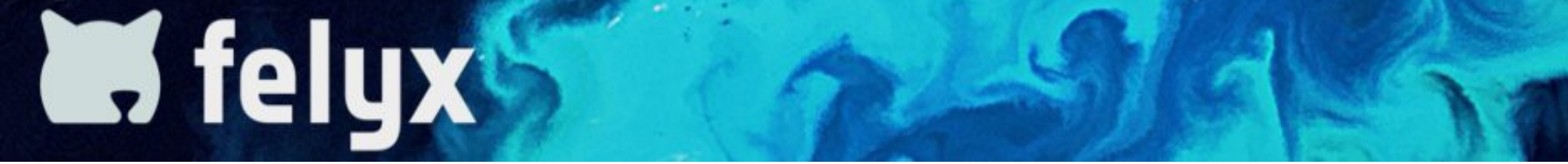

Felyx : free, open source, software system to support cal/val activities

Jean-François Piollé, Sylvain Herlédan – **Ifremer**

Dave Poulter - **Pelamis**

Jamie Shutler – **University of Exeter**

Peter Walker – **PML**

Philippe Goryl, Craig Donlon, Veronica Guidetti - **ESA**

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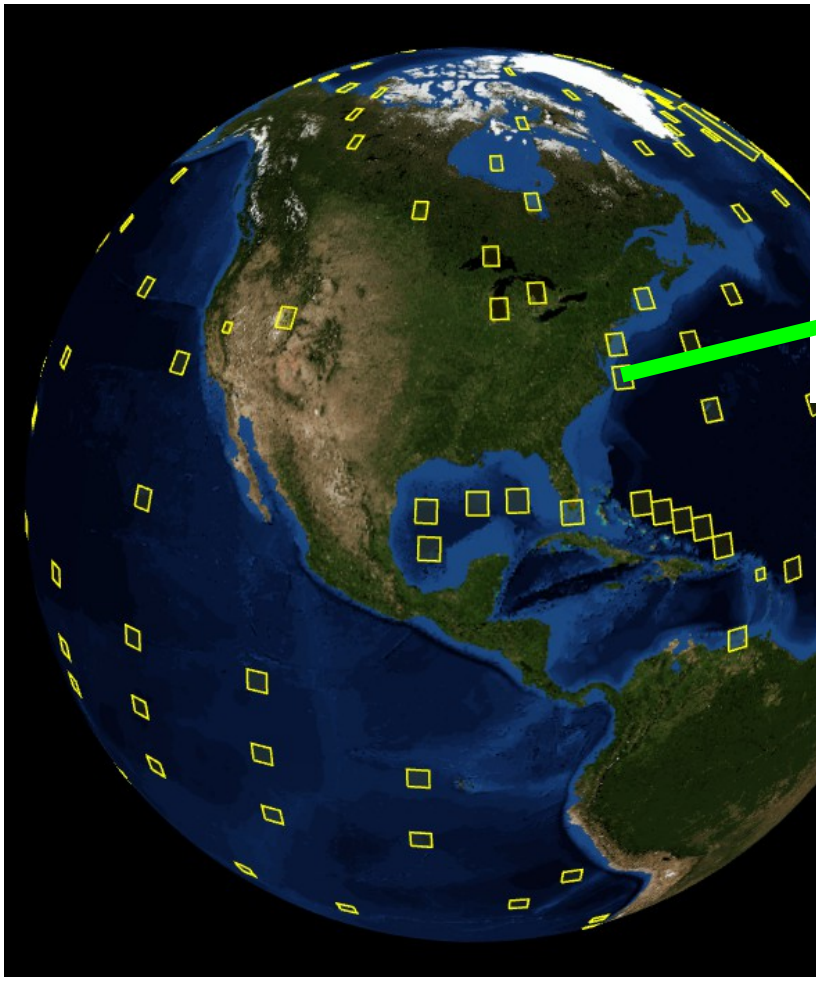
felyx

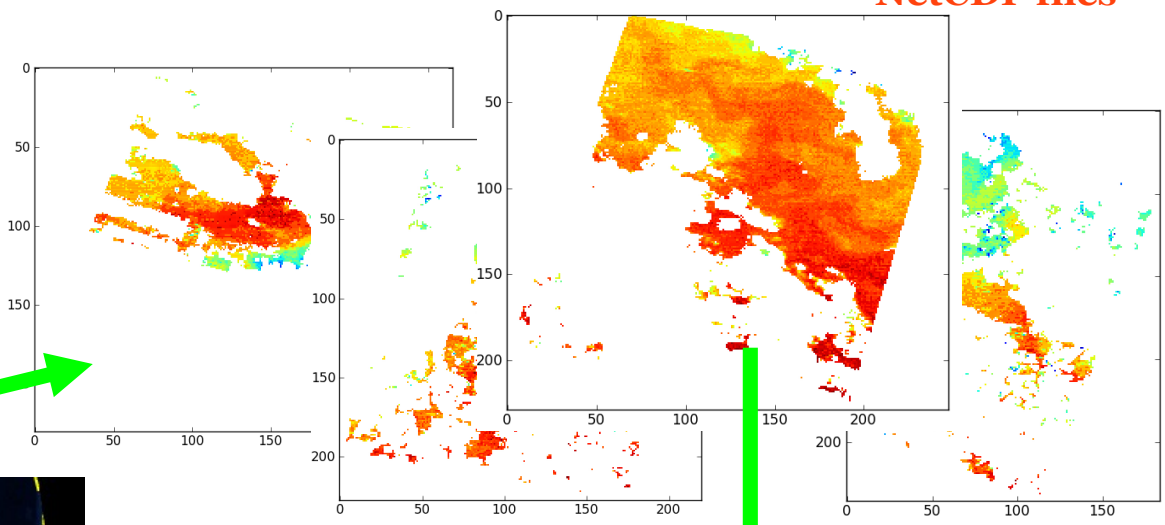
back-end concept

extract miniprods over static and dynamic sites

process quant, qual, stat metrics over miniprods

NetCDF files





source: 20130101-IFR-L4_GHRSST-SSTfnd-ODYSSEA-GLO_010-v2.0-fv1.0.nc
felyx_dataset_name: ifr-l4-sstfnd-odyssea-glob_010_v2.1
percentage_coverage_of_site_by_miniprod: 100.0
date_modified: 2014-04-18T10:30:21
felyx_site_identifier: ukm005
date_created: 2014-04-18T10:30:21
time_coverage_start: 2013-01-01T00:00:00
time_coverage_stop: 2013-0101T00:00:00

sst_standard_deviation : 1.34
mean_sst : 286.289
ice_presence: 0
cloud_presence": 46.80
day_or_night: "night"
mean_wind_speed: 4.8388

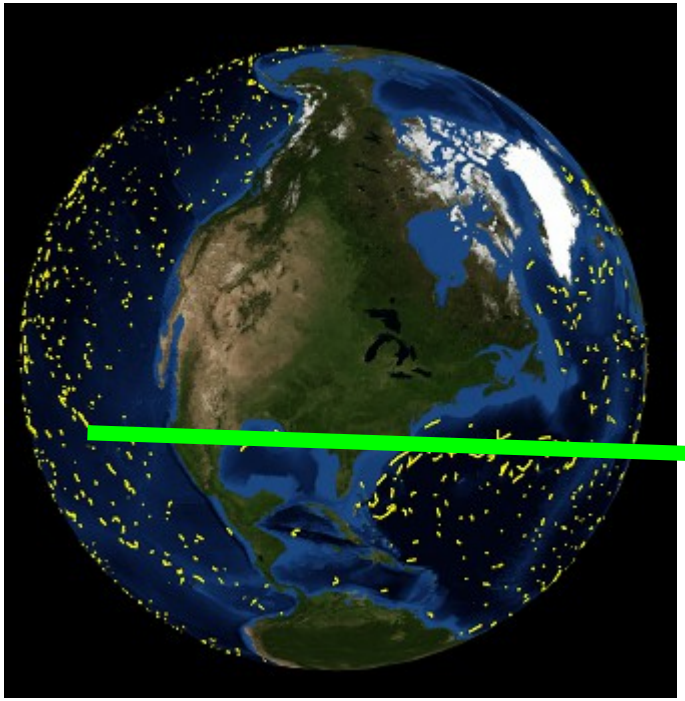
JSON files indexed in a search engine (ElasticSearch)

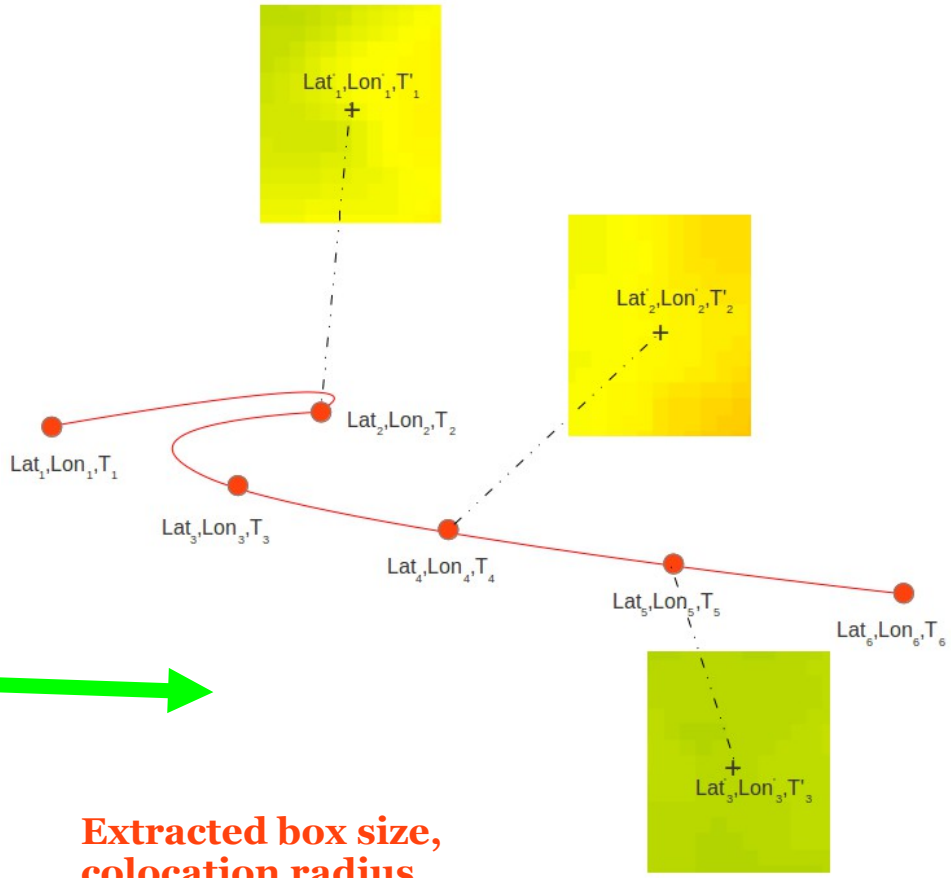
sites may be trajectories (buoys, cruise, hurricane)

sites may be trajectories (buoys, cruise, hurricane)

MINIPROD's centred on trajectory locations closest in time
locations closest in time

trajectory files ingested through import web service (CSV file)





Extracted box size, colocation radius, maximum temporal difference can be adjusted for each dataset

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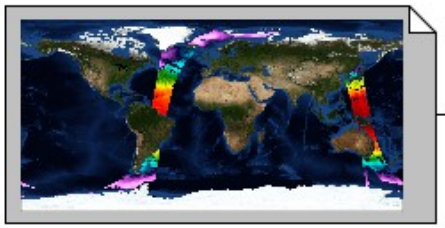
Command line production



EO source file

felyx-miniprod

--output option

manifest

miniprod storage

miniprods
(*.nc)

(1) from stdin

(2) from manifest

(3) --storage=file

json

felyx-metric

(2) --storage=file_and_elastic_search

felyx-metric-index

elasticsearch

(1) --storage=elastic_search

Can be produced by another felyx and provided here to avoid large data transfer of source data, for exchange.

Can also be enriched offline with other fields.

Metrics could also be processed by any external tool (ex: complex metrics that could not be implemented through plugins)

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Examples of metrics

For a GHRSST L2P product

mean sea surface temperature (quality >= acceptable)	mean({"field": "sea_surface_temperature", "must_have": [{"operator": "greater_equal", "field": "quality_level", "value": 4}]})
mean sses bias (quality >= acceptable)	mean({"field": "sses_bias", "must_have": [{"operator": "greater_equal", "field": "quality_level", "value": 4}]})
mean sses standard deviation (quality >= acceptable)	mean({"field": "sses_standard_deviation", "must_have": [{"operator": "greater_equal", "field": "quality_level", "value": 4}]})
mean wind speed	mean({"field": "wind_speed"})
day or night status	day_or_night({})
sea surface temperature standard deviation (quality >= acceptable)	standard_deviation({"field": "sea_surface_temperature", "must_have": [{"operator": "greater_equal", "field": "quality_level", "value": 4}]})
ice presence	ice_presence({})

Data access

Raw data (extracted miniprods and metrics) accessible through :

- Netcdf format for miniprods
- Csv, netcdf, json for metrics
- FTP / HTTP / OpenDAP
- Query through RESTful web service (tar file or values) for more advanced selection criteria (for instance matchup)
- Selection results (for instance MDB) could be pre-processed and packaged for specific applications

Reporting and visualization through front-end

Examples of queries (2)

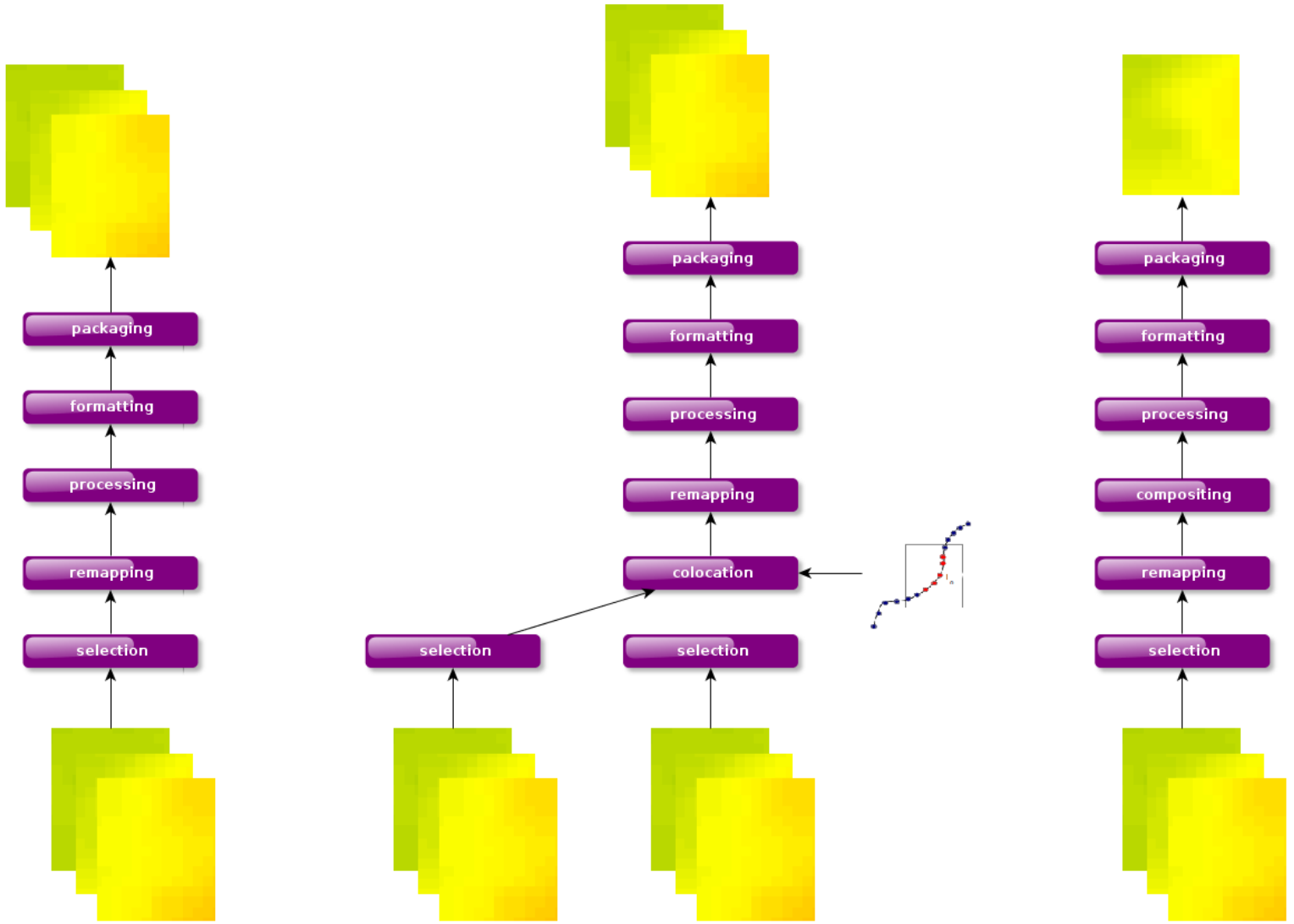
Get metrics M_1, M_2 for miniprods from dataset D_1,D_2 over site S_1 between dates T_1 and T_2 where M_1 > value

Get miniprods from dataset D_1,D_2 over site S_1 between dates T_1 and T_2 where metric M_1 > value

Get metrics M_1, M_2 for miniprods from dataset D_1 over site S_1 between dates T_1 and T_2 where bit 3 of flag F_1 is set

Get miniprods from dataset D_1,D_2 over site S_1 between dates T_1 and T_2 where difference between metric M_1 and metric M_2 > value when D_1 and D_2 colocated within a time window of 30 minutes

API – workflow concept



Match-up generation

Miniprods extracted over trajectories can be recombined with in situ data.

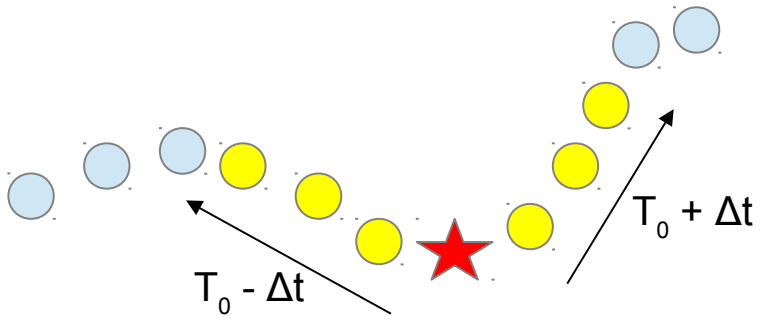
The in situ data server is a third party tool provided together with felyx.

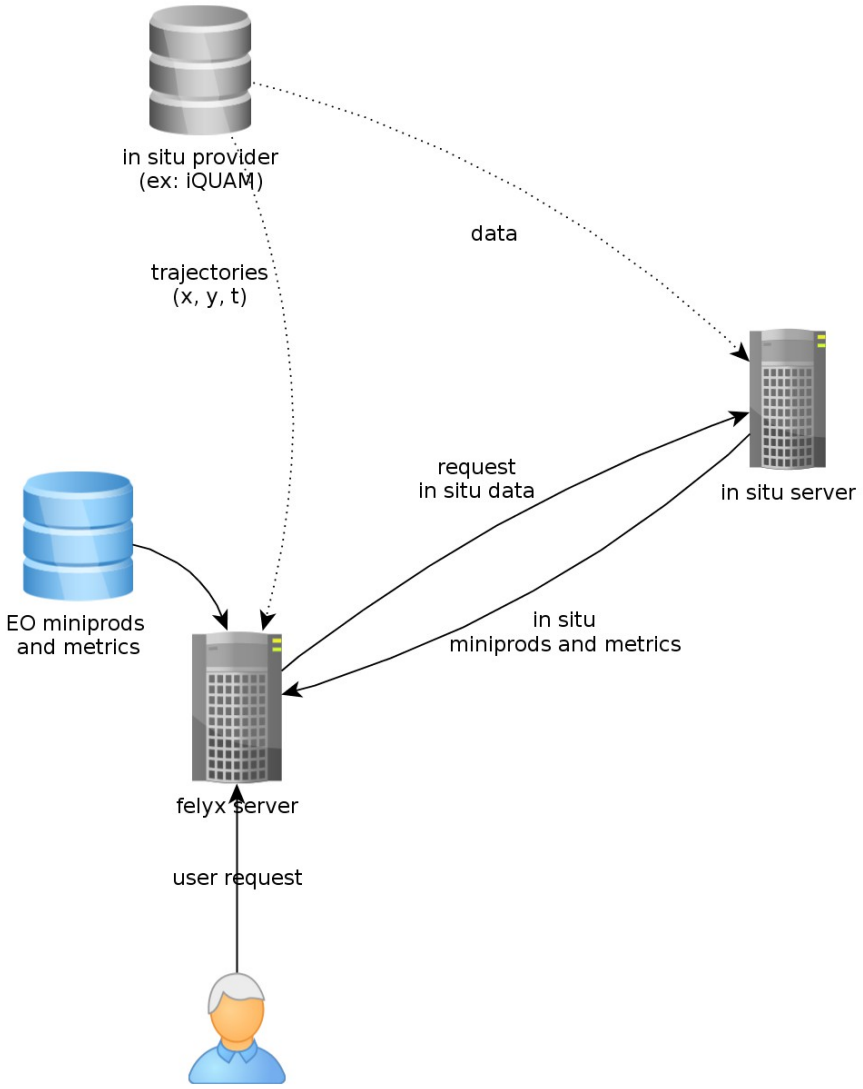
Colocation time criteria can be adjusted

Multiple datasets can be selected at once

The in situ data server has the same API as felyx and can perform similar operations (and execute similar workflow)

For instance, In situ history can be extracted for each matchup (“in situ miniprod”).





felyx

Configuration interface

Mozilla Firefox

localhost:1080/configure

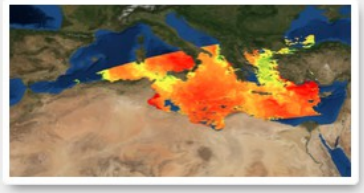
Felyx | Home | Configure | Monitor | Analyse | Ifremer

Visitor

Home > Configure

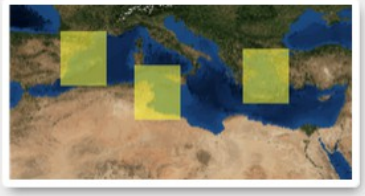
WELCOME TO THE FELYX ADMINISTRATION

Fully configure here your felyx instance : describe and connect to your favorite datasets, define the sites over which you want to extract miniprods and process some metrics.



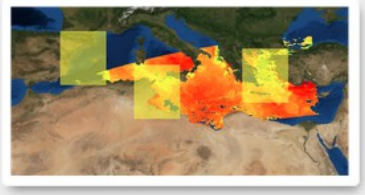
Dataset configuration »

Add datasets, configure their content and format description.
Optionally, set up remote data pull to later automatically produce your miniprods and metrics.



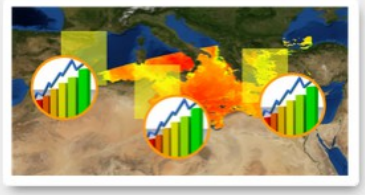
Site configuration »

Define the list of extraction sites (where miniprods and metrics can be extracted). Group these extraction sites by thematic collections.



Extraction configuration »

Link the datasets to the site collections where you want to extract miniprods.



Metric configuration »

Define which metrics you want to process for each extracted miniprod.
Different sets of metrics can be defined for different collections of sites.

Reports

Reports assemble plots for a selection of sites, datasets and metrics or miniprod into a single web document.

This is the way to explore and display the felyx data content interactively.

Reports can be :

- Saved and reloaded : can be reloaded with new time frame and same content (« periodic reports »)
- Shared with other users (bookmarks). Can be full report or a specific plot.
- Reports are links that can be shared between users or through social tools (facebook & twitter)
- Automated : link sent to subscribers periodically, time window can be daily, weekly, monthly (but easy to change to any time coverage)

Results of queries is stored in cache for repeated access (or pre-generation)

felyx

Site selection

Felyx | Home | Configure | Monitor | Analyse | Ifremer

Visitor

Home > Analyse > Report[31d6933b1b91d3361c2d6729f9ed715a3d24801c] > Sites

+ Create new report | Manage bookmarks | Manage reports | Save bookmark | Save report

Collections and sites

Select first a collection and then select some sites from this collection. You can not mix sites from different collections not change later your collection once it is chosen (you will need to start a new report).

Collection

GHRSST

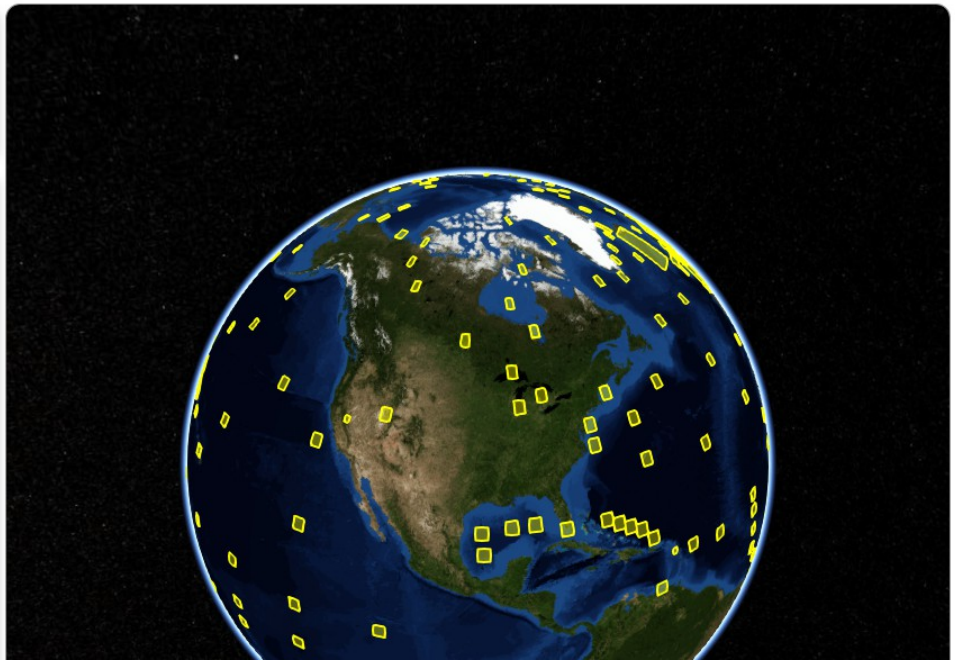
The original list of static sites defined by GHRSST science team for the high-resolution diagnostic dataset concept.

Sites

✔ Validate | ✖ Discard

Search

- can002 — Gulf Stream (Buoy Station 44141)
- ghr118 — Coral Reef Early Warning System Station French Frigate Shoals (Iridium)
- ghr115 — Coral Reef Early Warning System Station Kure Atoll
- ghr116 — Coral Reef Early Warning System Station Maro Reef
- ghr117



esa | Ifremer | pelamis scientific software | PML Plymouth Marine Laboratory

felyx

Site selection

Home | Configure | Monitor | Analyse

Visitor

Home > Analyse

Report 0

Collections and sites

Select first a collection and then select some sites from this collection. You can not mix sites from different collections not change later your collection once it is chosen (you will need to start a new report).

Collection

✔ Validate ✖ Discard

surface drifters from iQUAM

Quality controlled and filtered drifter data from NOAA iQUAM database

Search

GlobColour
All L2, L3, and L4 ocean colour datasets processed over the original GlobColour HRDDS sites.

GlobWave
All ocean wave products over the original GlobWave HR-DDS sites.

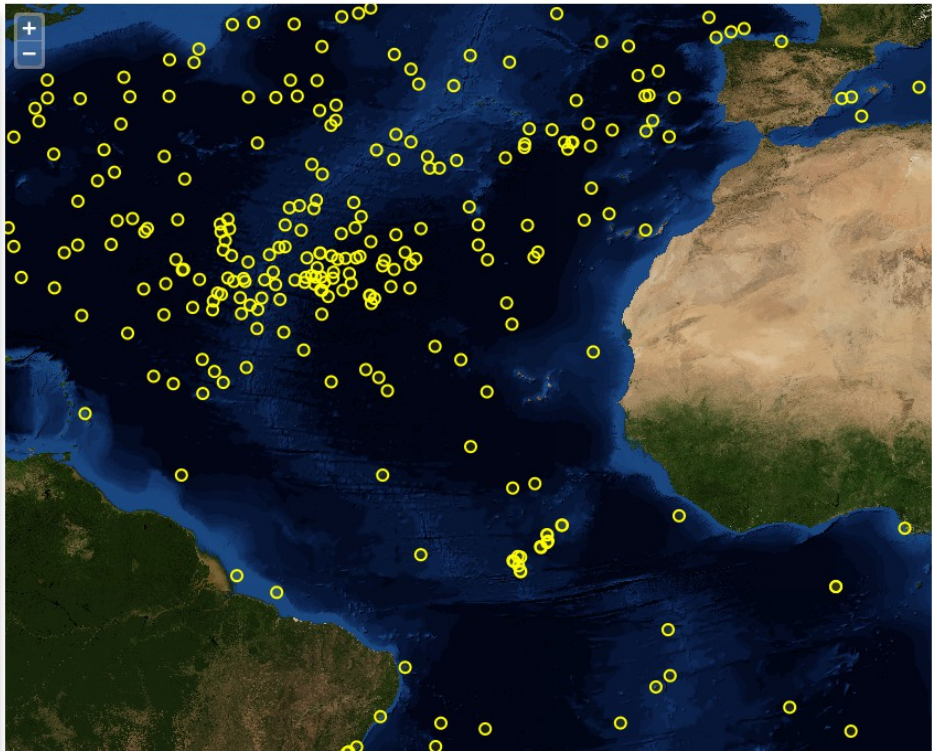
Initiative-PIM
Follow climate change and variability of small and medium islands in Mediterranean sea for some key ocean parameters

isar

surface drifters from iQUAM
Quality controlled and filtered drifter data from NOAA iQUAM database

Test 00000000C2

Test collection



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felyx

config your report

Configure your diagnostic **report**

This is where you display **felyx** metrics and miniprods. Select first your site(s) and dataset(s) of interest, compose the data and plots you want to display, your time frame and generate the report!

Show report

Sites

Configure

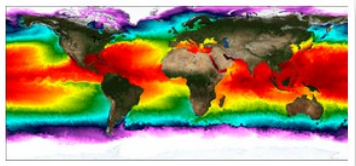
CREWS_French_Frigate_Shoals_261003 ×
Coral Reef Early Warning System Station French Frigate Shoals (Iridium)

CREWS_Kure_Atoll_21392 ×
Coral Reef Early Warning System Station Kure Atoll

CREWS_Maro_Reef_21531 ×
Coral Reef Early Warning System Station Maro Reef

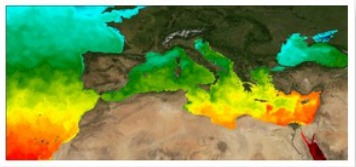
Datasets

Configure



ODYSSEA Multi-Sensor Merged High-Resolution Sea Surface Temperature over Global Ocean in 0.1° Geographical Grid

ifr-l4-sstfnd-odyssea-glob_010_v2.1



ODYSSEA Multi-Sensor Merged High-Resolution Sea Surface Temperature over Mediterranean Sea in 0.02° Geographical Grid

Plots

Mean Sea Surface Temperature ×
ifr-l4-sstfnd-odyssea-med_002_v2.1
Bin size: 1

Mean Sea Surface Temperature ×
ifr-l4-sstfnd-odyssea-med_002_v2.1
Resampling: none

Mean Foundation Sea Surface Temperature
ifr-l4-sstfnd-odyssea-glob_010_v2.1
Resampling: none

Time range

Start
2014-11-02 08:52:33

Stop
2014-12-02 08:52:33

Last year | Last month | Last 24h

Datasets coverage

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felyx

Felyx | Home | Configure | Monitor | Analyse | Ifremer

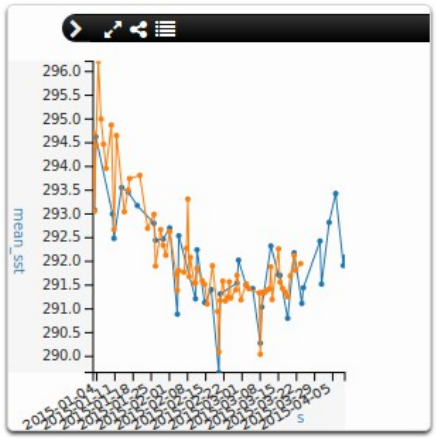
Visitor

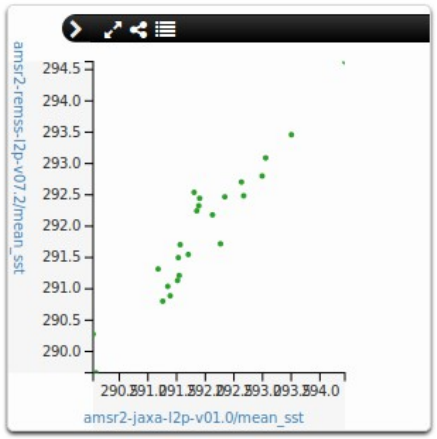
Home > Analyse > Report[8dce259f73e74ce65a48b961812186b91fb89d0e] > View

+ Create new report | Manage bookmarks | Manage reports | Save bookmark | Save report

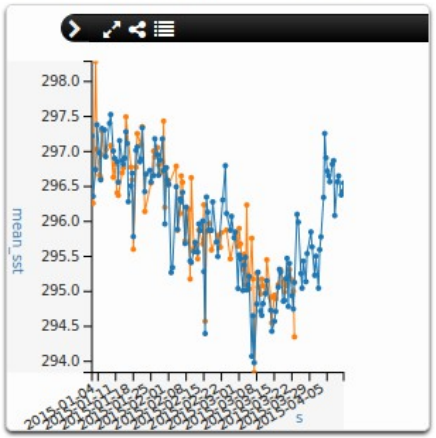
Settings

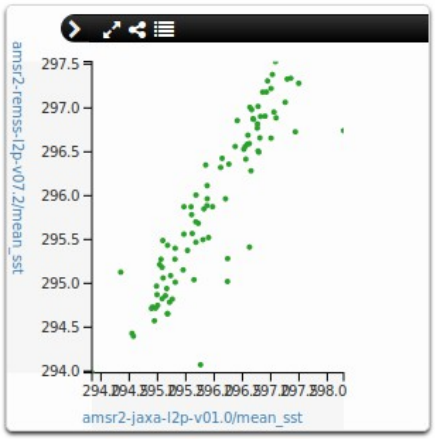
CREWS_Kure_Atoll_21392



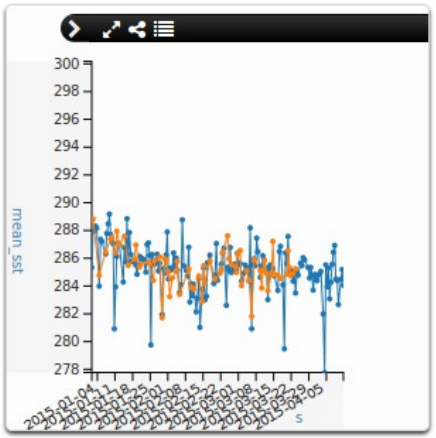


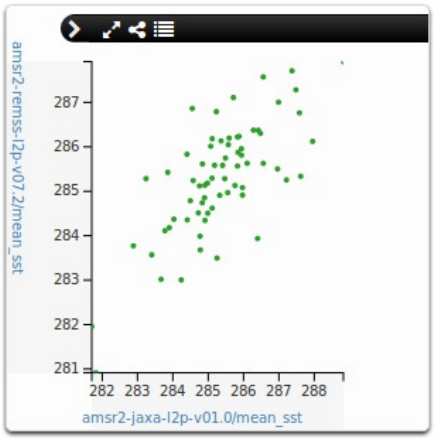
CREWS_French_Frigate_Shoals_261003



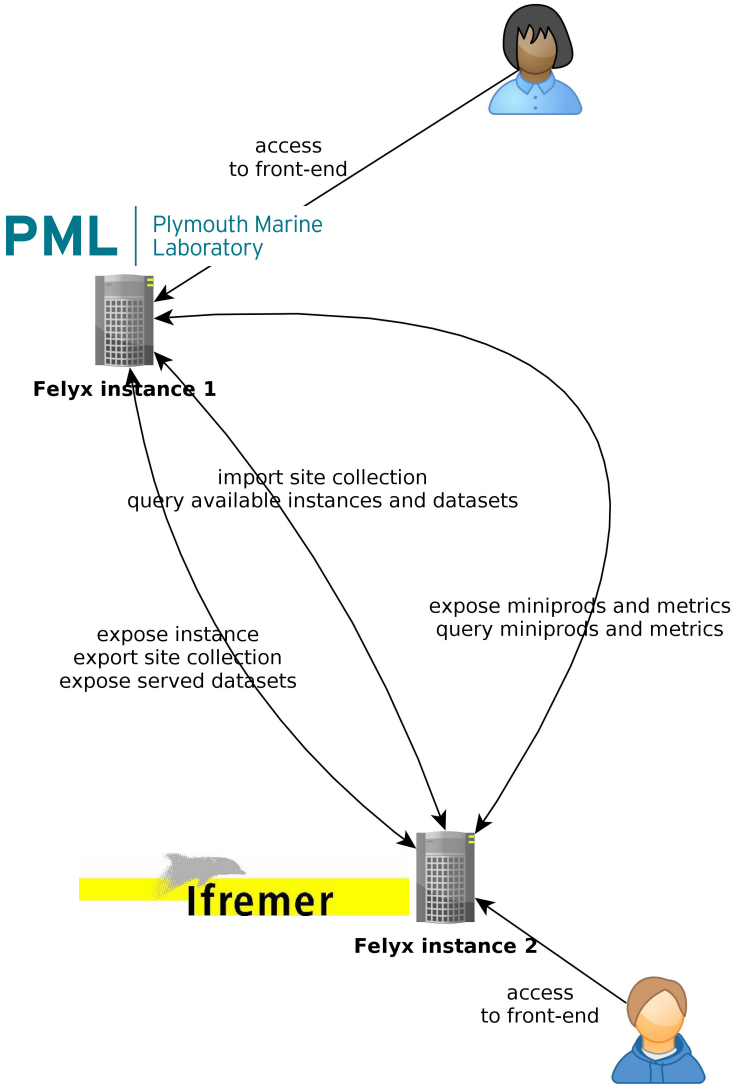


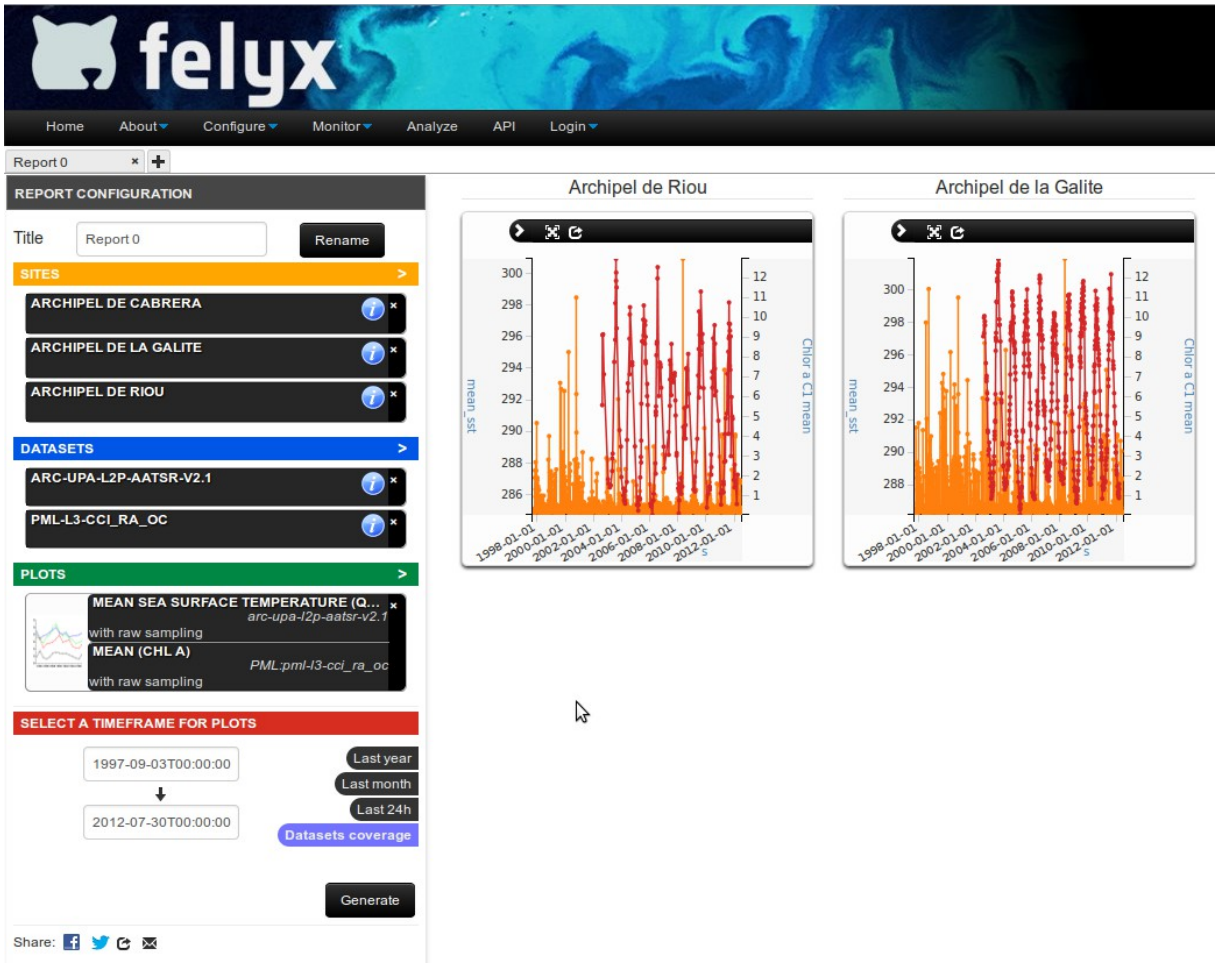
CAN_Gulf_Stream_44141





networking felyx – cross queries





orange / red curves correspond to metrics fetched from Ifremer and PML instances

Ifremer

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Installation and deployment

- source code will be freely available (GIT repo), GPLv3 license : users can do pretty much what they want, modification (sharing is encouraged), commercial usage allowed
- Fully documented : installation, administration, user and developer guide, reference documentation
- Software can be installed from source code or deployed using virtual images
- Building downstream applications on top of felyx servers:

  Instances share a common, base RESTfull API.

  Users are encouraged to build their own applications, and to host their own instance with their own data, configured to their needs.!
- System tailoring : parameter, datasets, metrics, front-end, ….

  Felyx is fully written in python (back-end) and javascript (front-end), using third party components compatible with above licensing

Implementation status

Objective is to deliver the final system in July.

6-months demonstration & testing phase before full release of system source code for download and installation by other hosts

Source code release for limited amount of partners : allow to test sysem deployment procedures, documentation,...

Early testing and implementation of « real life » use cases is ongoing.

Other features to be implemented this summer for a 2nd release at fall

Full public release early 2016.

Demonstration activities

- GHRSST match-up database (July)
  - cross sensor inter-comparison in GHRSST
  - NRT datasets METOP, VIIRS, AMSR2, SEVIRI, AVHRR
  - Satellite to in situ matchups
  - dynamic sites use (iQUAM drifters + argo floats)
- Sentinel-3 cal/val preparation
- OceanHeatFlux
- SMOS

Tested datasets

SST

ERS-1/ERS-2 ARC ATSR L2P
ENVISAT ARC AATSR L2P
JAXA AMSR2 L2P
REMSS AMSR2 L2P
O&SI SAF METOP L2P
O&SI SAF METOP L3
O&SI SAF SEVIRI
O&SI SAF GOES13
O&SI SAF NAR L2P
JPL MODIS L2P
NAVO LAC & GAC L2P
RSS AMSRE L2P
RSS TMI L2P
Medspiration L4
MyOcean L4s
Odyssea Global L4
AVHRR Pathfinder
OSTIA CCI L4 & NRT L4
S-3 SLSTR

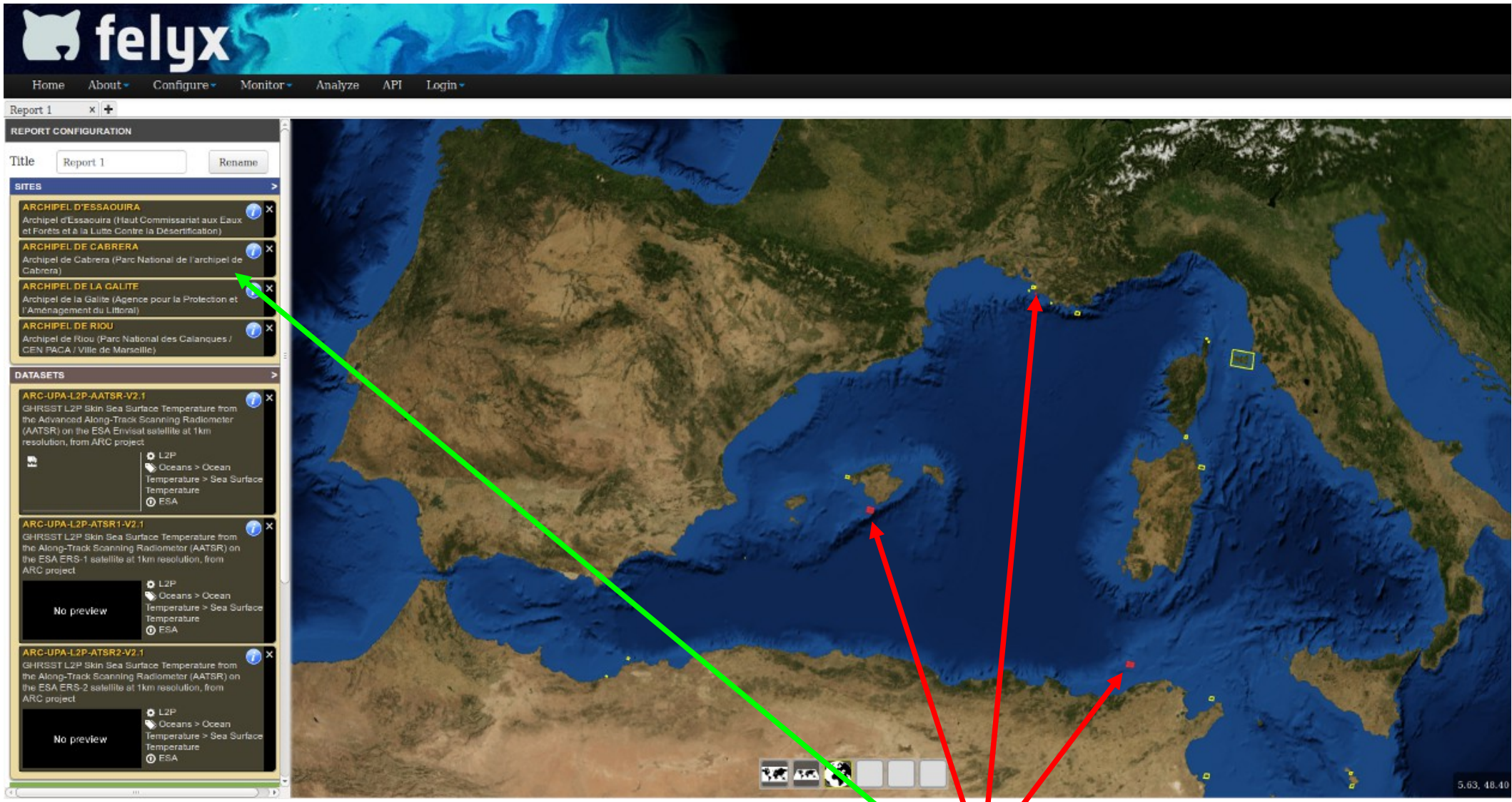
WAVES

All GlobWave L2P products
JASON-1 GDR & NRT
JASON-2 GDR & NRT
AltiKa IGDR
CryoSat-2 IGDR
Envisat GDR & NRT
Topex GDR
ERS-2 GDR
ERS-1 GDR
GFO
GeoSat

OCEAN COLOUR

NASA SeaWIFS L1A,L2
NASA MODIS L1A,L2
ESA CCI

felyx



site selection

esa

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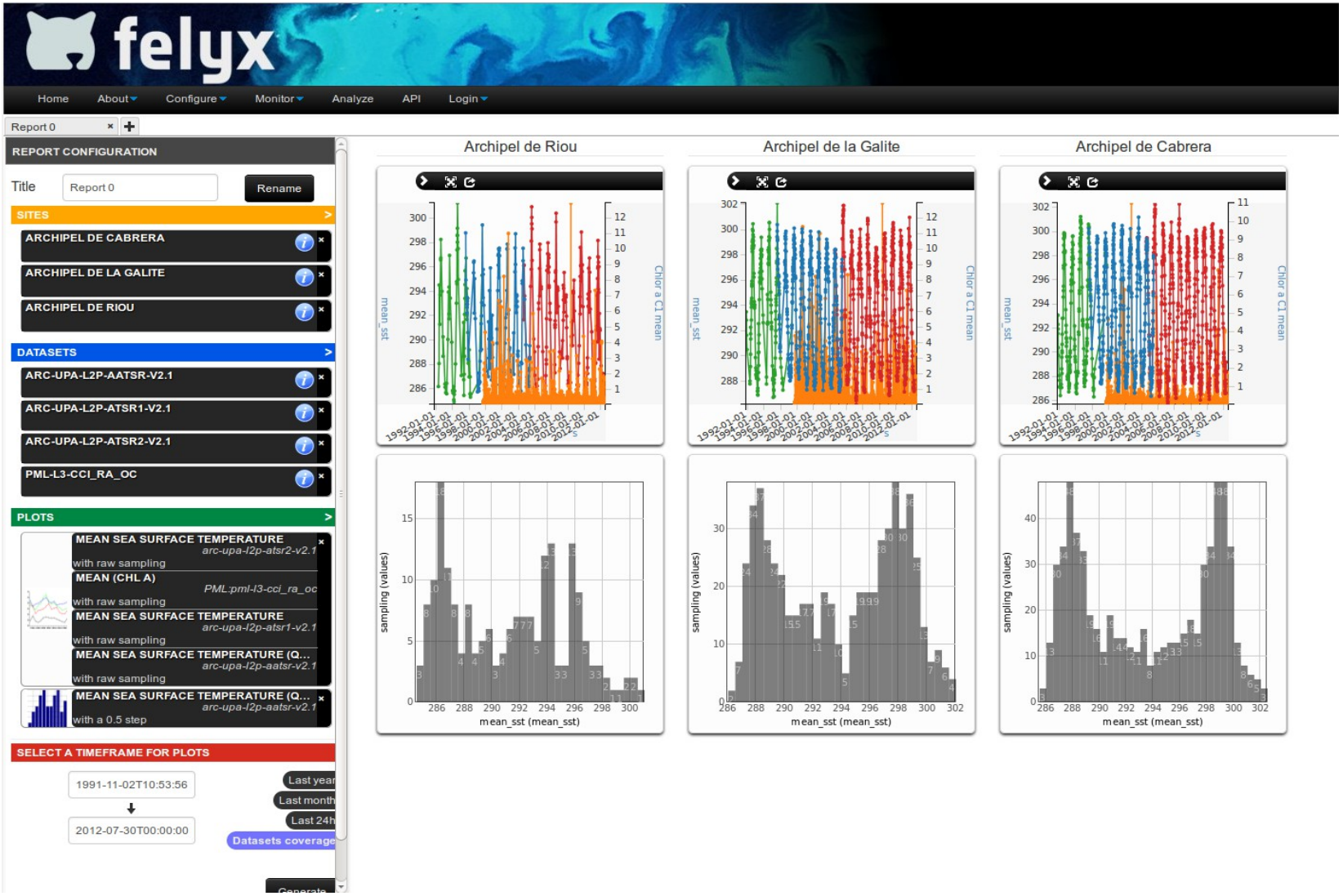
felyx



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User case 1 : SMOS Storm

Objective : better estimation of strong winds using synergy between SMOS and other datasets.

Tasks : build a catalogue of data subsets from various sources of observation, ordered by storm

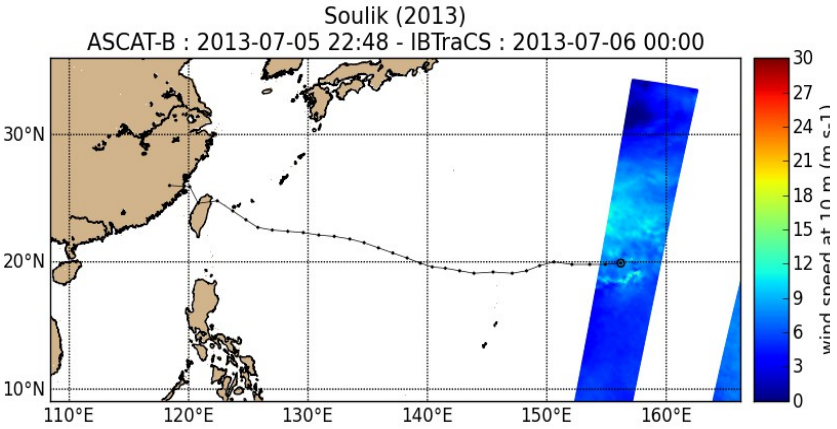
How felyx helped : perform colocation with storm tracks and extract data subset along this track at storm time (+/- 3 hour)

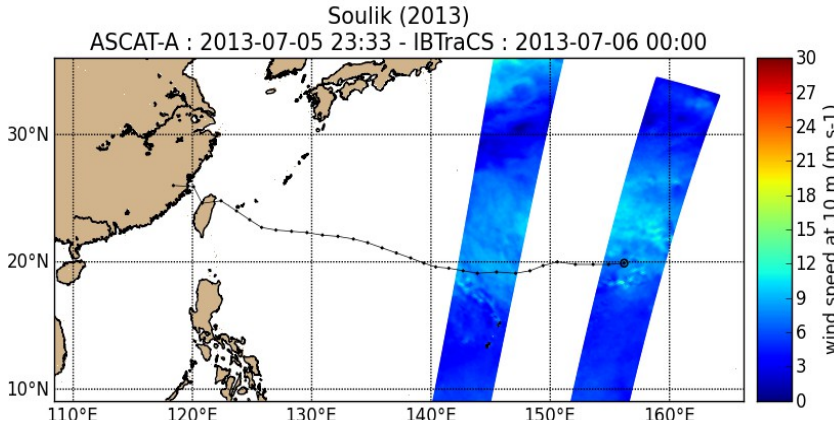
Inputs:

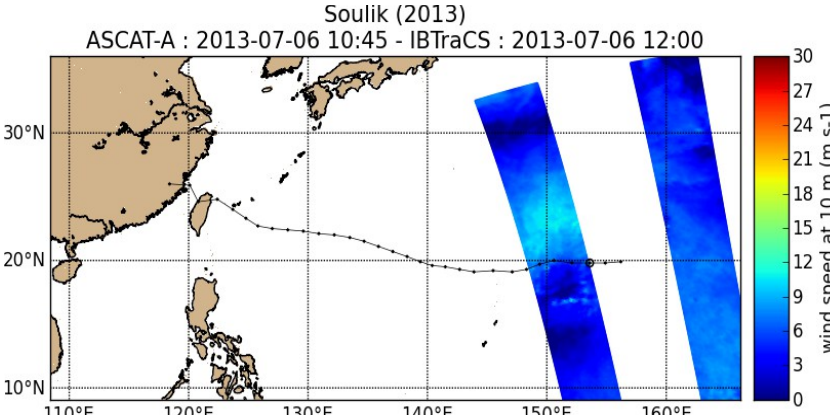
IBTRacS for hurricane trajectories

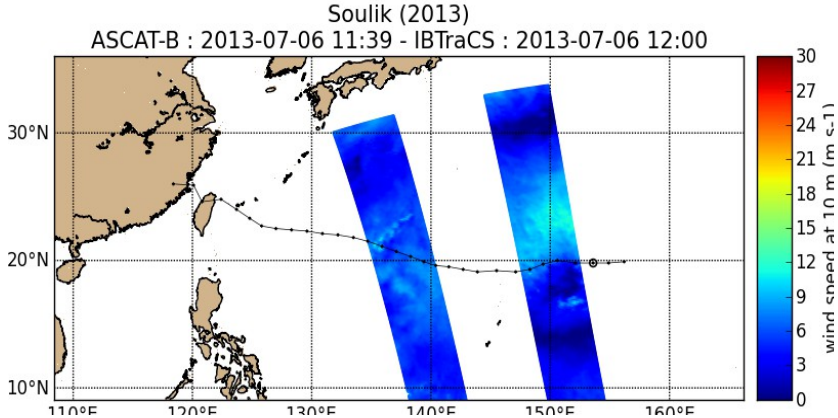
EO data : SMOS, AMSR-E, Jason-1/Jason-2/AltiKa data from GlobWave, ASCAT 12.5 km data from OSI SAF

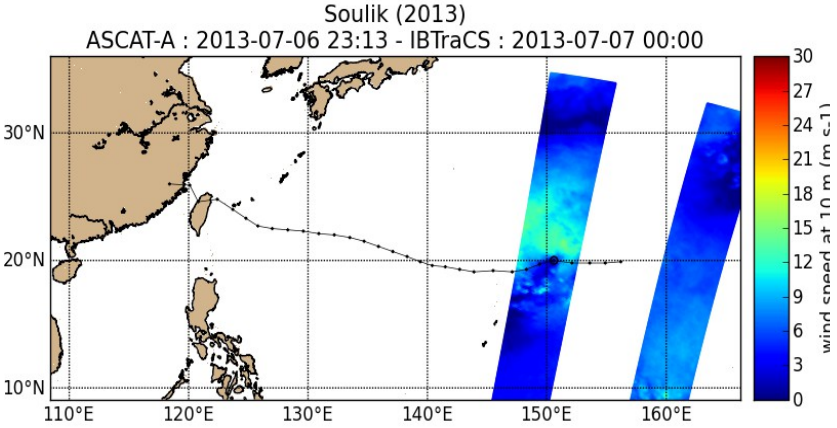
felyx

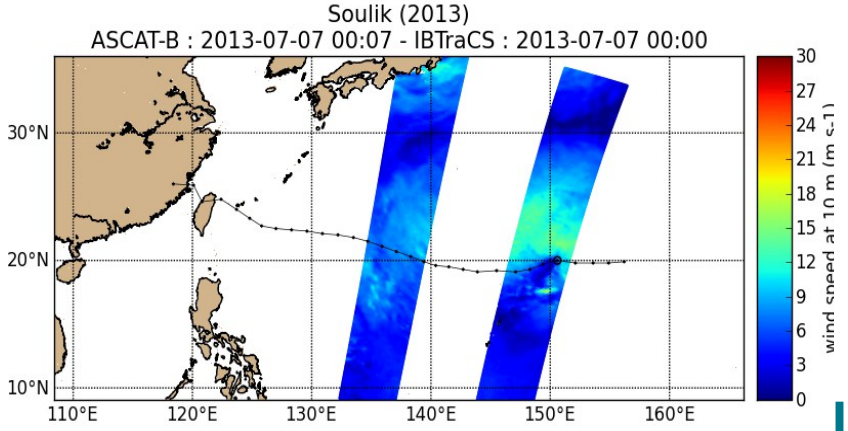












Ifremer

scientific software

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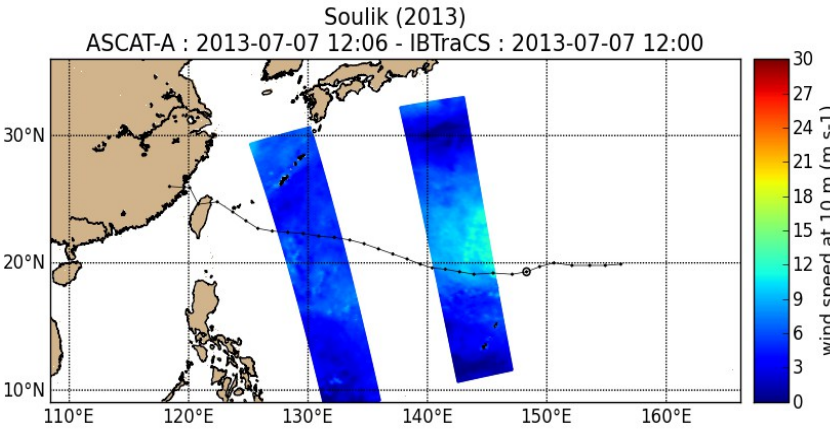
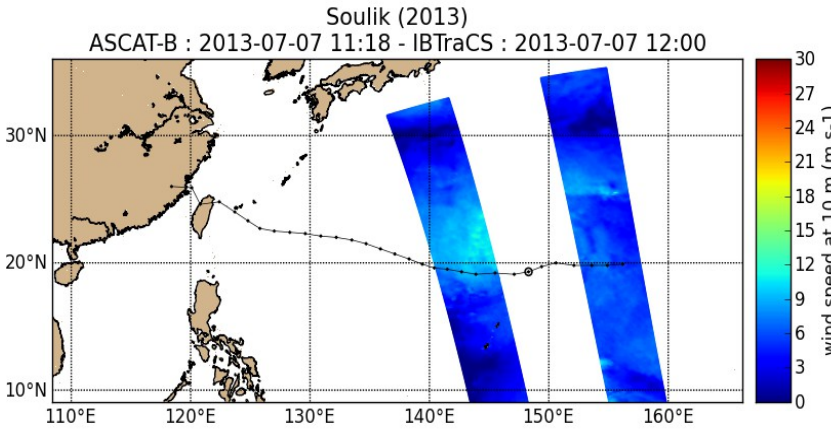
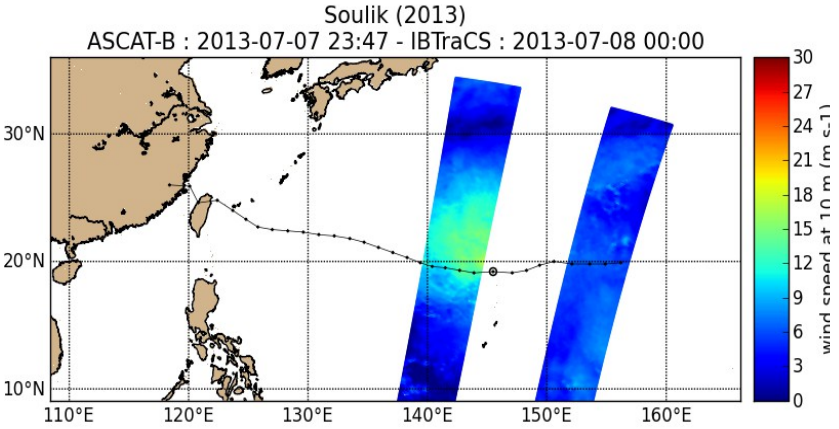
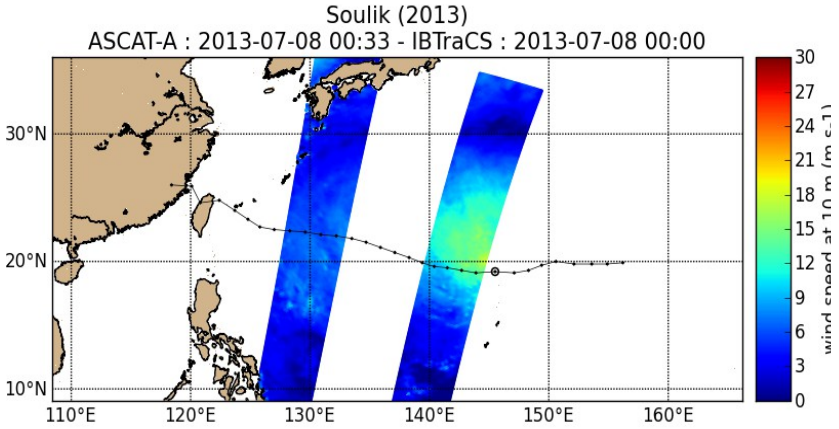
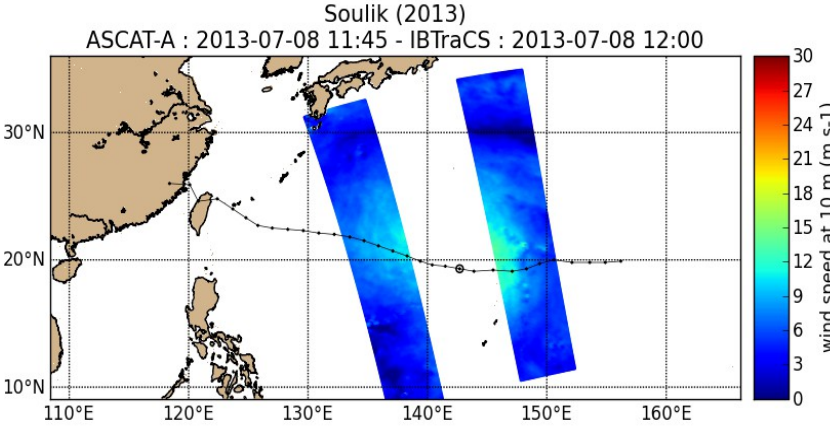
User case 1 : SMOS Storm

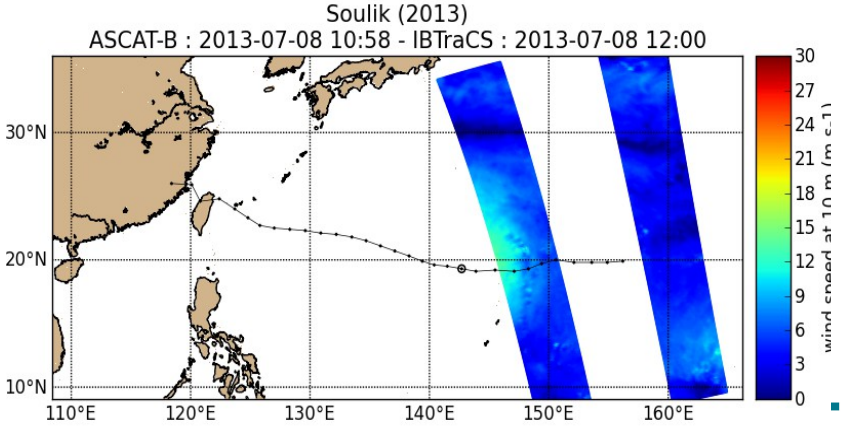












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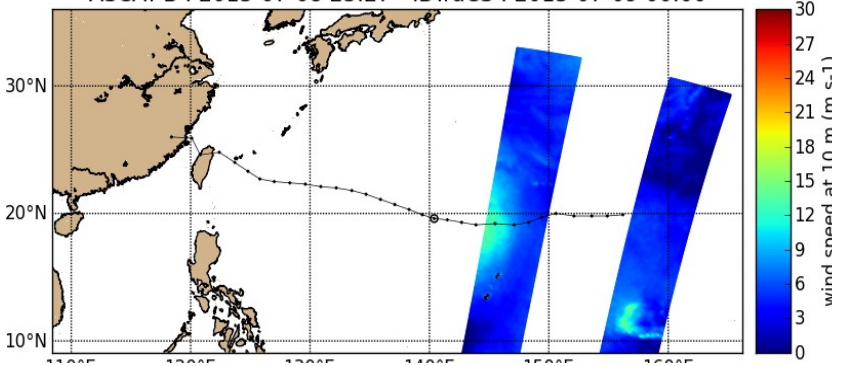
Soulik (2013)
ASCAT-B : 2013-07-08 23:27 - IBTraCS : 2013-07-09 00:00



Soulik (2013)
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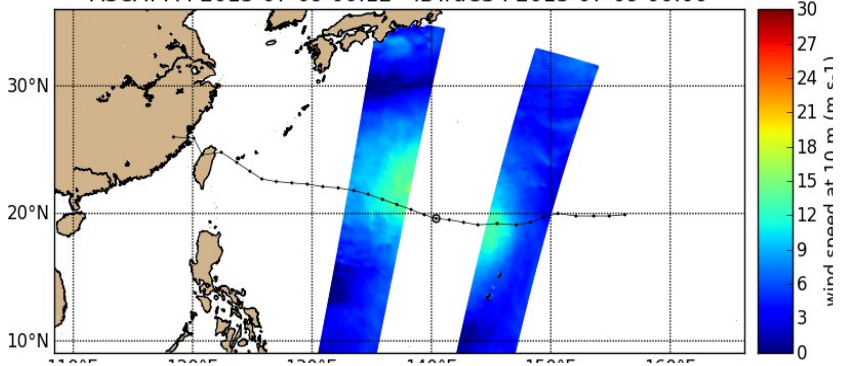
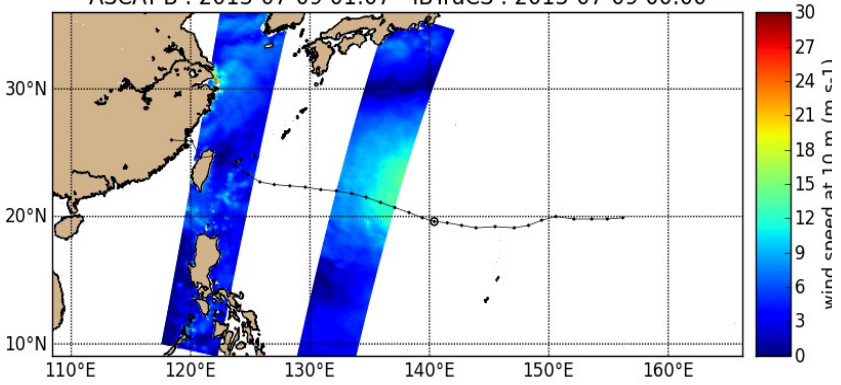
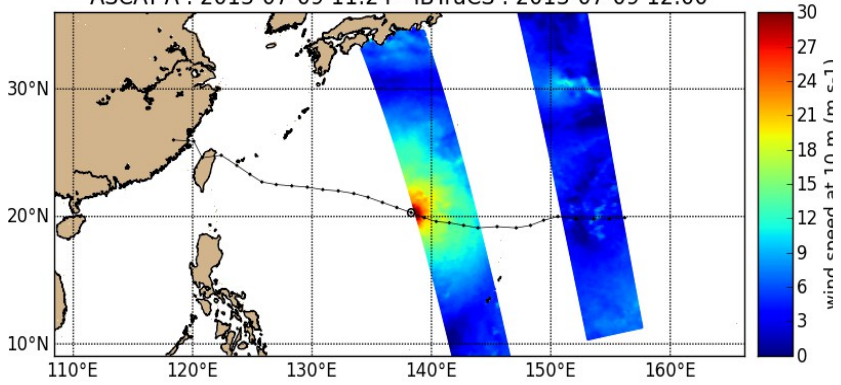


Soulik (2013)
ASCAT-B : 2013-07-09 01:07 - IBTraCS : 2013-07-09 00:00



Soulik (2013)
ASCAT-A : 2013-07-09 11:24 - IBTraCS : 2013-07-09 12:00



Soulik (2013)
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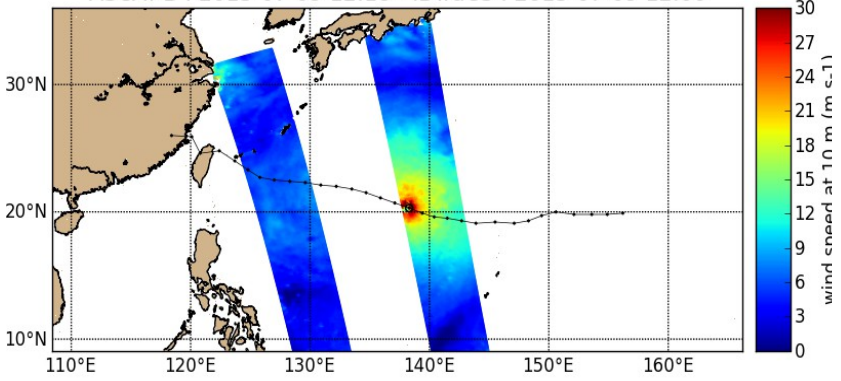

Soulik (2013)
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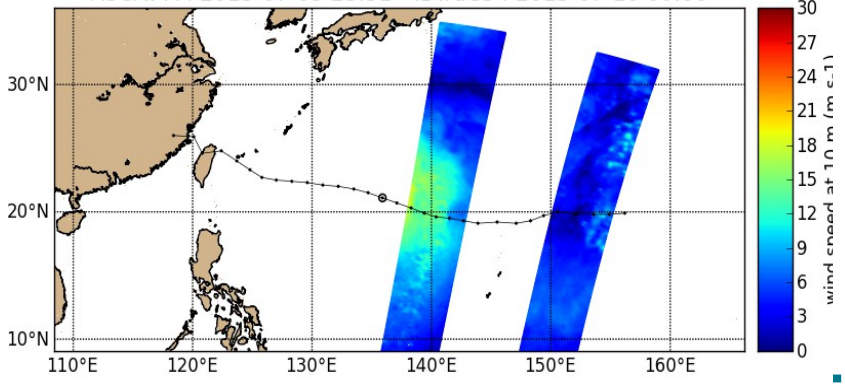
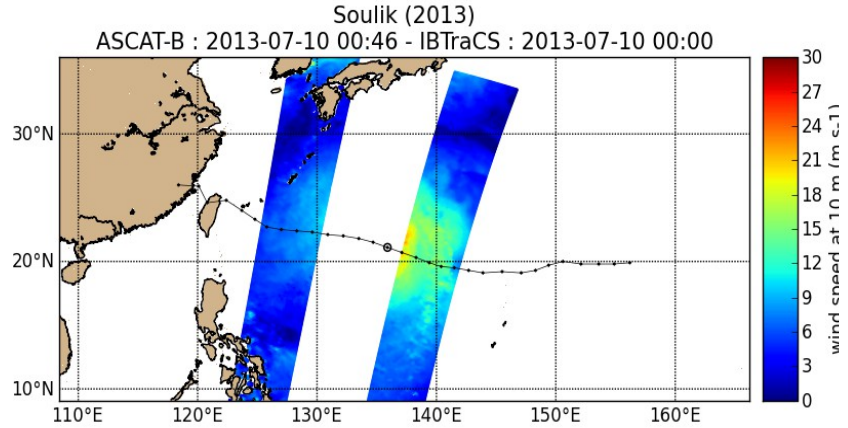
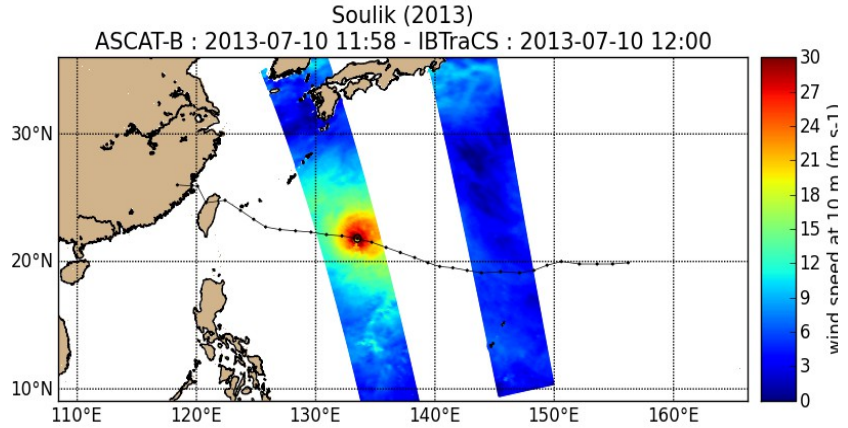



Soulik (2013)
ASCAT-B : 2013-07-10 00:46 - IBTraCS : 2013-07-10 00:00
30°N
20°N
10°N
110°E
120°E
130°E
140°E
150°E
160°E
wind speed at 10 m (m s-1)
0
3
6
9
12
15
18
21
24
27
30


Soulik (2013)
ASCAT-B : 2013-07-10 11:58 - IBTraCS : 2013-07-10 12:00
30°N
20°N
10°N
110°E
120°E
130°E
140°E
150°E
160°E
wind speed at 10 m (m s-1)
0
3
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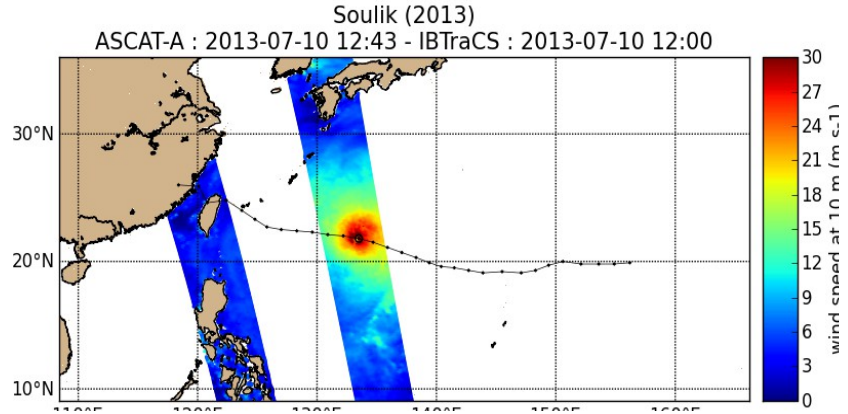
Soulik (2013)
ASCAT-A : 2013-07-10 12:43 - IBTraCS : 2013-07-10 12:00
30°N
20°N
10°N
wind speed at 10 m (m s-1)
0
3
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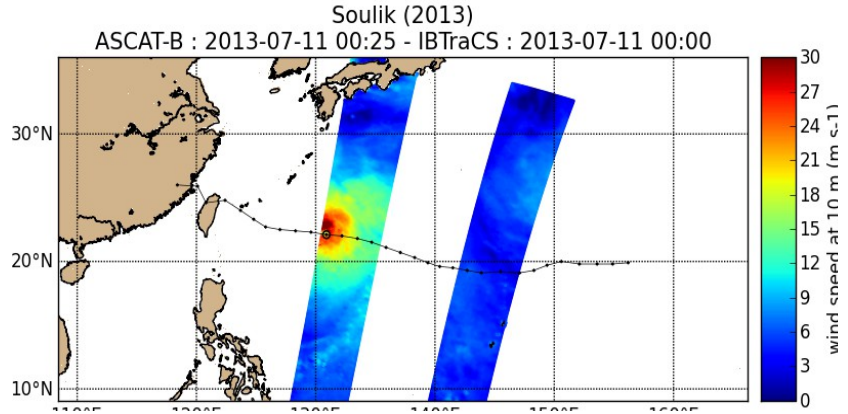
30


Soulik (2013)
ASCAT-B : 2013-07-11 00:25 - IBTraCS : 2013-07-11 00:00
30°N
20°N
10°N
wind speed at 10 m (m s-1)
0
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21
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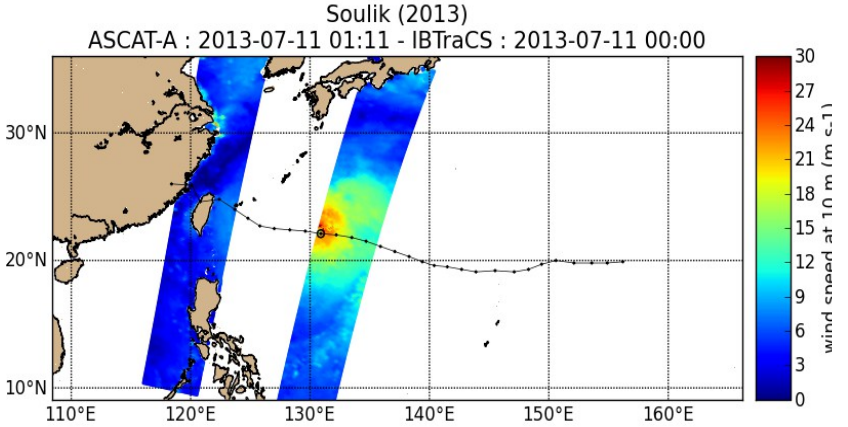
27
30


Soulik (2013)
ASCAT-A : 2013-07-11 01:11 - IBTraCS : 2013-07-11 00:00
30°N
20°N
10°N
110°E
120°E
130°E
140°E
150°E
160°E
wind speed at 10 m (m s-1)
0
3
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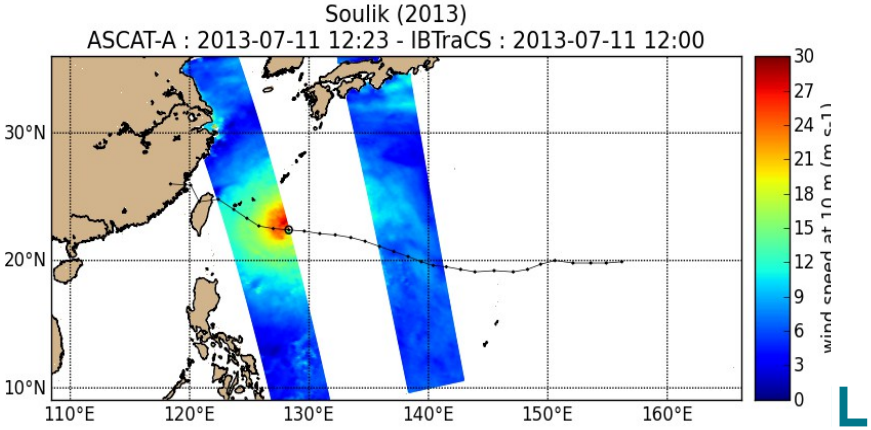
27
30


Soulik (2013)
ASCAT-A : 2013-07-11 12:23 - IBTraCS : 2013-07-11 12:00
30°N
20°N
10°N
110°E
120°E
130°E
140°E
150°E
160°E
wind speed at 10 m (m s-1)
0
3
6
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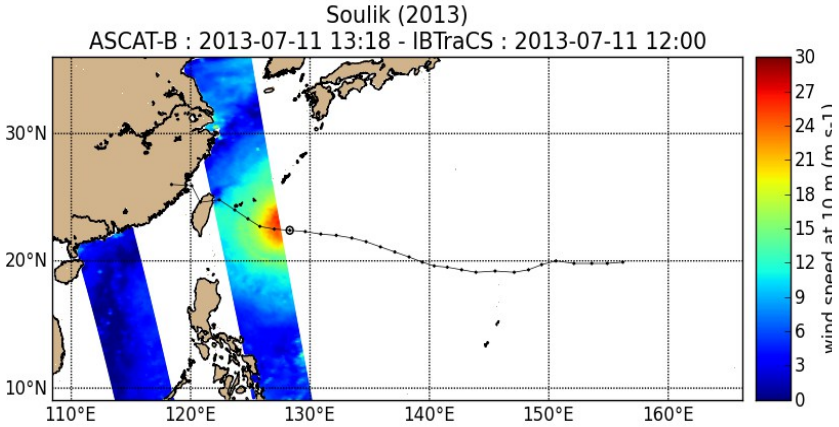
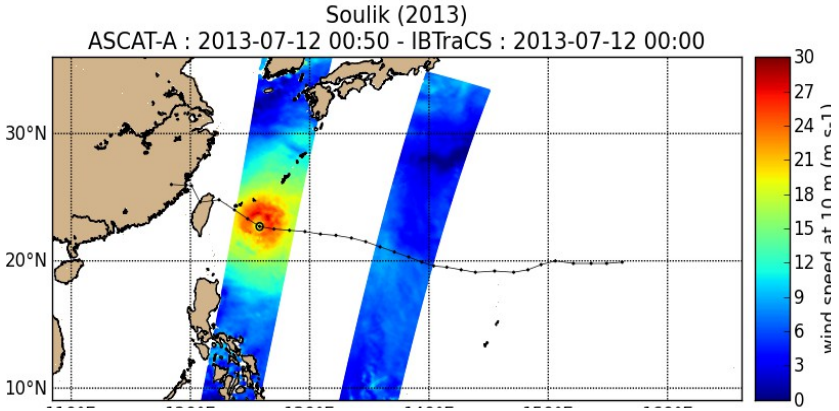
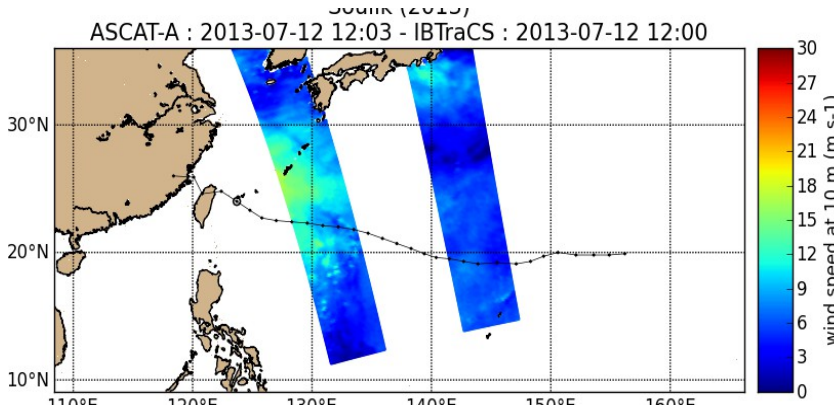
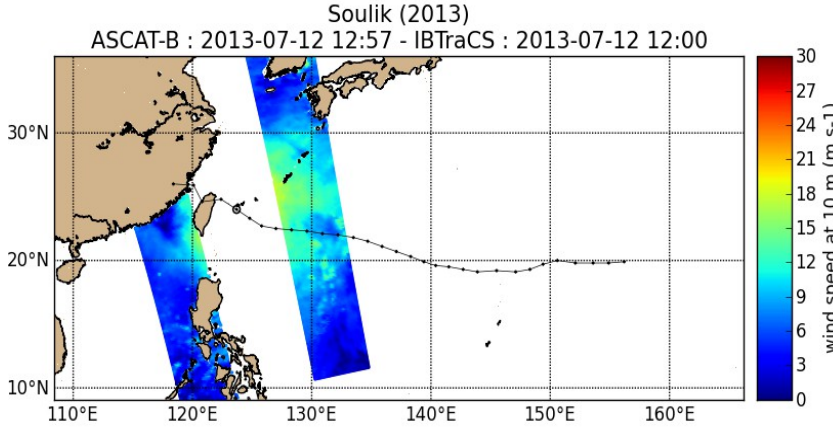
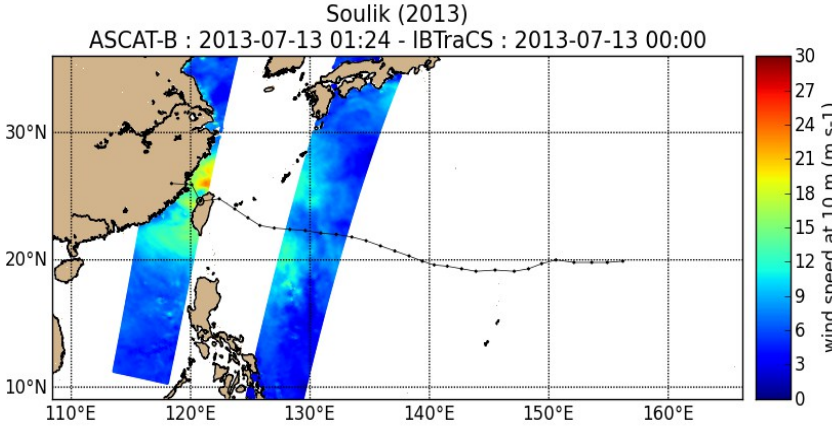
User case 1 : SMOS Storm











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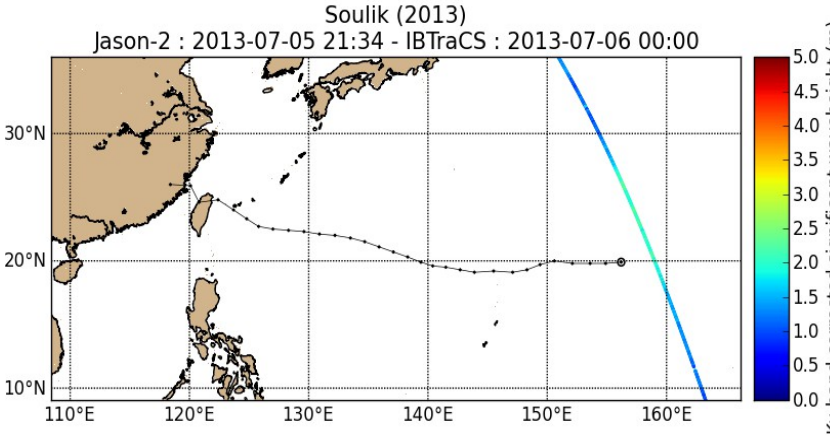
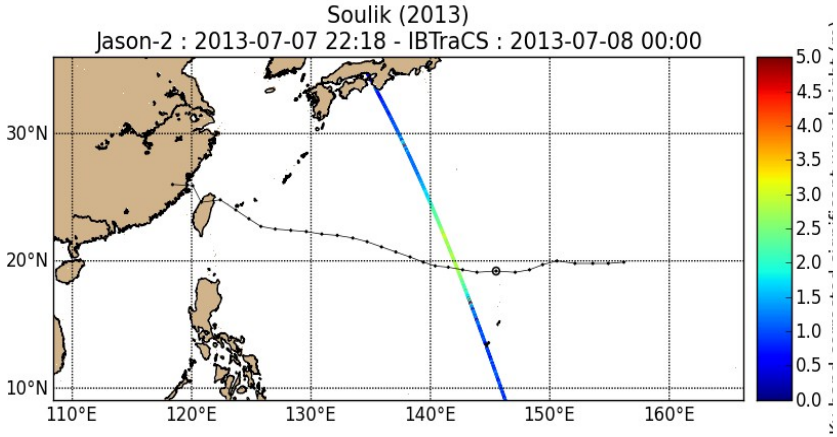
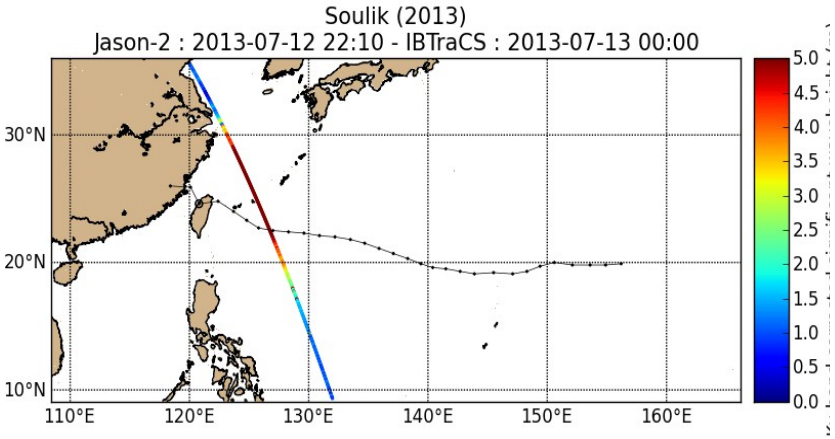
User case 1 : SMOS Storm







Colocation criteria to be adjusted to avoid too many irrelevant matches

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User case 2 : GHRSST MDB

Objective : assessment and monitoring of GHRSST datasets

Tasks : build a match-up database of SST datasets vs in situ data

How felyx helped : perform colocation with Argo, ship and surface drifters data (6km, 1h)

Inputs:

ISAR data provided by NOC
iQuam v2.0 data

EO data : OSTIA, AMSR-2 from Jaxa and REMSS, VIIRS & METOP data

Open issues for GHRSST

- Source of in situ data to be used for MDB generation ?
    - IQUAM ? Need to stable datastream format and quality
- Common MDB rules (some elements in older GDS version)
    - 25 km box extracted (AATSR team : 100 km?) for MW or IR products, L3/L4
    - Time colocation criteria : 1h ?
    - Distance of colocation : pixel size? More ?
    - History of in situ for each matchup : what time window?
- TBD by ST-VAL

1st release in July 2015

Project site : http://www.felyx.org

Online documentation : http://felyx.readthedocs.org