

SMOS

Pilot-Mission Exploitation Platform

(Pi-MEP)

STATUS of the pre-operational platform

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2. OceanDataLab, Plouzane, France

3. Ifremer, Laboratoire d'océanographie physique et spatiale, Plouzane, France

4. Telespazio-Vega UK Ltd for ESA, ESRI, Frascati, Italy

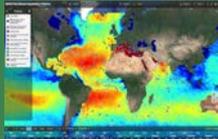
Ocean Salinity Science Conference, Paris

November 6, 2018

Pi-MEP design

Visualization

Syntool



Plots interface



Merginator



Reports &
Plots

Enhanced validation

Off-line processing

- Match-up generation
- Systematic validation reports
- Satellite SSS intercomparison (systematic bias)
- Spectral analysis

On demand user processing

- User extraction on Match-up (Space, time,...)
- Automatic validation report w.r. to user criteria
- Upload of personal datasets

Case studies

1) Large river plume Monitoring

2) Mesoscale Signatures in Western Boundary Current

3) High Latitude & closed seas

Pi-MEP website



SMOS Pilot-Mission Exploitation Platform






Latest news 

2018-10-29 **2019 Living Planet Symposium**
13-17 May 2019, Milan, Italy
[More details...](#)

2018-10-29 **OceanObs'19 Conference**
16-20 September 2019, Honolulu, Hawaii, USA
[More details...](#)

2018-05-16 **2018 Ocean Salinity Science conference**
6-9 Nov 2018, Sorbonne University, Paris, France
[More details...](#)

SMOS Pilot-Mission Exploitation Platform (Pi-MEP): A hub for validation and exploitation of ESA SMOS Sea Surface Salinity data

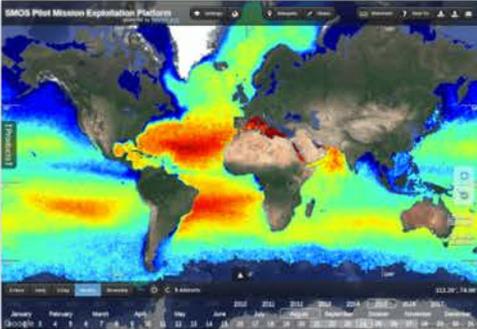
The Soil Moisture and Ocean Salinity (SMOS) mission was launched on 2nd November 2009 as the second Earth Explorer Opportunity mission within ESA's Living Planet programme. It has been continuously providing brightness temperature data in L-Band since January 2010, which are used to retrieve Soil Moisture (SM) and Sea Surface Salinity (SSS) data over land and ocean, respectively. This project funded by ESA is aims at setting up a Pilot Mission Exploitation Platform (Pi-MEP), focussing on ESA's SMOS mission and supporting enhanced validation and scientific process studies over ocean.

Pi-MEP project objectives:

- Focus 1 - Enhanced validation of satellite SSS and products assessment
- Focus 2 - Oceanographic exploitation and case-studies monitoring

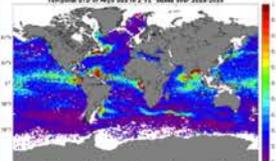
	Validation	Exploitation
User	Systematic validation reports and monitoring	Systematic assessment and monitoring selected process studies
Platform	Inspection, visualisation, extraction, computation data/products for validation	Inspection, merging, computation data/products for oceanographic applications

The platform provides several tools and facilities which are described in the [overview](#).

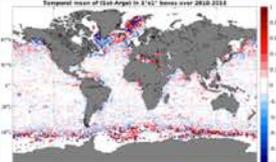


Explore available datasets and perform basic comparisons

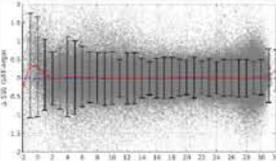
Dashboard - recent activities



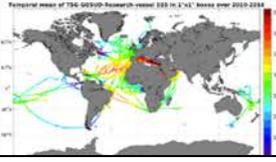
[Map of the temporal STD of Argo SSS in 1°x1° boxes over 2010-2016](#)



[Map of the temporal mean of ISat-Argo in 1°x1° boxes over 2010-2016](#)



[Scatter plot of ΔSSS \(SAT-Argo\) vs Argo SST \(deg C\)](#)



[Temporal series of 756-000000 Research vessel SSS in 1°x1° boxes over 2010-2014](#)

Latest reports 

2018-10-15 In-situ

2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsg-gosud-sailing-ship

2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsg-legos-dm

2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs mammal

2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsg-samos

2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs argo

2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs drifter

2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsg-gosud-research-vessel

2018-05-17 GBRP - smos-l3-catds-cpdc-v3-10d-25km vs tsg-gosud-sailing-ship

2018-05-17 GBRP - smos-l3-catds-cpdc-v3-10d-

Input data



SMOS Pilot-Mission Exploitation Platform



Home Overview **Data** Reports Case Studies Tools About

- Source
- Match-up
- PI-MEP regions
- Acronyms and abbreviations

PI-MEP data source

The PI-MEP downloads, regularly updates, archive of required input datasets that are used by the platform to perform satellite SSS remote sensing analyses. There are several types of data:

- Satellite SSS Core datasets (L2/L3/L4)
- In situ Core datasets
- Auxiliary geophysical datasets
- Numerical Weather Prediction (NWP) and Numerical Ocean Prediction (NOP) datasets
- Process study dedicated datasets

These datasets are described in detail in the tables here below:

PI-MEP CORE SATELLITE DATASETS

Dataset Name	Level	Spatial resolution	Temporal coverage	Variables	Version	Provider
		Temporal resolution	Update frequency			
SMOS SSS L2 v662 (ESA)	L2	30-80 km	From 2010-05-01 to present	SSS1	v662	ESA
		50-minute half-orbit	Daily			
SMAP SSS L2 v3 40km (RSS)	L2	~40 km (grid 0.25° x0.25°)	From 2015-03-27 (086) to present	sss_smap	v3	RSS
		98-minute orbit	Monthly			
SMAP SSS L2 v3 70 km (RSS)	L2	~70 km (grid 0.25° x0.25°)	From 2015-03-27 (086) to present	sss_smap	v3	RSS
		98-minute orbit	Monthly			
SMAP SSS L2 v4 (JPL)	L2	39 km x 47 km	From 2015-03-27 (090) to present	smap_sss	v4	JPL
		98-minute orbit	Monthly			
Aquarius SSS L2 OR v5 (NASA-GSFC)	L2	96 km (along-track) x 390 km (cross-track)	From 2011-08-25 (237) to 2015-06-07 (158)	smap_sss	v5	NASA Aquarius project
		98-minute orbit	end of mission data			
Aquarius SSS L2 CAP v5 (JPL)	L2	96 km (along-track) x 390 km (cross-track)	From 2011-08-25 (238) to 2015-06-04 (155)	sss_cap	v5	JPL
		98-minute orbit	end of mission data			
SMOS SSS L3 v3 - 10 Days (CATDS-CPDC)	L3	25 km	From 2010-01-01 to 2017-03-31 (RE05)	Mean_Sea_Surface_Salinity	v3	CATDS CPDC
		10 days (both ascending and descending orbits)	From 2017-04-01 to present (OPER)			
			10 days			
SMOS SSS L3 v3 - Monthly (CATDS-CPDC)	L3	25 km	From 2010-01-01 to 2017-03-31 (RE05)	Mean_Sea_Surface_Salinity	v3	CATDS CPDC
		Monthly (both)	From 2017-04-01 to present (OPER)			
			10 days			
SMOS SSS L3 v3 - 9 Days (CATDS-CECOS-LOCEAN)	L3	0.25°	From 2010-01-16 to 2017-12-31	SSS	v3	CATDS CECOS LOCEAN
		9 days (every 4 days)	yearly			
SMOS SSS L3 v3 - 18 Days (CATDS-CECOS-LOCEAN)	L3	0.25°	From 2010-01-16 to 2016-12-31	SSS	v3	CATDS CECOS LOCEAN
		18 days (every 4 days)	yearly			

Latest news

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Latest reports

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2018-05-17 **EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs samos**

2018-05-17 **EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs argo**

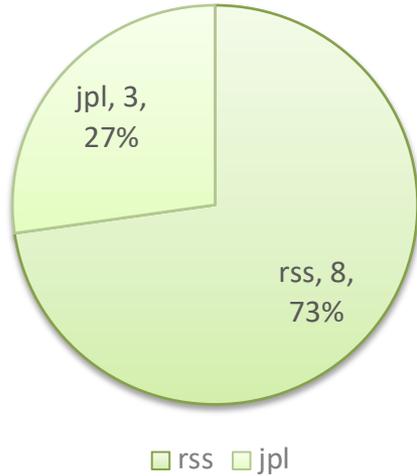
2018-05-17 **EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs drifter**

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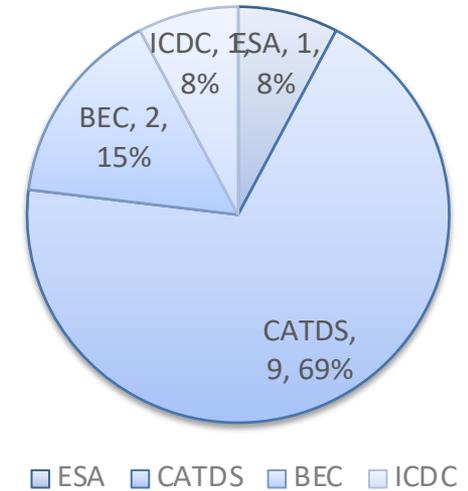
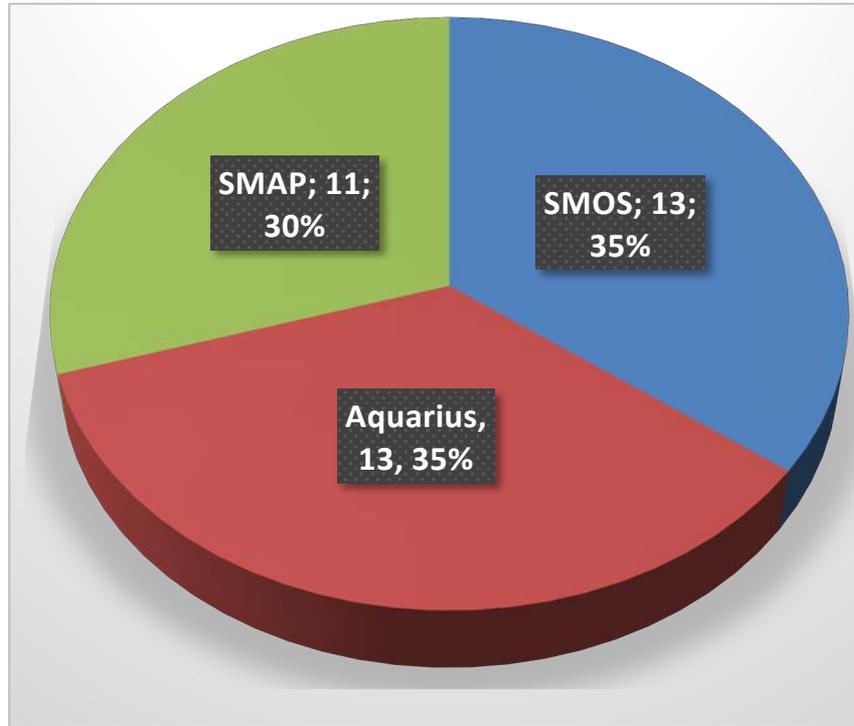
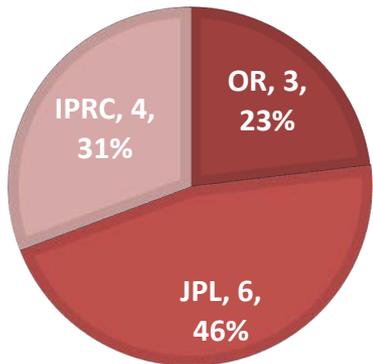
2018-05-17 **GBRP - smos-l3-catds-cpdc-v3-10d-25km vs tsg-gosud-sailing-ship**

2018-05-17 **GBRP - smos-l3-catds-cpdc-v3-10d-25km vs tsg-legos-dm**

Satellite SSS products



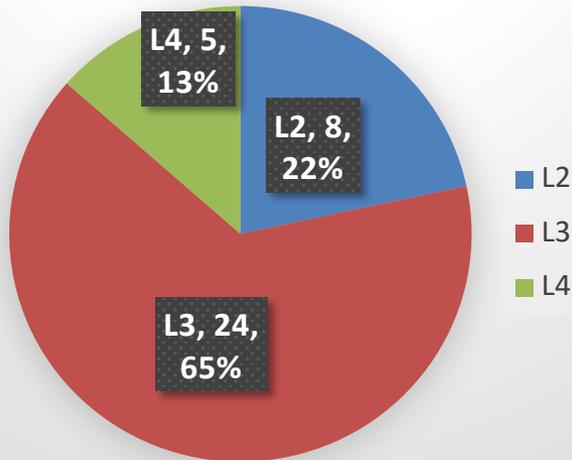
■ OR ■ JPL ■ IPRC



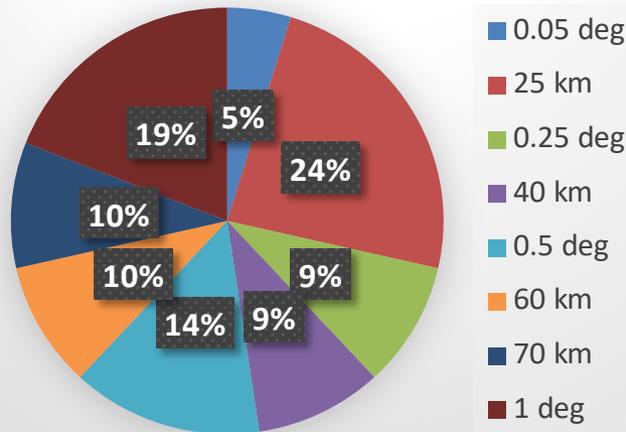
- **37 satellite SSS products**
- **8 different providers**

Satellite SSS products

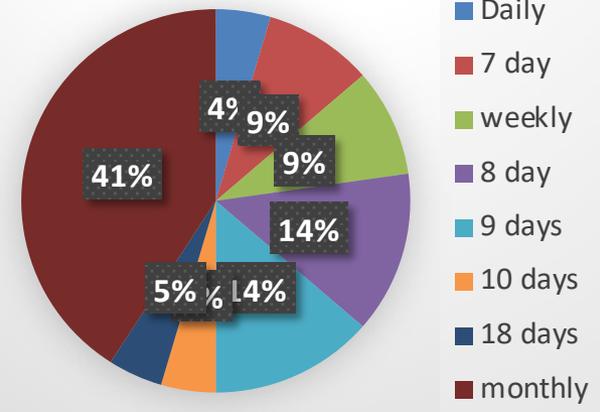
Processing levels



Spatial resolutions



Temporal resolutions



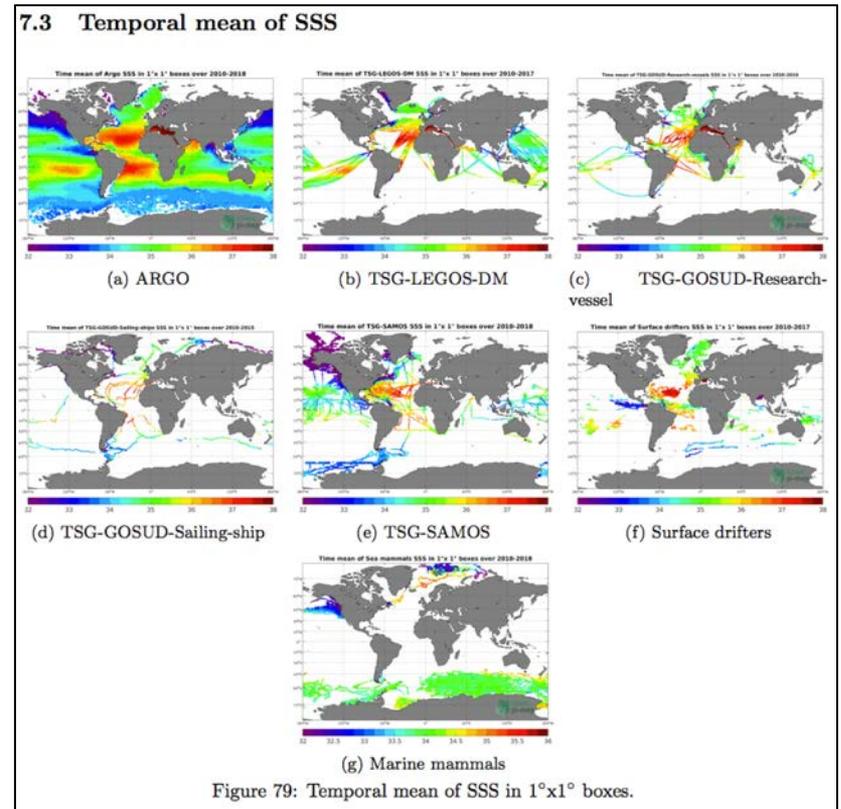
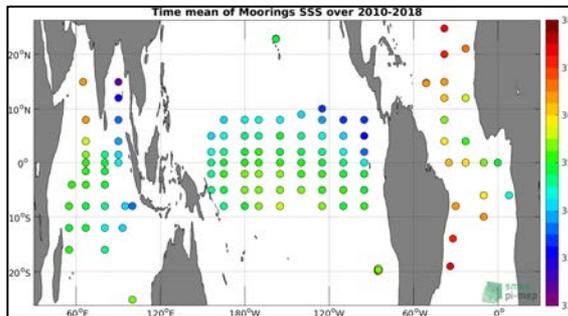
- **3 different processing levels: L2/L3/L4**
- **8 different spatial resolutions**
- **8 different temporal resolutions**

Pi-MEP datasets

- ◆ 37 satellite SSS products (13 SMOS / 13 Aquarius / 11 SMAP)
 - > **120 different satellite SSS sub-datasets**
- ◆ 5 in situ datasets (ARGO, TSG, Moorings, Surf. drifters, Marine mammals)
- ◆ 8 analysed in situ datasets (ISAS, EN4, JAMSTEC, SCRIPPS, IPRC, WOA09-13)
- ◆ 3 numerical models (HYCOM, MERCATOR (NEMO), ECCO (mitGCM))
- ◆ 21 thematic datasets (MLD, SST, RAIN RATE, Surf. Currents, evaporation ...)
- ◆ 8 process study dedicated datasets
 - = > **82 datasets (30 min to Monthly, 0.05° to 1°)**
 - = > **15 To stored on Datarmor (SuperComputer in Brest, France)**
 - = > **Update daily**

In situ SSS database

- ❑ ARGO floats (Coriolis)
- ❑ Moorings (TAO, TRITON, PIRATA, NTAS, STRATUS, SPURS1-2, WHOTS)
- ❑ Surface Drifters (LOCEAN)
- ❑ TSG (LEGOS, GOSUD, SAMOS)
- ❑ Marine mammals (MEOP)



In situ SSS database

Profilers

ARGO

Sea mammals

High spatial resolution

TSG

Drifters

Time series

Moorings

Quality control

Select "valid" salinity profiles
(salinity value for $z < 10$ m)

Calculate of mixed layer depth,
thermocline depth, barrier Layer
thickness, buoyancy frequency
 $N(z)$...

Spatial median filtering at
satellite SSS product resolution

Temporal
median
filtering

Colocation with Auxiliary datasets
(Wind, RAIN, SST, Models, ...)

Pi-MEP in situ database & report

In situ SSS database

The screenshot displays the SMOS Pilot-Mission Exploitation Platform website. The main navigation bar includes Home, Overview, Data, Reports, Case Studies, Tools, and About. The 'Reports' menu is expanded to show 'In-situ' and 'Match-up'. The 'In-situ Reports' section is highlighted, containing the following text:

The characteristics of the 5 major in situ datasets (Argo, TSG, Moorings, surface drifters and Sea mammals) used by the Pi-MEP to validate SMOS, SMAP and Aquarius satellite SSS products are summarize in an "in-situ data report". For each in situ datasets, we detail the QC controls used by the platform and present a series of plots showing:

- Number of SSS data as a function of time and distance to coast
- Histogram of shallowest salinity and pressure (if relevant)
- Spatial maps of the Temporal mean of shallowest salinity and pressure (if relevant)
- Spatial maps of the temporal STD of shallowest salinity
- Spatial density of shallowest salinity
- Δ SSS between local in situ data and ISAS analyses sorted as function of geophysical conditions

The latest in-situ data report produced by the platform is available here:
[View version of 2018-10-15](#)
[View version of 2018-04-27](#)

The central focus is a large box titled "In Situ database Analyses Report" which features the logos of ESA, Ifremer, and OceanDataLab, along with the SMOS pi-mep logo. Below the title, it states "prepared by the Pi-MEP Consortium" and "October 15, 2018".

On the right side, the "Dashboard - recent activities" section displays four plots:

- 1. "Temporal STD of Argo SSS in 1°x1° boxes over 2010-2016": A world map showing the spatial distribution of temporal standard deviation for Argo SSS data.
- 2. "Temporal mean of (Sat-Argo) in 1°x1° boxes over 2010-2016": A world map showing the temporal mean difference between satellite and Argo SSS data.
- 3. "Scatter plot of ASSS (SAT-Argo) vs Argo SST (dev)": A scatter plot showing the relationship between the difference in salinity and sea surface temperature.
- 4. "Temporal mean of ICG-OSCEP Research vessel SSS in 1°x1° boxes over 2010-2016": A world map showing the temporal mean of research vessel SSS data.

The left sidebar contains "Latest news" and "Latest reports" sections with various dates and titles related to symposiums, conferences, and specific data reports.

In situ SSS database: report

Database	#	Time _{min}	Time _{max}	S _{min}	S _{max}	S _{Mean}
Argo	1191285	01/01/2010	11/10/2018	2.32	44.69	34.81
TSG LEGOS-DM	4356334	05/01/2010	11/08/2017	0.04	42.74	34.57
TSG GOSUD-research vessels	2929464	05/01/2010	30/12/2016	0.01	42.00	35.50
TSG GOSUD-sailing ships	863277	03/06/2010	08/09/2015	0.01	38.33	32.96
TSG SAMOS	20165465	07/01/2010	25/09/2018	5.03	41.99	33.41
Surface Drifters	1803639	01/01/2010	14/08/2017	1.03	40.56	35.99
Mammals	199580	01/01/2010	14/01/2018	4.06	36.67	33.95
Moorings	4830384	01/01/2010	22/10/2018	26.50	38.44	34.99
Total	36339428	01/01/2010	22/10/2018	0.01	44.69	34.52

2.2 Number of SSS data as a function of time and distance to coast

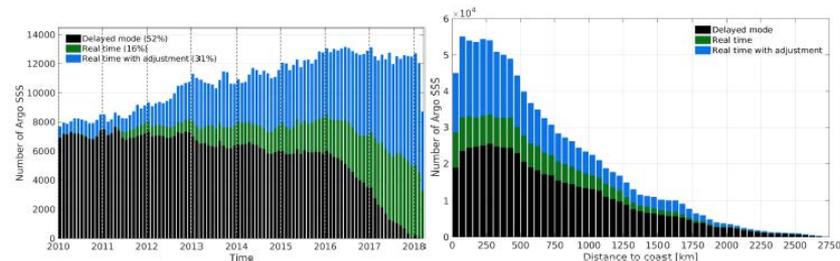


Figure 1: Number of SSS from Argo floats as a function of time (left) and distance to coast (right).

2.3 Histogram of shallowest salinity and pressure

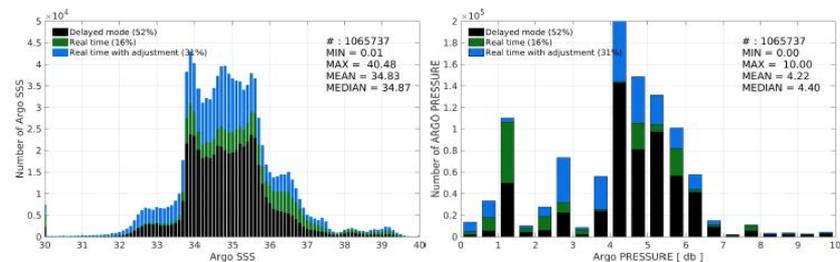
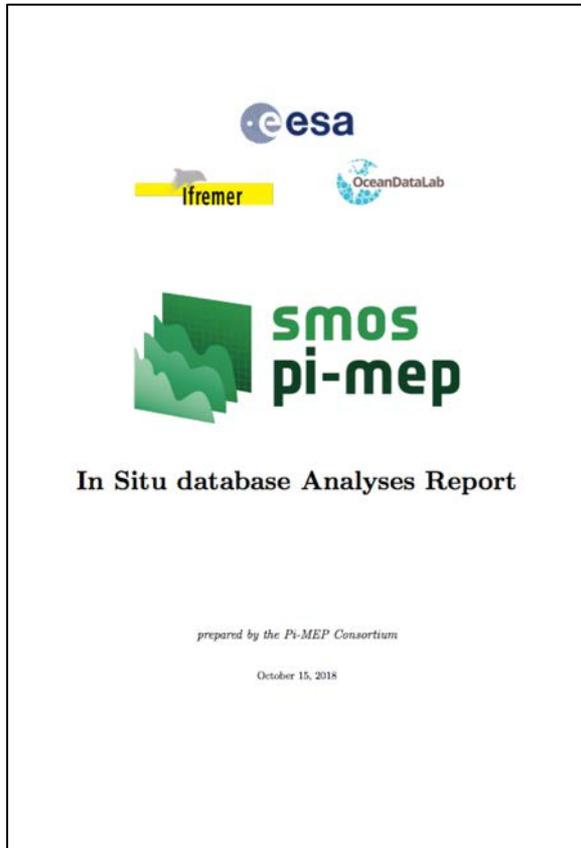


Figure 2: Distribution of SSS (left) and pressure (right) from Argo floats per bins of 0.1 and 0.5, respectively.



In situ SSS database: report

2.4 Temporal mean of shallowest salinity and pressure

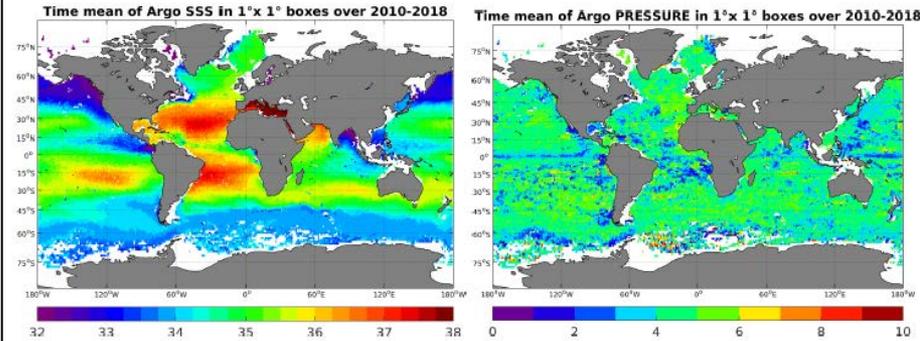


Figure 3: Time-mean SSS and pressure from Argo floats in 1°x1° boxes.

2.5 Temporal STD of SSS

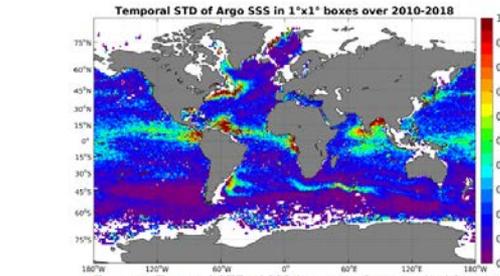


Figure 4: Temporal STD of SSS from Argo floats in 1°x1° boxes.

2.6 Spatial density of SSS

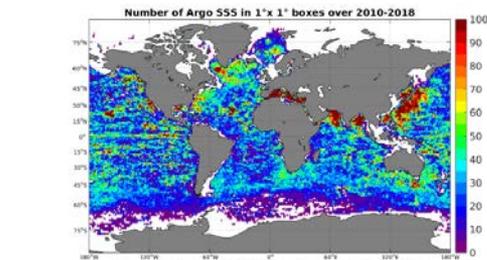
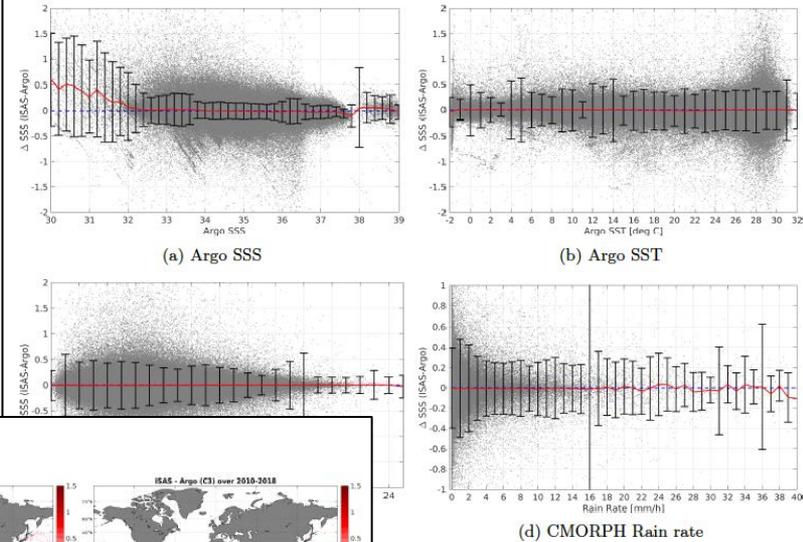


Figure 5: Number of SSS from Argo floats in 1°x1° boxes.

2.7 Δ SSS sorted as geophysical conditions



2.8 Conditional analyses

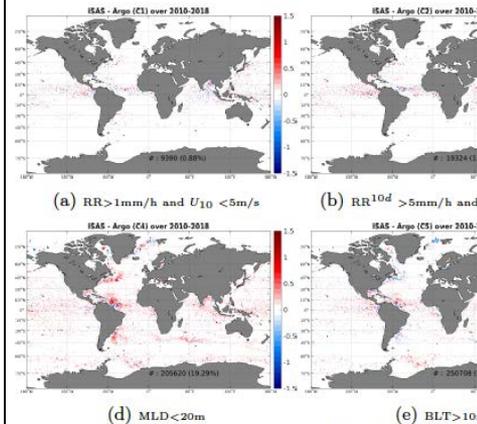


Figure 7: Temporal mean of Δ SSS (ISAS - Argo) for C1 (a),..., C6 (f).

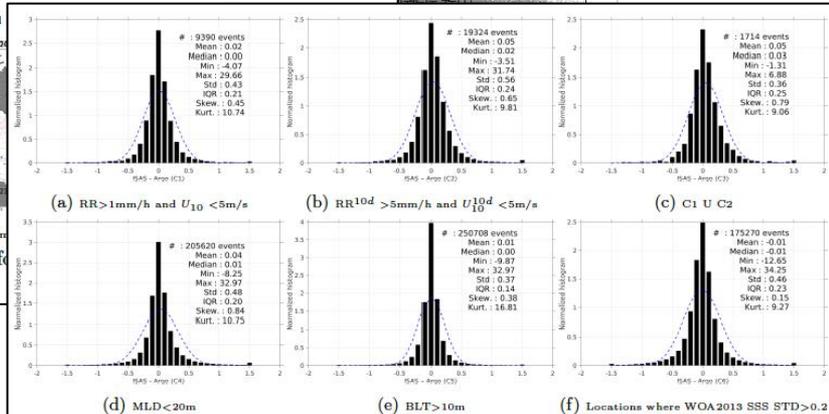


Figure 8: Normalized histogram of Δ SSS (ISAS - Argo) for 6 different subdatasets corresponding to C1 (a),..., C6 (f).

Match-up database

INPUTS

SMOS,
SMAP,
Aquarius
L2 to L4

In situ

+ Auxiliary
parameters
(rain, wind,
sst, mld, ...)

Match-up
generator

MDB generator code design

- 1) Read a SSS satellite file
Store temporal/spatial resolution (Res) and grid of the satellite products for further collocation (cf 3))
- 2) Select quality controlled In situ data falling in the time window ($\pm 6h$ for L2, $\pm D/2$ for L3/L4)
- 3) Find nearest L2-L4 pixel within a distance $R=[0, Res/2]$ for each in situ data
- 4) Store actual Δt & $\Delta distance$ between product pixel & in situ data
- 5) Generate NetCDF4 files

OUTPUTS

pimep-mdb_satelliteID_insituID_Time_V01.nc

Match-up database

SMOS Pilot-Mission Exploitation Platform

Home Overview **Data** Reports Case Studies Tools About

Source
Match-up
PI-MEP regions
Acronyms and abbreviations

The platform systematically co-localizes satellite and in-situ SSS products from all sensors and associated data centers with the various pre-processed (Level 2) SSS products. For a given satellite/in situ SSS product pair, the results of the co-location are stored in the so-called Match-up DataBase (MDB) files provided in NetCDF format to the users.

Match-up data consist of satellite and in-situ SSS pair datasets but also of auxiliary geophysical parameters such as local and history of wind speed and rain rates, as well as various information (climatology, distance to coast, mixed layer depth, barrier layer thickness, etc) that can be derived from in situ data and which are included in the final match-up files. Match-up files are generated for each available satellite SSS product files and all available in situ data for the duration of each satellite product.

The granularity of the Match-up files follows the one of the input satellite data product files. The content of the NetCDF files, the in situ QC filtering and the co-localisation methods are described in details in the Match-Up analyses reports available [here](#).

Match-up files can be accessed using either an HTTP or FTP client using the following menu:

Satellite: any In-situ: any

Satellite	In-situ	Access
SMOS SSS L2 v662 (ESA)	TSG (GOSUD-Sailing ships)	FTP/HTTP
SMOS SSS L2 v662 (ESA)	TSG (GOSUD-research vessels)	FTP/HTTP
SMOS SSS L2 v662 (ESA)	TSG (LEGOS-DM)	FTP/HTTP
SMOS SSS L2 v662 (ESA)	TSG (LEGOS-Survostra)	FTP/HTTP
SMOS SSS L2 v662 (ESA)	TSG (LEGOS-Survostra adélie)	FTP/HTTP
SMOS SSS L2 v662 (ESA)	TSG (SAMOS)	FTP/HTTP
SMOS SSS L2 v662 (ESA)	ARGO profilers	FTP/HTTP
SMOS SSS L2 v662 (ESA)	Marine mammals	FTP/HTTP
SMOS SSS L2 v662 (ESA)	Surface drifters	FTP/HTTP
SMOS SSS L2 v662 (ESA)	Moorings	FTP/HTTP
SMOS SSS L2 v662 (ESA)	All in situ databases	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	TSG (GOSUD-Sailing ships)	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	TSG (GOSUD-research vessels)	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	TSG (LEGOS-DM)	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	TSG (LEGOS-Survostra)	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	TSG (LEGOS-Survostra adélie)	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	TSG (SAMOS)	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	ARGO profilers	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	Marine mammals	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	Surface drifters	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	Moorings	FTP/HTTP
SMOS SSS L3 v2 - Daily (CATDS-CECOS-IFREMER)	All in situ databases	FTP/HTTP
SMOS SSS L3 v2 - Monthly (CATDS-CECOS-IFREMER)	TSG (GOSUD-Sailing ships)	FTP/HTTP
SMOS SSS L3 v2 - Monthly (CATDS-CECOS-IFREMER)	TSG (GOSUD-research vessels)	FTP/HTTP

Dashboard - recent activities

Map of the temporal STD of Argo SSS in 1°x1° boxes over 2010-2018

Map of the temporal mean of (Sat-Argo) in 1°x1° boxes over 2010-2018

Scatter plot of GSSS (Sat-Argo) vs Argo SST (deg C)

Index of /diffusion/data/smos-l2-v662/argo

Name	Last modified	Size	Description
Parent Directory	-	-	-
2010/	02-May-2018 01:39	-	-
2011/	02-May-2018 01:49	-	-
2012/	02-May-2018 03:06	-	-
2013/	02-May-2018 03:46	-	-
2014/	02-May-2018 04:25	-	-
2015/	02-May-2018 06:35	-	-
2016/	02-May-2018 07:00	-	-
2017/	02-May-2018 07:18	-	-
2018/	02-May-2018 07:18	-	-

HTTP

Index de ftp://ftp.ifremer.fr/ifremer/cersat/pimep/diffusion/data/smos-l2-v662/argo/

Vers un rép. de plus haut niveau

Nom	Taille	Dernière modification
2010		02/05/2018 01:39:00 UTC+2
2011		02/05/2018 01:49:00 UTC+2
2012		02/05/2018 03:06:00 UTC+2
2013		02/05/2018 03:46:00 UTC+2
2014		02/05/2018 04:25:00 UTC+2
2015		02/05/2018 06:35:00 UTC+2
2016		02/05/2018 07:00:00 UTC+2
2017		02/05/2018 07:18:00 UTC+2
2018		02/05/2018 07:18:00 UTC+2

FTP

Match-up database

- 37 satellites products
 - 10 in situ datasets
- ⇒ 200 Gb ~ 600.000 files
- ⇒ Processing time ~ 3 days (parallelized)

Reprocessing: once/year

Monthly update: only new pairs in situ/satellite are generated.

Analyses Regions



SMOS Pilot-Mission Exploitation Platform



Home Overview Data Reports Case Studies Tools About

Latest news

- 2018-10-29 **2019 Living Planet Symposium**
13-17 May 2019, Milan, Italy
[More details](#)
- 2018-10-29 **OceanObs 19 Conference**
16-20 September 2019, Honolulu, Hawaii, USA
[More details](#)
- 2018-05-16 **2018 Ocean Salinity Science conference**
6-9 Nov 2018, Sorbonne University, Paris, France
[More details](#)

Latest reports

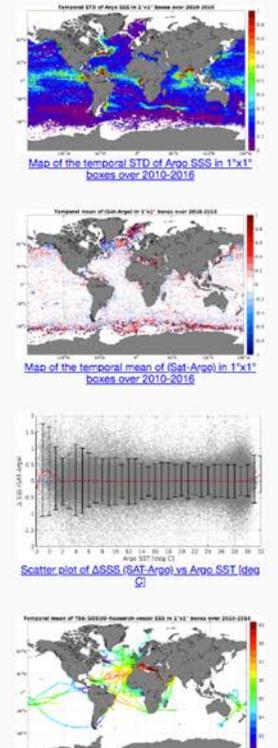
- 2018-10-15 **In-situ**
- 2018-05-17 **EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsq-gosud-sailing-ship**
- 2018-05-17 **EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsq-legos-dm**
- 2018-05-17 **EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs mammal**
- 2018-05-17 **EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsq-samos**
- 2018-05-17 **EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs argo**
- 2018-05-17 **EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs drifter**
- 2018-05-17 **EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsq-gosud-research-vessel**
- 2018-05-17 **GBRP - smos-l3-catds-cpdc-v3-10d-25km vs tsq-gosud-sailing-ship**
- 2018-05-17 **GBRP - smos-l3-catds-cpdc-v3-10d-**

Pi-MEP Regions

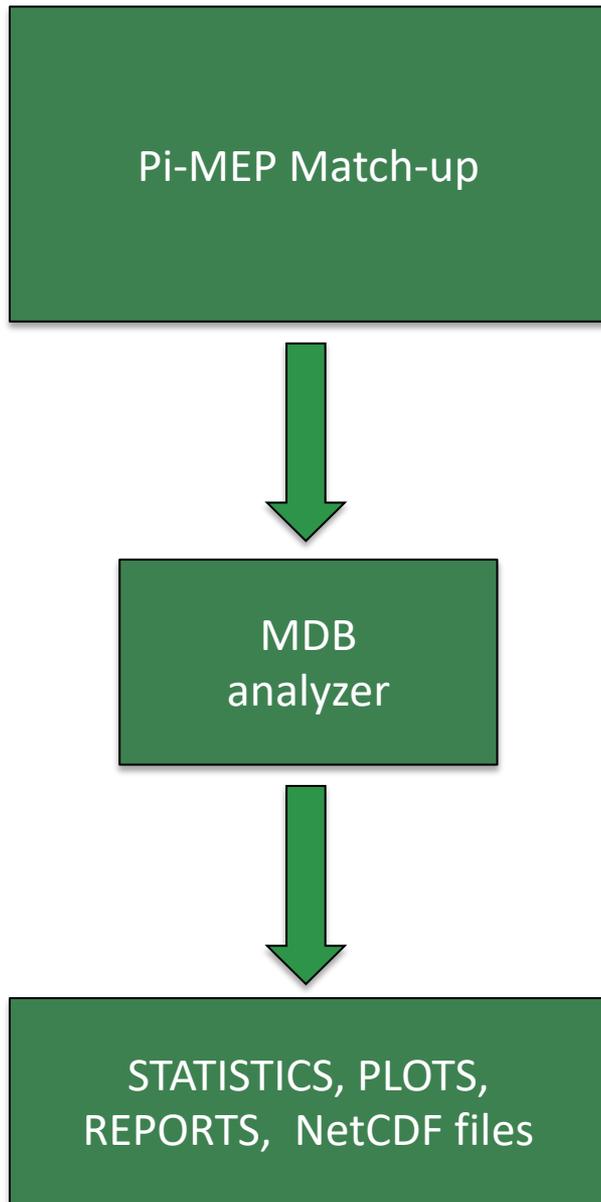
Match-up databases are analyzed globally but also for each Pi-MEP validation region. A dedicated MDB report is provided for each triplet: Pi-MEP Region-Satellite SSS product-In situ SSS product. These regions are defined in the following table:

PI-MEP Region#	Short Name	Name	Lon/Lat Range	Map	Mask
1	GO	Global Ocean	[-180 180] / [-78 90]		netcdf
2	MLL-45	Mid-Low Latitudes 45N-45S	[-180 180] / [-45 45]		netcdf
3	EO-10	Equatorial Ocean 10N-10S	[-180 180] / [-10 10]		netcdf

Dashboard - recent activities



Match-up database reports



INPUTS

```
pimep-mdb_satelliteID_insituID_*_V01.nc
```

MDB analyzer code design

- 1) Read each MDB dataset file
- 2) Extraction of sub-dataset corresponding to the predefined Pi-MEP region
- 3) Systematically generate predefined plots, tables and statistics for each zone
- 4) Generate pdf reports

OUTPUTS

```
pimep-mdb-report_regionID_satelliteID_insituID.pdf  
pimep-mdb-figure_satelliteID_insituID.png  
pimep-mdb-ncfile_satelliteID_insituID.nc  
pimep-mdb-stat_satelliteID_insituID.csv
```

Match-up database reports



SMOS Pilot-Mission Exploitation Platform



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[More details...](#)
- 2018-10-29 OceanObs'19 Conference
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[More details...](#)
- 2018-05-16 2018 Ocean Salinity Science
conference
6-9 Nov 2018, Sorbonne University, Paris, France
[More details...](#)

Latest reports

- 2018-10-15 In-situ
- 2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsq-gosud-sailing-ship
- 2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsq-legos-dm
- 2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs mammal
- 2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tag-samos
- 2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs argo
- 2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs drifter
- 2018-05-17 EO-10 - smos-l3-catds-cpdc-v3-10d-25km vs tsq-gosud-research-vessel
- 2018-05-17 GBRP - smos-l3-catds-cpdc-v3-10d-25km vs tsq-gosud-sailing-ship

In-situ Match-up Match-up reports

Results of systematic analyses of the Match-up DataBase (MDB) files generated by the PI-MEP are provided to the users in the form of specific PDF reports here below. MDB files are analyzed for all pairs of Satellite/In situ SSS data and for an ensemble of 30 geographical [Pi-MEP regions](#). Each report presents successively:
The MDB file DataSets:

- A short description of the satellite SSS product considered in the match-up
- A short description of the In situ SSS dataset considered in the match-up
- A short description of the auxiliary geophysical datasets co-localized with SSS pairs
- An overview of how the Match-ups were evaluated
- An overview of the MDB characteristics for the particular in situ/satellite pairs

The major results of the MDB file Analyses:

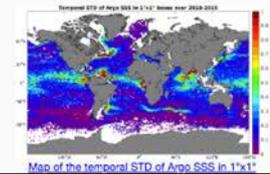
- Spatial Maps of the Time-mean and temporal STD of in situ and satellite SSS and of the ΔSSS where $\Delta SSS = SSS_{SAT} - SSS_{in situ}$ denotes the difference between the satellite and in situ SSS at the colocalized points that form the MDB,
- Time series of the monthly averaged mean and STD of in situ and satellite SSS and of the ΔSSS ,
- Zonally-averaged Time-mean and temporal STD of in situ and satellite SSS and of the ΔSSS ,
- Scatterplots of satellite vs in situ SSS by latitudinal bands,
- Time series of the monthly averaged mean and STD of the ΔSSS sorted by latitudinal bands,
- ΔSSS sorted as function of geophysical conditions,
- A summary with tables of statistics and validation metrics.

All analyses are conducted over the user-chosen Pi-MEP Region, satellite/In situ SSS pair and over the full satellite SSS product period. The Match-Up analyses reports can be accessed using the menu below:

Region: Global Ocean Satellite: any In-situ: any

Date	Satellite	In-situ	
2018-05-17	SMOS SSS L3 v3 - 10 Days (CATDS-CPDC)	ARGO profilers	View
2018-05-17	SMOS SSS L3 v3 - 10 Days (CATDS-CPDC)	Surface drifters	View
2018-05-17	SMOS SSS L3 v3 - 10 Days (CATDS-CPDC)	Marine mammals	View
2018-05-17	SMOS SSS L3 v3 - 10 Days (CATDS-CPDC)	TSG (GOSUD-research vessels)	View
2018-05-17	SMOS SSS L3 v3 - 10 Days (CATDS-CPDC)	TSG (GOSUD-Sailing ships)	View
2018-05-17	SMOS SSS L3 v3 - 10 Days (CATDS-CPDC)	TSG (LEGOS-DM)	View
2018-05-17	SMOS SSS L3 v3 - 10 Days (CATDS-CPDC)	TSG (SAMOS)	View
2018-05-16	Aquarius SSS L2 CAP v5 (JPL)	ARGO profilers	View
2018-05-16	Aquarius SSS L2 CAP v5 (JPL)	Surface drifters	View
2018-05-16	Aquarius SSS L2 CAP v5 (JPL)	Marine mammals	View
2018-05-16	Aquarius SSS L2 CAP v5 (JPL)	TSG (GOSUD-research vessels)	View
2018-05-16	Aquarius SSS L2 CAP v5 (JPL)	TSG (GOSUD-Sailing ships)	View
2018-05-16	Aquarius SSS L2 CAP v5 (JPL)	TSG (LEGOS-DM)	View
2018-05-16	Aquarius SSS L2 CAP v5 (JPL)	TSG (SAMOS)	View
2018-05-16	Aquarius SSS L2 OR v5 (NASA-GSFC)	ARGO profilers	View

Dashboard - recent activities



Match-up database Analyses Report

Aquarius-L2-OR-V5

Argo

Global Ocean

prepared by the Pi-MEP Consortium
May 15, 2018

Match-up characteristics

2.5 MDB characteristics for the particular in situ/satellite pairs

2.5.1 Number of paired SSS data as a function of time and distance to coast

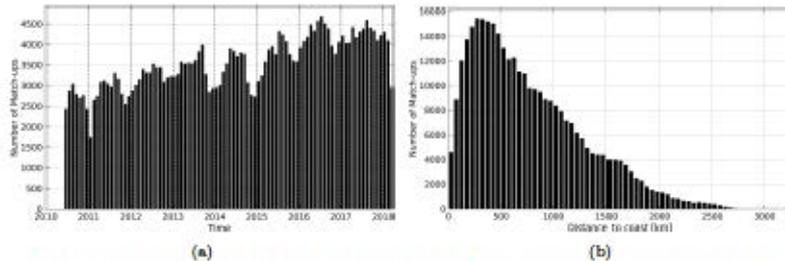


Figure 1: Number of match-ups between Argo and SMOS-L2-DPGS-v662 SSS as a function of time (a) and as function of the distance to coast (b) over the Global Ocean Pi-MEP region and for the full satellite product period.

2.5.2 Histograms of the SSS match-ups

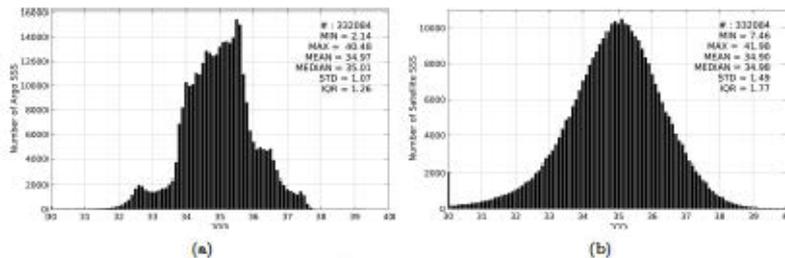


Figure 2: Histograms of SSS from Argo (a) and SMOS-L2-DPGS-v662 (b) considering all match-up pairs per bins of 0.1 over the Global Ocean Pi-MEP region and for the full satellite product period.

2.5.3 Distribution in situ SSS depth in match-ups pairs

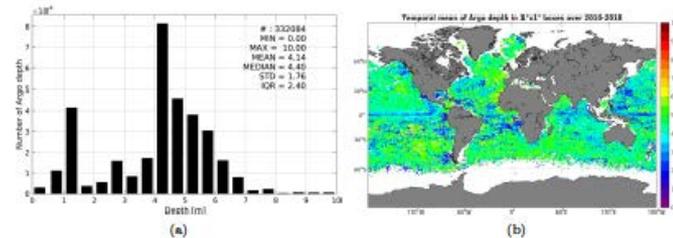


Figure 3: Histograms of the depth of the upper level SSS measurements from Argo in the Match-up DataBase for the Global Ocean Pi-MEP region (a) and temporal mean spatial distribution of pressure of the in situ SSS data over $1^\circ \times 1^\circ$ boxes and for the full satellite product period (b).

2.5.4 Spatial Distribution of Match-ups

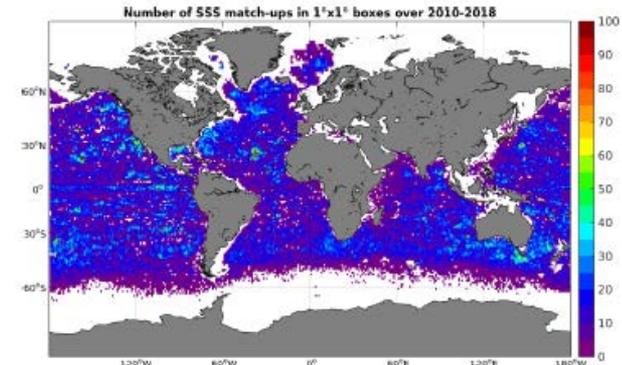


Figure 4: Number of SSS match-ups between Argo and the SMOS-L2-DPGS-v662 SSS product for the Global Ocean Pi-MEP region over $1^\circ \times 1^\circ$ boxes and for the full satellite product period.

2.5.5 Histograms of the spatial and temporal lags of the match-ups pairs

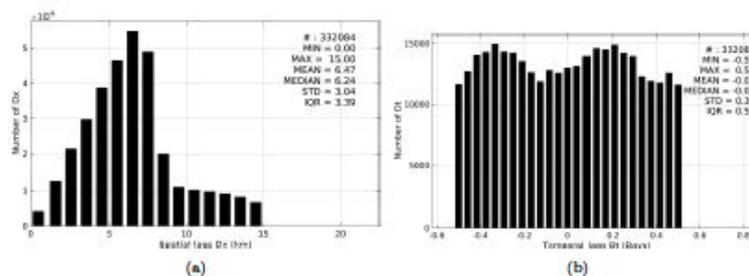


Figure 5: Histograms of the spatial (a) and temporal (b) lags between the time of the Argo measurements and the date of the corresponding SMOS-L2-DPGS-v662 SSS product.

Match-up analyses

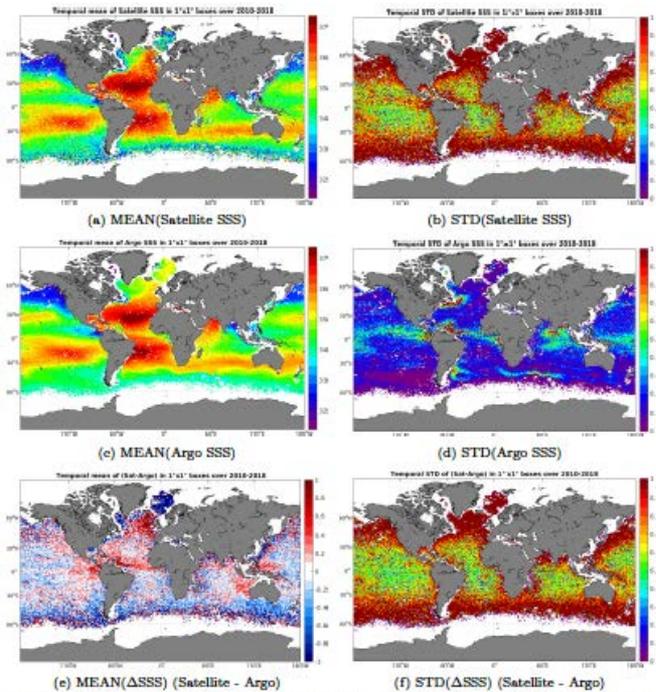


Figure 6: Temporal mean (left) and STD (right) of SSS from SMOS-L2-DPGS-v662 (top), Argo (middle), and of Δ SSS (Satellite - Argo). Only match-up pairs are used to generate these maps.

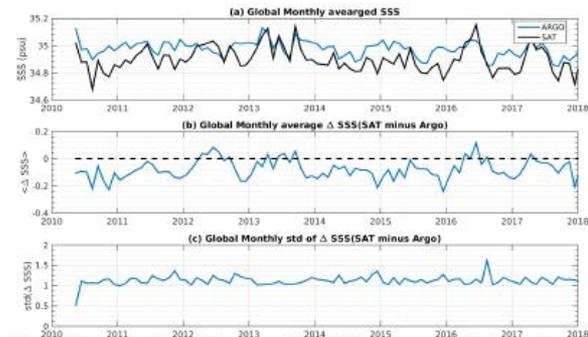
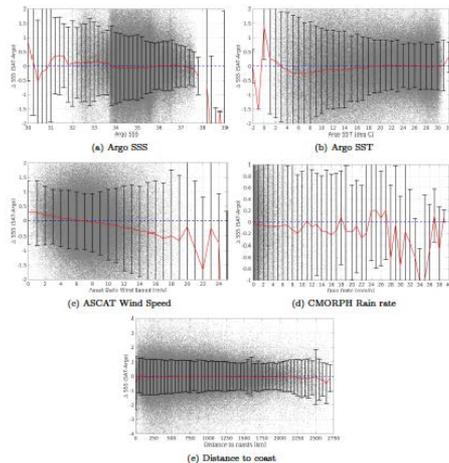


Figure 7: Time series of the monthly averaged mean SSS (top), mean Δ SSS (Satellite - Argo) and STD of Δ SSS (Satellite - Argo) over the Global Ocean Pi-MEP region considering all match-ups collected by the Pi-MEP platform.

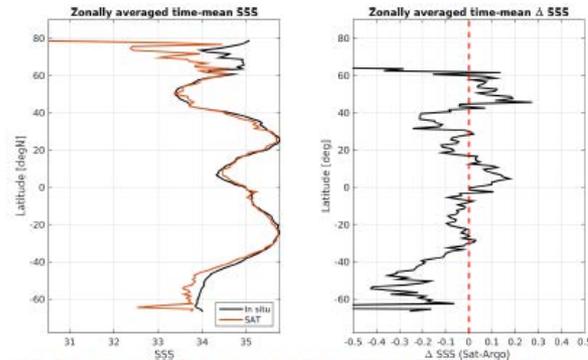
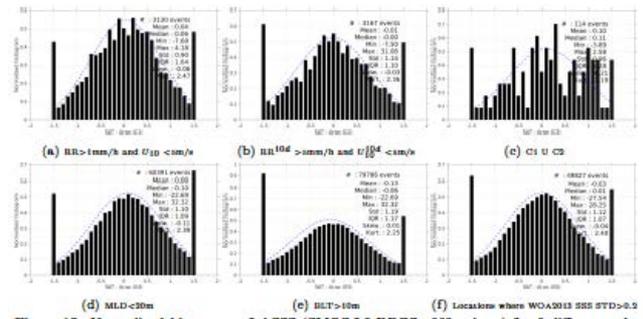
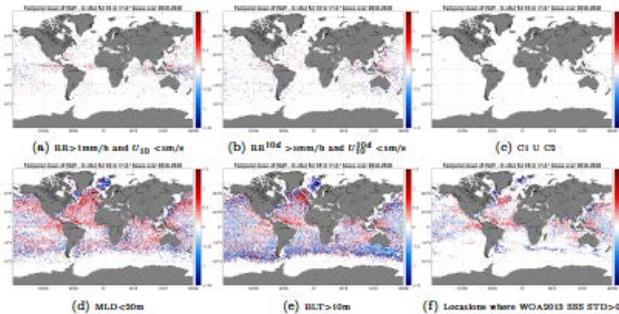
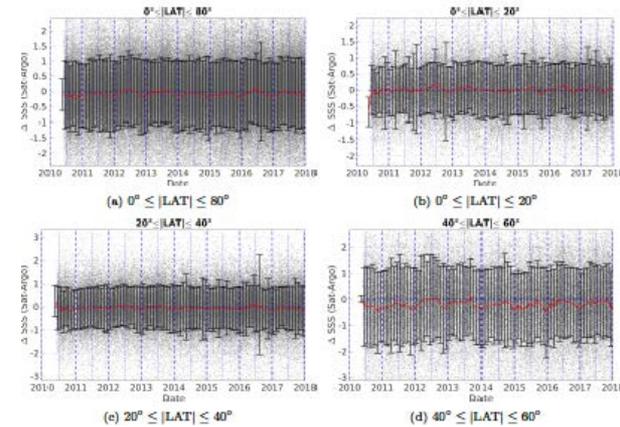
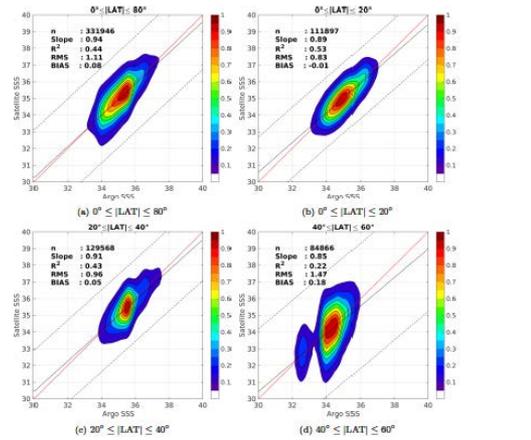


Figure 8: Left panel: Zonally averaged time mean SSS from SMOS-L2-DPGS-v662 (black) and from Argo (blue). Right panel: zonally averaged time-mean Δ SSS (Satellite - Argo) for all the collected Pi-MEP match-up pairs estimated over the full satellite product period.



Pi-MEP systematic reporting

- By satellite products (37)
- By in situ database (10)
- By Pi-MEP region (30)

~ 9.000 reports

~40 plots/report

~1 min to generate 1 report

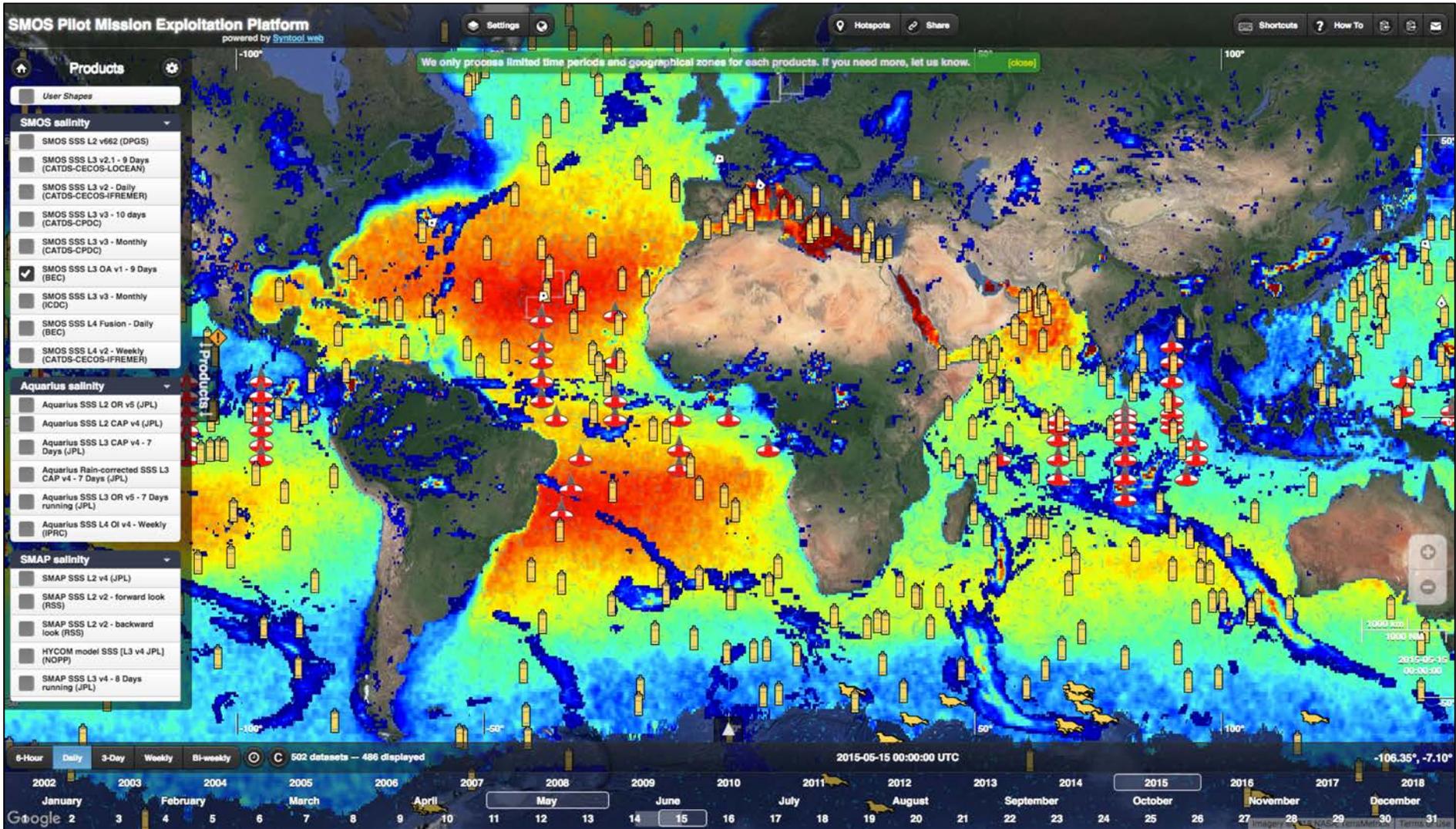


Pi-MEP TOOLS

Pi-MEP provides 5 different tools to **explore**, **visualize** and **extract** SSS related datasets:

- Syntool
- Plots interface
- Match-up interface
- Merginator
- Jupyter

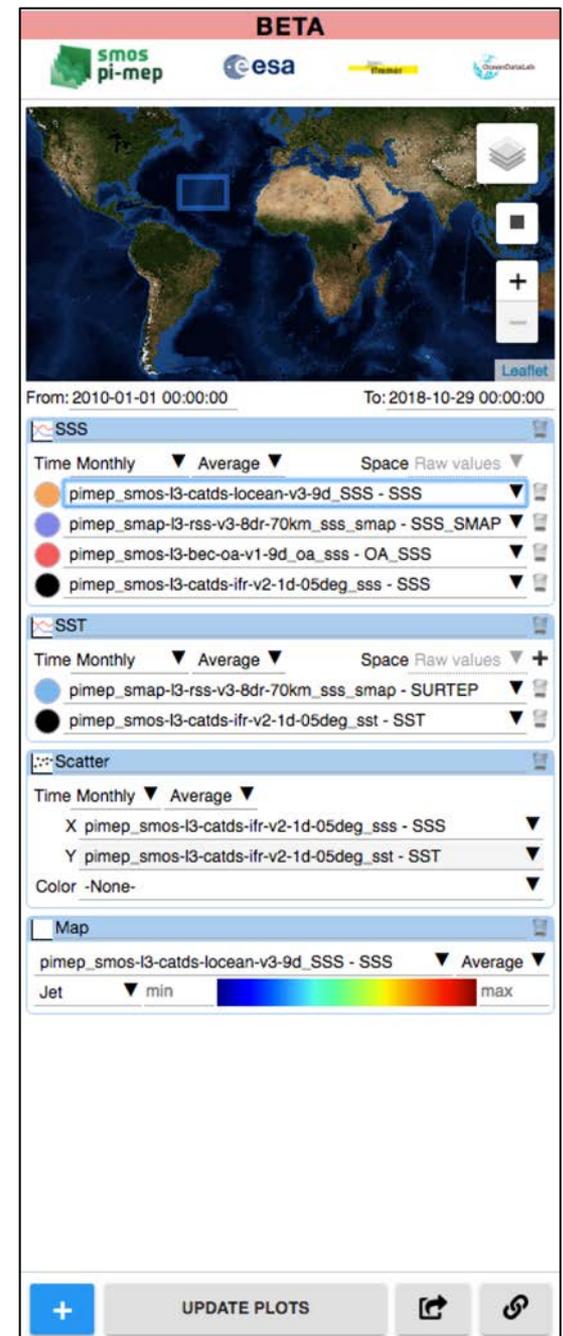
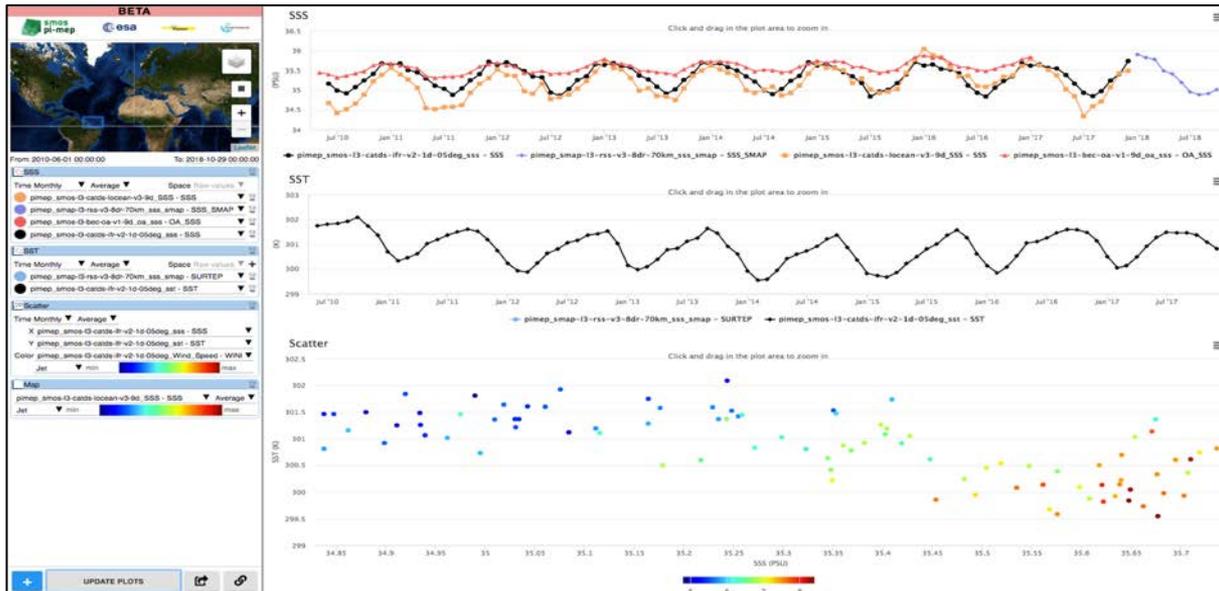
Syntool



Plots interface

Interface with five types of plots :

- Time series
- Scatterplots
- Histograms
- Hovmöller diagrams
- Maps



Match-up interface

Interface to query MDB data and :

- Extract match-ups (CSV, JSON or NetCDF)
- Generate plots for match-up metrics
- Produce custom PDF reports

BETA

smos pi-mep esa

pimep_mdb_argo_smos-l3-catds-locean-v2-9d

ARGO profiles

Custom Region



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

Depth	Dist2Coast	SST	SSS
0	0	-2,1	0
10	2000	35	100

Δtime	Δdist	ΔSSS
0	0	0
12	100	5

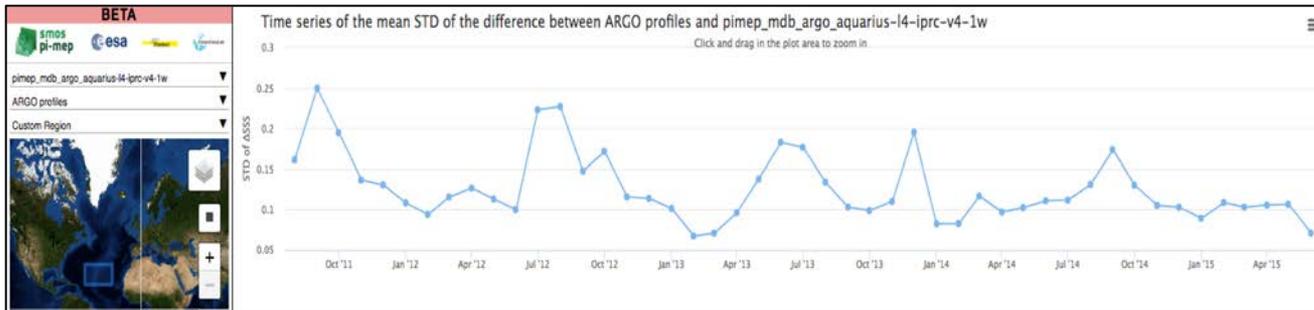
ARGO Real-time Delayed-time

Precipitation rate (CMORPH)
At matchup mm/h

Wind speed (ASCAT)
At matchup m/s

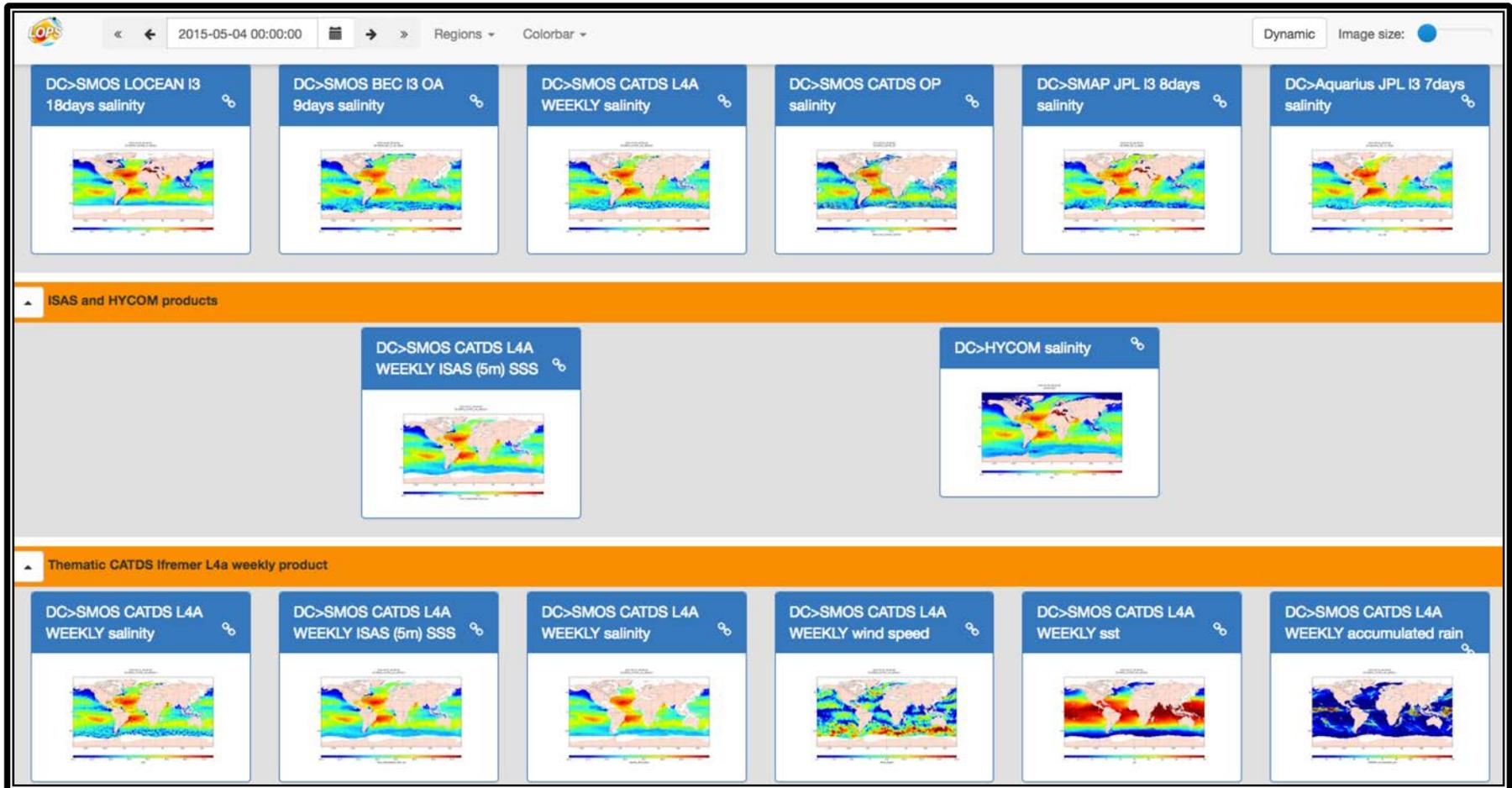
Download

Numerical tables
 Collocations map
 STD map of ΔSSS
 Time series of ΔSSS
 Scatterplot
 Histogram



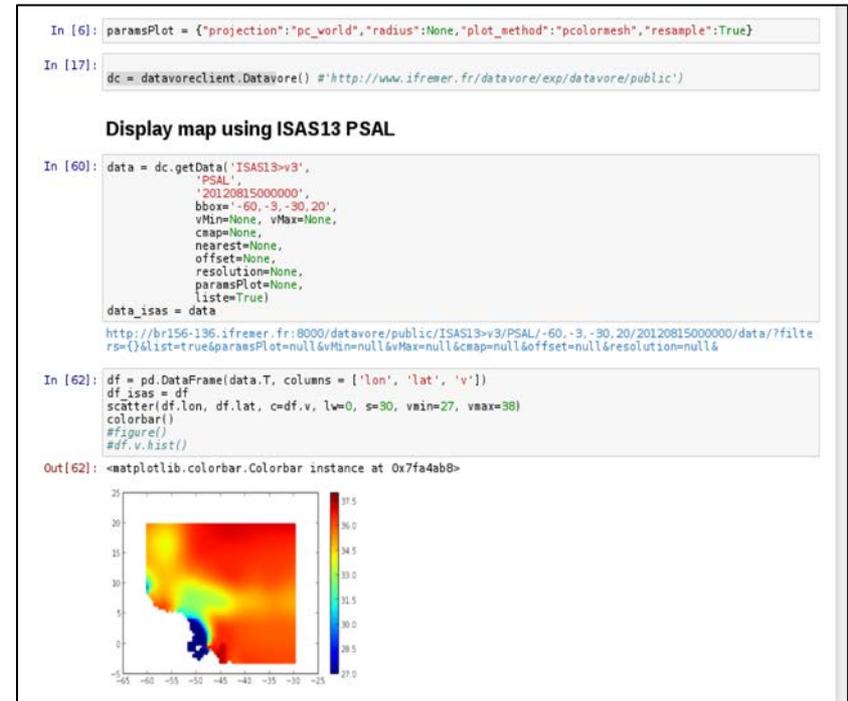
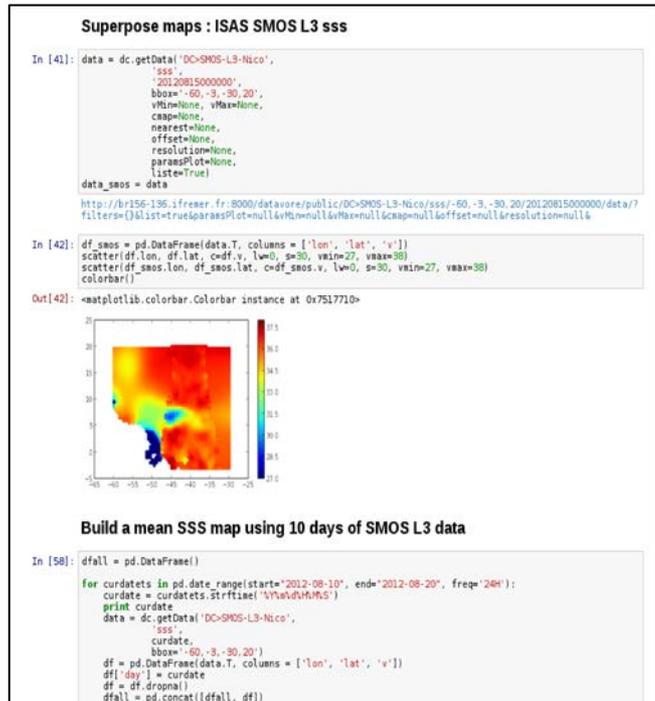
MERGINATOR

- Explore spatial patterns of numerous datasets at a glance

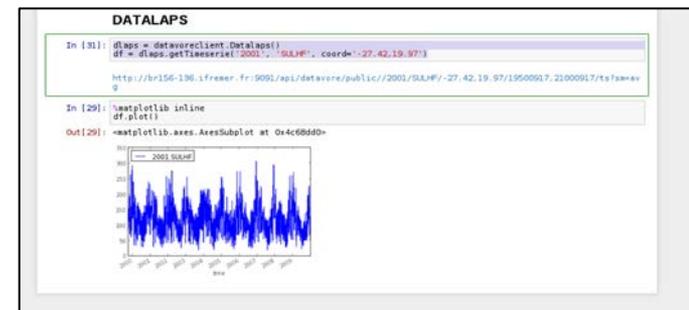


Jupyter

Interactive analysis of data on a distant server via a web browser



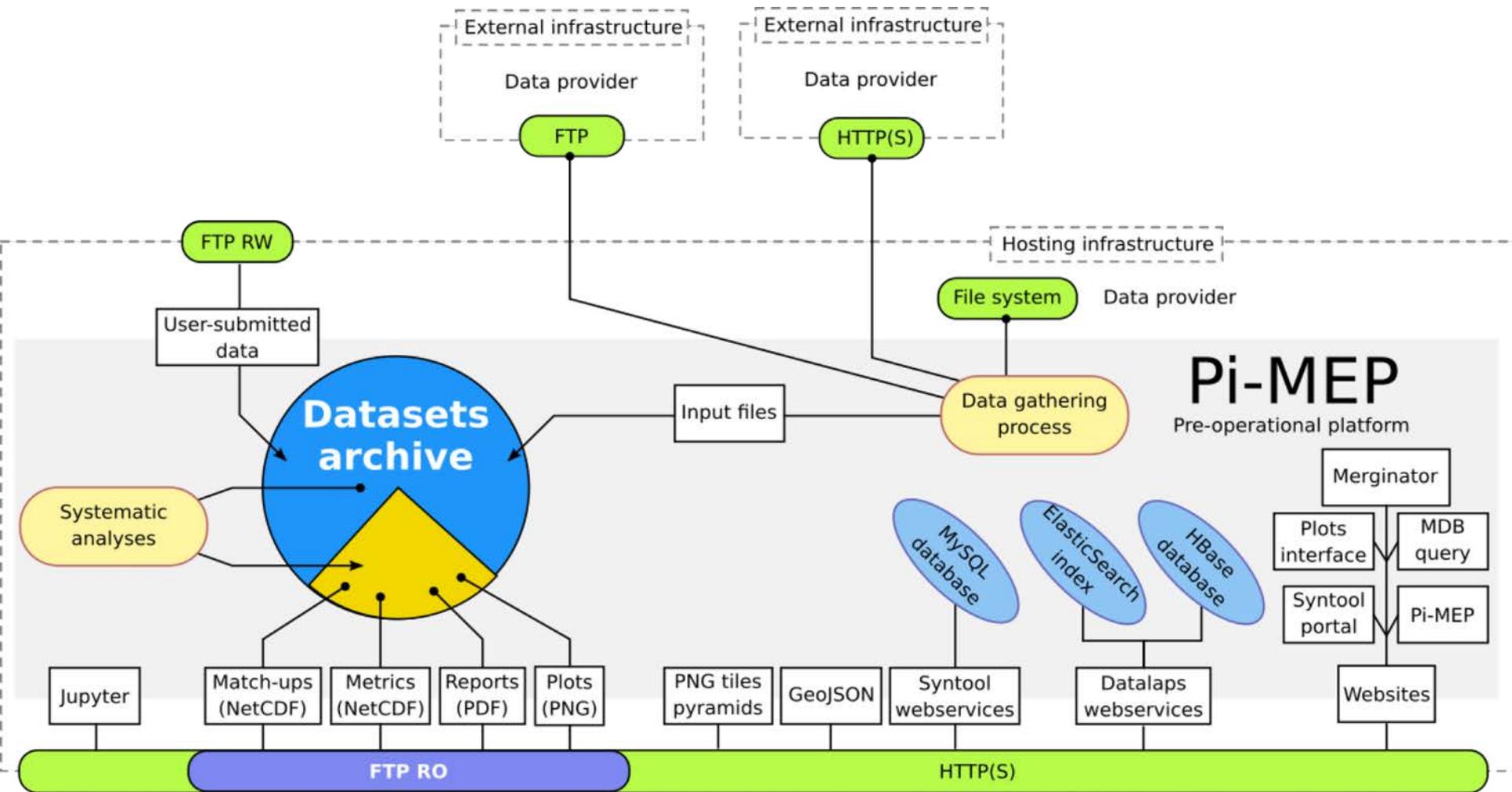
- Python console in a webpage
- Code executed on the platform (direct access to data)
- Results displayed in the web browser
- Python environment pre-installed
- Authenticated/Trusted users only



Summary

- DEMO this evening during the POSTER session
- MAY 2019, ESA Living planet symposium
=>Pi-MEP operational phase

Pi-MEP Platform architecture



Work in progress

Home Overview **Data** Reports Case Studies About

MDB Temporal Spectrum

Work in progress

Using Moorings data

Home Overview **Data** Reports Case Studies About

MDB Spatial Spectrum

Work in progress

Using TSG data in predefined areas

Satellite inter-comparisons reports/metrics

Home Overview **Data** Reports Case Studies About

- Input
- MDB
- MDB Analysis
- MDB Temporal Spectrum
- MDB Spatial Spectrum

The platform systematically co-localizes all Level 2 to Level 4 satellite and associated data centers with the various pre-processed (QC-controlled) in situ datasets.

For a given satellite/in situ SSS product pair, the results of the co-localization are stored in the so-called match-up DataBase (MDB) files provided in netcdf format to the users. MDB data consist of satellite and in-situ SSS pair datasets but also of auxiliary geophysical parameters such as local and history of wind speed and rain rates, as well as various information (climatology, distance to coast, mixed layer depth, barrier layer thickness, etc) that can be derived from in situ data and which are included in the final match-up files.

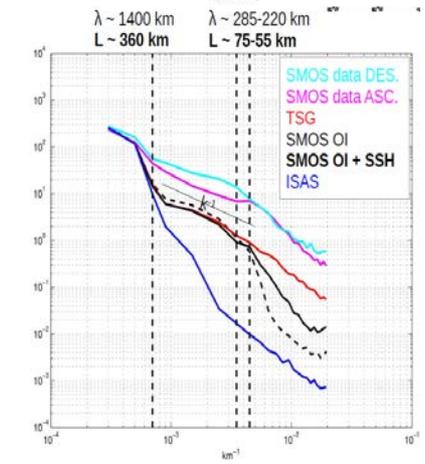
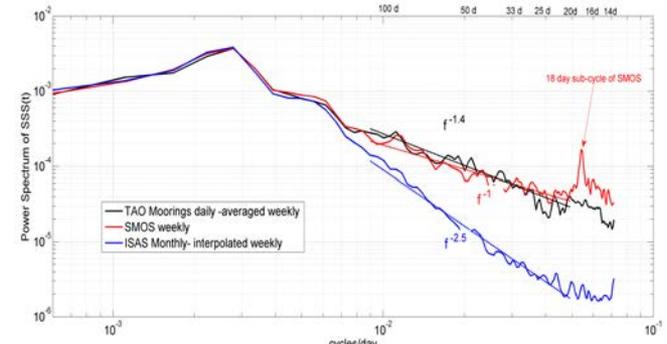
MDB files are generated for each available satellite SSS product files and all available in situ data for the duration of each satellite product.

The granularity of the MDB files follows the one of the input satellite data product files.

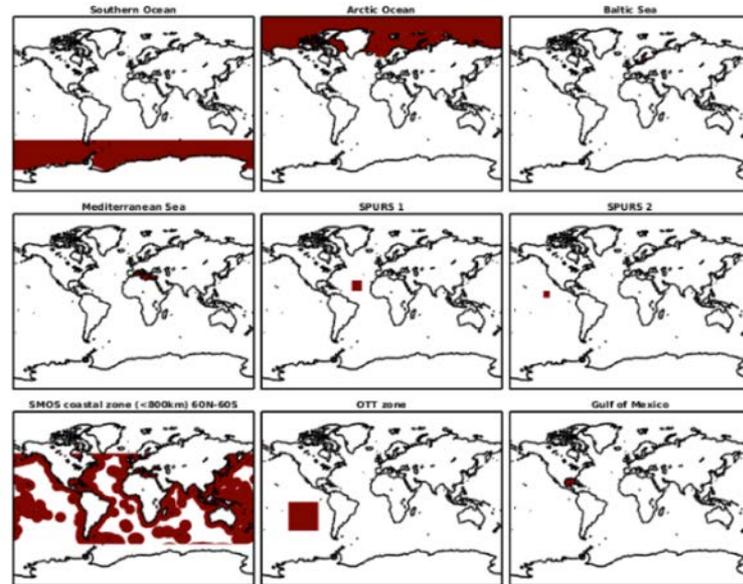
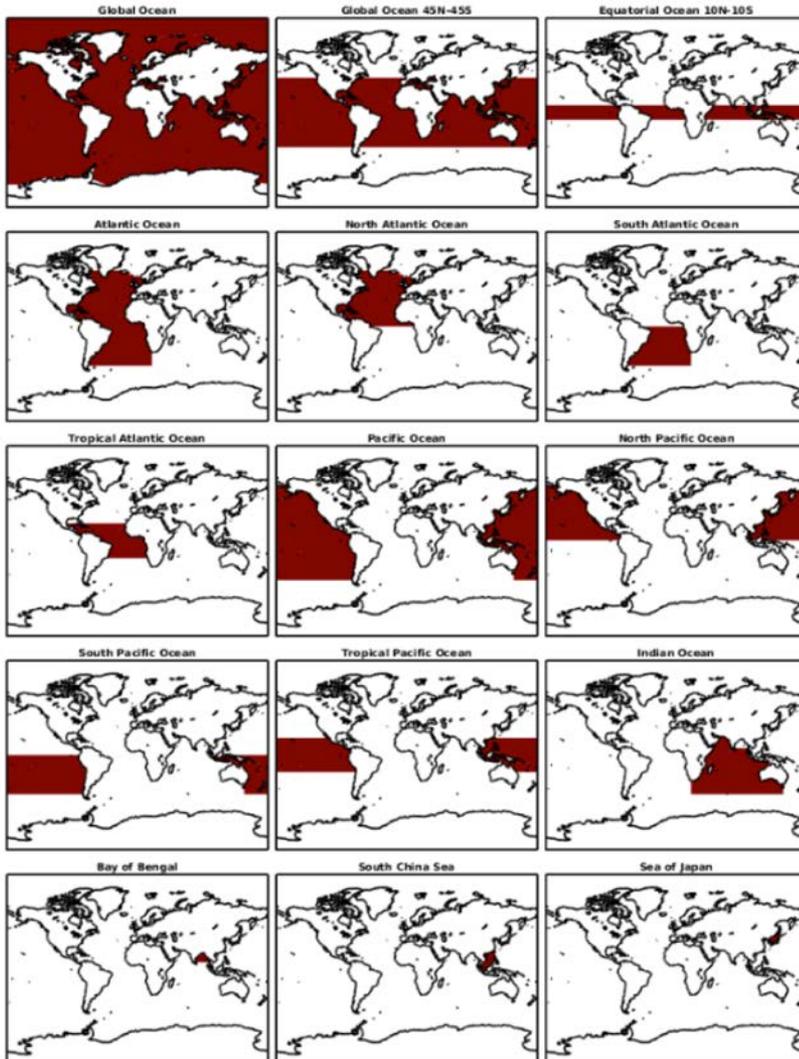
The content of the netcdf files, the in situ QC filtering and the co-localisation methods are described in details in the Match-Up analyses reports available [here](#). MDB files can be accessed using either an HTTP or FTP client using the heretofore menu:

Satellite: any In-situ: any

Satellite	In-situ	
SMOS SSS L2 v662 (ESA)	TSG (GOSUD-NRT)	FTP/HTTP
SMOS SSS L2 v662 (ESA)	TSG (GOSUD-Sailing ships)	FTP/HTTP
SMOS SSS L2 v662 (ESA)	TSG (GOSUD-research vessels)	FTP/HTTP
SMOS SSS L2 v662 (ESA)	TSG (LEGOS-DM)	FTP/HTTP



24 regions



Maps of the 24 Pi-MEP Validation regions shown in red.

+ 6 case study regions
+ user-defined regions