

# Impact of Argo for Sea Surface Temperature validation

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**Description of impact study carried out (overview, objectives, role of Argo):** An assessment of sampling requirements for the use of Argo near-surface observations for validation of sea surface temperature (SST) analyses was carried out. Additionally, the first routine monthly assessment of SST analyses was implemented.

**Results:** The sampling error associated with the monthly mean difference between OSTIA (Operational SST and Ice Analysis) and near-surface Argo temperature observations (using the shallowest observations between 3-5 m depth) has been investigated. Figure 1 demonstrates that the monthly total number of near-surface Argo observations is associated with a sampling error of  $<0.030$  K for most major ocean regions, for the representative example month of December 2013. The exceptions are western boundary current regions, with sampling errors up to 0.082 K, and the Polar regions, with sampling errors up to 0.200 K. Higher sampling errors in western boundary current regions are due to larger standard deviations of Argo-analysis differences in these areas, whereas the higher sampling errors in Polar regions are due to a lack of Argo observations of the ocean under sea ice. In order to achieve a sampling error of 0.020 K across the global ocean, the number of Argo observations in the western boundary current regions would need to be increased by up to 1300 observations per month (Figure 2).

Results from assessments of standard deviation reliability and detection of statistically significant differences between analyses illustrate that more floats are needed in the North and South Atlantic respectively. These results were not broken down into smaller regions but it is reasonable to assume that the results are due to the high variability in the Gulf Stream and Falklands/Malvinas regions respectively. Owing to the large regional variation in sampling error it is important that uncertainty estimates are included with difference statistics.

An increase in the number of near-surface Argo observations available would be required to validate SST analyses on weekly or daily frequencies, or monthly over smaller regions than those defined by MyOcean. The current distribution of Argo floats (nominally  $3 \times 3^\circ$ ) should be maintained in order to allow their use for monthly validation of SST analyses over the MyOcean regions to continue.

Routine monthly validation of OSTIA and GMPE SST products using quality-controlled Argo observations from the EN4 database ([www.metoffice.gov.uk/hadobs/en4](http://www.metoffice.gov.uk/hadobs/en4)) has now been set up. Timeseries of global and regional statistics (using the MyOcean region definitions) with uncertainty estimates are updated monthly and are freely available on the web: [http://ghrsst-pp.metoffice.com/pages/latest\\_analysis/sst\\_monitor/argo](http://ghrsst-pp.metoffice.com/pages/latest_analysis/sst_monitor/argo)

## Figures:

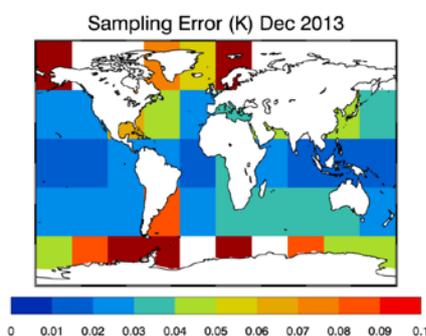


Figure 1: Monthly sampling error for recent distribution of Argo observations (from SST: Results and Recommendations, Figure 3)

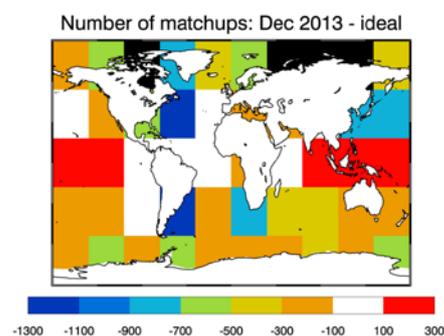


Figure 2: Total number of Argo near-surface observations for December 2013 minus monthly number of observations required to achieve sampling error of 0.02 K in all ocean areas (from SST: Results and Recommendations, Figure 4)