Meridional variability of SSS in the North Atlantic Ocean from satellite and in-situ data

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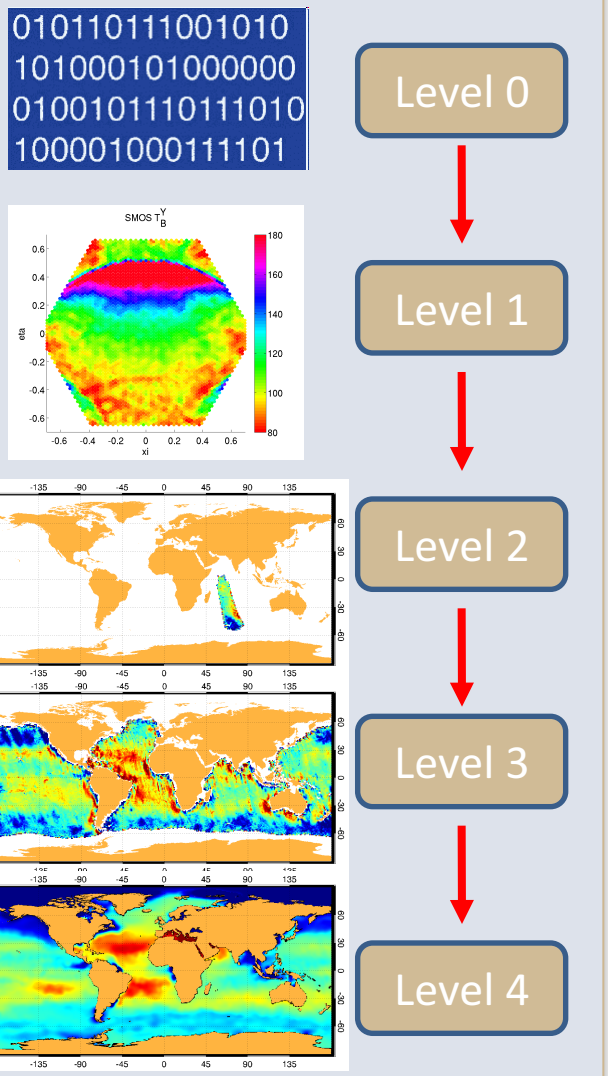
Motivation

• To compare the ability of various data sets (a numerical simulation, climatology fields, and various satellite retrievals) to match the meridional structure observed in the *in-situ* data in the North Atlantic Ocean.

• To compare the meridional spectral response of the various data sets to infer information about their relative *effective resolution*.

• Assess the similarities of the **Power Density Structure** (PDS) of the meridional SSS and SST modulation in the region.

Data



- SMOS LEVEL 3 (Binned maps) SSS monthly product at 0.25 degree resolution.

- SMOS Optimally Interpolated (OI) SSS monthly product at 0.25 degree resolution. The method uses WOA09 climatology as a background, and spatially varying decorrelation scales.

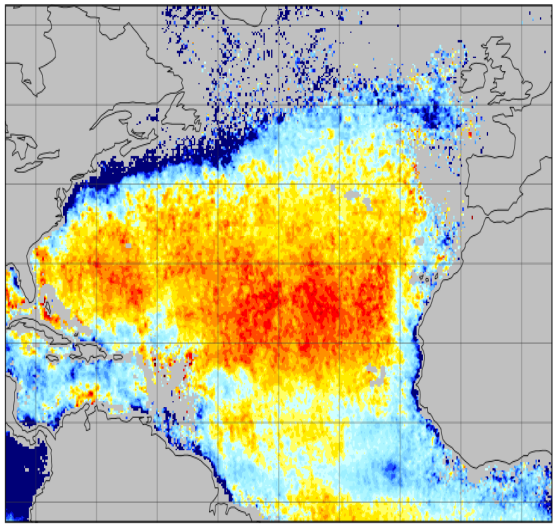
- SMOS LEVEL 4 (Data fusion with OSTIA SST) SSS monthly product at 0.25 degree resolution. The method uses OSTIA SST field as a template to improve the singularity structure of Binned maps.

- AQUARIUS LEVEL 3 (v.2.7) 1 degree resolution monthly averaged.

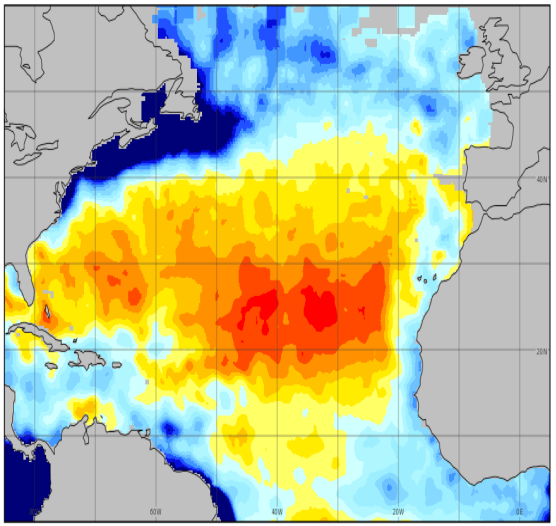
- DRAKKAR NATL025 numerical quarter degree numerical simulation.

- WOA09 SSS and SST 1 degree climatology fields.

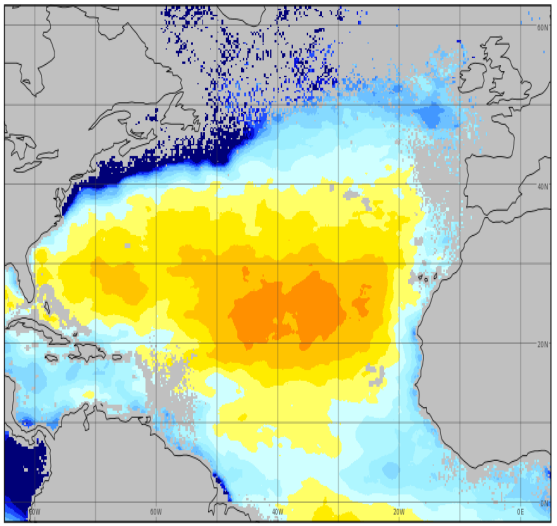
SMOS binned



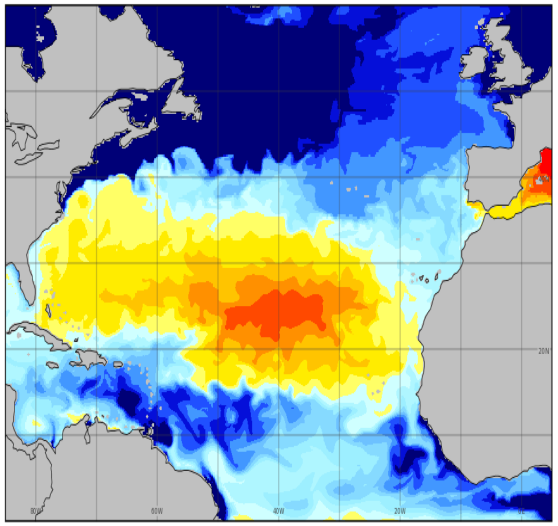
SMOS OI



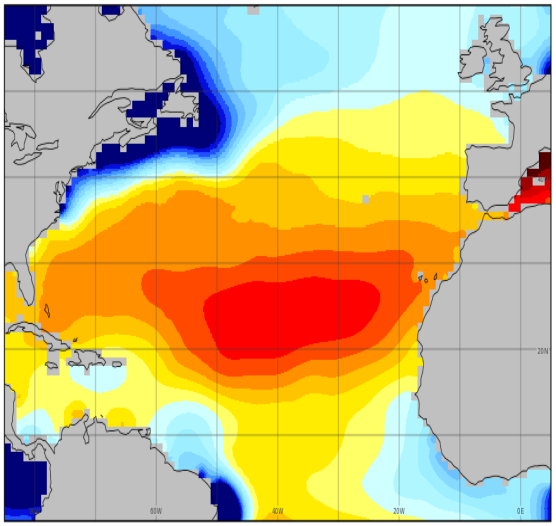
SMOS L4



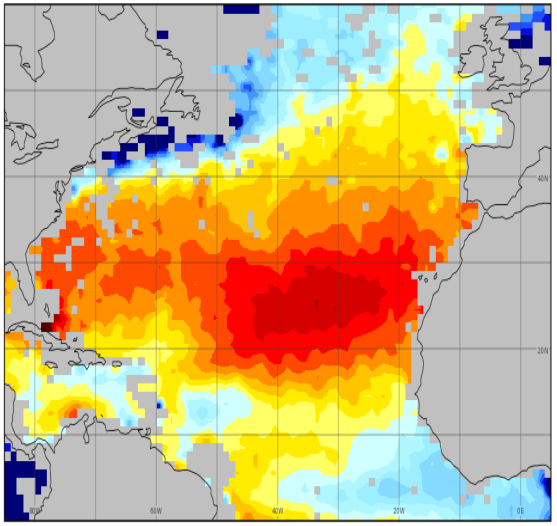
NATL05

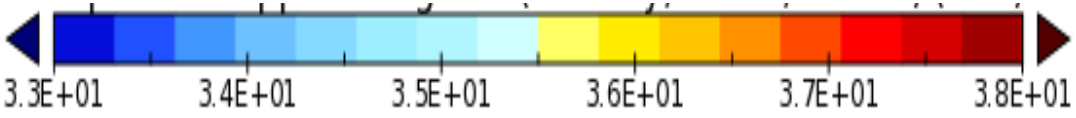


WOA09

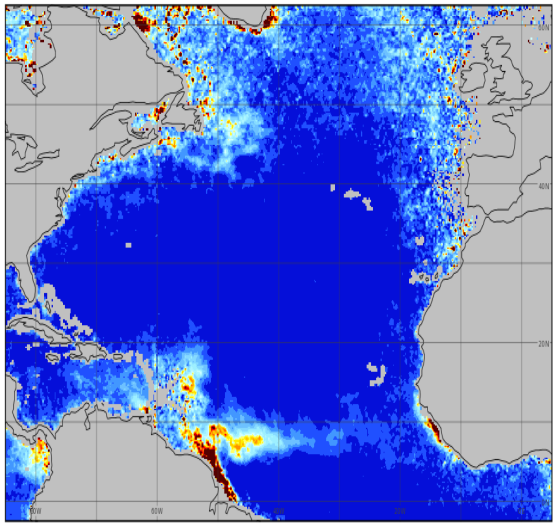


AQUARIUS

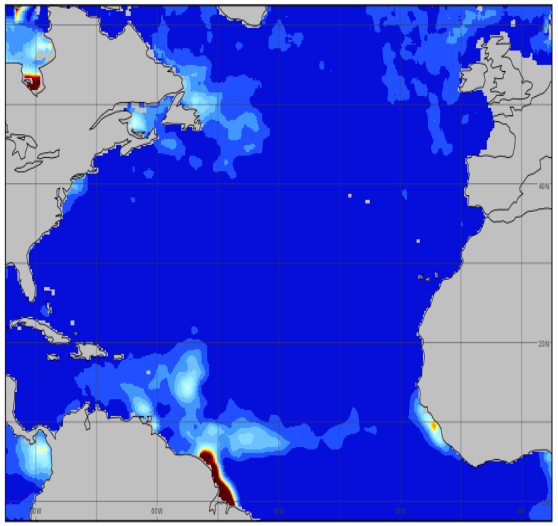




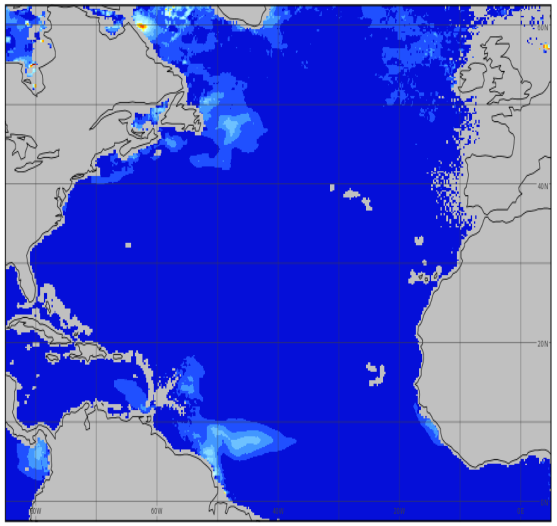
SMOS binned



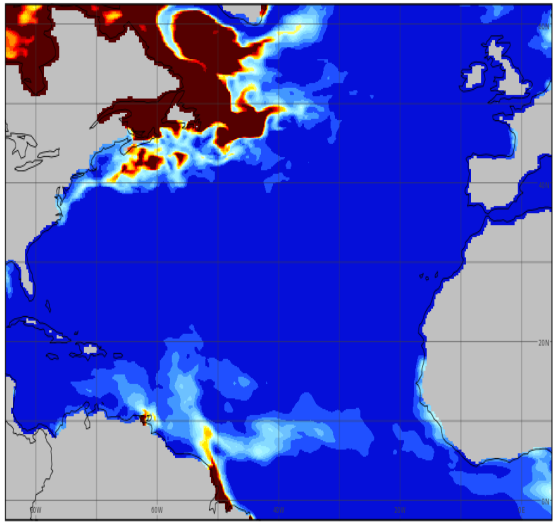
SMOS OI



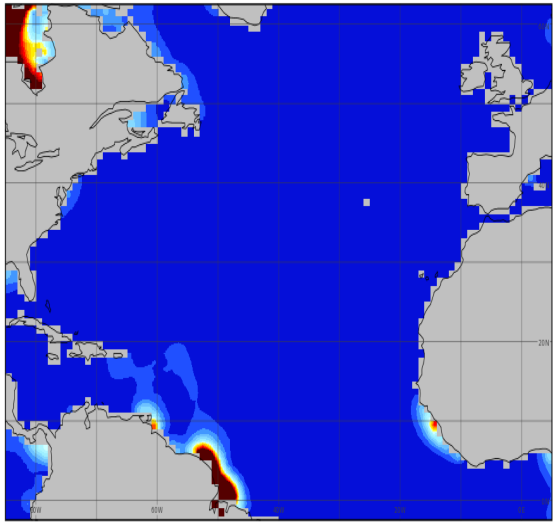
SMOS L4



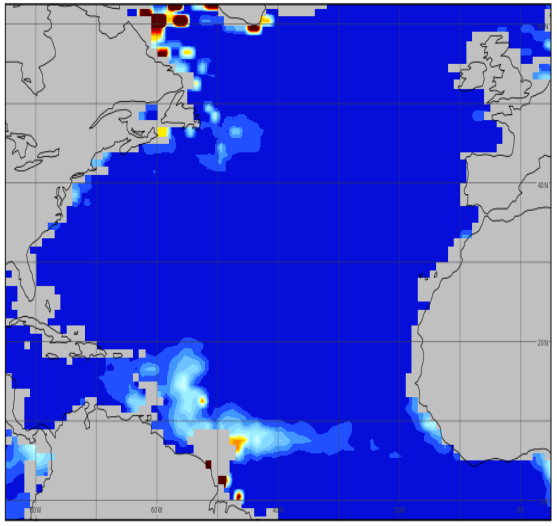
NATL05

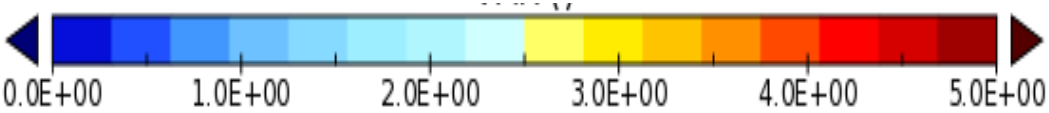


WOA09



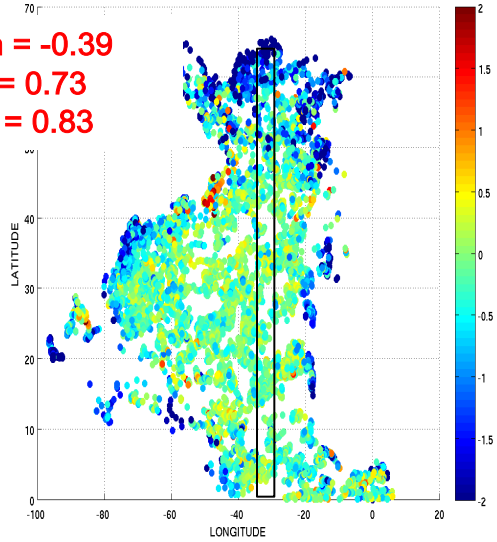
AQUARIUS





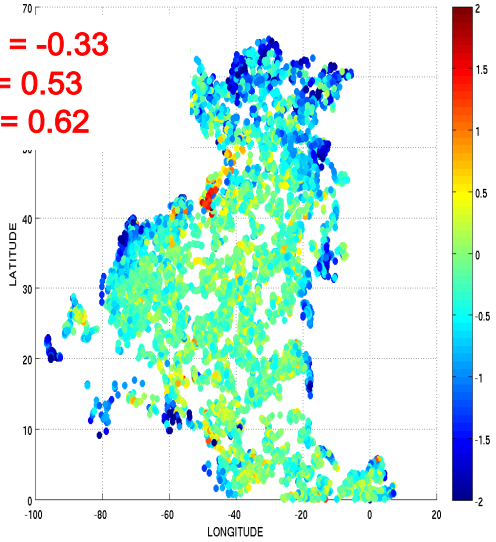
SMOS binned

Mean = -0.39
STD = 0.73
RMS = 0.83



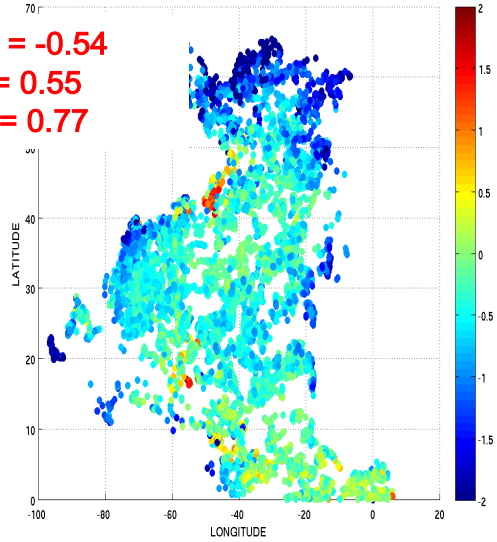
SMOS OI

Mean = -0.33
STD = 0.53
RMS = 0.62



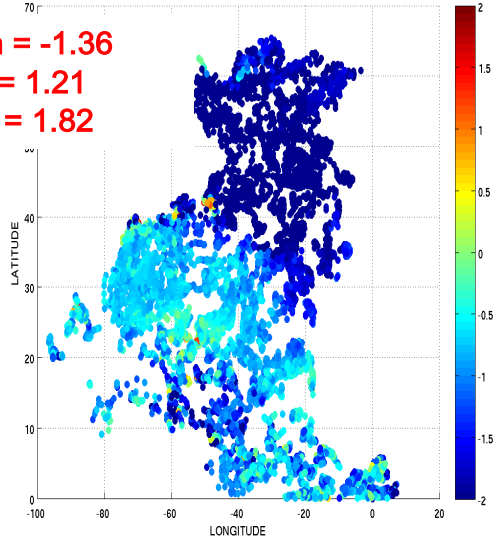
SMOS L4

Mean = -0.54
STD = 0.55
RMS = 0.77



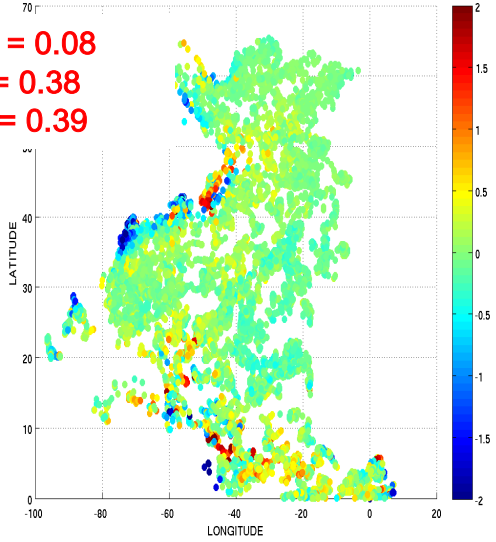
NATL05

Mean = -1.36
STD = 1.21
RMS = 1.82



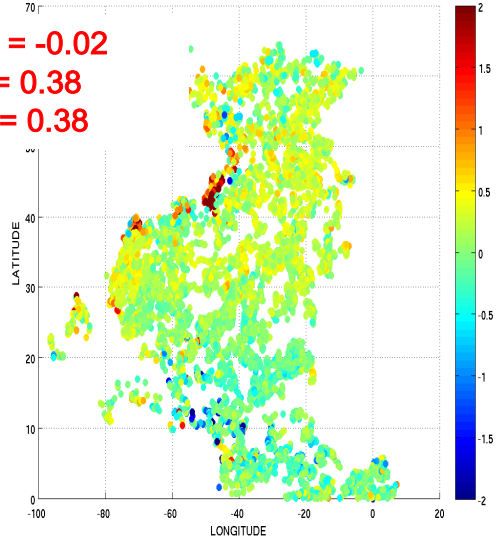
WOA09

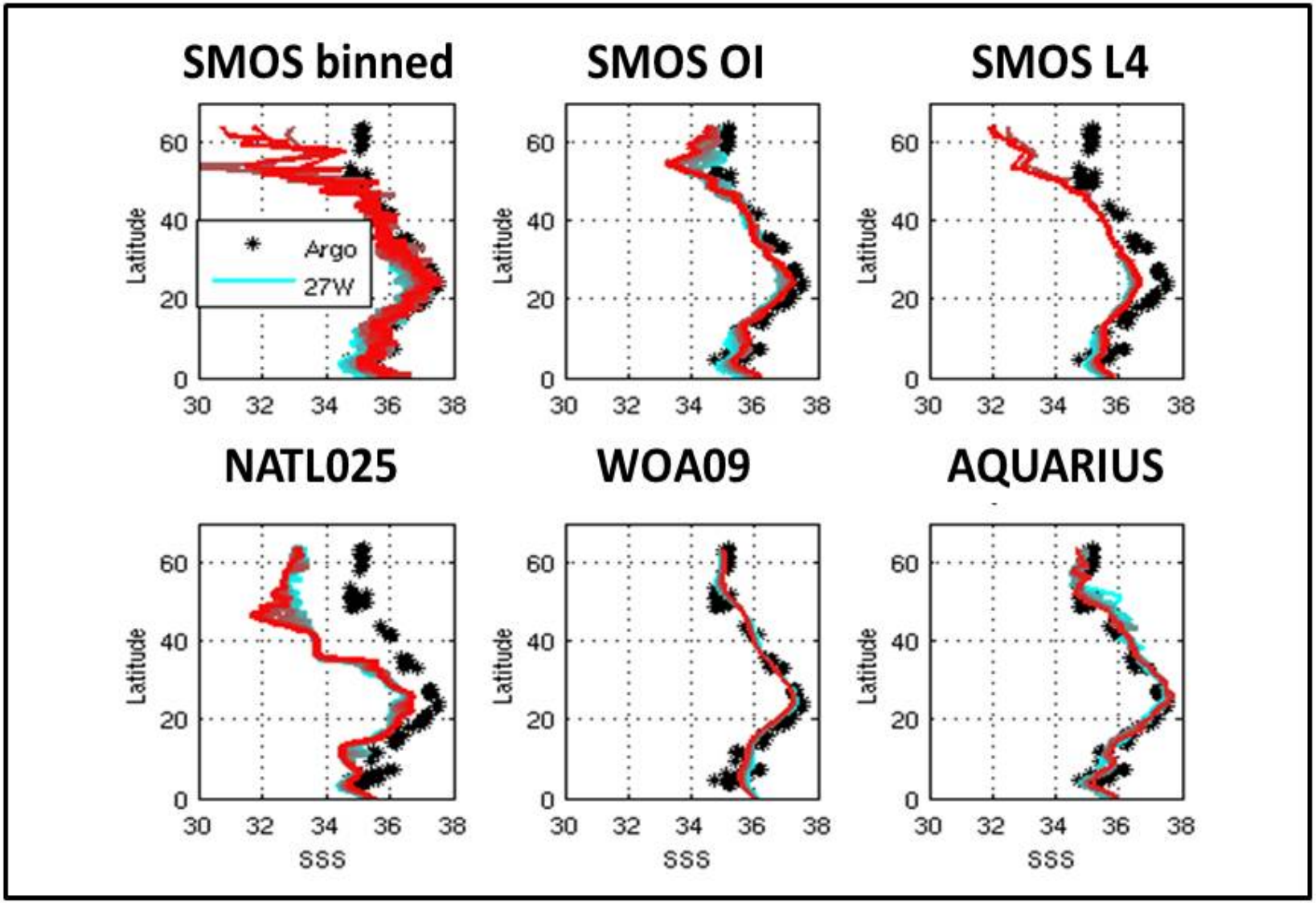
Mean = 0.08
STD = 0.38
RMS = 0.39



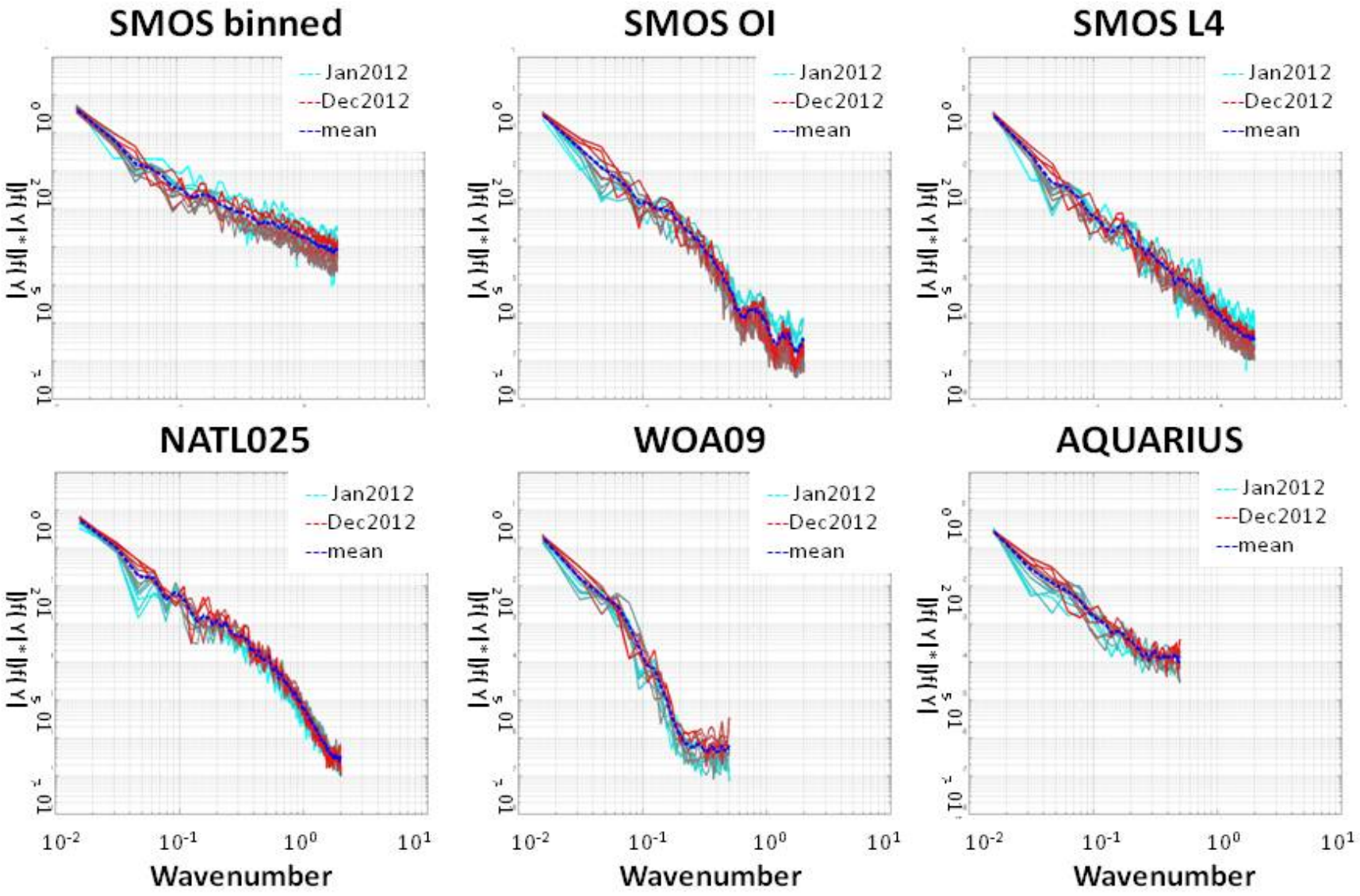
AQUARIUS

Mean = -0.02
STD = 0.38
RMS = 0.38

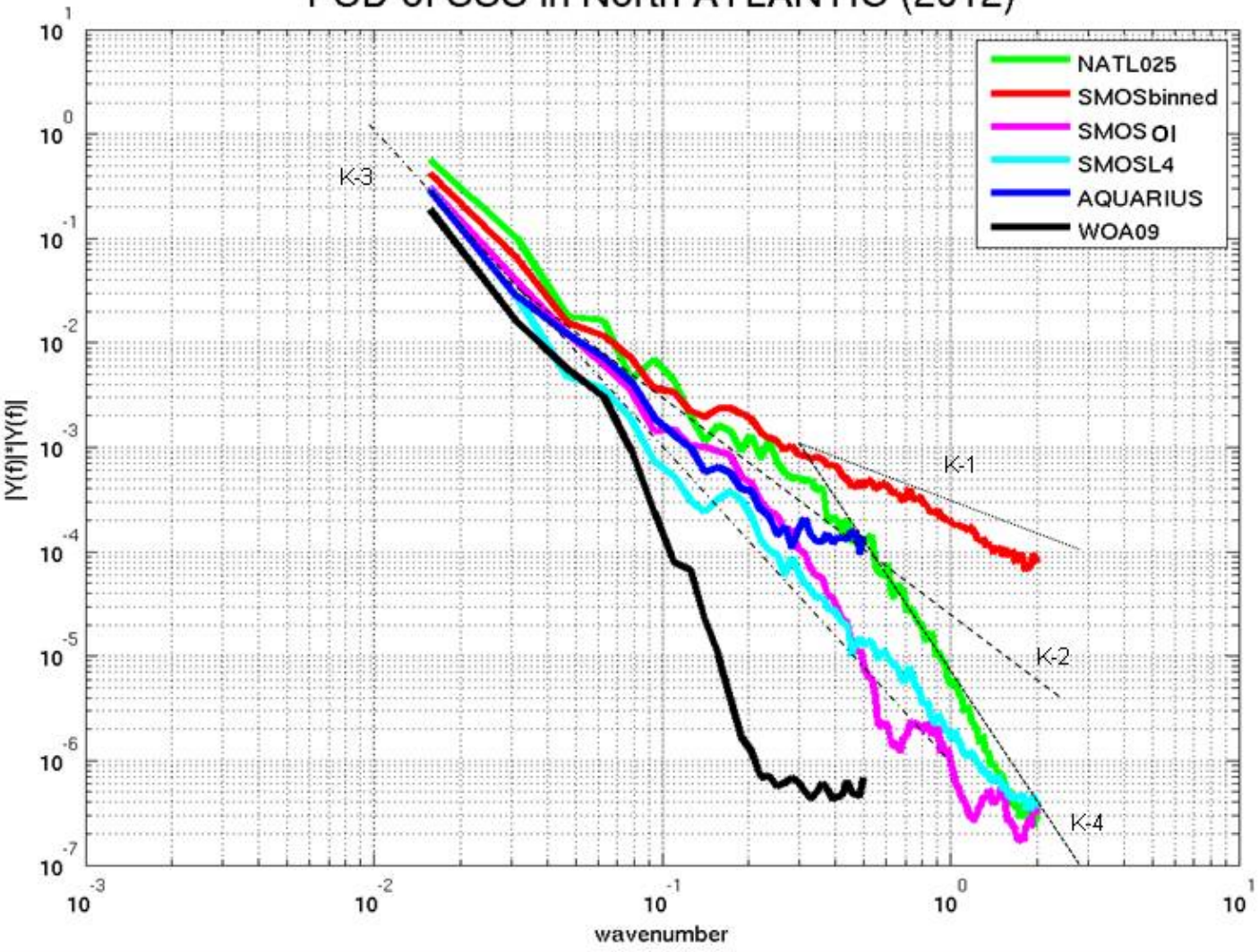




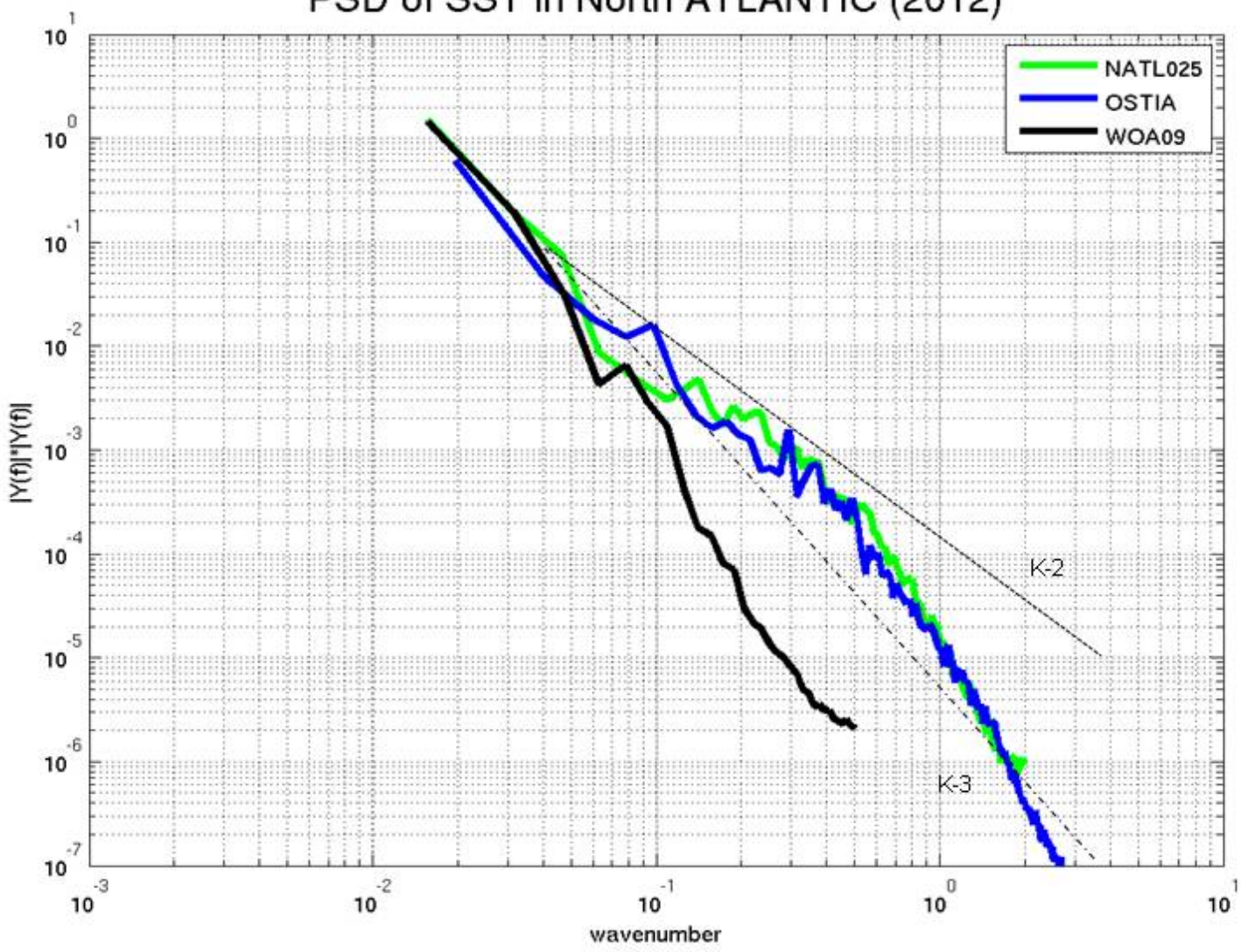
Example of 1D meridional tracks from the 6 products of SSS for January 2012. The tracks are North-South from 0 to 65N, between 27W and 33W. Argo salinity values at 7.5 meter depth are also plotted.



PSDs of 1D meridional tracks for the monthly SSS products in 2012. Top plots: SMOS binned (left), L3 OI (mid) and L4 (right). Bottom plots: NATL025 (left), WOA 2009 (mid) and Aquarius (right). The dash blue line corresponds to the mean over 2012.



Mean PSD of the 1D meridional monthly tracks for 2012.



Mean SST PSD of OSTIA, NATL025 and WOA 2009 in 2012.

Summary and conclusions

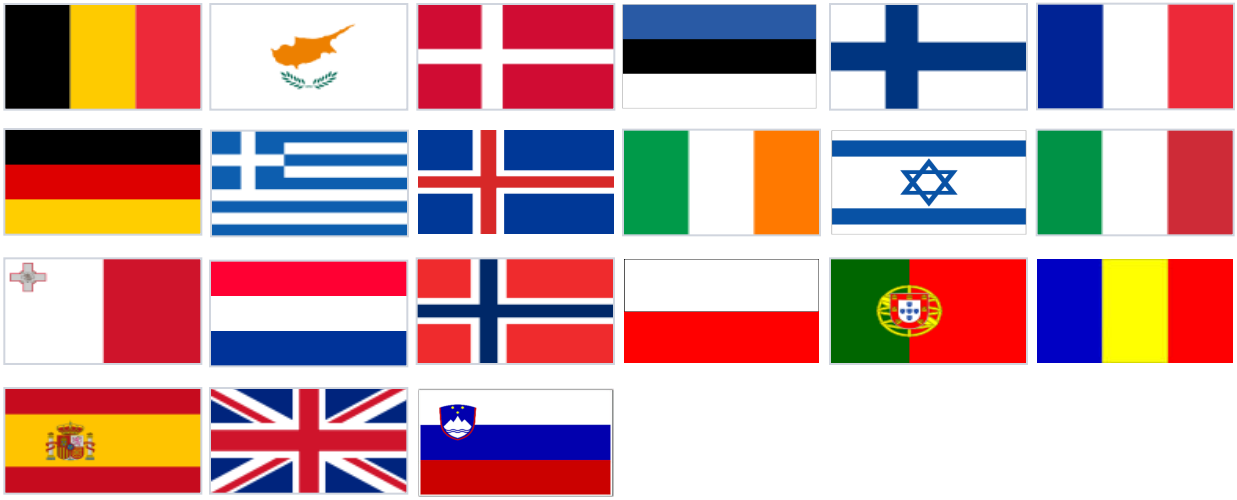
- The spectral analysis shows that all six products share a **similar slope** of about -3 a the largest scales, but they strongly differ at short scales.
- Aquarius L3 has a **noise floor** below 300 km.
- SMOS products show a consistent -3 slope, except for the L3 BINNED product which shows an **increased noise variance below 700 km**.
- WOA 09 climatology data display a **strong variance decay** below 1500 km sales.
- Although NATL025 simulation has the worst comparison against in-situ data, it has a large-scale slope of -3 and of -4 below 250 km scales.
- NATL025 SSS and SST and OSTIA SSS have similar spectral decay. Large source of uncertainties in resolving salinity still remains.
- Further spectral analysis for different regions (zonal) and temporal domains.

SMOS-Mission Oceanographic Data Exploitation

SMOS-MODE

www.smos-mode.eu
info@smos-mode.eu

SMOS-MODE supports the **network** of SMOS ocean-related R&D



Final event: **2nd SMOS Science Workshop** (Madrid, May 2015)

Thank you