UK Met Office: planned use of satellite salinity

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Contents

This presentation covers the following areas

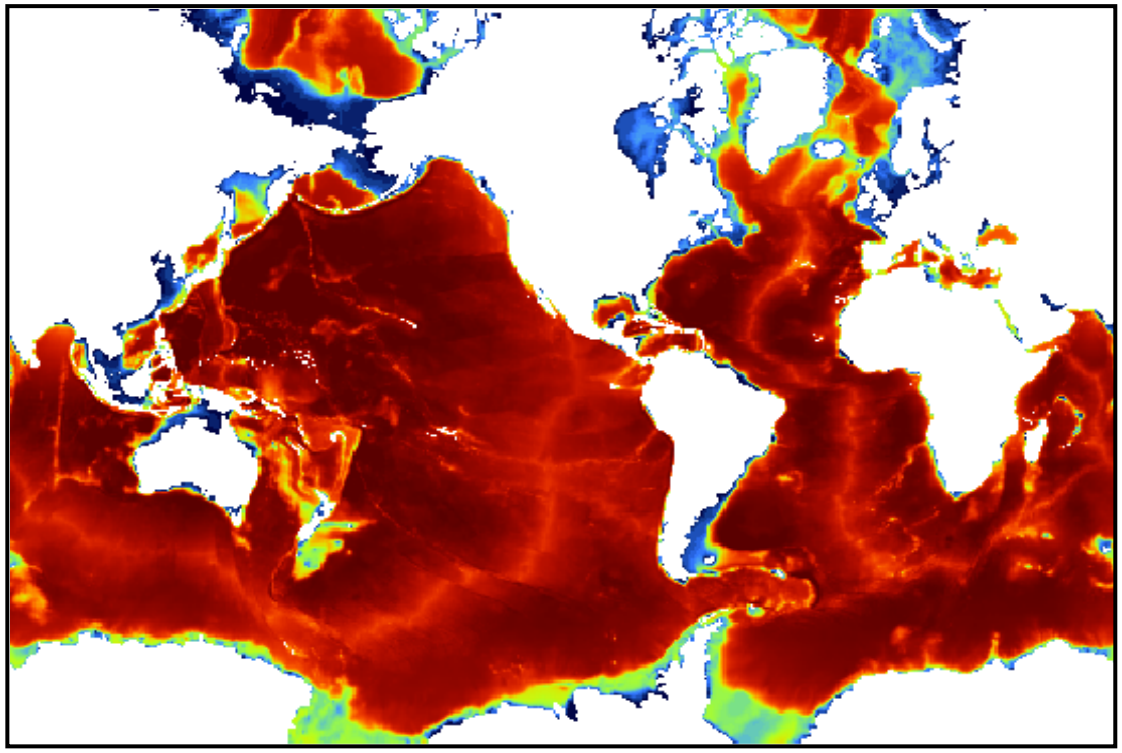
- Introduction to Met Office FOAM ocean forecasting system
- Path towards assimilation of satellite salinity data
- Initial comparisons with global FOAM model

Met Office

FOAM : Forecast Ocean Assimilation Model

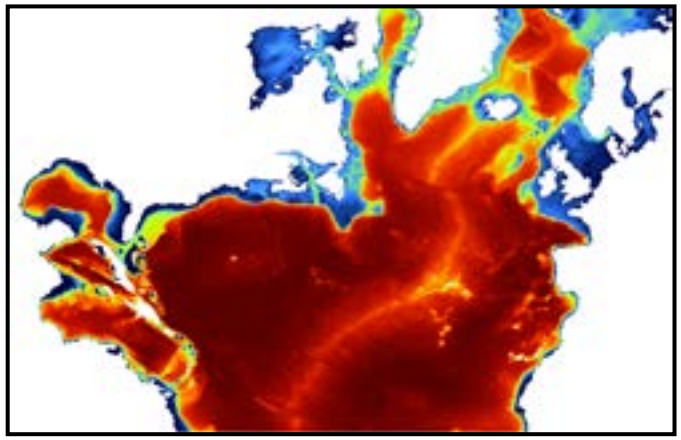
A brief introduction

FOAM Deep Ocean Configurations

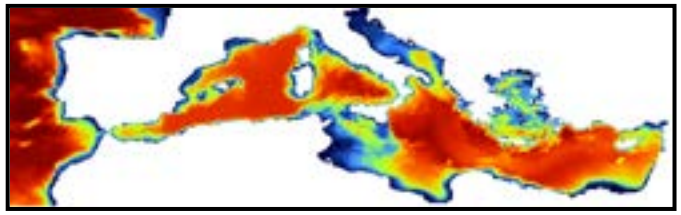


1/4˚ Global (**orca025**)

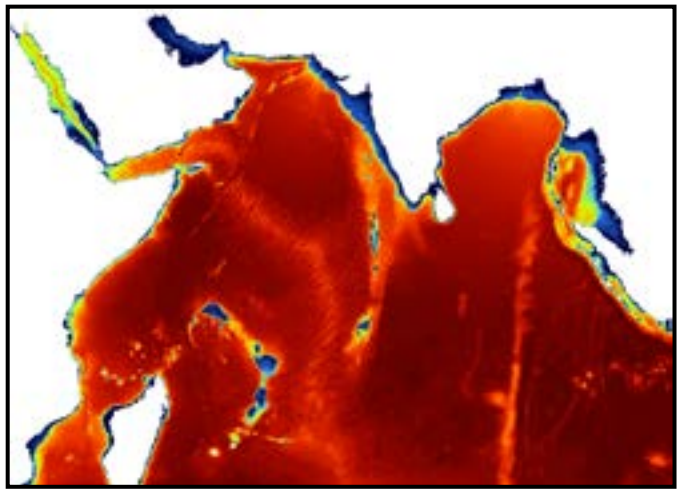
Provides lateral boundary conditions for the regional models



1/12˚ North Atlantic

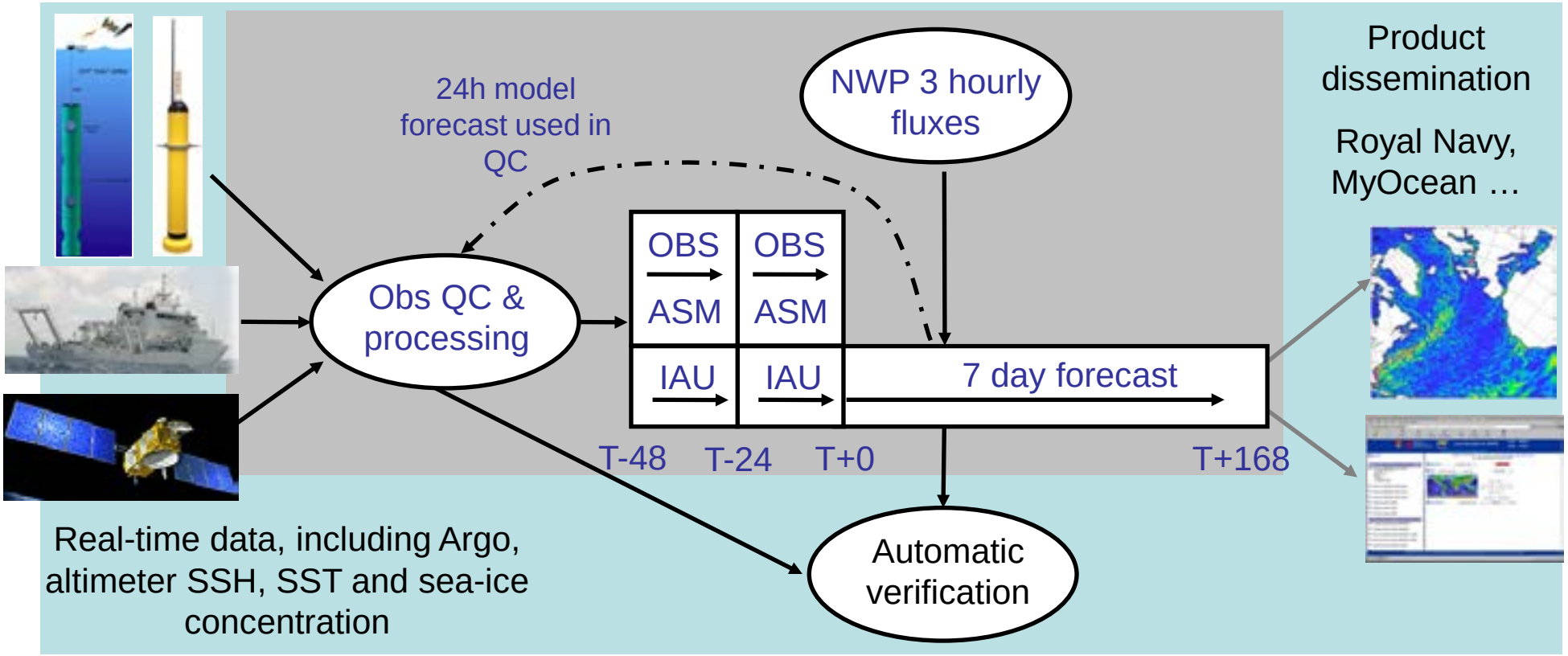


1/12˚ Mediterranean



1/12˚ Indian Ocean

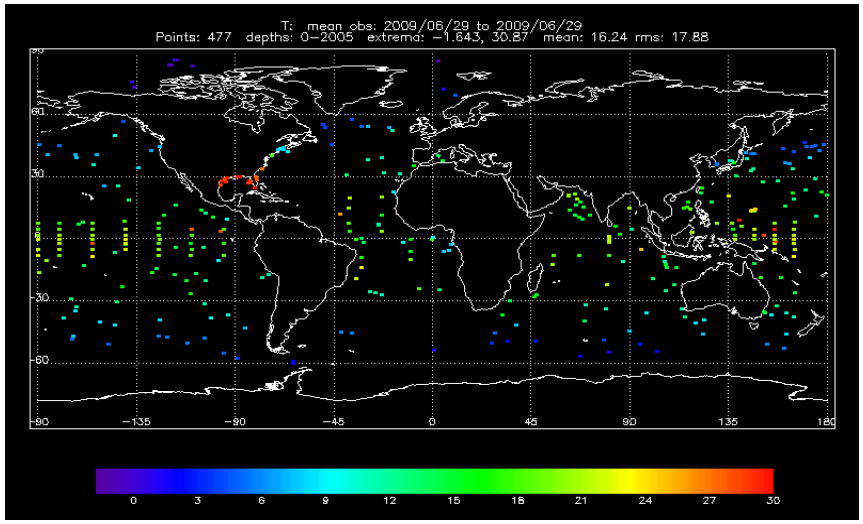
FOAM System overview



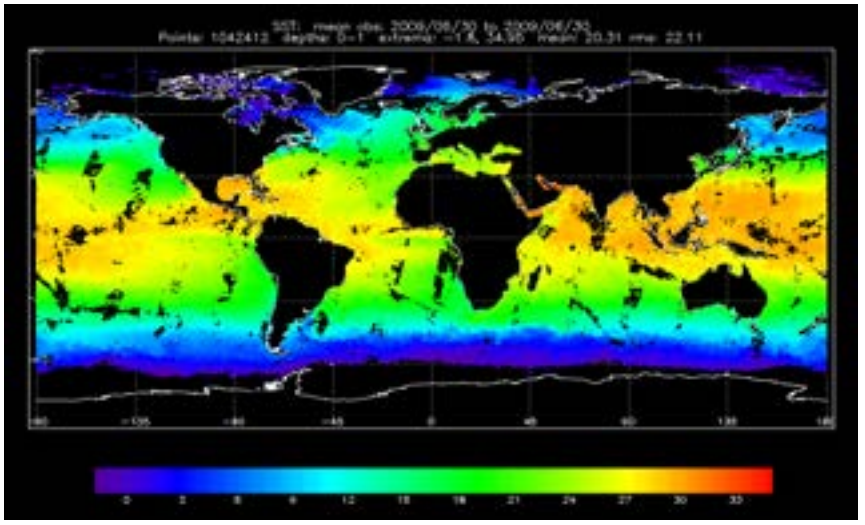
- 48-hour observation window allows us to include much more data into the FOAM system

FOAM Data assimilation

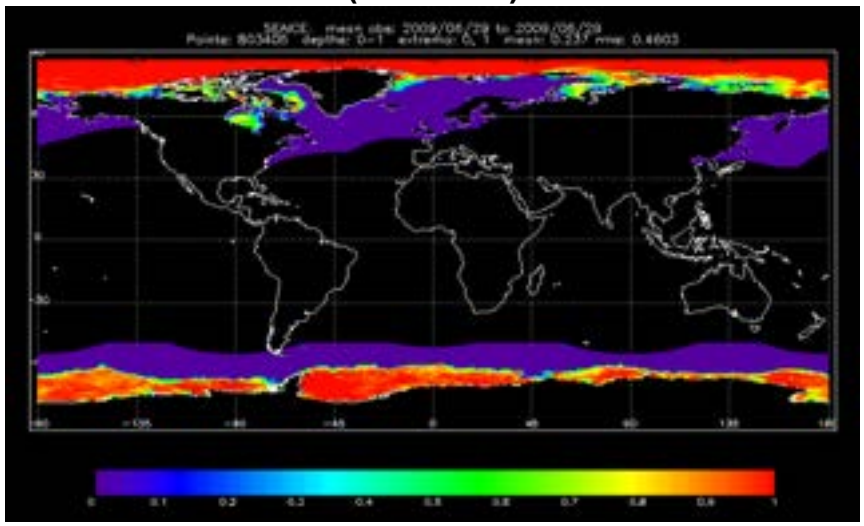
Temperature and salinity profiles
(Argo floats, XBTs, CDTs, buoys,…)



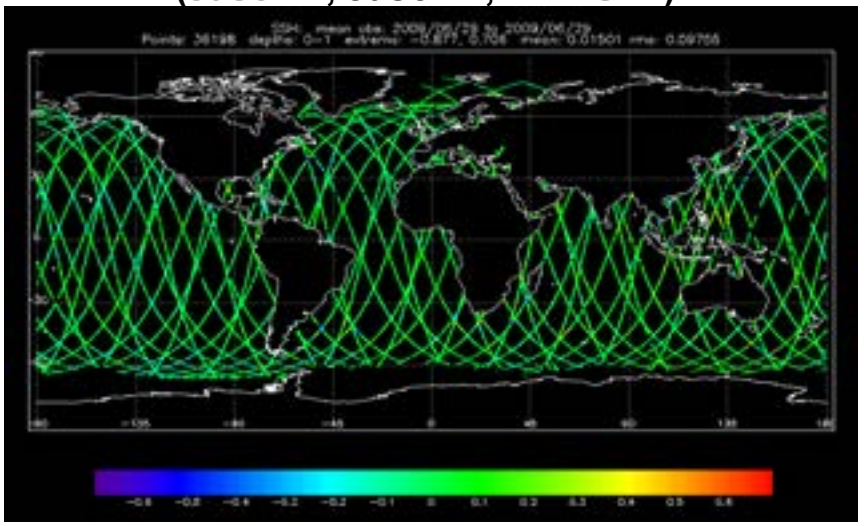
Satellite and in-situ SST
(AATSR, AVHRR, AMSRE, METOP)



Sea-ice concentration
(OSI-SAF)



Satellite Altimeter SSH
(Jason 1, Jason 2, ENVISAT)



Outline plans

Path towards assimilation of satellite salinity data

1. Routine model-observation comparisons to build an understanding of typical differences
    - Initially with L3 data for convenience
    - Ideal L3 dataset would be a 1-day mean – global coverage not a priority (c.f. AATSR L3 SST data from Ifremer)
2. Output operational obs-background match-ups with L2 data
    - More precise understanding of differences against model at the precise time of observation (incl. triple collocation)
    - Allows calculation of error covariances for data assimilation
3. Assimilation trials
4. Operational implementation

Requirements for data assimilation of L2 data (in order of priority)

1. Timeliness
   - Ideally receive data within 6 hours of validity time
   - Longer delays result in lower impact on model
2. Error estimates
   - Ideally an error estimate for every data point delivered
3. Low bias
   - Biased observations are more challenging to assimilate
4. Accuracy
   - With ~1 PSU errors, SMOS data would have some impact
   - Impact of data scales as ~1/error (for large errors)

Met Office

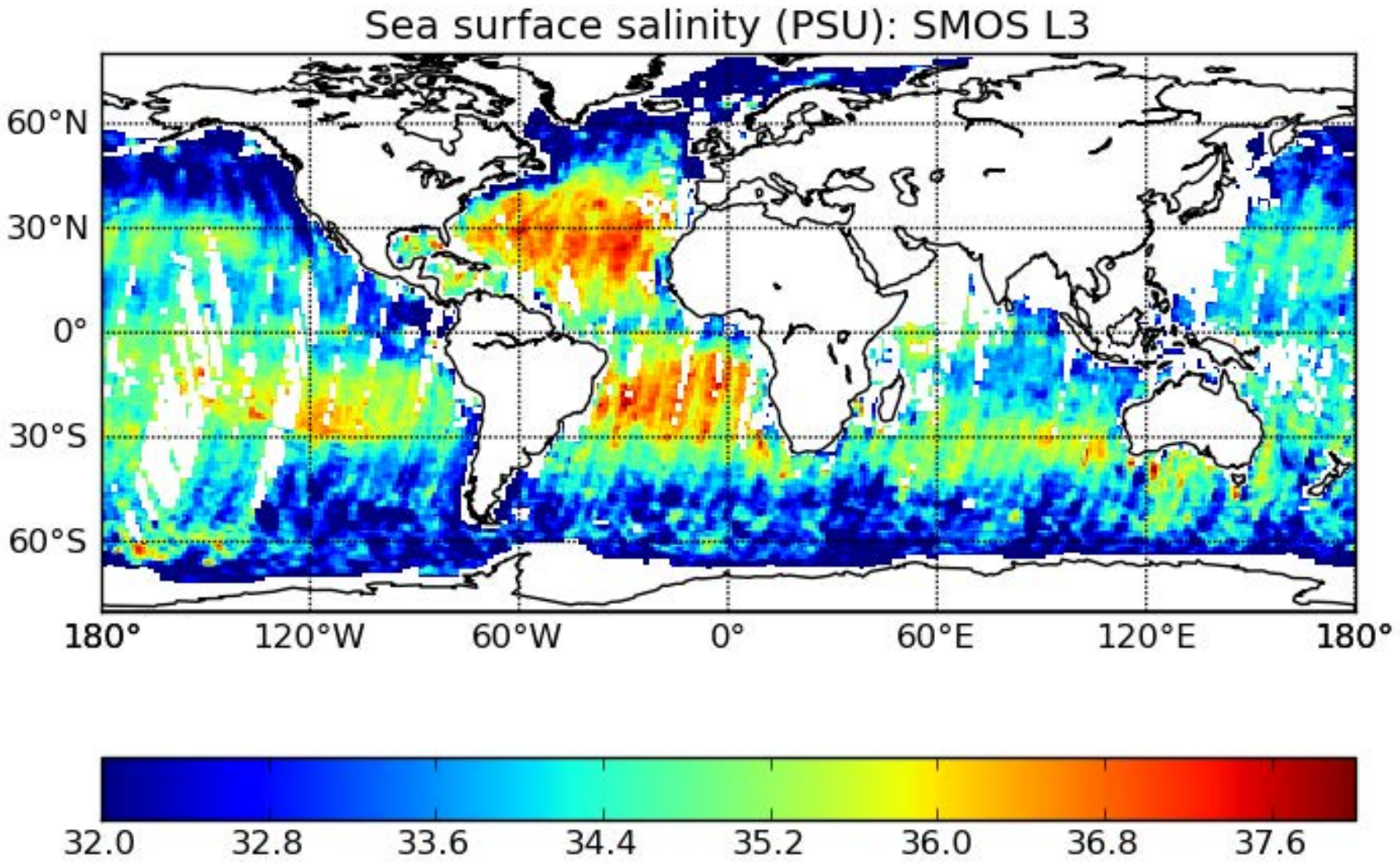
First results

SMOS – FOAM comparisons

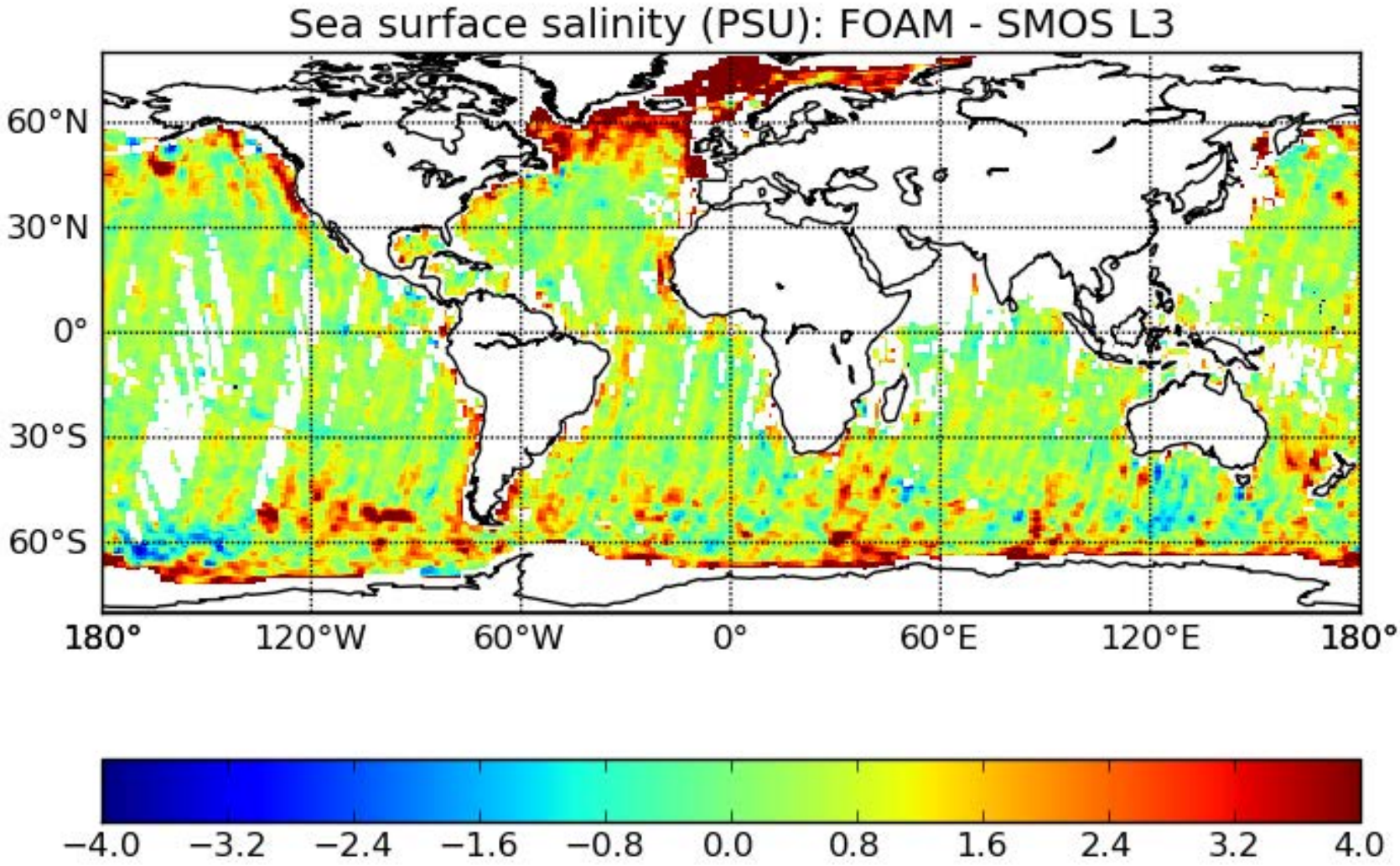
- SMOS L3 data from CP34 (L3OS1b):
  - 3-day mean
  - 1 degree grid
  - June 2011 – April 2012 (9 months)
- FOAM global ¼° model data from operational analyses
  - 3-day mean
  - interpolated to ½° lat-long grid

Example L3 SMOS data 9-12 April 2012

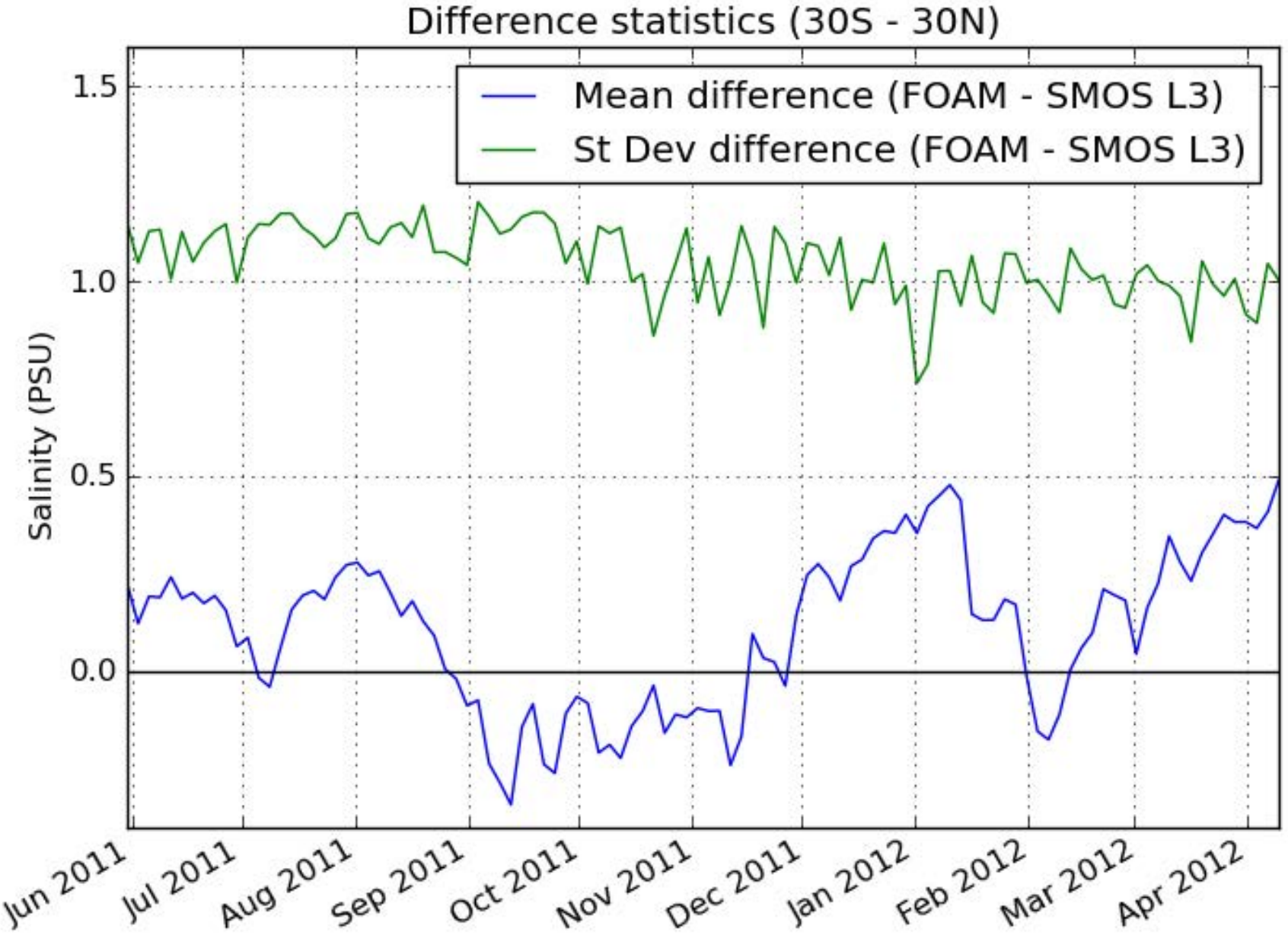
- Systematic cross-swath differences
- A known feature of the L2 data



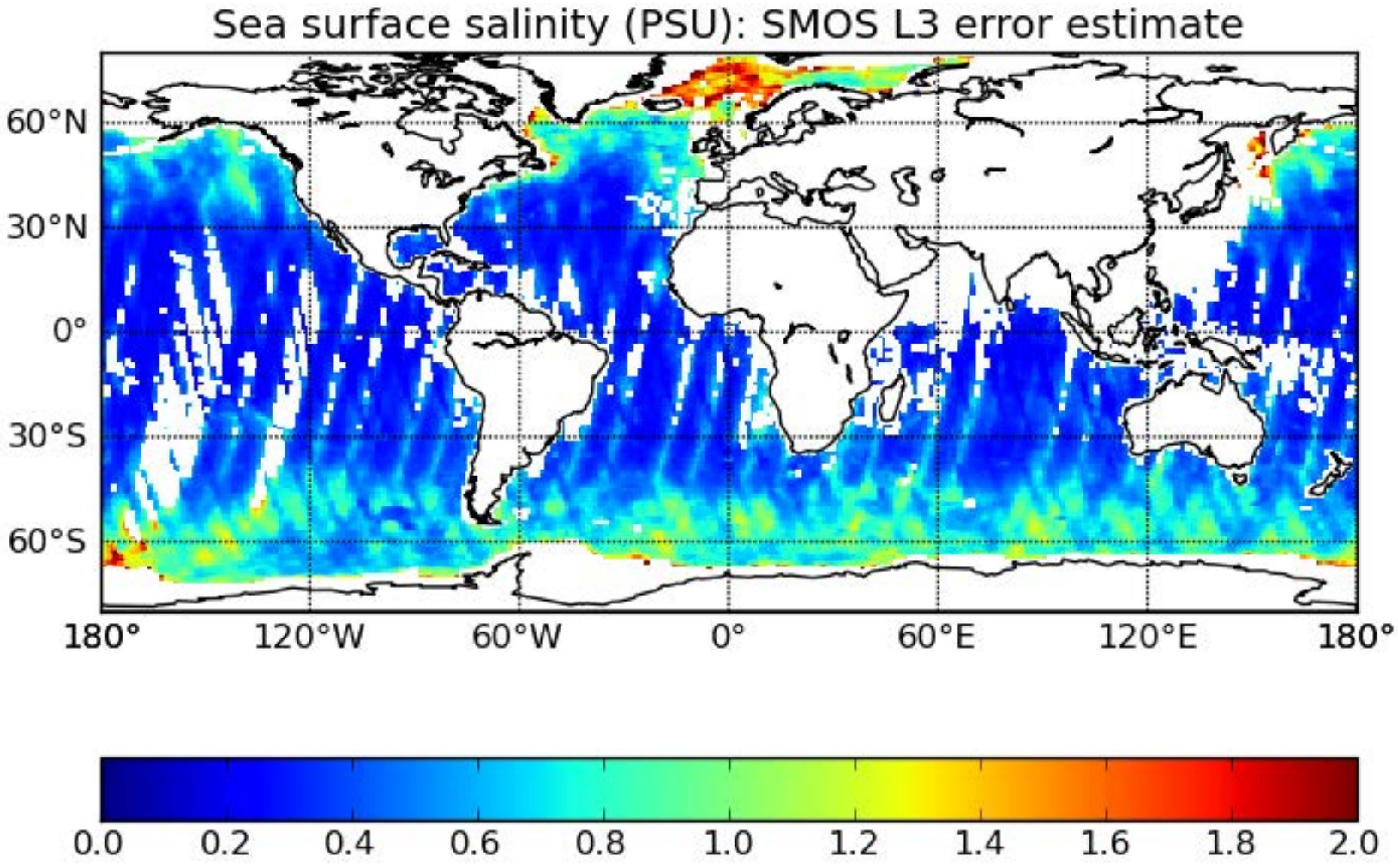
FOAM-SMOS difference
9-12 April 2012



Difference statistics (tropics only)

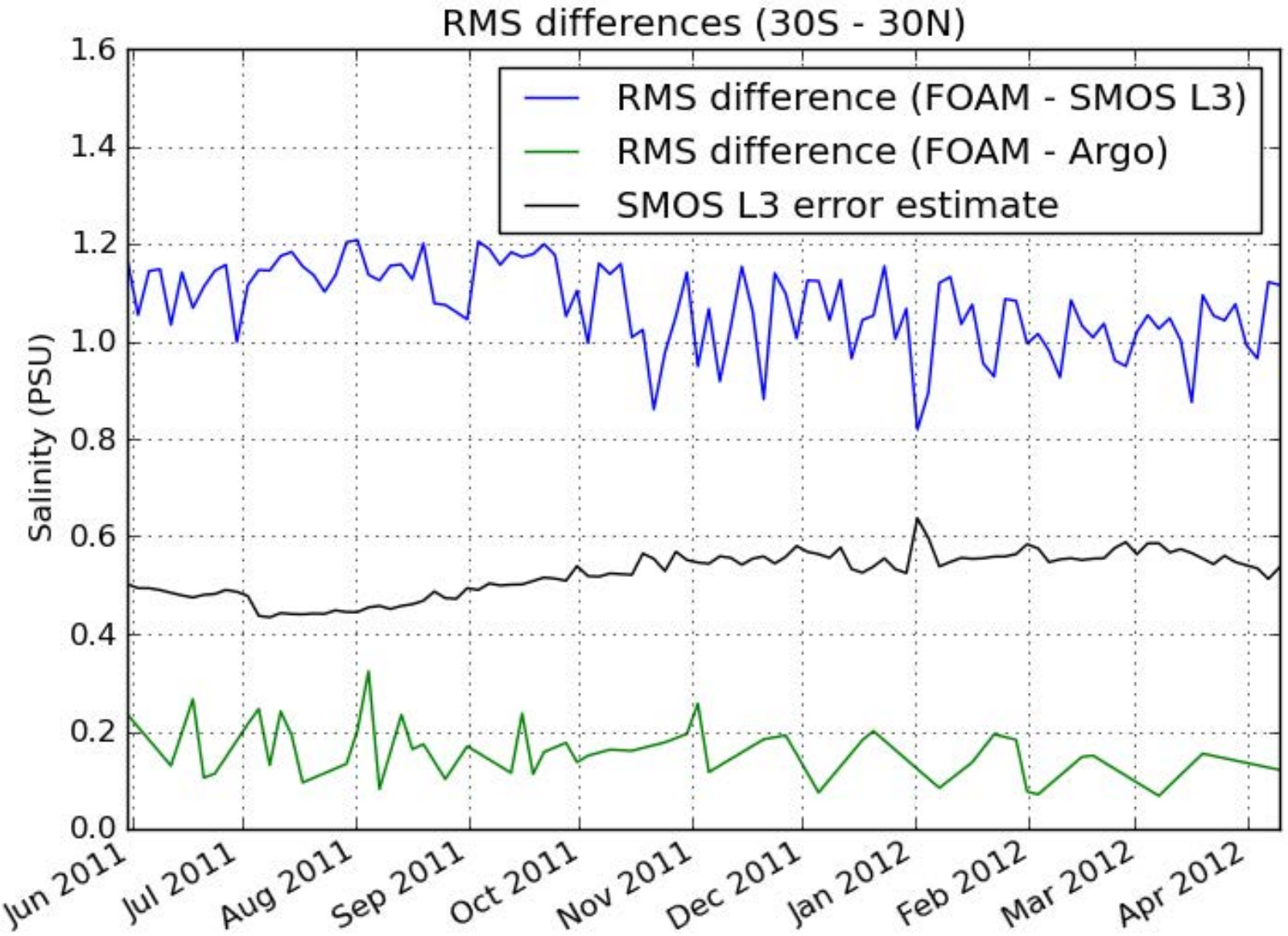


SMOS error estimate
9-12 April 2012



Are the differences consistent with L3 error estimates?

- L3 error estimates are ~half of FOAM-SMOS differences
- Argo validation suggests FOAM errors < 0.2 PSU.
- => L3 error estimate too low?



Next steps

- Set up routine comparisons between L3 SMOS and Aquarius data and FOAM and other models
- Use L2 data to output operational obs-background differences
- Use triple collocation to better understand errors
- Prepare for data assimilation...

Extra slides

FOAM Deep Ocean Models

- NEMO ocean model (with a linear free surface) coupled to LIM2 sea-ice model
- 50 constant depth vertical levels (z-levels)
- Surface forcing using 3-hourly NWP fluxes
- Assimilation of satellite and in-situ observations of temperature, salinity, SSH and sea-ice concentration
- Provides lateral boundary conditions for the UK shelf seas models