostrophic current)

Current terms

stokes_drift_velocity	As waves travel, the water particles that make up the waves do not travel in a straight line, but rather in orbital motions. Water particles do not move over a closed orbital path but instead have an additional movement in the direction of wave propagation. As the particles progress in an orbital motion, their movement is enhanced at the top of the orbit and slowed slightly at the bottom. The resulting Lagrangian current is called the Stokes drift.	Provided generally at significant wave height (hs) **Typically estimated by** wave forecasting models.
tidal_current_velocity	Tides are related to gravitational variations associated to the Sun and Moon alignments, resulting in periodical changes in water levels.	Provided generally at significant 0 meter depth **Typically estimated by** tide prediction models. Discarded for now.

Current terms

inertial_current_velocity	When wind and wave forces that have set upper ocean motions cease to strongly act, water will not rest immediately. Energy imparted by the wind and waves takes time to fully dissipate. The Coriolis force will then continue to apply as a centripetal force, leading to rotational flows, referred as inertial currents. The period of rotation will vary with the local Coriolis parameter f (e.g. latitude dependent). As friction cannot be completely neglected, inertial oscillations in the real ocean decay in a few days. The amplitude of the inertial motion is proportional to the cumulative wind forcing term and inversely proportional to the water density and thickness of the mixed layer.	Estimated generally above mixed layer depth. **Typically estimated by** continuous high resolution drifter position
internal_wave_related_current_velocity	Internal waves occur at the boundary between water layers of different densities.	Estimated generally at mixed layer depth **Typically estimated by** in situ profilers and surface manifestations seen by SAR and visible instruments

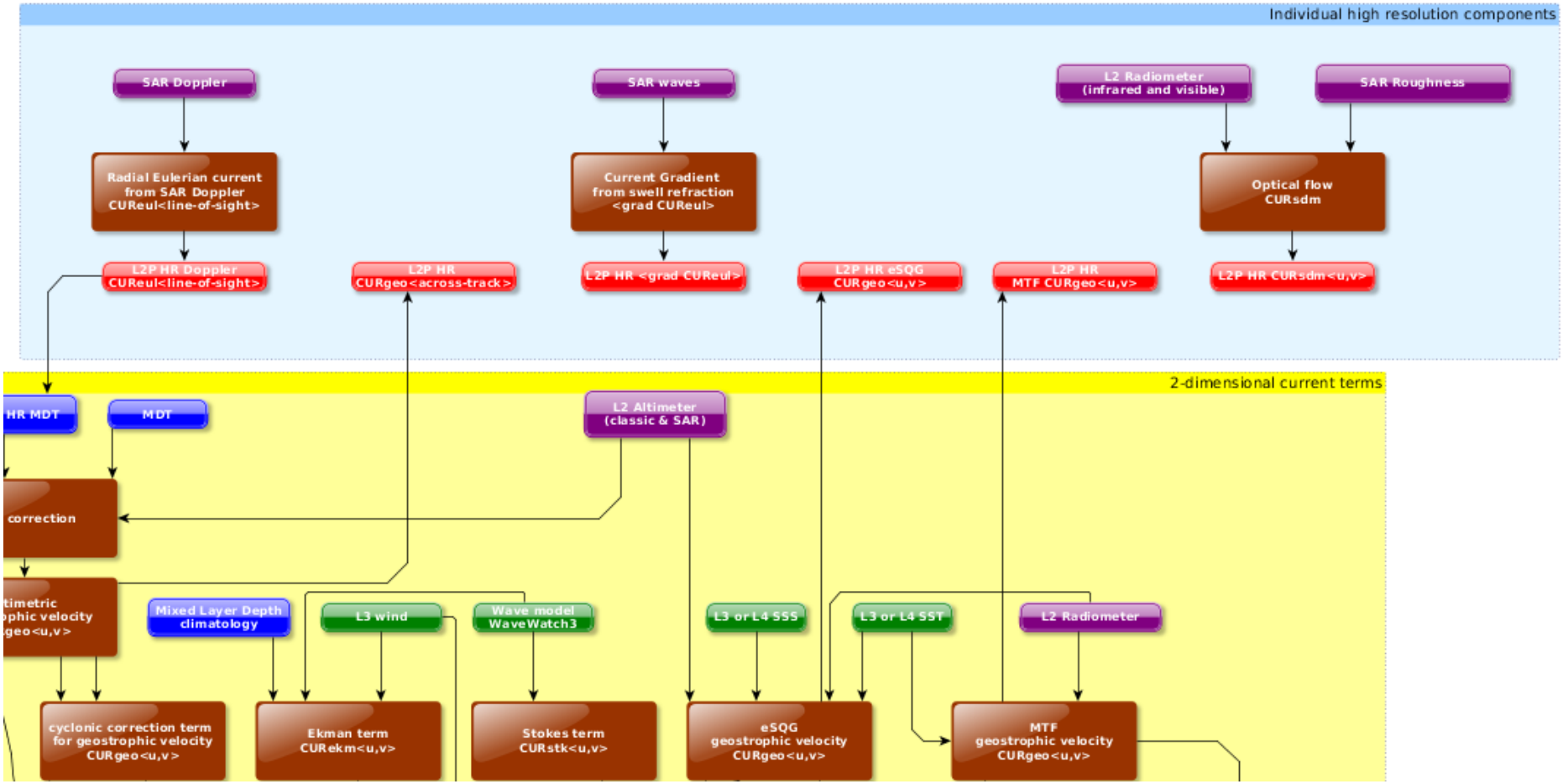
Current terms

internal_wave_related_current_velocity	Internal waves occur at the boundary between water layers of different densities.	Estimated generally at mixed layer depth **Typically estimated by** in situ profilers and surface manifestations seen by SAR and visible instruments
eulerian_total_current_velocity	Total velocity of the current as measured at a fixed point (by means of a currentmeter for instance)	Provided generally at 0m (this is the case for instance for the first GlobCurrent Eulerian current product, sum of geostrophy at 0m and Ekman at 0m), significant wave height (hs), mixed layer depth (mld) or 15 meters. **Typically estimated By** combination of infrared (SST) and hyperspectral (ocean colour) imagers, or combination of altimeters with other sources (weather model)
lagrangian_total_current_velocity	Total velocity of the current as measured along the fluid particle trajectory (by means of a drifting buoy for instance)	at significant wave height (hs) **Typically estimated by** in situ drifters

Current terms

surface_tracer_velocity	This is the apparent average rate of displacement of a parcel of water (assuming surface properties are conserved). This is not defined as an instantaneous velocity, but an arithmetic average over a given period of time. This velocity should correspond to the total current acting on fully submerged marine debris e.g. oil or person in water, but may not represent floating object with significant wind exposure e.g. liferafts.	Provided generally at 0 meters **Typically estimated by** feature motion tracking (MCC, optical flow) from ocean colour or infrared radiometer data.

Individual current components



Individual current components

« Instantaneous » current observation from a single (or short sequence) satellite acquisition (image, altimeter track, swath). Level 2 or Level 3 products.

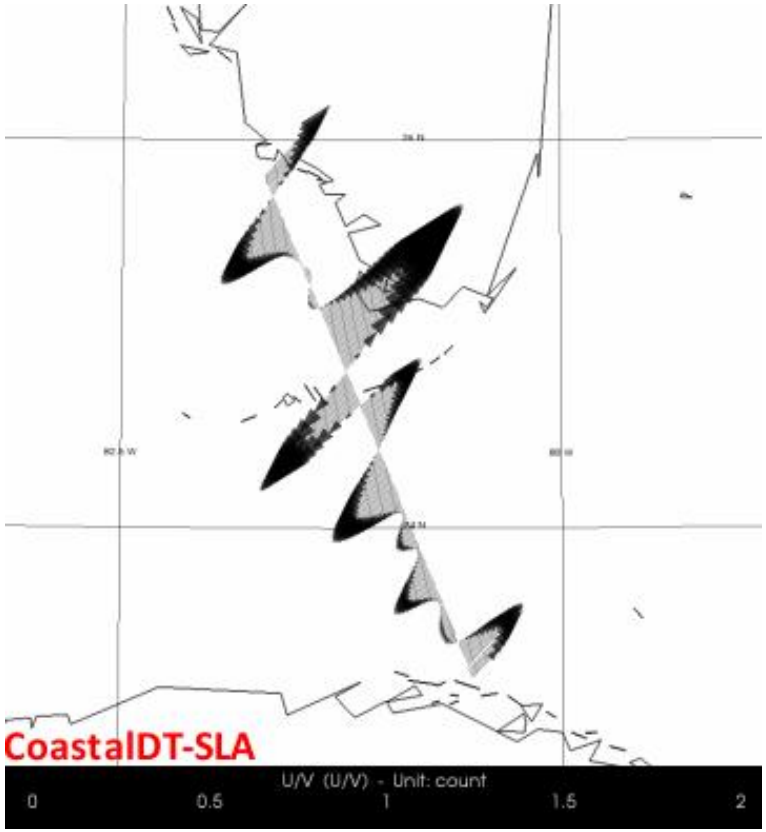
- geophysical variables derived from Level 1 or Level 2 source data at the same resolution and location as the Level 1 or Level 2 data, typically in a satellite projection with geographic information.
- L2 data granules remapped to a space grid without combining any Observations from overlapping orbits.
- sequences of images to derive current vectors, such as the MCC method.

Grid specification, resolution native to sensor.

No merging or averaging.

Input to higher level products combining multiple passes, acquisition or merging different sensors.

Individual current components



(ESA/CNES)

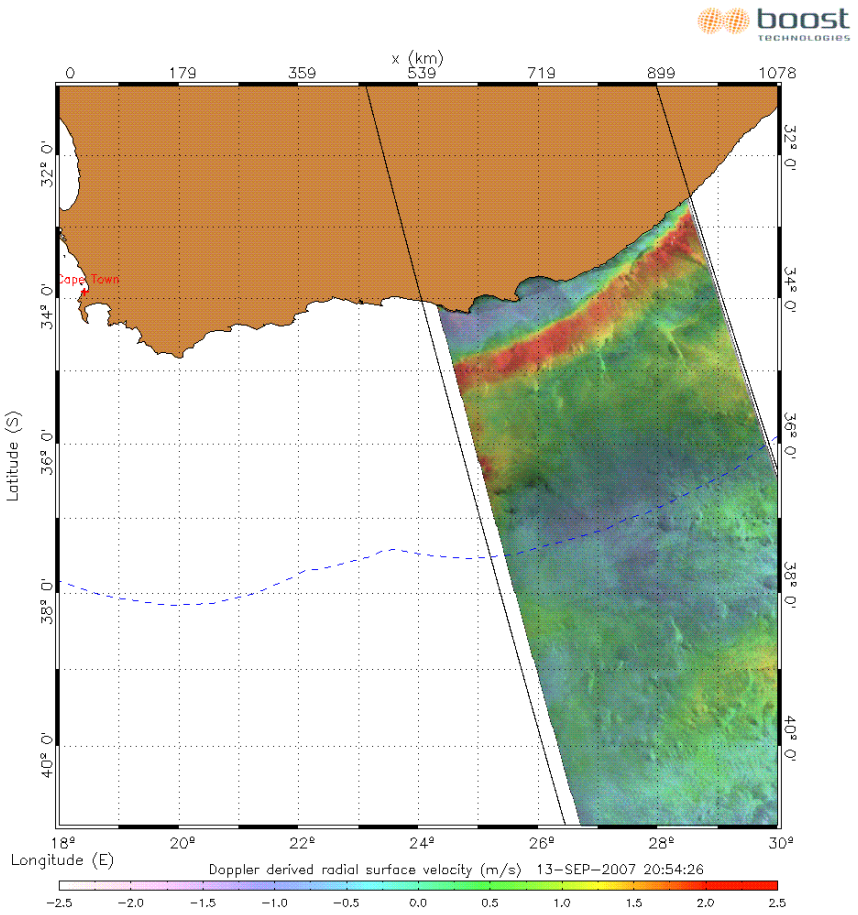
Across-track geostrophic current velocity along an altimeter track.

High resolution information that can be enriched with SST, etc. obervation layers.

Available from multiple altimeters : Jason-1 & 2, Cryosat, Altika, Sentinel-3,…

Merged together over

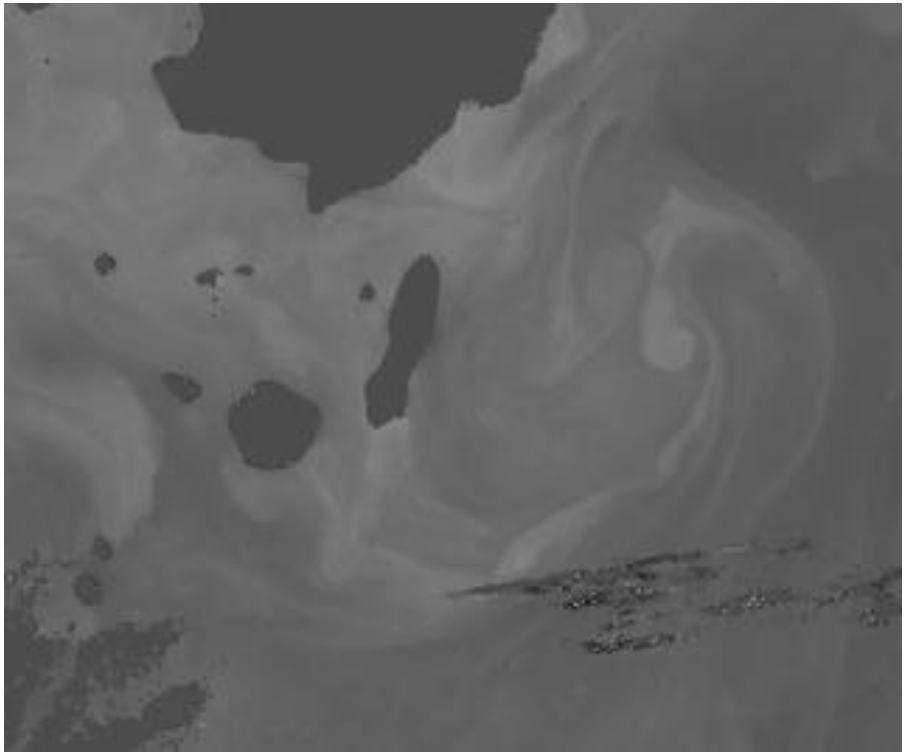
Individual current components



(CLS)

- Line-of-sight surface velocity from SAR doppler (no vector)
- Can be enriched with SST, salinity, altimeter
- Available from Envisat, soon Sentinel-1

Individual current components



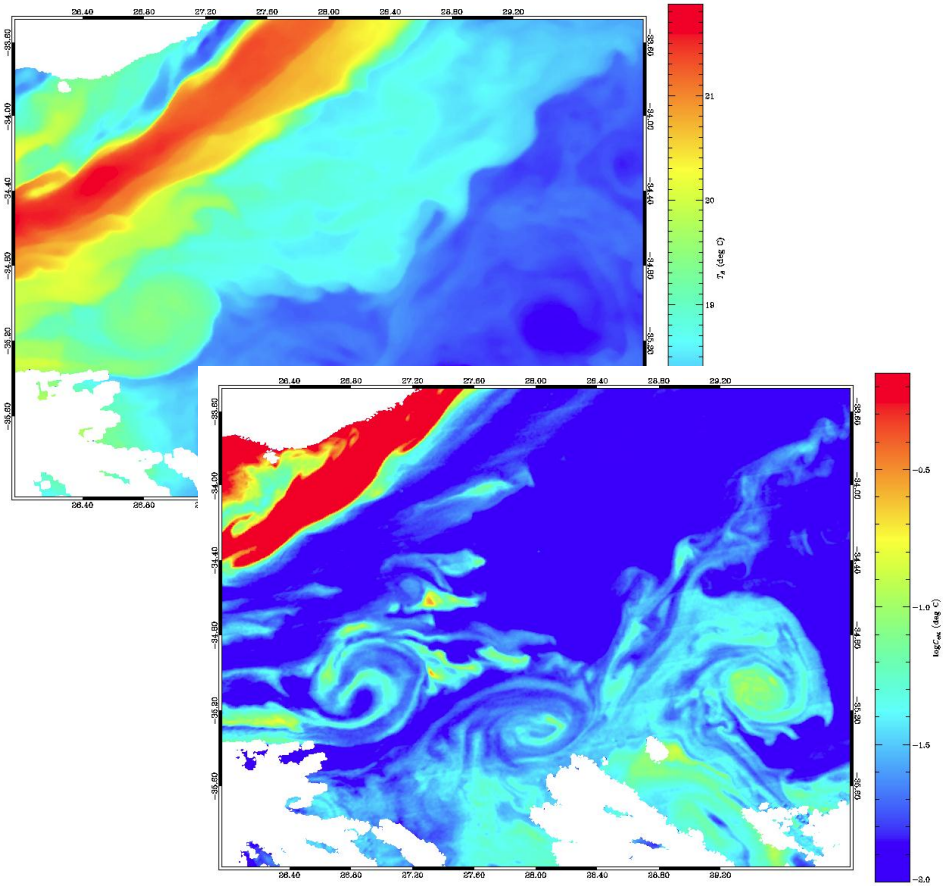
(GlobCurrent)

Maximum Cross-Correlation – estimation from a sequence of images (ocean colour, SST)

Estimated between two time steps

http://globcurrent.ifremer.fr/component/content/article/100-

Other L2 inputs considered

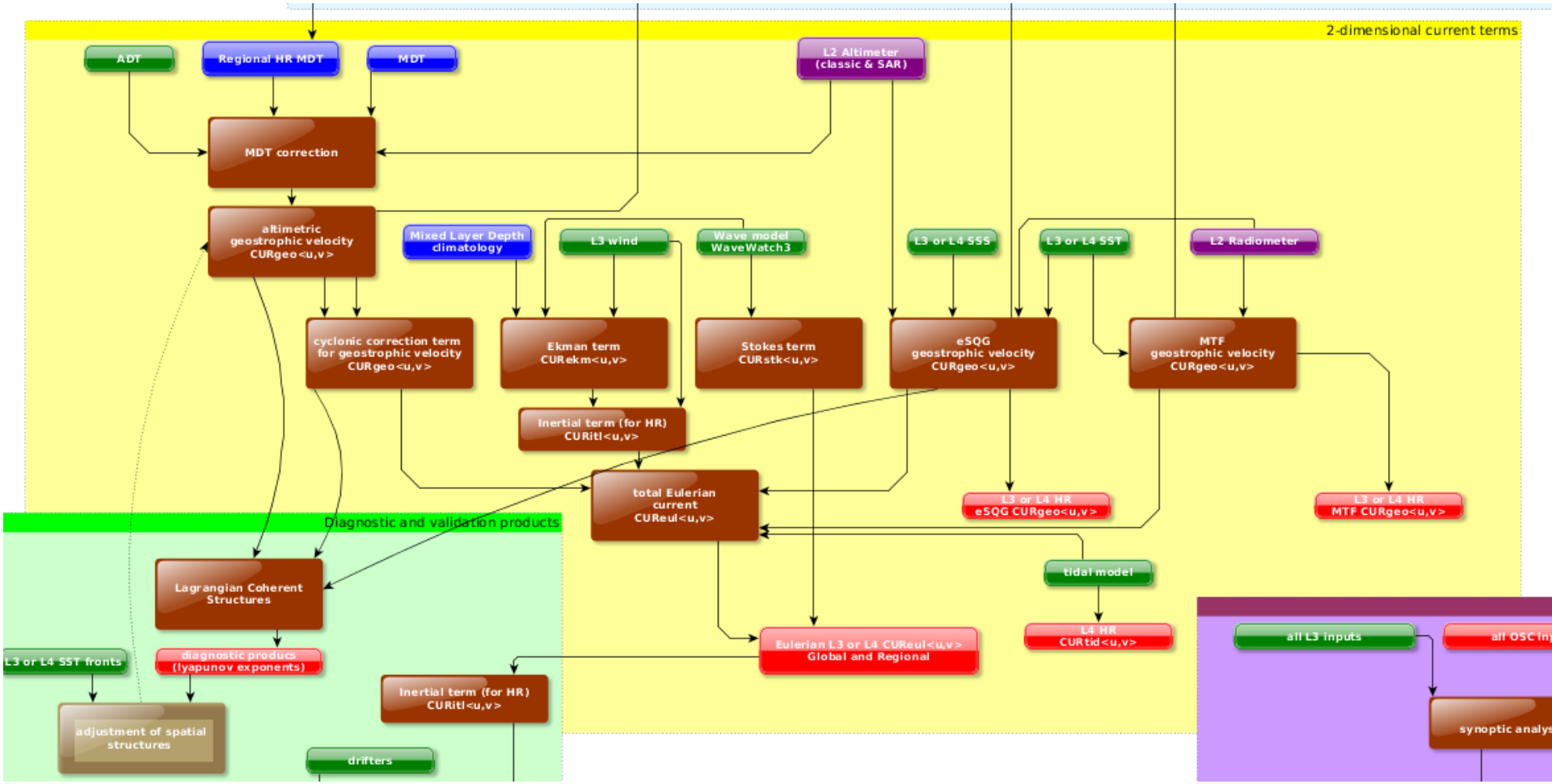


Inputs for L2 current processing or product assessment and validation

Additional layers to other observation sources (altimeter, SAR, …)

Glitter from swath data (MODIS, MERIS, …)

Gridded products



Gridded products

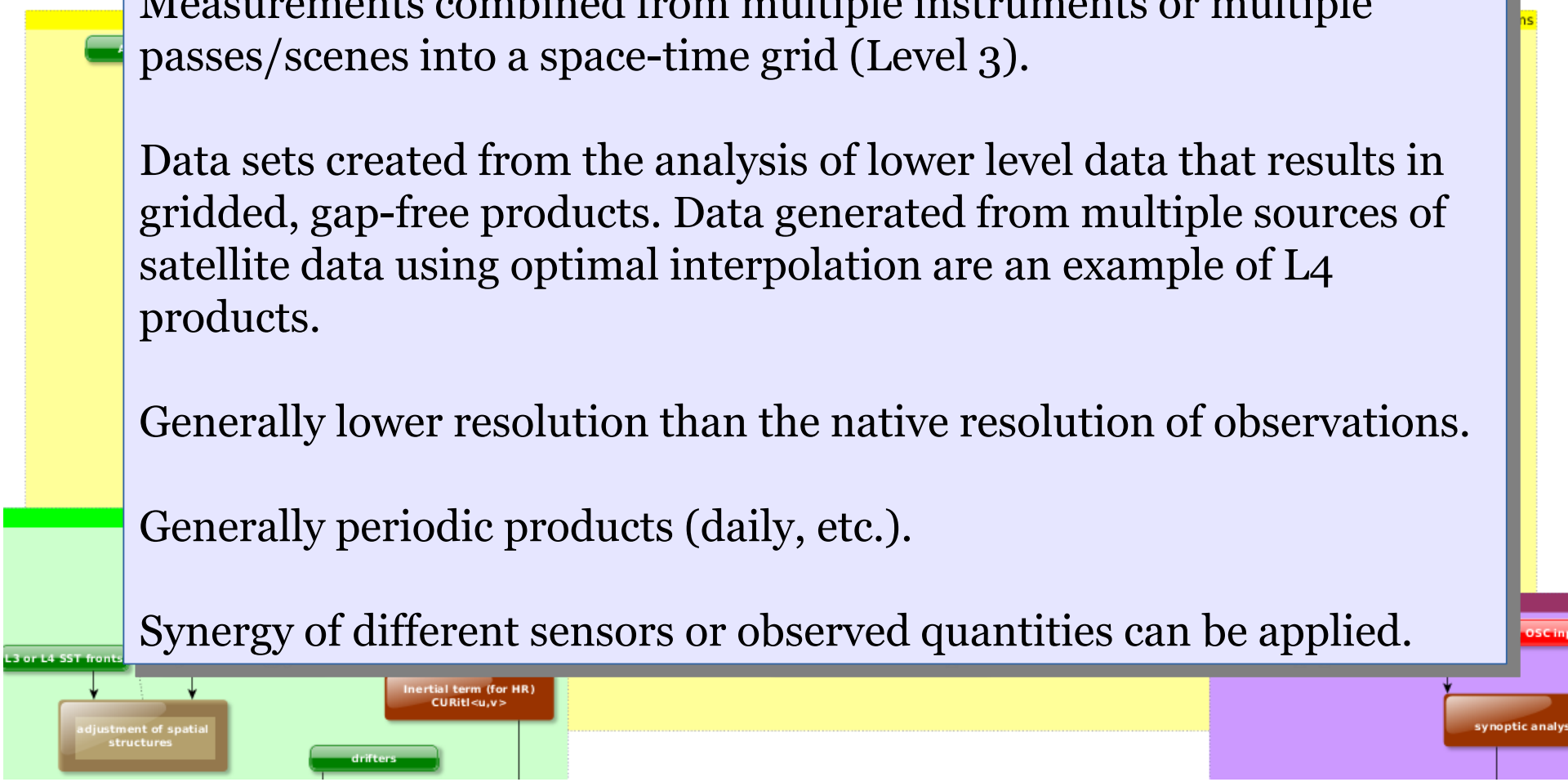
Measurements combined from multiple instruments or multiple passes/scenes into a space-time grid (Level 3).

Data sets created from the analysis of lower level data that results in gridded, gap-free products. Data generated from multiple sources of satellite data using optimal interpolation are an example of L4 products.

Generally lower resolution than the native resolution of observations.

Generally periodic products (daily, etc.).

Synergy of different sensors or observed quantities can be applied.



Gridded products

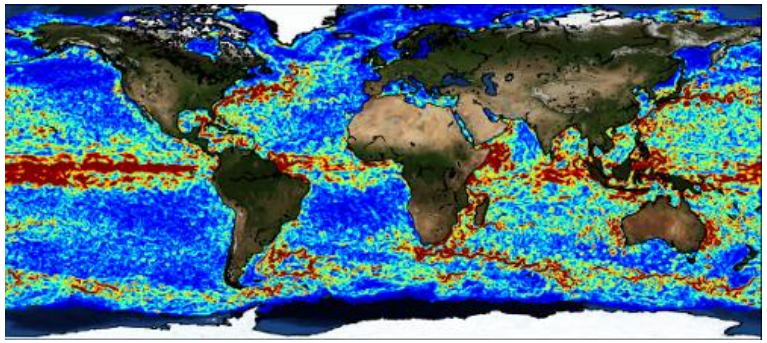
Effort is made by GlobCurrent to homogenize gridded products.

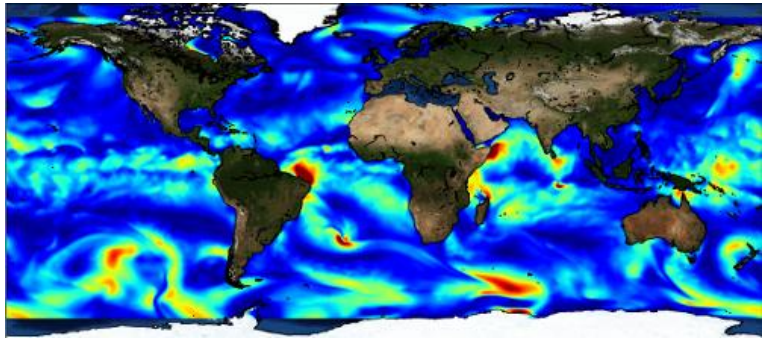
Data are re-interpolated to a common spatial grid : global, isolat-isolong, 0.1° resolution **=> may be changed back to 0.25° !**

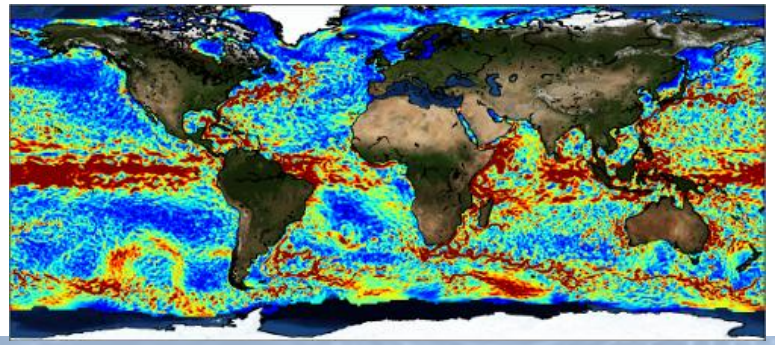
Use common time steps and resolution : daily or 3-hourly.

Objective is to ease data combination,

Gridded products







GlobCurrent altimeter product suite :

Geostophic

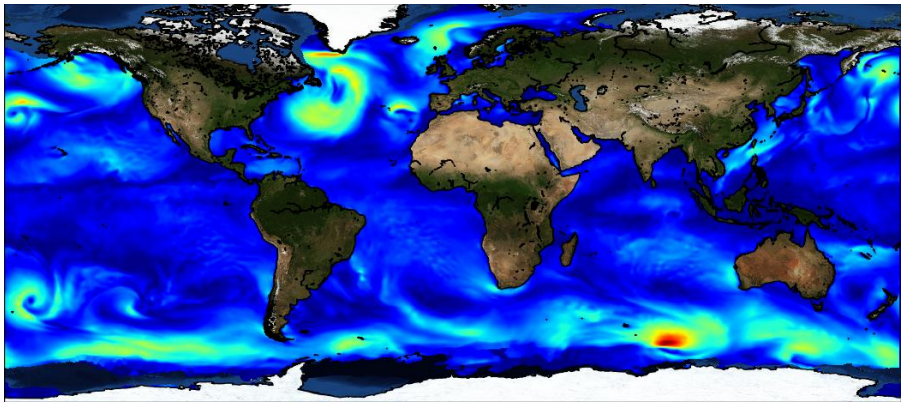
Ekman

Geostrophic + Ekman

10 year time series (soon)

(cf : M-H Rio presentation)

Gridded products



Stokes drift (u,v)

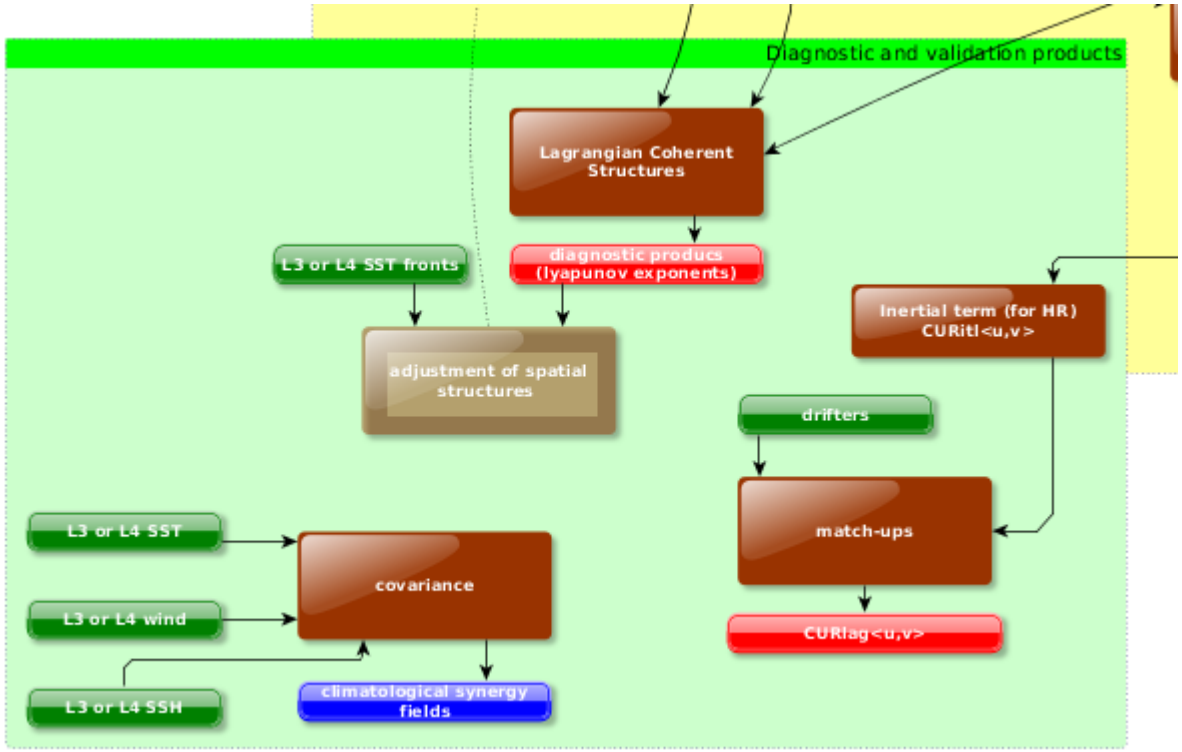
Estimated from WW3 model run at Ifremer (also used for Sentinel-1 processing)

3-hourly, available over the same 10 years time series

Complementary gridded products

Sea surface temperature	MW OI from RSS, 1/4 deg, daily, 2002-2012 ODYSSEA global analysis, 0.1 deg, daily, 2010-
winds	ECMWF 1/4 deg, 3 hourly
Sea surface salinity	CATDS SMOS L4a, weekly, 0.5 degree, 2010-2014
waves	WaveWatch3, 0.5 deg, 3-hourly, 1991-
...	

Diagnostic datasets



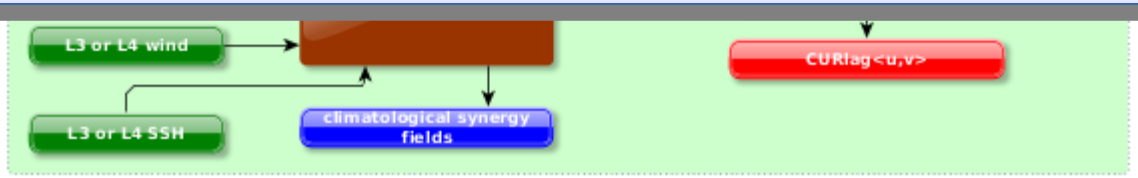
Diagnostic datasets

Direct validation with in situ measurements

Comparison with climatologies

Consistency with ocean features (fronts)

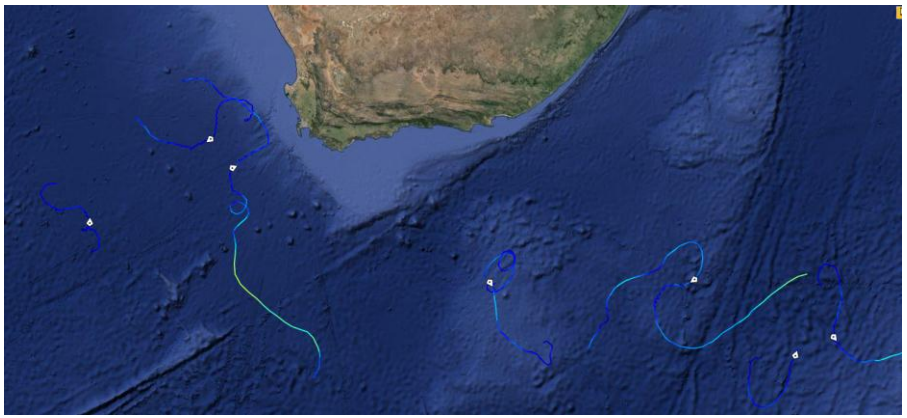
Coherence with different observed parameters (SST, SSH, winds, …)



In situ data

Surface drifter database (Rio/GlobCurrent)

- 1993-2014
- Drog on/off
- Enriched with ancillary information (altimetry velocity, SLA and MDT, wind stress from ERA Interim, estimation of Ekman)



Yomaha Argo database

- 1997-2014

CARTHE Grand

Reference data

Mixed Layer Depth climatology (Ifremer / Boyer Montégut)	2°x2°, monthly
Mean Dynamic Topography (Global / Rio 2013 and Mediterranean Sea)	0.25 °
ANDRO - Mean geostrophic current climatology at 1000 dbar from ARGO floats, by Ollitrault & Colin de verdiere (2013)	
Climatological Monthly Means of Drifter Data (Lumpkin and Johnson (2013) J. Geophys. Res., doi:10.1002/jgrc.20210)	
NAVO/AVHRR Front and eddy climatology	North Atlantic, 2000-2012, daily
OSTIA Sea Surface Temperature horizontal gradient climatology	Global, monthly means, 0.25°
SST fronts and gradient climatology, P.Cornillon, University of Rhode Island	Multi-sensor (microwave and infrared, LEO and geostationary)

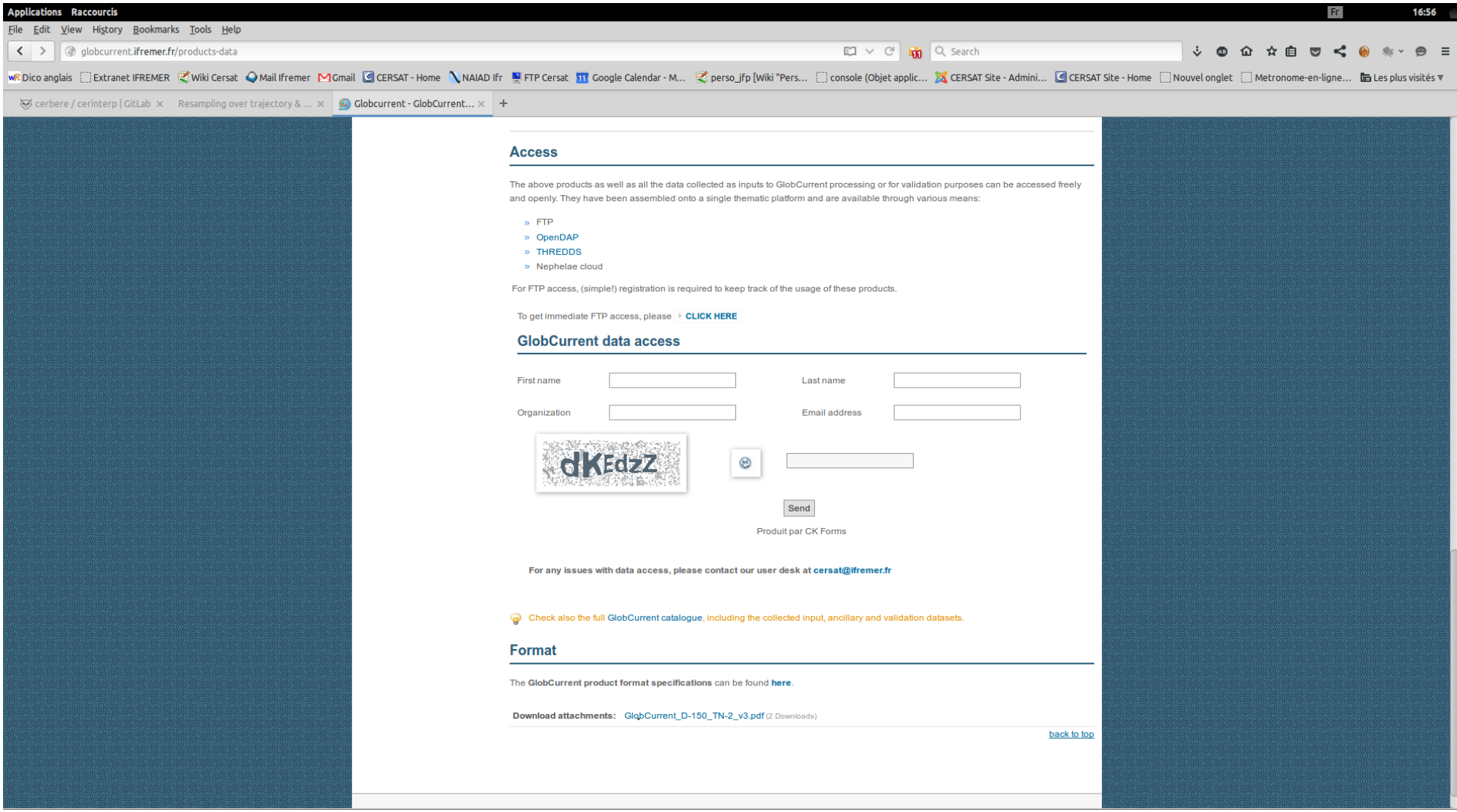
How to access the data

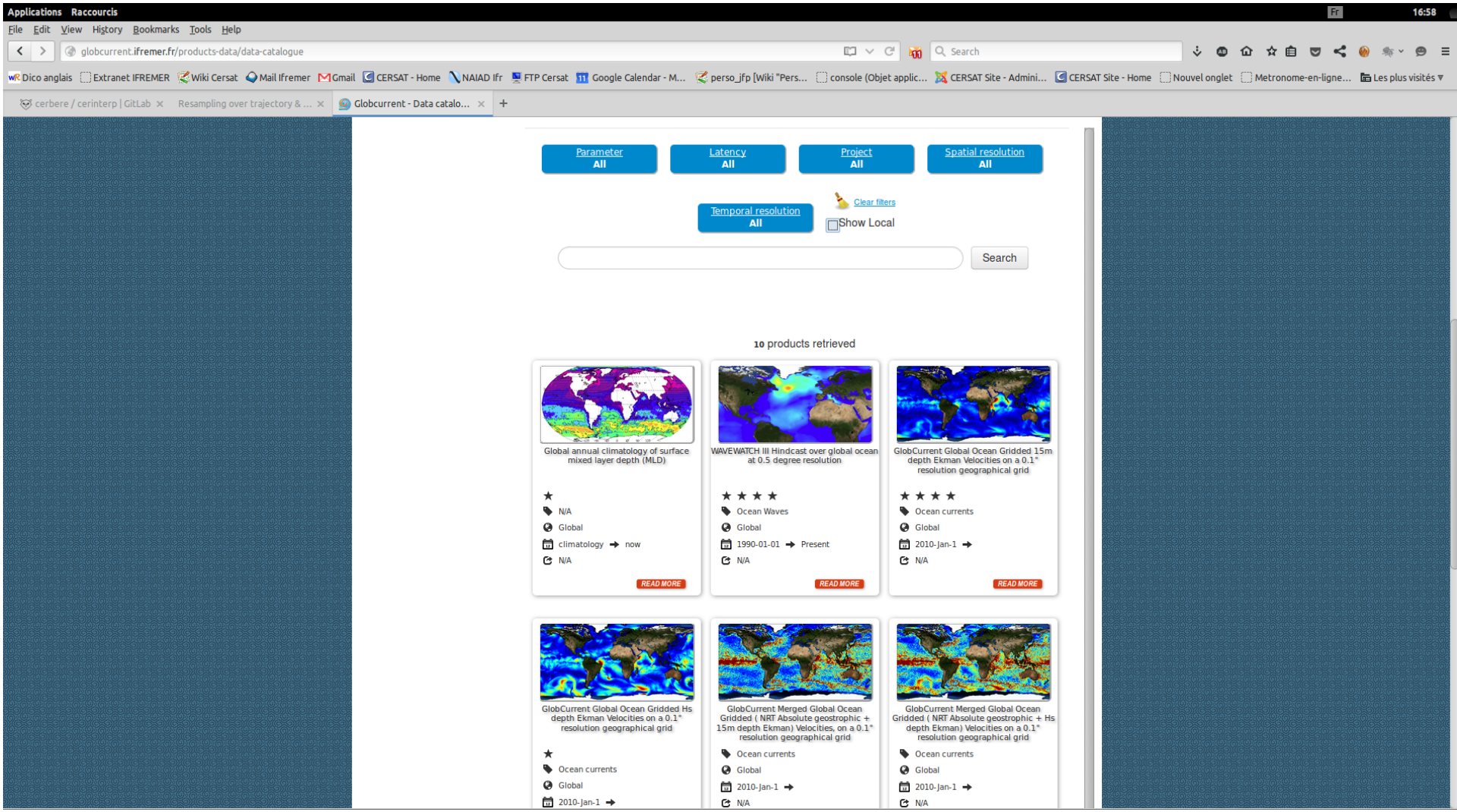
Check product web page :http://globcurrent.ifremer.fr/products-data

Data can be accessed on FTP server : ftp://eftp.ifremer.fr/

Login and password is required. Obtained by filling in the registration form on product web page.

For advanced operational usage, OpenDAP and Thredds protocols are also available (data produced by GlobCurrent only).


Applications Raccourcis
16:56
File Edit View History Bookmarks Tools Help
globcurrent.ifremer.fr/products-data
Search
Dico anglais
Extranet IFREMER
Wiki Cersat
Mail Ifremer
Gmail
CERSAT - Home
NAIAD Ifr
FTP Cersat
Google Calendar - M...
perso_jfp [Wiki "Pers...
console (Objet applic...
CERSAT Site - Admini...
CERSAT Site - Home
Nouvel onglet
Metronome-en-ligne...
Les plus visités
cerbere / cerinterp | GitLab
Resampling over trajectory & ...
Globcurrent - GlobCurrent...
Access
The above products as well as all the data collected as inputs to GlobCurrent processing or for validation purposes can be accessed freely and openly. They have been assembled onto a single thematic platform and are available through various means:
» FTP
» OpenDAP
» THREDDS
» Nephelae cloud
For FTP access, (simple!) registration is required to keep track of the usage of these products.
To get immediate FTP access, please CLICK HERE
GlobCurrent data access
First name
Last name
Organization
Email address
dKEdzZ
Send
Produit par CK Forms
For any issues with data access, please contact our user desk at cersat@ifremer.fr
Check also the full GlobCurrent catalogue, including the collected input, ancillary and validation datasets.
Format
The GlobCurrent product format specifications can be found here.
Download attachments: GlobCurrent_D-150_TN-2_v3.pdf (2 Downloads)
back to top


Applications Raccourcis
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File Edit View History Bookmarks Tools Help
globcurrent.ifremer.fr/products-data/data-catalogue
Search
Dico anglais
Extranet IFREMER
Wiki Cersat
Mail Ifremer
Gmail
CERSAT - Home
NAIAD Ifr
FTP Cersat
Google Calendar - M...
perso_jfp [Wiki "Pers...
console (Objet applic...
CERSAT Site - Admini...
CERSAT Site - Home
Nouvel onglet
Metronome-en-ligne...
Les plus visités
cerbere / cerinterp | GitLab
Resampling over trajectory & ...
Globcurrent - Data catalo...
Parameter All
Latency All
Project All
Spatial resolution All
Temporal resolution All
Clear filters
Show Local
Search
10 products retrieved
Global annual climatology of surface mixed layer depth (MLD)
N/A
Global
climatology → now
N/A
READ MORE
WAVEWATCH III Hindcast over global ocean at 0.5 degree resolution
Ocean Waves
Global
1990-01-01 → Present
N/A
READ MORE
GlobCurrent Global Ocean Gridded 15m depth Ekman Velocities on a 0.1° resolution geographical grid
Ocean currents
Global
2010-Jan-1 →
N/A
READ MORE
GlobCurrent Global Ocean Gridded Hs depth Ekman Velocities on a 0.1° resolution geographical grid
Ocean currents
Global
2010-Jan-1 →
GlobCurrent Merged Global Ocean Gridded (NRT Absolute geostrophic + 15m depth Ekman) Velocities, on a 0.1° resolution geographical grid
Ocean currents
Global
2010-Jan-1 →
N/A
GlobCurrent Merged Global Ocean Gridded (NRT Absolute geostrophic + Hs depth Ekman) Velocities on a 0.1° resolution geographical grid
Ocean currents
Global
2010-Jan-1 →
N/A

Remote access to processing platform

Direct remote access to Nephelae platform through ssh

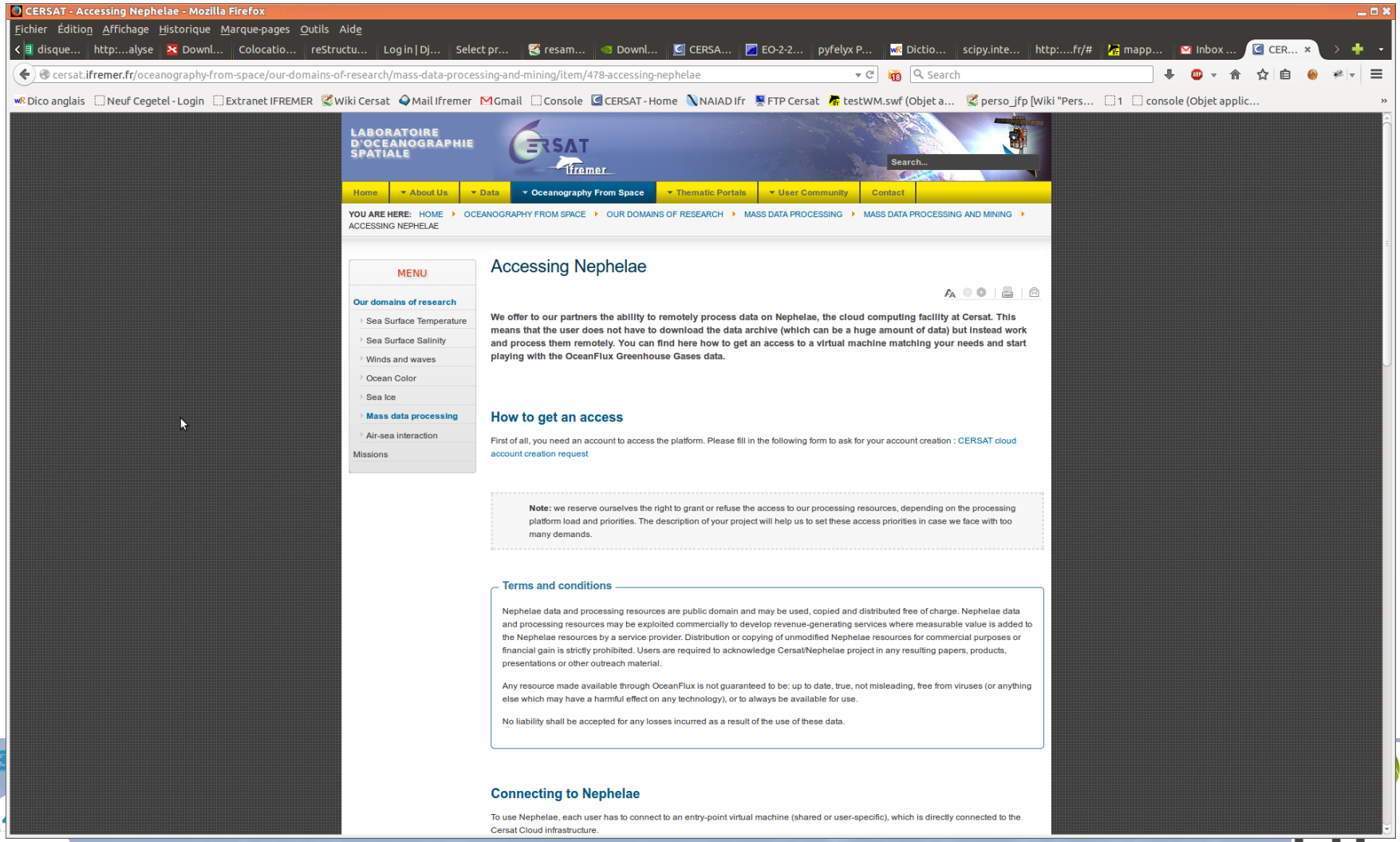
- access and read all assembled data
- access processing resources (single server or distributed processing for the reprocessing of long time series for instance)
- available scientific processing environment (python scientific packages and Ifremer toolboxes, matlab, …)

Access is restricted to identified users and partners : GlobCurrent team, case studies, on-demand requests

Contact Cersat help desk : cersat@ifremer.fr

Access to Nephelae plaform

http://globcurrent.ifremer.fr/products-data/access-with-nephelae



Acces

Laboratoire d'Océanographie Spatiale

Cersat Cloud – Account Creation Form

Please note that we reserve ourselves the right to grant or refuse the access to our processing resources, depending on the processing platform load and priorities. The description of your project will help us to set these access priorities in case we face with too many demands.

To create your Cersat Cloud account, please fill the following form :

Name *

First name *

Email *

Phone number *

Organization *

Organization type *

- ○ Private / Other
- ○ Education / Research
- ○ Government

Access to Nephelae plaform

Registration

http://forms.ifremer.fr/los/cersat-cloud-account-creation-form/

Confirmation email

Dear Sir,

Here are your Ifremer Intranet account settings :

** Login : <login> / <password>*

** SSH access authorized from IP 192.171.164.40 to :*

*- the oceanflux project shared entry point *vepoceanflux.ifremer.fr* (134.246.156.149), for basic ssh-only access*

*- your user-specific virtual machine : *br156-167.ifremer.fr* (134.246.156.167), for NX Client access.*

To use your user-specific virtual machine, we recommand you to install the NX Client software to get a graphical remote desktop on the platform : http://www.nomachine.com/download.php

Once logged, you will find a GLOBCURRENT-DATA folder which contains some README.GLOBCURRENT. and the data access.*

Access to Nephelae plaform

```
ssh -X <user>@<server address>
```

```
ananda:~%
ananda:~%
ananda:~%
ananda:~% ssh vepoceanflux.ifremer.fr
Welcome to Ubuntu 12.04.1 LTS (GNU/Linux 3.2.0-27-generic x86_64)

 * Documentation:  https://help.ubuntu.com/

894 packages can be updated.
533 updates are security updates.

New release '14.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Tue Nov  3 17:21:26 2015 from br152-148.ifremer.fr
br156-149:~% ls GLOBCURRENT*
data  README.GLOBCURRENT.DATATREE.TXT  README.GLOBCURRENT.TXT
br156-149:~%
br156-149:~%
```

README.GLOBCURRENT.DATATREE.TXT

```
data/sources/
├── insitu
│   ├── drifters-glad
│   └── drifters-rio
├── model
│   ├── currents
│   │   └── oscar
│   ├── tide
│   │   └── fes2012
│   │       └── harmonics
│   │           └── fes2012
│   │               ├── autom4te.cache
│   │               ├── build
│   │               │   └── temp.linux-x86_64-2.7
│   │               ├── config
│   │               ├── data
│   │               ├── examples
│   │               ├── src
│   │               └── test
│   ├── wave
│   │   └── ww3_ifremer_global_hindcast -> /home/cercache/project/ww3/public/HINDCAST/GLOBAL/
│   └── wind
│       └── ecmwf_0125 -> /home/cerdata/provider/ecmwf/model/forecast_0125/netcdf/
├── references
│   └── climatologies
│       ├── currents
│       │   └── insitu
│       │       ├── ifremer_andro_1000dbar
│       │       └── lumpkin
│       ├── fronts
│       │   ├── navo-avhrr -> /home/cerdata/provider/navo/features/fronts/avhrr/
│       │   └── ostia-gradients -> /home/cerdata/provider/oceanflux/climatologies/sst-gradients
│       ├── mdt
│       │   ├── mdt_cls_global_2009
│       │   ├── mdt_cls_global_2013
│       │   └── mdt_cls_mediterranean_sea
│       └── mld
│           └── mld_ifremer_global
└── satellite
    ├── currents
    │   ├── l2
    │   ├── l3
    │   └── l4
    │       └── surcouf
    ├── ocean_colour
    │   └── goci -> /home/cerdata/provider/kosc/satellite/coms/goci
    └── ocean_topography
```

Scientific work session

Loading the environment :

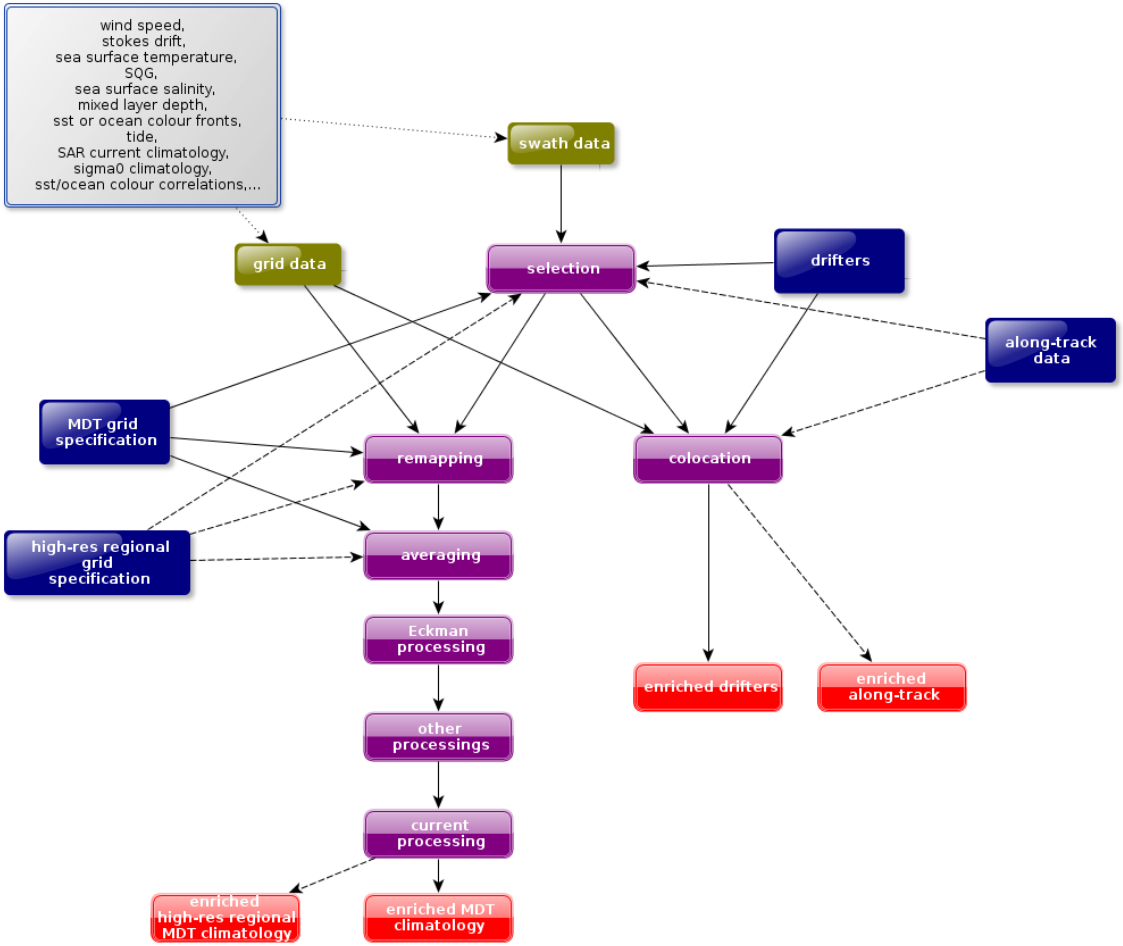
```
source /home/cercache/tools/environments/scientific_toolbox_cloudphys_precise/bin/activate.csh
```

Do some work in python

Rapatriate result

```
scp <user>@<server address>:<full directory to output>/*.nc .
```

Processing flow



Expert tools suite for data processing

We encourage implementation of open source packages and software, open source access for the user community

Data reading and handling

- Scientific python packages
- Cerbere

Data processors

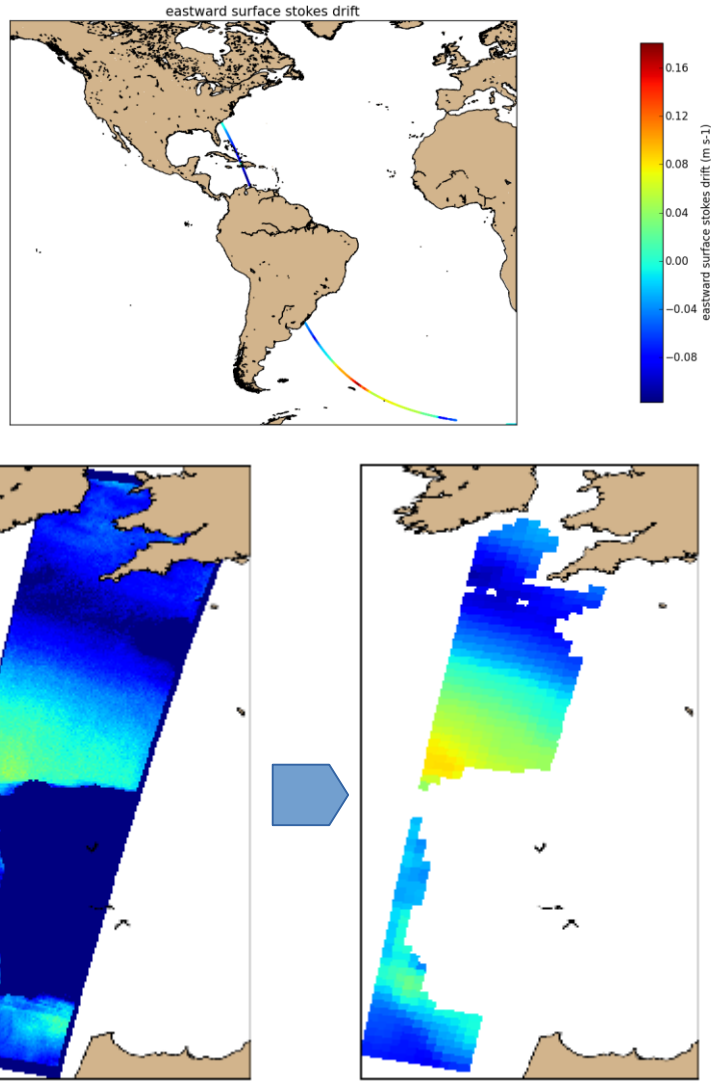
Data combination

- Resampling of features on top of each other, regridding of data on a common reference
- Colocation

Ex : resampling tools

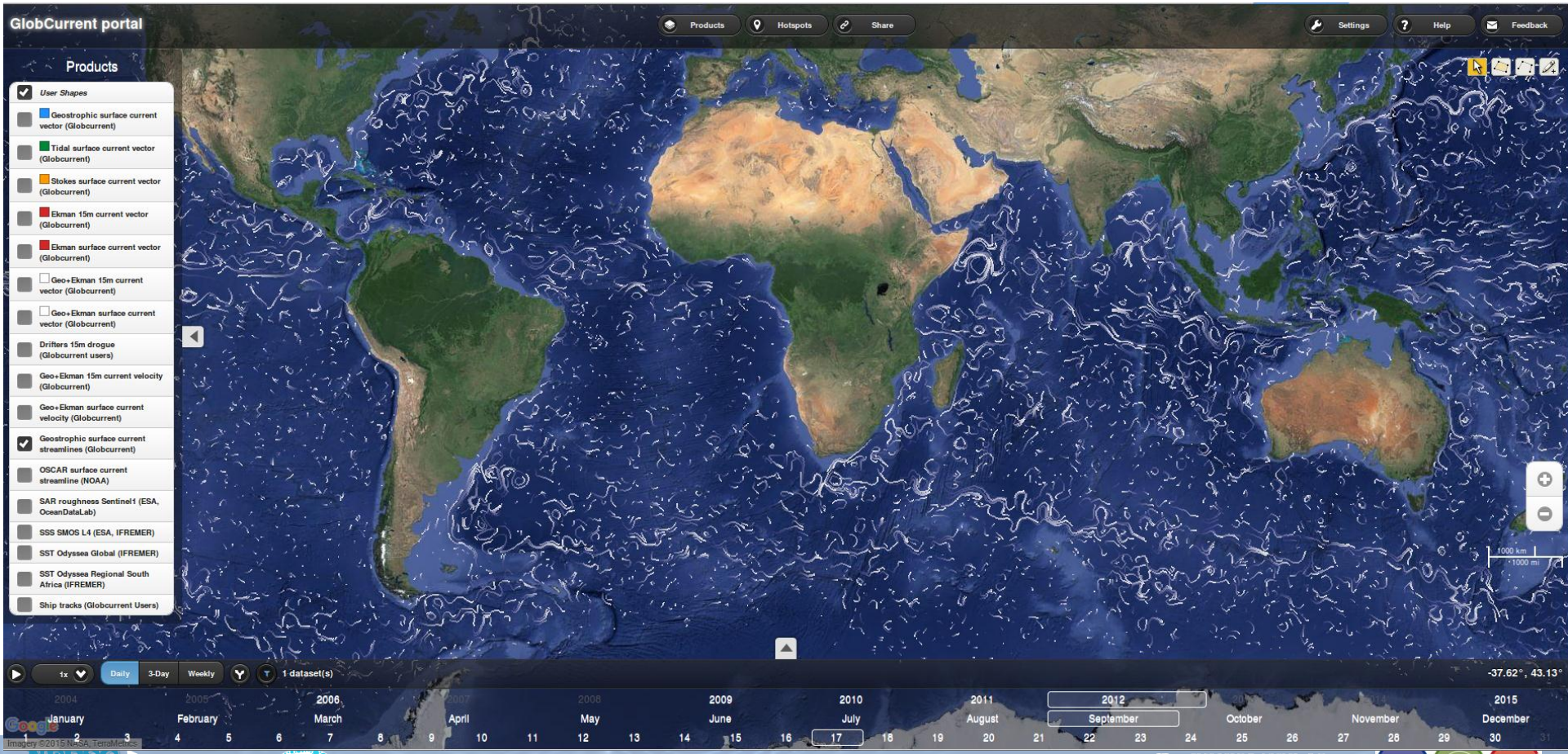
Complement data with several layers of information. Ex : enrich altimeter track with SST from another satellite pass or grid, or other current components.

Works for any pattern (along-track, swath, image, grid, ...)



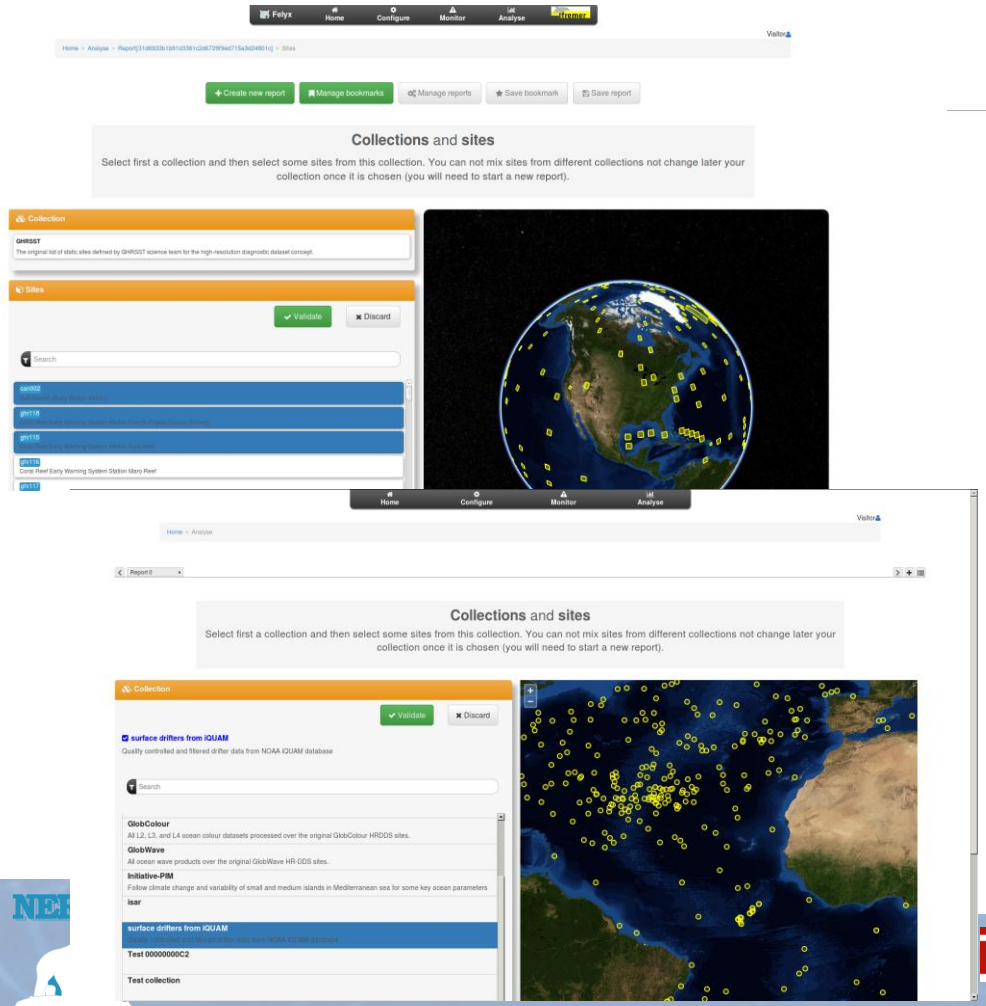
Advanced tools

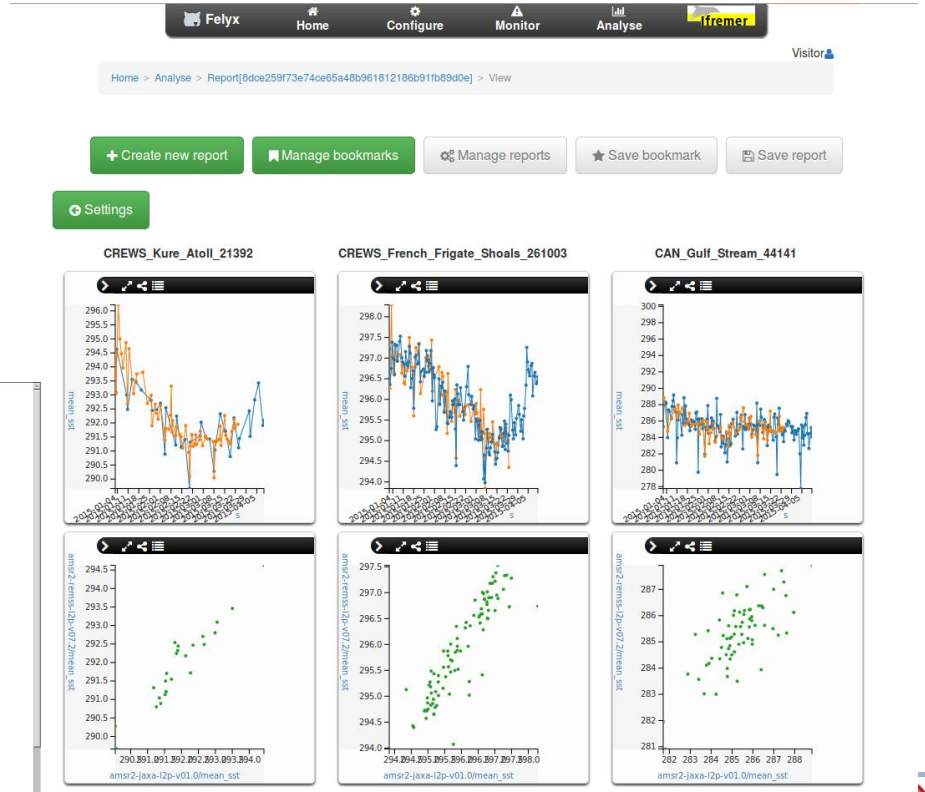
Visualization with Syntool



Advanced tools

Match-ups, long-term statistics with felyx





Conclusion

GlobCurrent will deliver various products for different terms and scales, using innovative and experimental methods.

End-users : our aim is to provide the means of assessing the quality and suitability of these products, and support case studies through data and tools.

Experts : foster development and evaluation of new products, based on sensor synergy, using a unique combination of a comprehensive database, tools and processing resources on a single « ecosystem ».