

**smos**  
**pi-mep**

## Quick-start Guide for the Plot Interface, MDB interface, Merginator and Syntool

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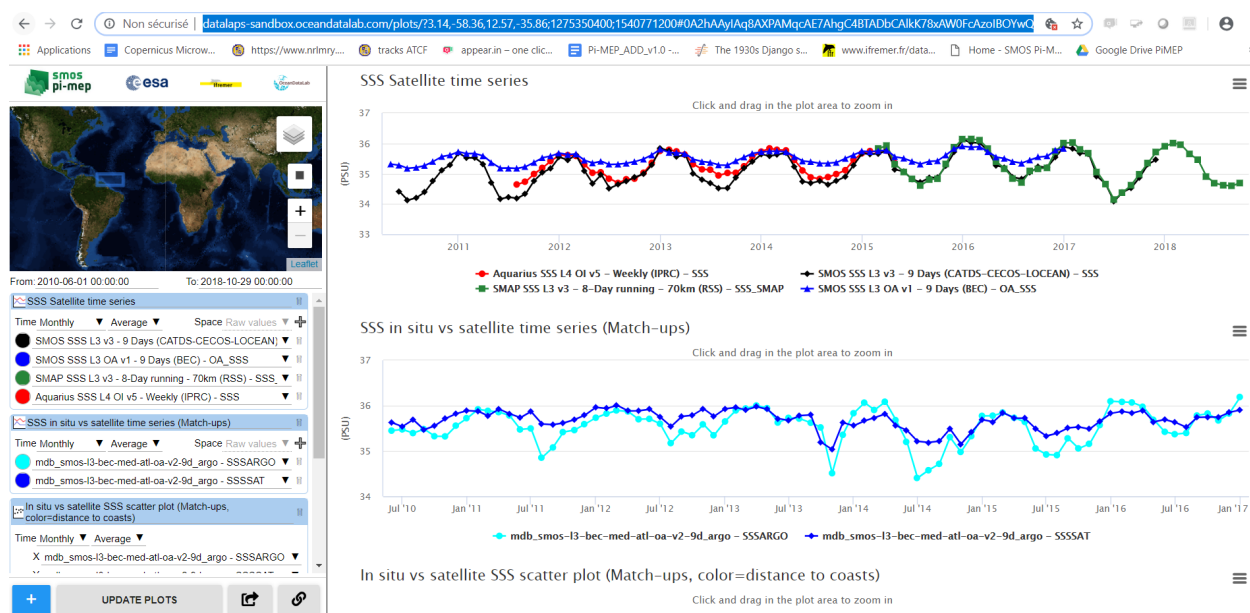
# 1 Introduction

This document is a quick start guide for the “plot interface” (§2), “MDB interface” (§3), “Merginator” (§4) and Syntool (§5) of the Pi-MEP platform.

## 2 Plot Interface

The plot interface allows extraction and plots of satellite and in situ SSS time-series at virtual buoys location, or some time series of statistics (averages, standard deviation, ...) of SSS data or scatterplots of these data over some user-selected spatial and temporal domains. This tool relies on “Datalaps” which is the “time series real-time extractor”: it allows fast access to data available given multi-criteria requests (over regional areas usually), to generate time series plots or statistical maps, even when using dozen years of data. It relies on Big Data technology for the efficient storage and manipulation of georeferenced time series.

### 1.2 General Layout of the interface

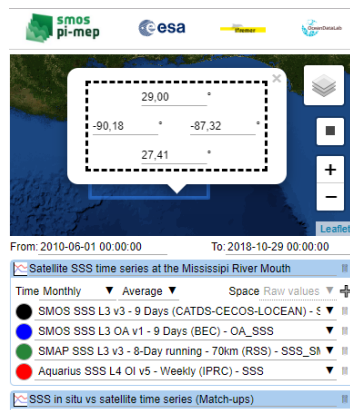


The image above describes the layout of the interface. The left side contains the controls for selecting an area and a time range, selecting the satellite/in situ products to be analysed, for adding a new plot and for the configuration of each type of plot: (multi-) time series, scatter plots, and map charts (Hovmöller diagrams, and histograms shall be added in the next updated version of the platform).

The right side contains the resulting plots. All plots can be exported as PNG images to be easily embedded in documents. Time series, scatter plots and maps provide some additional interactivity to focus on a subdomain (zoom/pan) or a specific data point (value under cursor). A menu also offers the possibility to download the data as CSV files for these three plots.

## 1.3 Spatial domain Selection

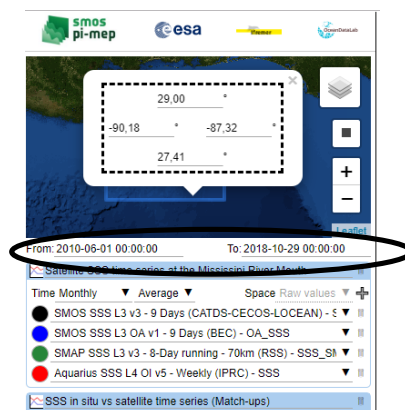
Using the map on the top left menu and the “draw a rectangle” selection tool (middle left black rectangle panel of the map) and the zoom functions, the user-chosen domain of analysis can be selected.



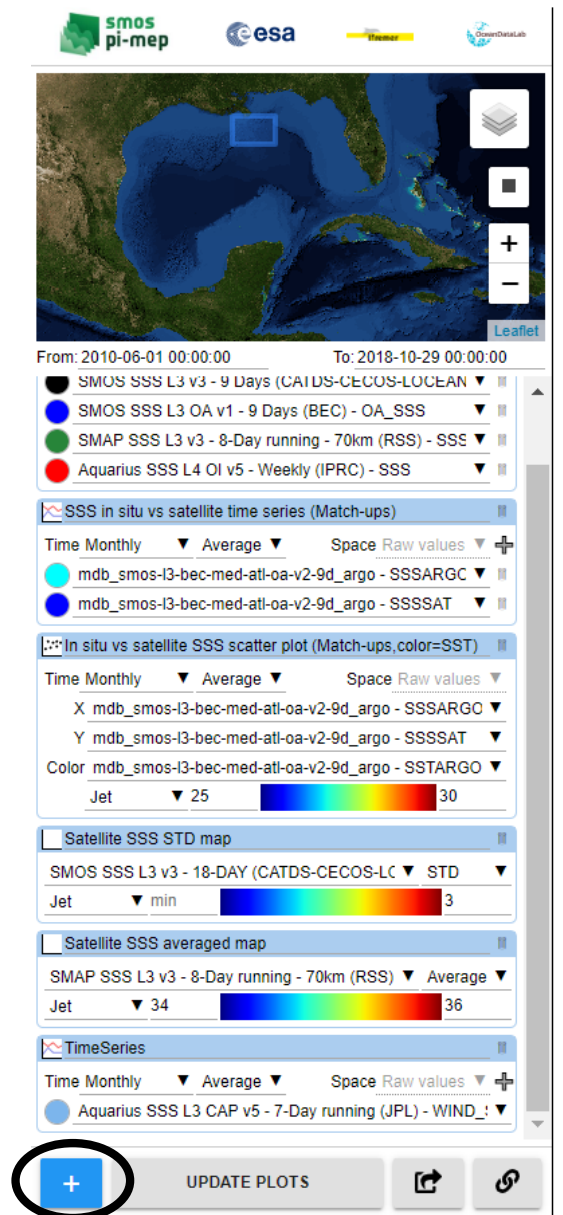
By clicking on the blue rectangle (chosen domain) on the map, the latitude/longitude boundaries of the rectangular domain of analysis can be precisely entered and selected.

## 1.4 Period Selection

The period of analysis can be defined by the user using the selection tool located just below the map on the left menu. Starting and ending date can be defined using: “From” to “To”.



## 1.5 Selection of the type of plots



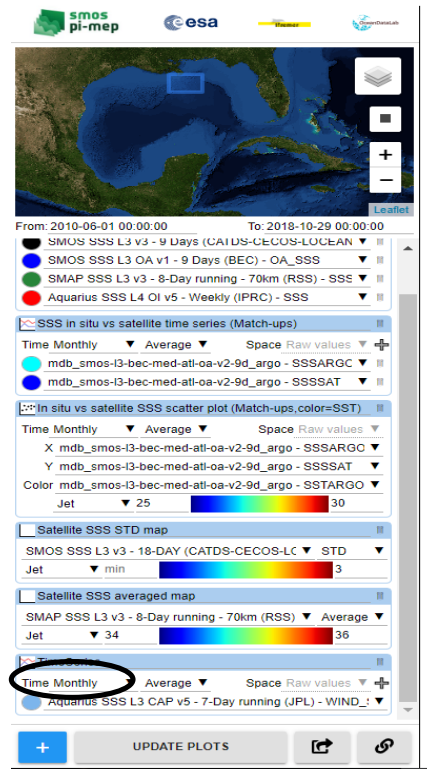
Using the blue “+” button on the left menu (at the bottom left), the user can choose the type of plot to be visualize on the right panels beyond:

- Time Series Plot
- Scatter Plot
- Map Plot

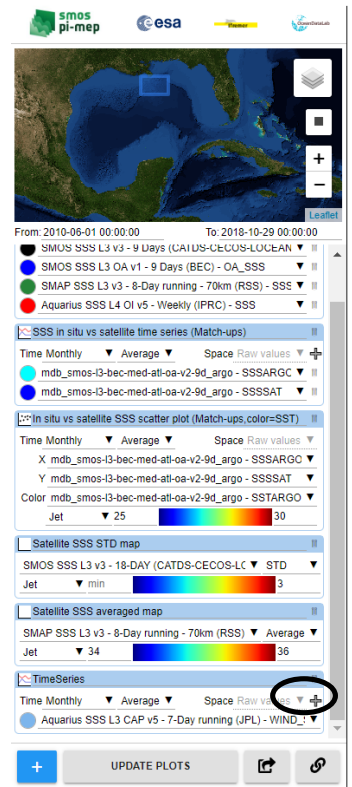
Each “cyan colour” menu bar on the left indicates a new type of plot which will appear on the right panels with the appearing order on the right as defined by the order of the successive “cyan-bar” plots in the left panels. The plots will appear updated on the right panels only after clicking on the “update plots” button if a selection parameter has been changed by the the user. Each plot can be removed by using the “II” Remove plot button on the right part of each cyan color bar.

## 1.5 Time series plots

- If on the previous step, the user selects a “TimeSeries” Plot, then a new cyan-bar menu entitled “TimeSeries” will appear on the left menu. The name of the time series can be given by the user by clicking and changing the title directly in the “cyan-bar”.



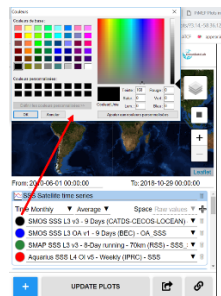
- Using the “**Time Monthly**” button located below the cyan-bar menu, the user can choose the *Time aggregation method* with either:
  - *Raw values*
  - *Yearly a*
  - *Monthly*
  - *Daily*
- Using the “**Average**” button, the user can choose the *spatio-temporal* statistics which will be used for generating the time series using either:
  - *Average*
  - *Sum*
  - *Min*
  - *Max*
  - *STD (standard deviation)*
  - *count*



- **Selecting the products and variables to be visualized.**

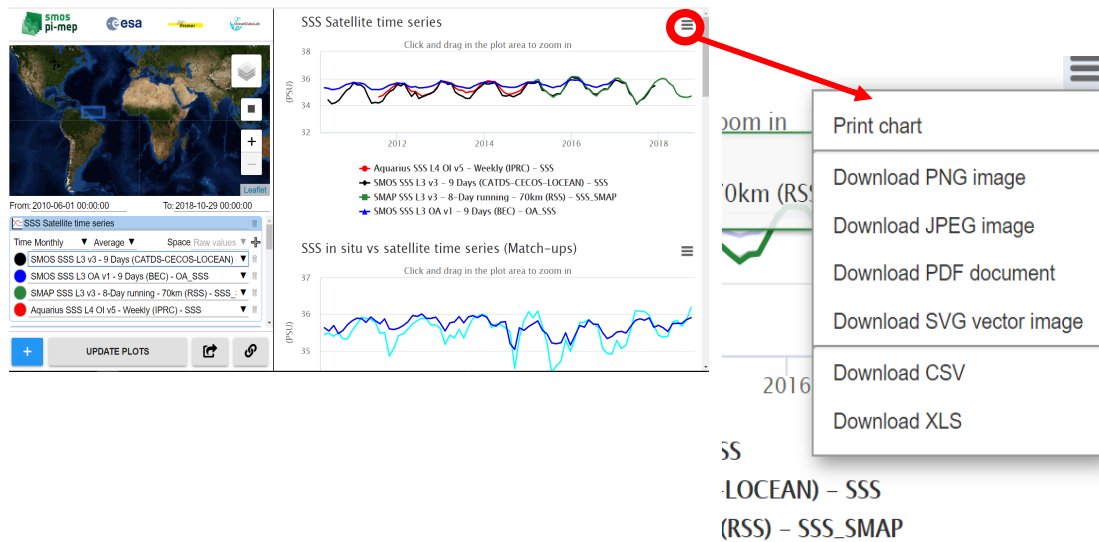
The “+” small button below each cyan-bar on the right can be used to add some products to be visualized in the time series. When clicking on this button a new variable will appear under the “cyan bar”. The user can then make his/her own choice by selecting the product in the list/menu proposed. The list first shows all the Pi-MEP satellite SSS products and associated variables, and then follows in the list the variables included into the platform-generated match-up satellite/in situ files. The naming convention is defined as follows:

*mdb\_name of satellite SSS product\_name of in situ data-name of variable.*



The user can select the color of the curve (on the right) for each selected product/variable by clicking on the colored circle located on the left of each product.

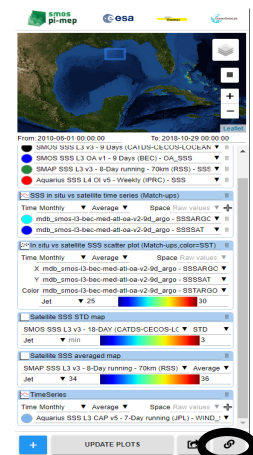
- **Exporting the data**



The time series and plots generated by the user and visible on the right plot panels can be exported by the users in image format (PNG, JPEG, PDF SVG) or in numerical tables format (csv and xls) using the top right button of each plot.

- **Creating and sharing Links of some user pre-configured plot interface page:**

The state of the left side of the interface (i.e. the area, time range and plots options) are stored in the web page URL, it is therefore possible to create links to a pre-configured plots interface. The links of a user-preconfigured page can be copied using the link symbol on the bottom right of the left-menu. These links can then be used in other web applications which define (or let the user define) similar parameters to provide a seamless transition between the applications.

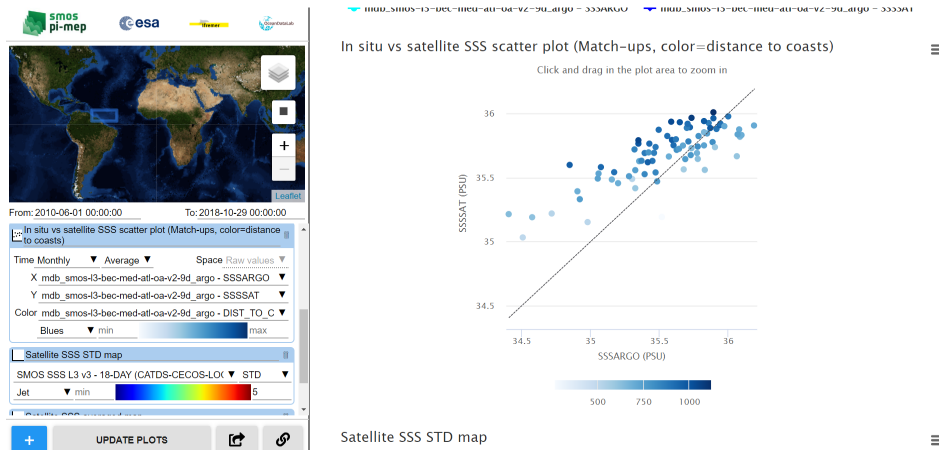


## 1.6 Scatterplots

Using the blue “+” button on the left menu (at the bottom left), the user can choose the type of plot to be visualized on the right panels beyond:

- Time Series Plot
- Scatter Plot
- Map Plot

If the user selected the “scatter plot” option:



The user can

- define the title of the plot (similarly to the time series)
- select the X-axis data (in the example above we show the SSS from ARGO at co-localized SMOS-M3-BEC.v2-9d/ARGO pairs from the match-up database)
- select the Y-axis data (in the example above the SSS from SMOS at co-localized SMOS-M3-BEC.v2-9d/ARGO pairs is selected)
- select the color which will show a third variable characterizing the satellite/in situ SSS pairs overlay in the scatter plot (in the example above a “blues” colorbar is used to represent the distance to coast at co-localized pairs), the colorscale and range can be selected.

From: 2010-06-01 00:00:00 To: 2018-10-29 00:00:00

In situ vs satellite SSS scatter plot (Match-ups, color=distance to coasts)

Time Monthly ▼ Average ▼ Space Raw values ▼

X mdb\_smos-l3-bec-med-atl-oa-v2-9d\_argo - SSSARGO ▼

Y mdb\_smos-l3-bec-med-atl-oa-v2-9d\_argo - SSSSAT ▼

Color mdb\_smos-l3-bec-med-atl-oa-v2-9d\_argo - DIST\_TO\_C ▼

Blues ▼ min max

All the other functionalities (export, links, etc..) are similar to the functionalities described for the time-series plots.

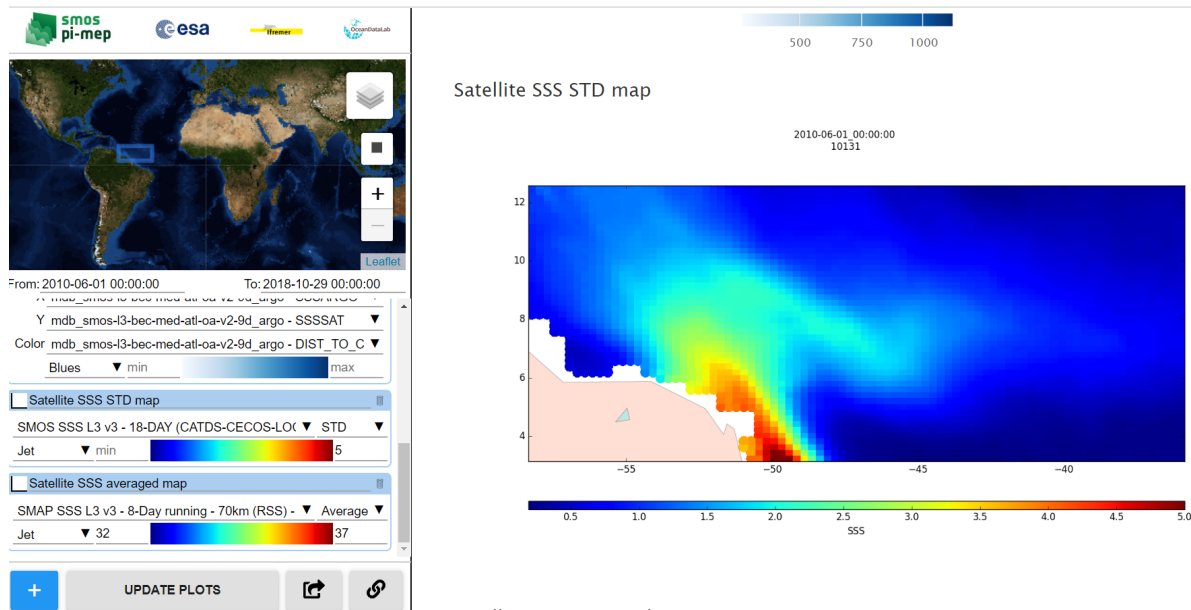
## 1.7 Mapping

Using the blue “+” button on the left menu (at the bottom left), the user can chose the type of plot to be visualized on the right panels beyond:

- Time Series Plot
- Scatter Plot
- Map Plot

If the user selects “Map Plot” then





The user can

- define the title of the plot (similarly to the time series). In the example above the title is “Satellite SSS STD map”
- select the the product to be mapped on the selected region (in the example above we show the SSS from CATDS-LOCEAN SMOS SSS Level 3 v3 products)
- select the statistics to evaluated for the mapping (in the example above the statistics selected is “STD”)

All the other functionalities (export, links, etc..) are similar to the functionalities described for the time-series plots.

### 3 MDB Interface

Searching match-ups and extracting the associated data can be performed using the MDB query interface, a web page which contains a form to define the search filters, provides means to visualize the results as plots or numerical tables and lets the user download them as CSV files.



*Sketch of the MDB query interface menu (on the left of the pages)*

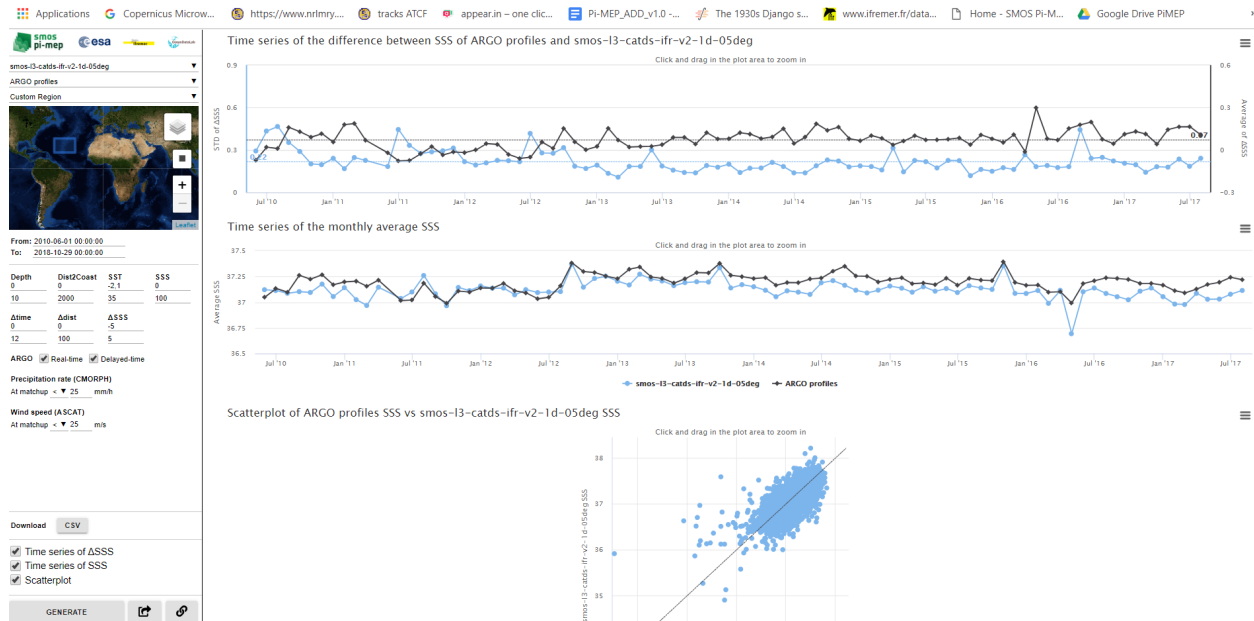
### 3.1 Match-up Data selection

Before performing a search or an extraction, the interface requires the user to select an in-situ/satellite couple, an area (from the list of pre-sets Pi-MEP region) and a time range. A user defined spatial domain can also be selected using the rectangle and zoom functions on the map

More advanced filters are also available but are locked until the in-situ/satellite couple has been selected since some options are specific to a satellite or an in-situ sensor:

- Depth of in-situ measurements (between 0 and 10 m)
- Distance to coast (from 0 to 2000 km)
- SST range of the extraction from in situ (from -2.1 to 35°C)
- SSS range of the extraction from in situ
- Temporal lag in the collocation process between in-situ date and SSS satellite data (between 0 and 12 h)
- Spatial lag in the collocation process between in-situ date and SSS satellite data (between 0 and 100 kms).
- Real time or Delay mode or both (ARGO)
- CMORPH rain rate at time and location of the in-situ measurement: filter if it is superior or inferior to a specified threshold (0 to 25 mm/h)
- ASCAT wind speed at time and location of the in-situ measurement: filter if it is superior/inferior to a specified threshold (0 to 30 m/s)
- CMORPH rain rate values during the (1 to 7) days before time of the in-situ measurement (same location): filter if sum or mean or max or std of rain rate is superior or inferior to a specified threshold (0 to 25 mm/h)
- ASCAT wind speed values during the (1 to 7) days before time of the in-situ measurement (same location): filter if mean or max or std of wind speed is superior or inferior to a specified threshold (0 to 30 m/s)
- Difference between in-situ and satellite SSS values range (-5 to 5).

### 3.2 Plot functionalities



The plots displayed in the interface include:

- time series of the monthly average (in black) and standard deviation (in blue) of the difference in-situ/satellite  $\Delta$ SSS over the selected domain
- a plot of the in situ and satellite SSS values at match-up pairs monthly average over the selected user domain
- a scatterplot of in-situ vs satellite SSS

As with the plots interface, the state of the configuration panel (left side of the sketch) is stored in the URL to allow the creation of links that lead to a pre-configured MDB query interface.

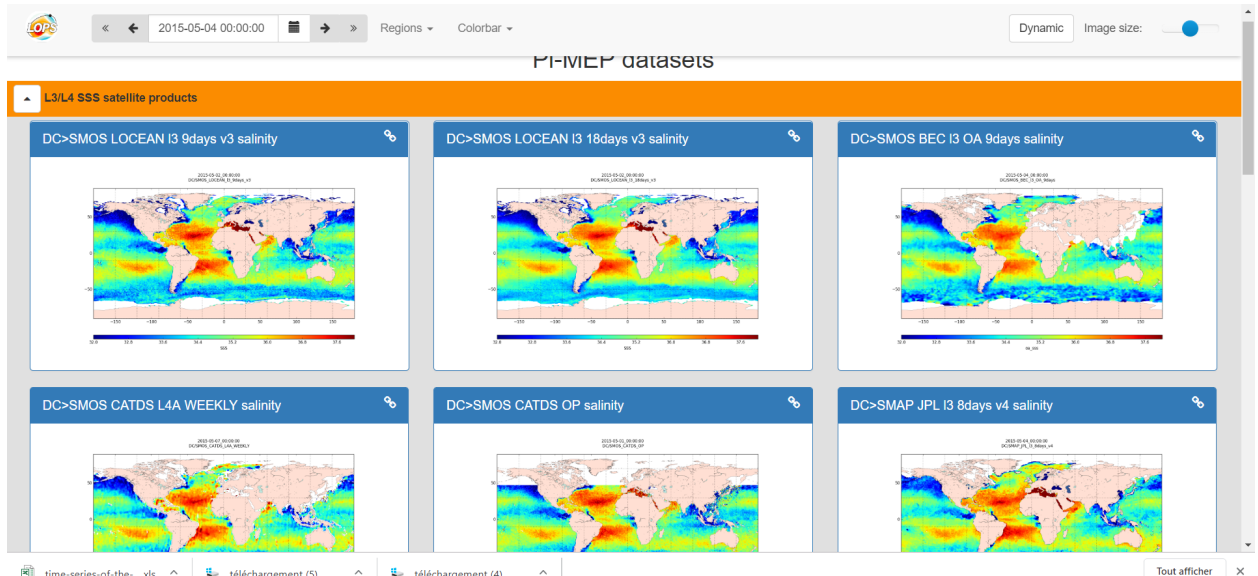
### 3.3 Export

Numerical tables (csv, xls) show statistics about the extracted match-ups: number of collocations, mean bias, variance and root-mean-square deviation and the time series themselves. The time series and plots generated by the user and visible on the right plot panels can be exported by the users in image format (PNG, JPEG, PDF SVG) or in numerical tables format (csv and xls) using the top right button of each plot.

The filtered MDB data can also be directly extracted in csv format using the “download csv” menu on the left.

## 4 Merginator

This tool is useful to explore spatial patterns of numerous datasets at a glance. For the moment the products shown in the interface are pre-selected. A menu will be soon added to be able visualizing other datasets.



The data maps shown by the interface are :

1) The **L3/L4 SSS from satellite products** with temporal averaging period which include the date chosen by the user

- SMOS CATDS/LOCEAN Level 3 - 9 days
- SMOS CATDS/LOCEAN Level 3 - 18 days
- SMOS BEC Level 3 OA - 9 days
- SMOS CATDS/IFREMER L4a weekly
- SMOS CATDS/ OP
- SMAP JPL Level 3 - 8 days V4
- Aquarius JPL Level 3 - 7days V5

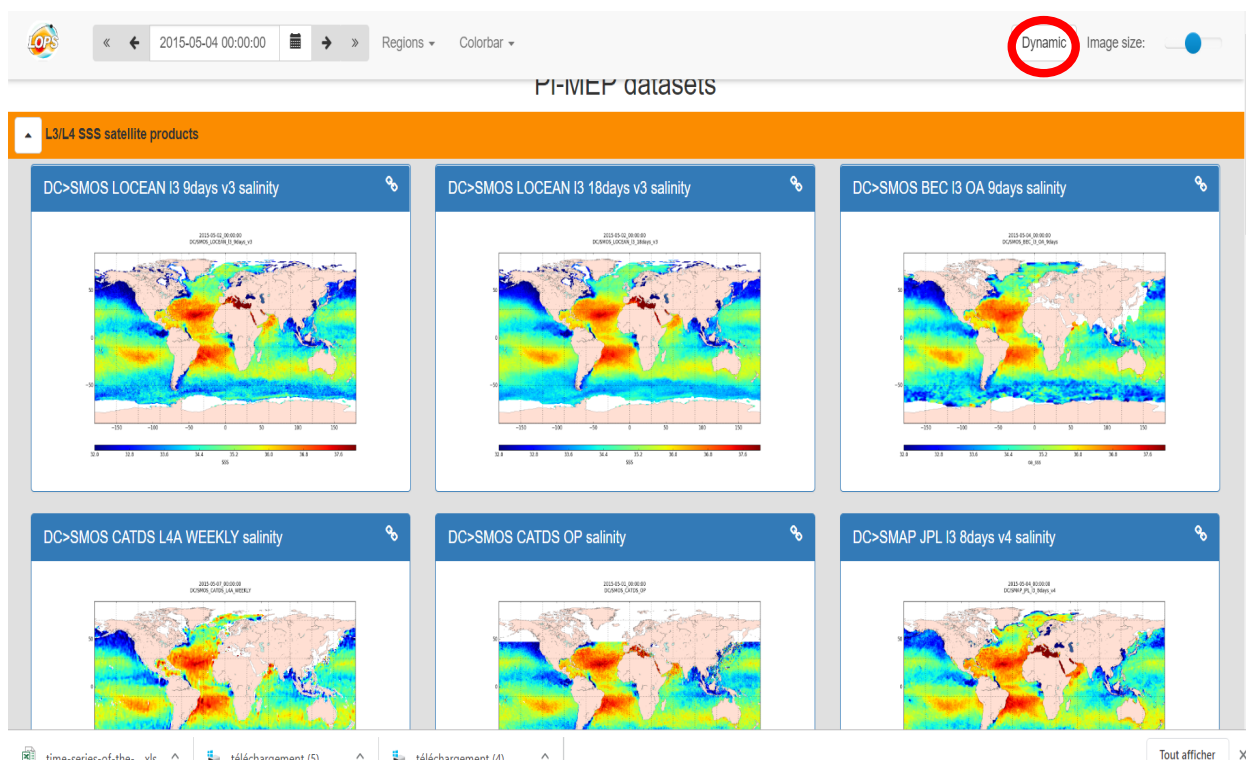
2) The **In situ Objectively analyzed SSS ISAS** and the **HYCOM model SSS**

3) The **SSS, wind speed** (ascats), **sst** (ECMWF) and **accumulated rain** (CMORPH)

#### 4.1 Selection of the date, region and colorbar

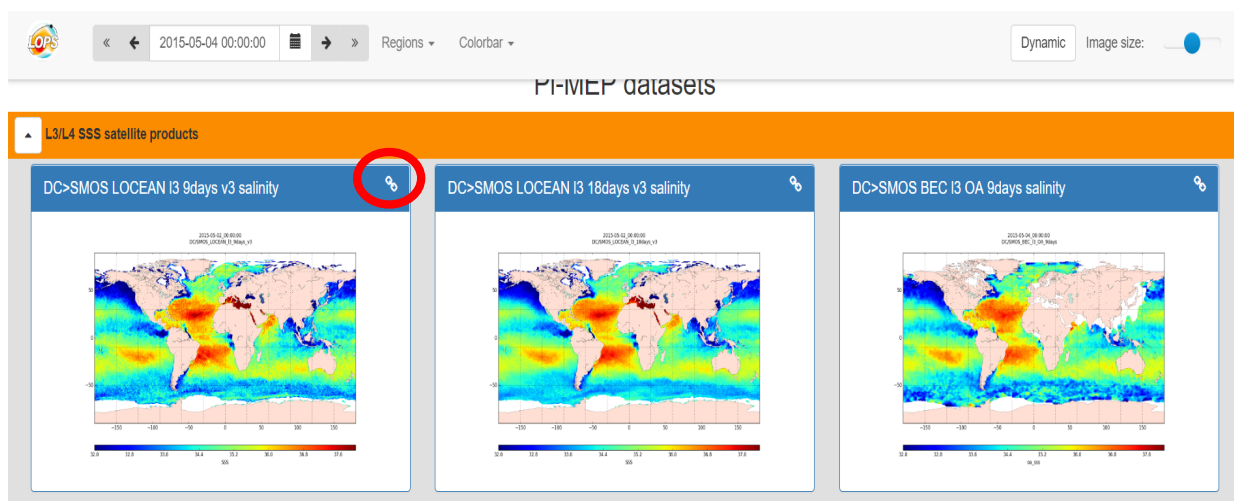
In the top left menu, the user can select the central date which is used to visualize all the products within some pre-selected region as well as the colorbar ranges to be used for the different variables shown on the maps.

## 4.2 Dynamical Mapping

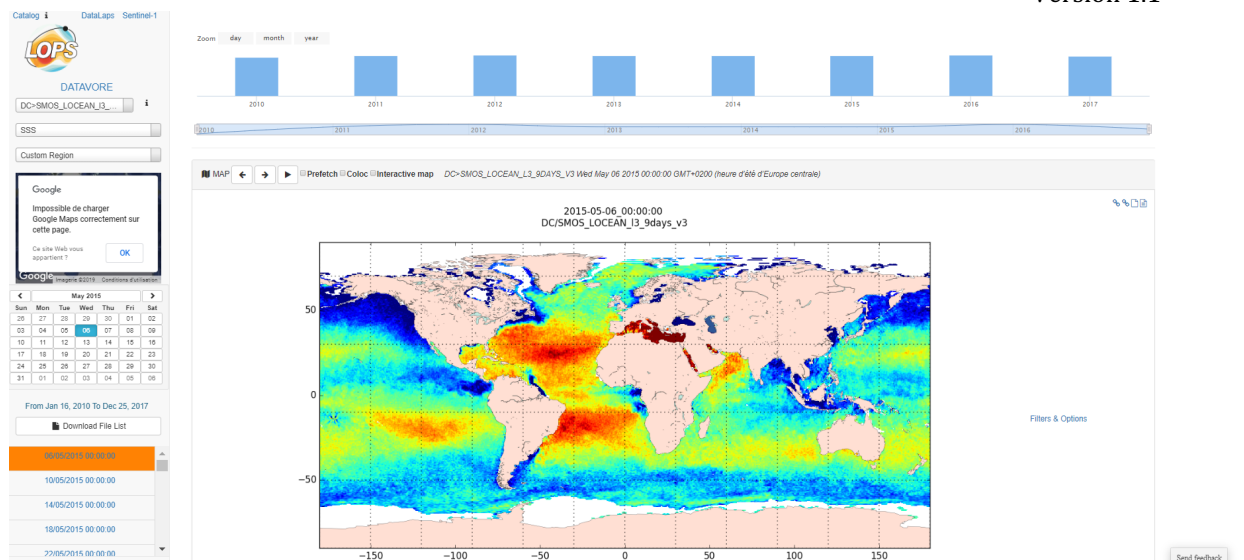


By clicking on the “Dynamic” button on the top right menu, the user can also chose to zoom dynamically on all fields simultaneously

## 4.2 Animation Mapping, File listing and exports



By clicking on the link symbol on the top right of each plot the user will see a new page opening:



The user can select the time sampling/averaging of the maps on of the top right panel menu (day, month, year). The histogram then shows the number of products per sampled period. An animation can be generated directly by the user, to see the maps temporal evolution.

By using the filters & options, the user can select the colorbar and range as well as the projections of the maps.

By clicking on the “link” found on the map, the user opens a new window with the image which can be saved.

The file list of the products found over the selected time period and domain can be accessed on the left menu using the “Download file list”

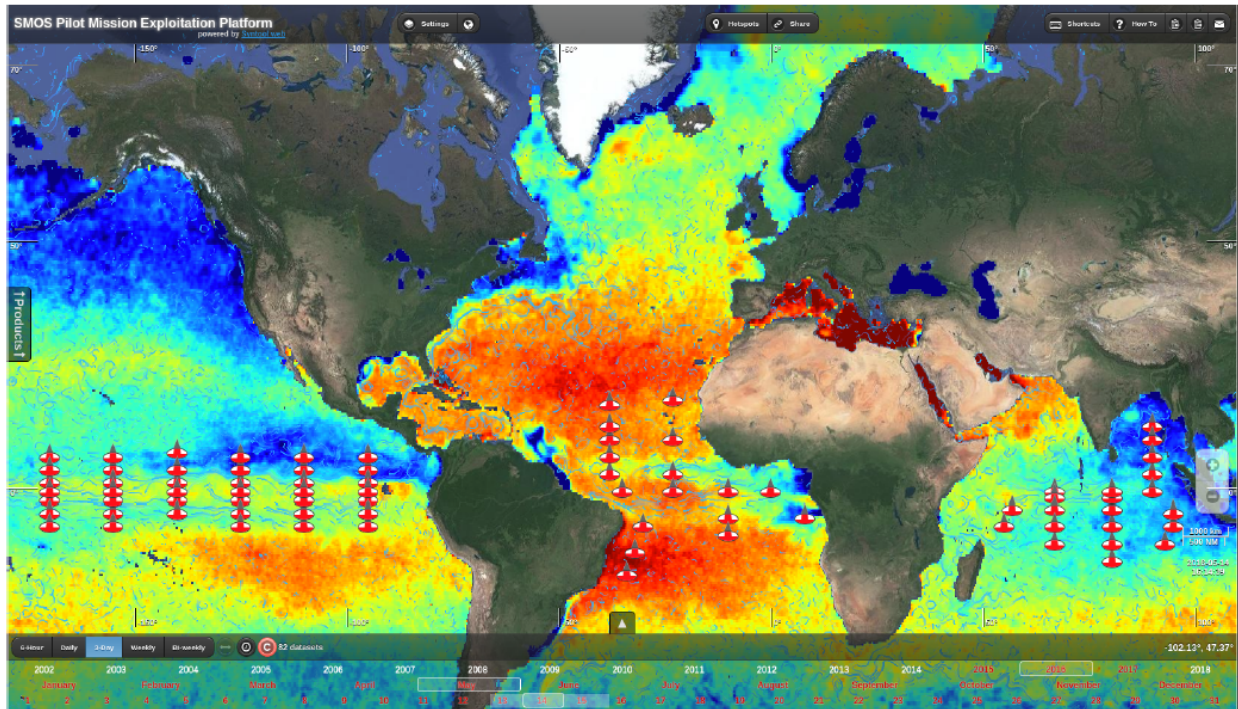
## 5. Syntool

The Pi-MEP data portal is available to anyone using a relatively recent web browser without need to login <http://pimep.oceandatalab.com/> (Figure 1)

**Warning !** If the portal won't load you might need to empty your cache or follow instructions :<https://www.thesststore.com/blog/clear-hsts-settings-chrome-firefox/>

The portal is temporarily on OceanDataLab server but is accessing data at Ifremer that prevents us to use https protocol, so if you have been on the previous version of the portal using https, your browser remembers it and may cause this error.





*Figure 1 : Pi-Mep data portal interface*

The selection of products to be displayed is controlled by the left “Products” Menu (Figure 2). The date and time selection is controlled by the Lower Banner (timeline). The mouse scroll controls zoom levels while on the map and time while on the timeline. Dates when selected products are available appear in white, or grey otherwise. When activating the colocation trigger ©, dates when all selected products are available within the time range and the visible map area appear in red.

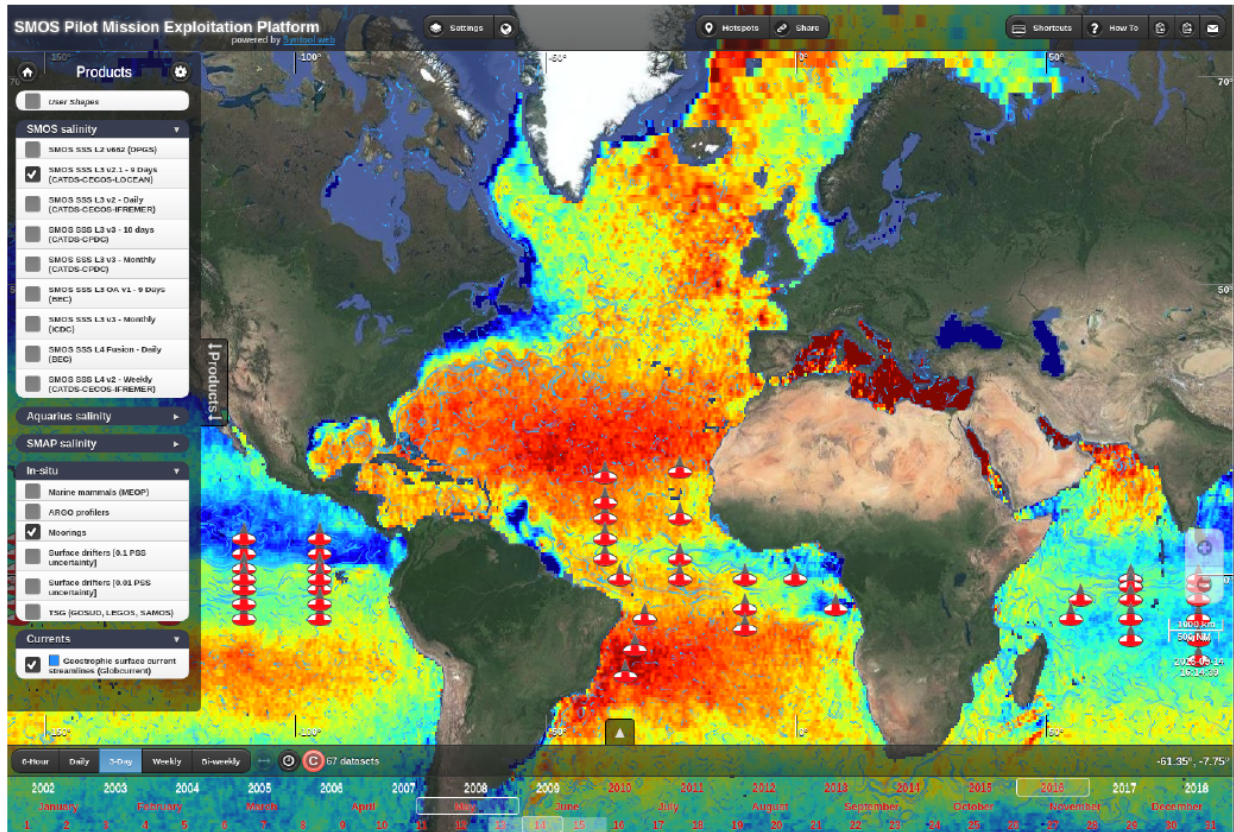


Figure 2 : Product list toolbar of the Pi-Mep data portal

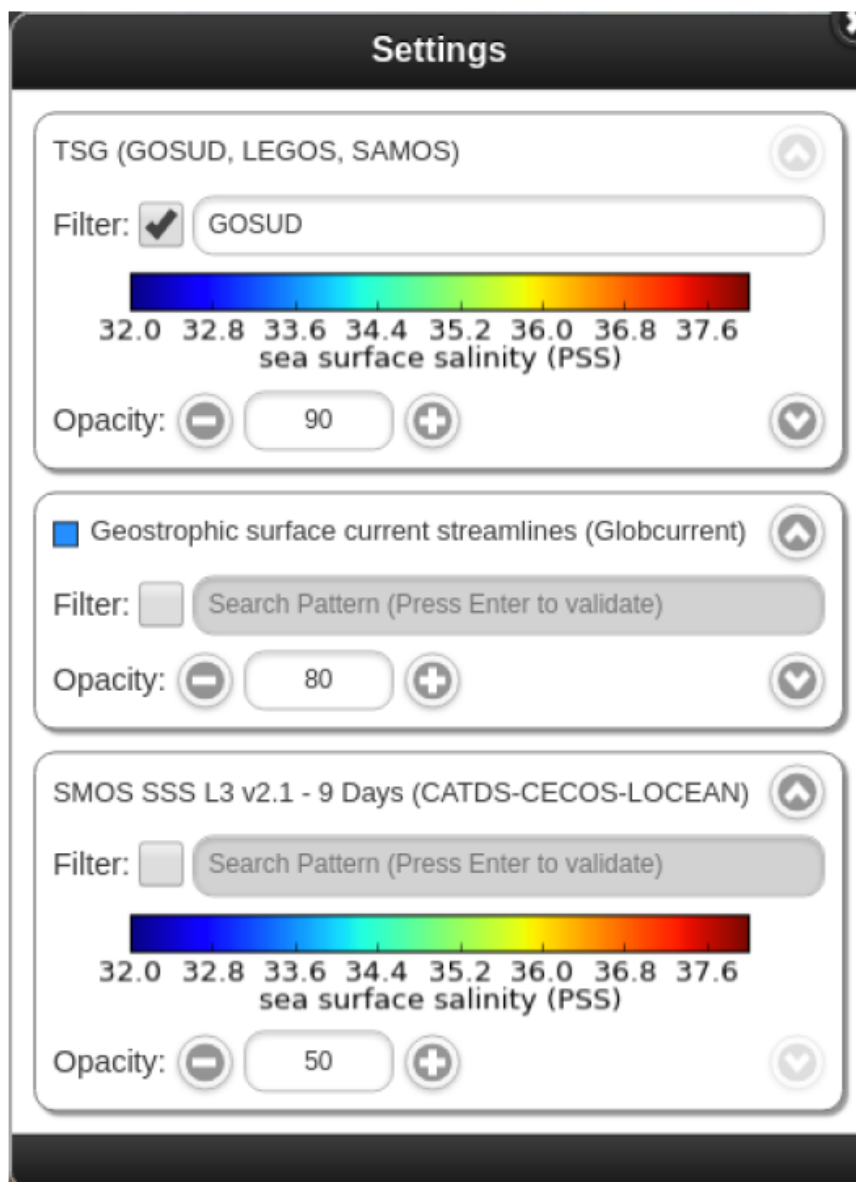
This interface is meant to be intuitive with tooltips available when hovering buttons and can also be controlled using Keyboard “Shortcuts” detailed in the Top Menu Banner. Hereafter the main functionalities:





The “Settings” menu (Figure 3) can be used to control transparency, layer ordering, colorbars, and advanced filters. The “Share” button generates a short URL permalink that can be used to share the same view of the portal to somebody else. From the top banner one can also send some feedback or change the background map from satellite imagery to maps.





*Figure 3 : colorbar, transparency, dataset name filtering, layer ordering available from "Settings" in the upper menu bar*

When selecting drifters or TSG products, one day of trajectory is shown depending on the selected date in the bottom banner timeline, if the time range is smaller than daily, the time window is highlighted with a thicker line with a diamond shape indicating the position of the drifter/ship at the selected time (Figure 4). A simple mouse click on a given drifter trajectory, as any other products, can be used to select it and thereby displaying it's dataset name (Figure 5).

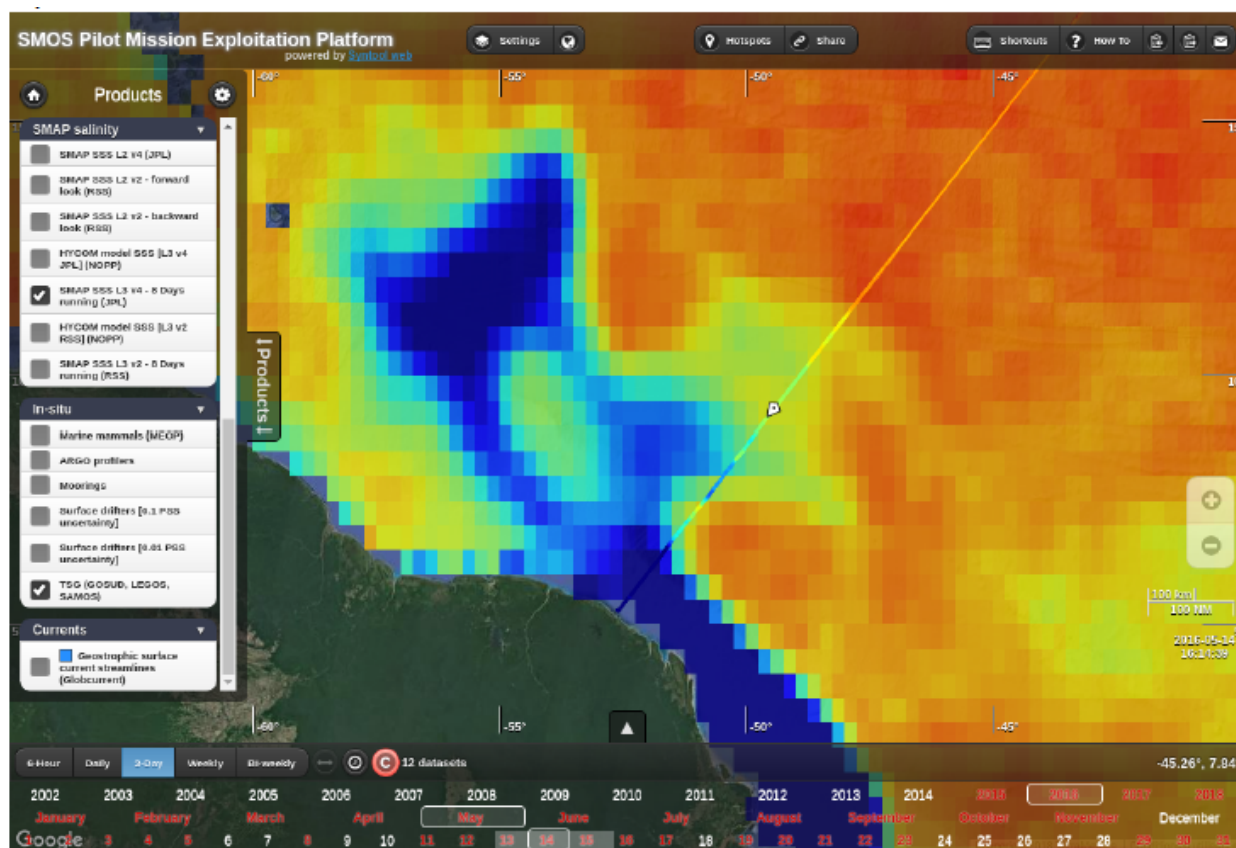


Figure 4 : zoom in the Amazon plume region with TSG trajectory on SMAP SSS L3 V4 product.

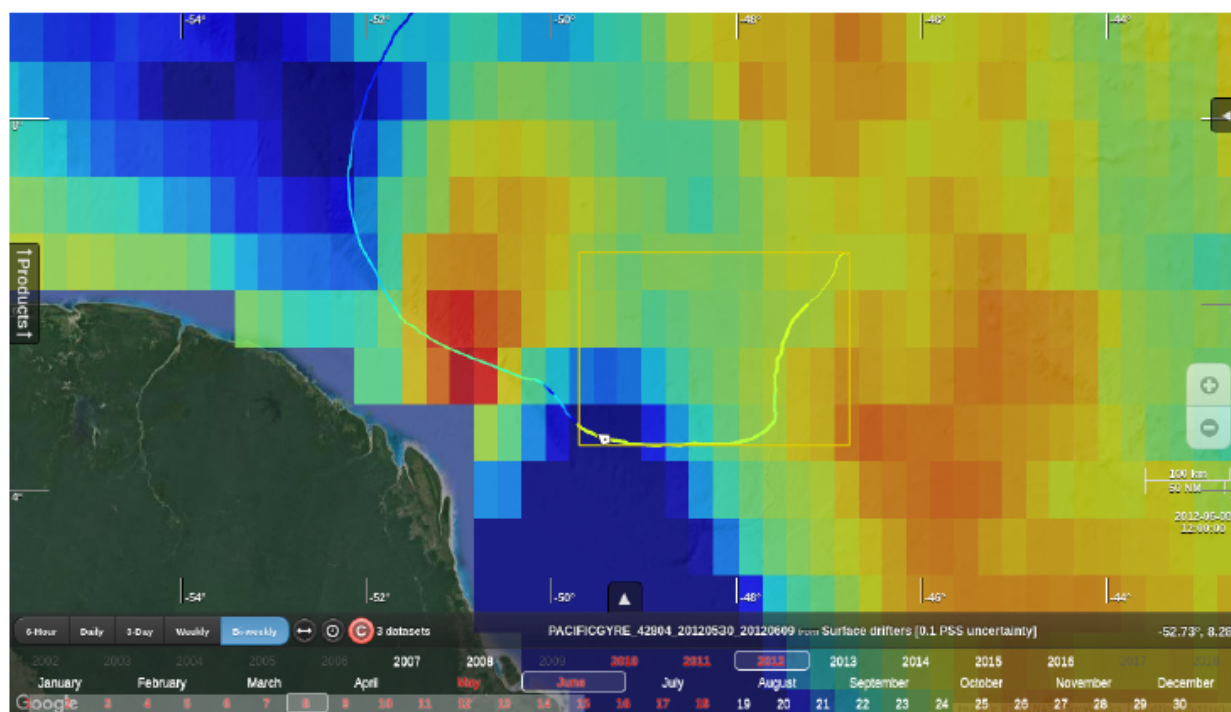


Figure 5 : dataset name highlight upon selection by clicking on any dataset on the map.

The “Hotspots” Menu allow to go quickly to some predefined interesting cases (Predefined hotspots if any), or to save the portal state to come back to it at a later time (local hotspots).

Creation of local hotspot is as easy as typing a name for this hotspot and clicking on “Create”. Any hotspot can be share using the button at the right side of each hotspot line (see Figure 6)

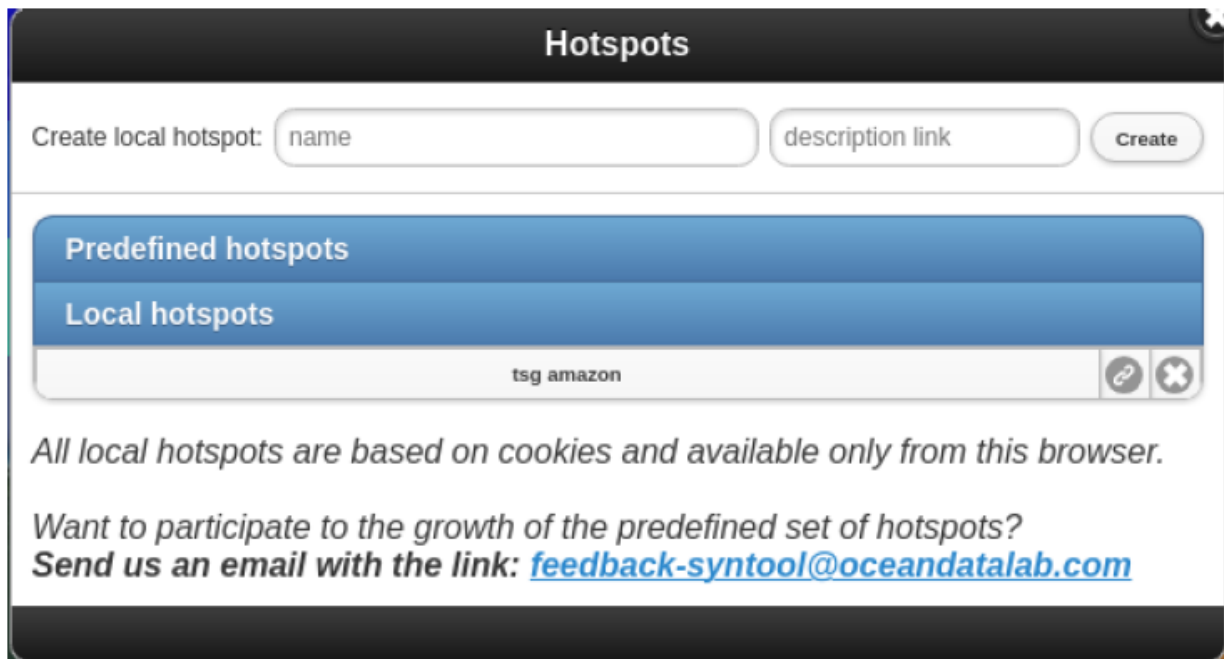


Figure 6 : Hotspots menu