

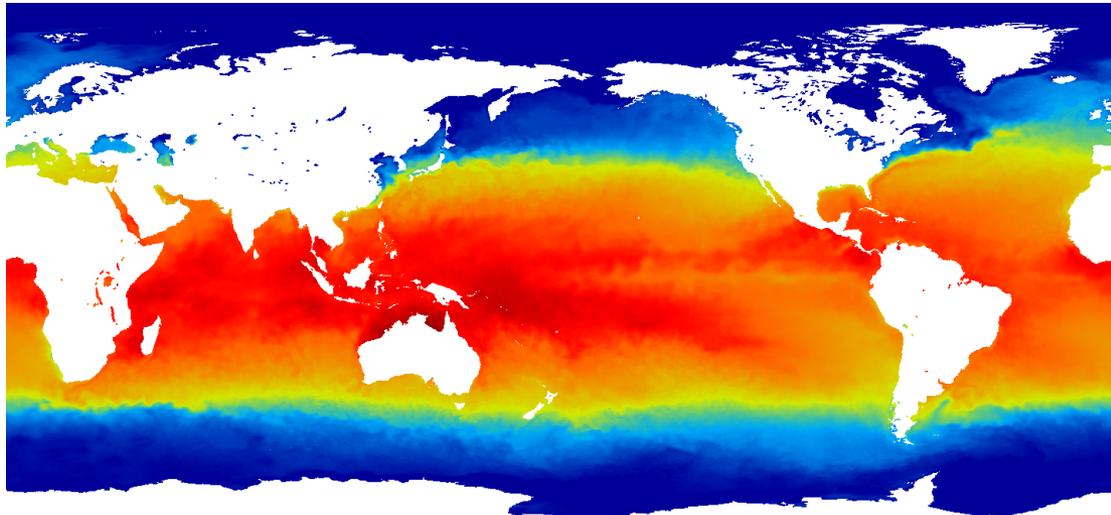


Recent updates to the OSTIA system

Jonah Roberts-Jones, Emma Fiedler, Alison McLaren.

Introduction

- The OSTIA system is continuously being developed and updated, the updates presented focus on the NRT system.
- Background error covariance parameters were updated in Jan 2013.
- Addition of a subset of Met-Op observations to the reference dataset used in the bias correction of other satellites was included in Jan 2013.
- Lake ice was included in OSTIA in Apr 2013.
- Other minor updates at the these times.

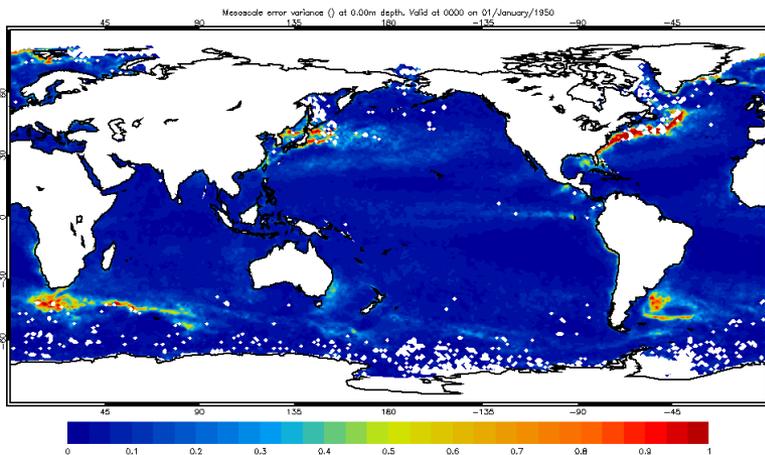




Met Office

Updates to the background error covariance parameters

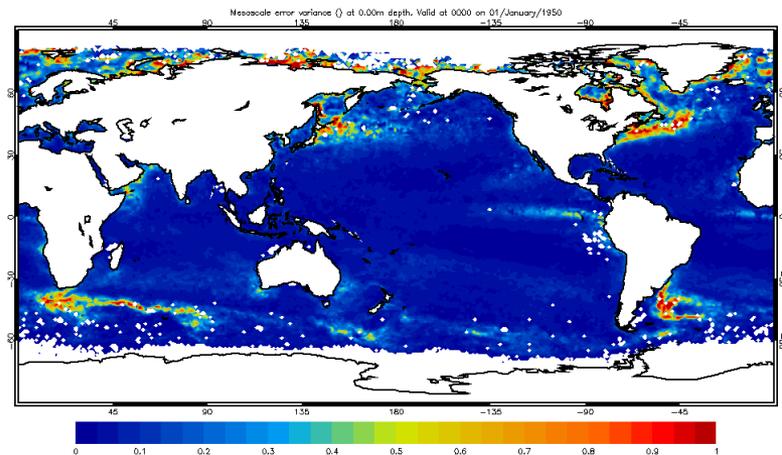
- In OSTIA the background errors are decomposed into those associated with mesoscale ocean features and the longer length-scale errors associated with synoptic atmospheric systems.
- The background error covariances were estimated using AATSR innovations from the OSTIA reanalysis v1.
- Each component of the background error covariances is parameterised into error variances and associated length scales.
- Seasonally varying background error variances are now used along with anisotropic latitudinally varying length-scales.



0

DJF

1



0

JJA

1



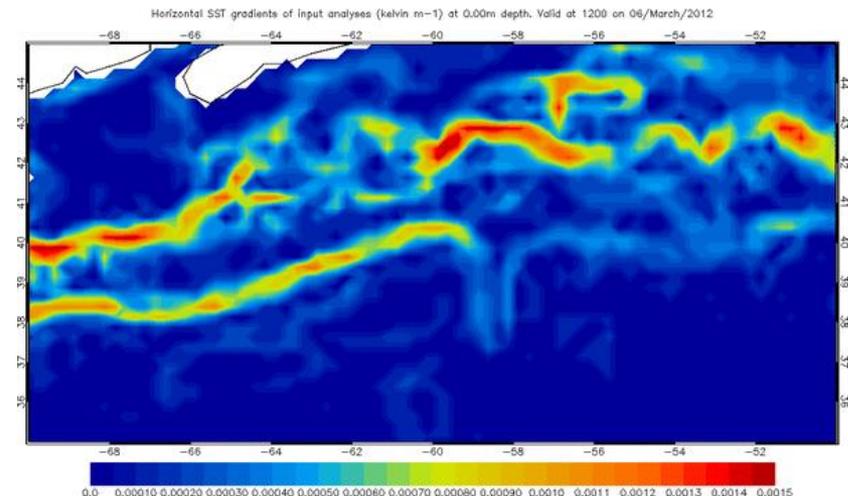
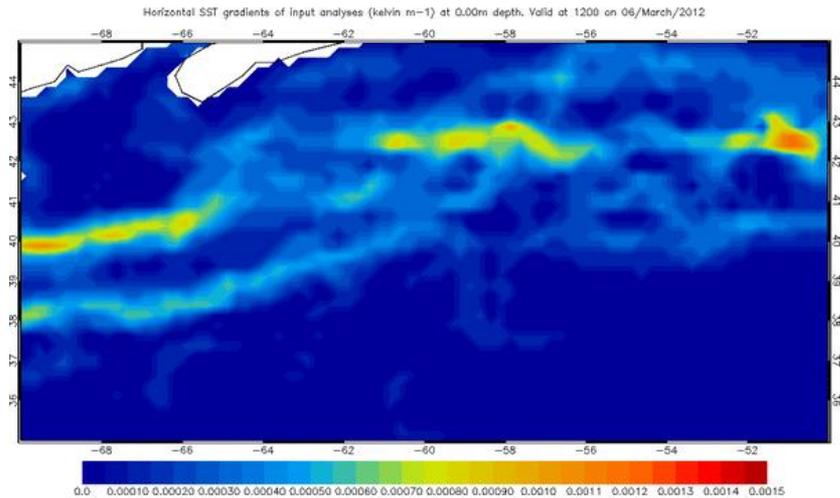
Data assimilation methodology

Met Office

- These updates along with increasing the no. of analysis iterations improved the accuracy of the OSTIA analysis.
- They also improved the resolution of small-scale ocean features without introducing unrealistic observational noise.

	Old OSTIA	Updated OSTIA
Drifter o-b	0.52(-0.01)	0.37(0.00)
AATSR o-b	0.45(0.04)	0.37(0.03)
ARGO o-b	0.47(0.03)	0.43(0.04)

Observation-minus-background/analysis RMSE (bias) calculated for March 2012.





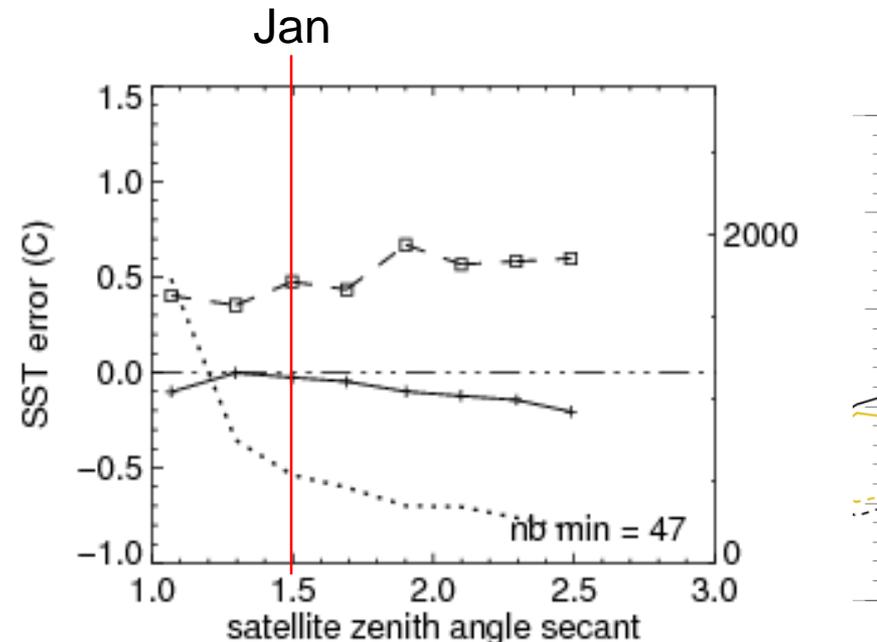
Met Office

Bias Correction in the absence of AATSR

- The loss of AATSR data was detrimental to the OSTIA analysis due to its use as a reference in the bias correction of other satellites. In situ obs alone were used in its absence.
- Using an accurate subset of METOP data based on satellite zenith angle (used data $\text{sza} < 48^\circ$) in the reference we were able to mitigate this impact.

	In-situ only	subset METOP	AATSR
Global	0.53	0.50	0.47
North Atlantic	0.67	0.67	0.62
Tropical Atlantic	0.34	0.28	0.27
South Atlantic	0.47	0.40	0.37
North Pacific	0.40	0.39	0.32
Tropical Pacific	0.40	0.37	0.29
South Pacific	0.54	0.48	0.50
Indian Ocean	0.41	0.30	0.28
Southern Ocean	0.60	0.53	0.56

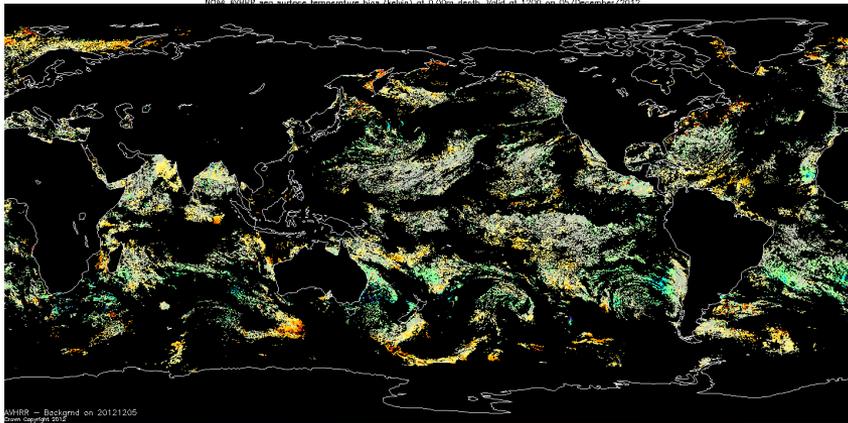
ARGO observation-minus-analysis stats for March 2012.



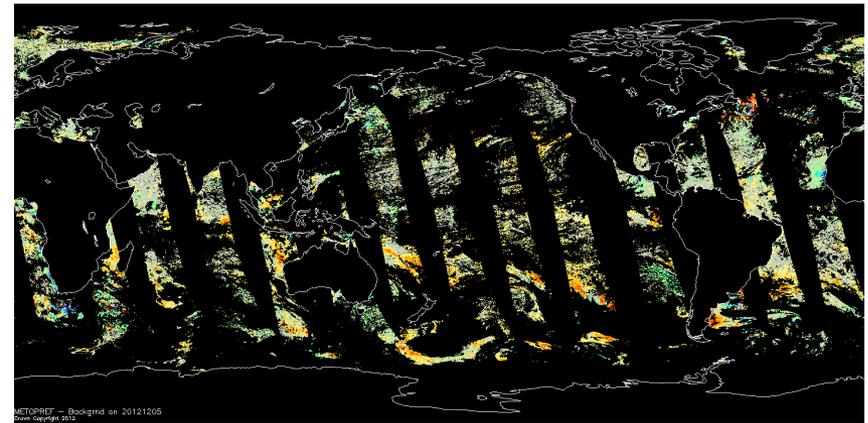


Bias Correction in the absence of AATSR

The spatially noisy bias fields obtained using sparse in situ data alone in the reference dataset had a discernable impact on the OSTIA analysis. Example shown from 5th Dec 2012.

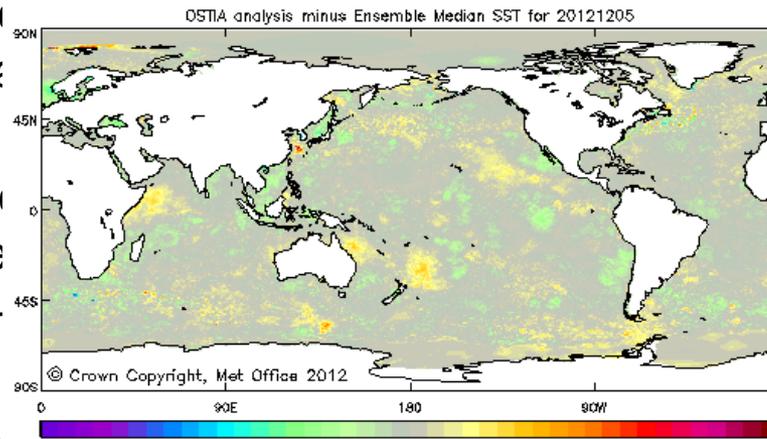


NOAA AVHRR



MetOp

- Large o-b difference observed for ALL satellites using GMPE.
- Caused by large, noisy bias fields, not only is used as reference.
- When we include the reference bias fields, the OSTIA analysis is smoother.
- OSTIA field is more accurate.



ocean which can be seen as a anomaly from the reference dataset. The OSTIA analysis is smoother than the satellite data as in situ data are used to correct the bias fields.



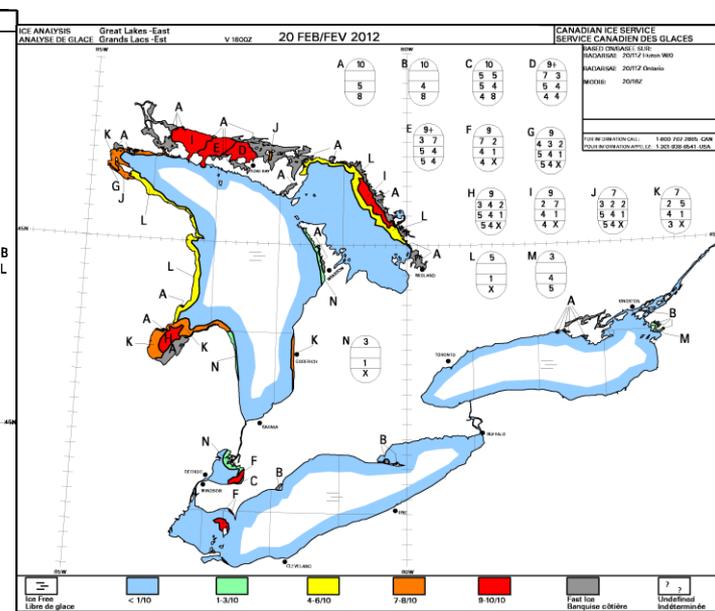
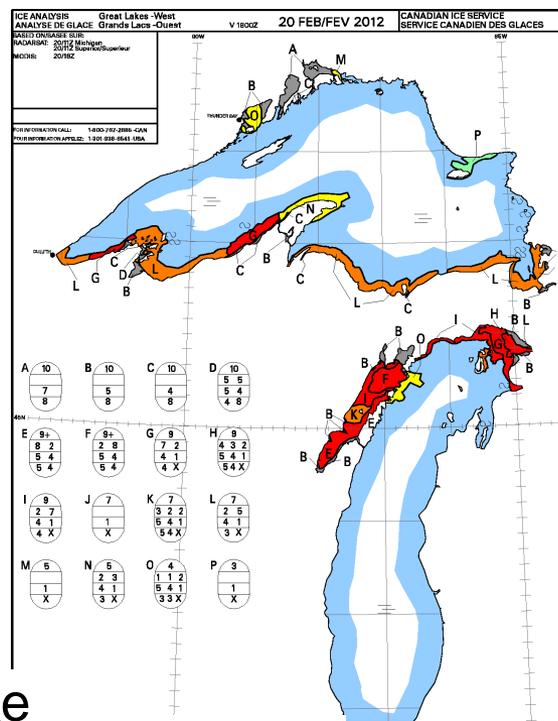
Addition of lake ice to OSTIA product

- Complements the lake surface water temperatures added in Nov 2011.
- Based on combination of NCEP 1/12° ice concentration data and OSTIA SST analysis in lakes. Operational OSI-SAF 10 km polar stereographic sea ice concentration data used in OSTIA doesn't include lake ice
- Lake temperatures relaxed to 0°C under lake ice, similar to SSTs under sea ice (-1.8°C).
- Lake ice added at 100% concentration if OSTIA LSWT < 0.1°C
- Lake ice removed if OSTIA LSWT analysis in lake > 4°C



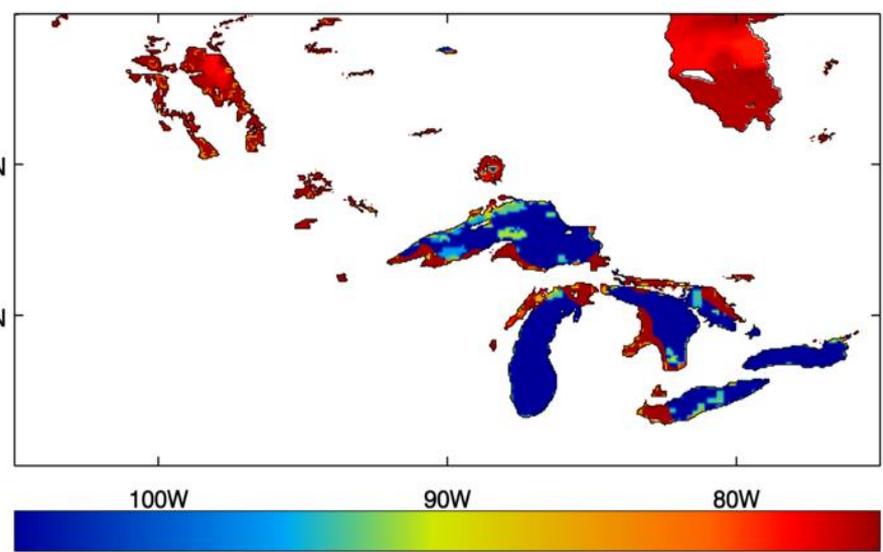
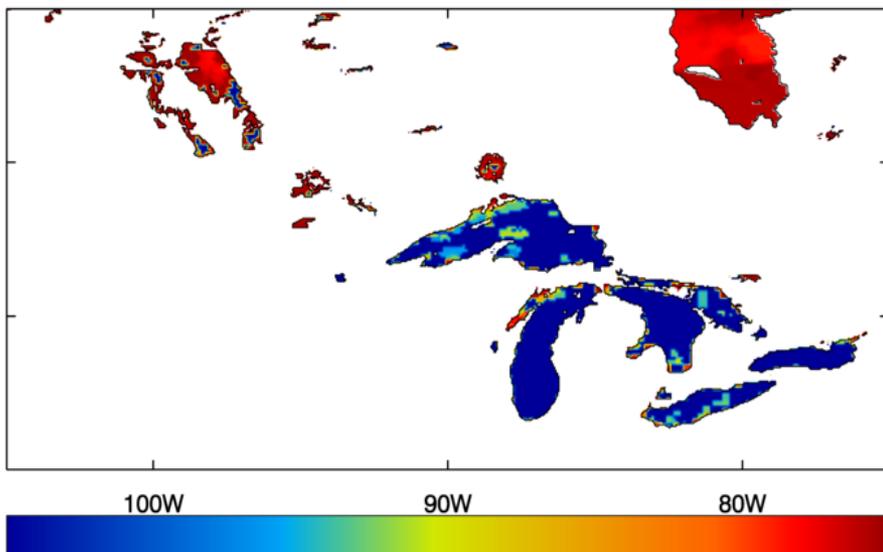
Met Office

Ice charts from Canadian Ice Service



OSTIA with no lake temperature check

OSTIA with lake temperature check





Met Office

Other OSTIA updates

- Change in the minimum quality flag of the OSI-SAF geostationary data (SEVIRI and GOES-E) used in the OSTIA analysis. This increases the size of the disk, of particular interest is the increases coverage in European North West Shelf and in the Persian Gulf.
- Enforce minimum SST of -2°C on the OSTIA analysis. This is to stop negative increments pushing the SST below this minimum.
- QC satellite data above 87°N . To stop the assimilation of erroneous SST observations where the data providers ice flagging has failed due to the lack of ice concentration data in the SSM/I pole hole e.g. MetOp AVHRR data in July 2012.



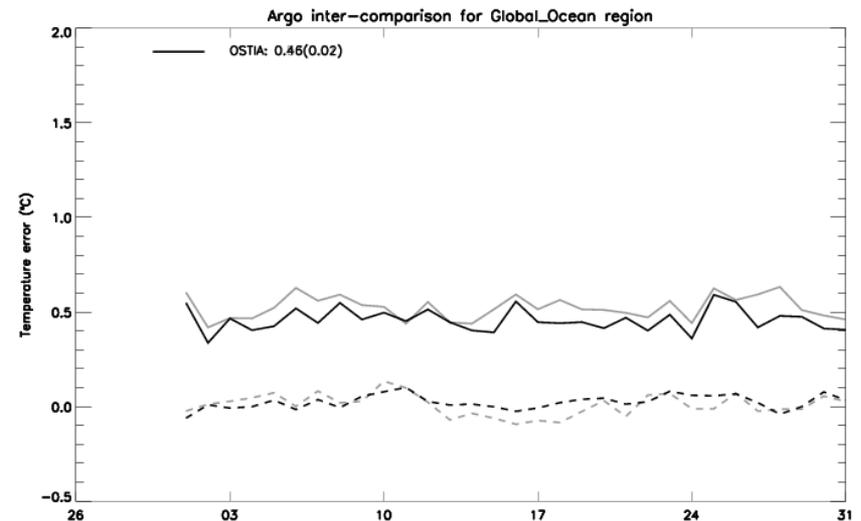
Impact of the OSTIA updates

The combined impact of the updates detailed has been assessed by carrying out a parallel run of the updated NRT OSTIA system that can be assessed against a control run of the old OSTIA system. This was carried out between 9th Nov 2012 and 15th Jan 2013.

- The magnitude of the improvements are as expected from those obtained from the testing of the individual updates.

	Old OSTIA	Updated OSTIA
Drifter o-b	0.44(-0.01)	0.36(0.01)
In situ o-b	0.52(-0.02)	0.41(0.01)
ARGO o-b	0.52(0.02)	0.44(0.03)

Observation-minus-background/analysis RMSE (bias) calculated for March 2012.



Daily ARGO observation-minus-analysis SD and bias calculated for Dec 2012.

Future work

- Diurnal SST Analyses will be produced within the OSTIA framework. This will produce 3 hourly Δ SST fields which can be used in conjunction with the OSTIA foundation SST.
- Update the data assimilation scheme used in OSTIA to use the NEMOVAR scheme.
- Include flow-dependence in the background error covariances, these could be based on observational density and/or SST gradients.





Met Office

Questions?

jonah.roberts-jones@metoffice.gov.uk