Initial progress in the ESA SMOS-NINO15 project.

The first project meeting after the kick-off was held on 25th January 2017. The partners discussed the initial progress on analysing the 2015/16 El Niño using existing data-sets, developments of observation bias correction schemes, and plans for the Observing System Experiments to assess the impact of satellite sea surface salinity (SSS) data on the Mercator-Ocean and Met Office ocean forecasting/assimilation systems.

**El Niño 2015/16**

The Mercator-Ocean reanalysis (GLORYS2v4) was used to compare the 2015/16 El Niño with the 1997 El Niño, the two strongest El Niños of recent times. Some of the features of the 2015 event have also been investigated, in particular the three-dimensional patterns of temperature, salinity and currents, and their evolution during the onset of the 2015 El Niño. Fig 1 shows the evolution of the surface temperature, salinity and wind stress anomalies in the lead up to and during the 2015 El Niño in the equatorial Pacific ocean. There is a strong signature in salinity with a fresh pool in the central Pacific due to enhanced precipitation (displacement of the atmospheric patterns). This is in broad agreement with the results of Gasparin and Roemmich (2016) who describe the strong freshwater anomaly during the 2015/16 El Niño based on ocean observational data-sets.

![Figure 1. Evolution of the SST (left), SSS (middle) and zonal wind stress (right) inter-annual anomalies in the equatorial band (2°N-2°S) in the Global 1/4° Mercator Ocean reanalysis during the period 2010-2015.](image)

**Satellite salinity observation bias correction**

The bias correction scheme currently used at Mercator-Ocean for in situ data-sets has been modified to estimate monthly biases in SMOS data in preparation for the future assimilation. Figure 2 shows an example of the observation-minus-model forecast values (innovations) for bias corrected SMOS data compared with the innovations for in situ near-surface salinity data. The bias corrected SMOS data have similar areas where they differ to the model compared with the in situ data, indicating that the bias correction method is able to remove the significant biases in the data compared to the model.
The bias correction scheme planned to be used at the Met Office was also described. They plan to calculate match-ups between satellite SSS data and reference in situ data (near-surface Argo data), carry out a large-scale 2D analysis of the differences, interpolate this “bias” field back to the satellite SSS locations and subtract it to produce bias-corrected observations. These can then be assimilated into the FOAM system. This bias correction is expected to account for real satellite biases, and also deal with issues related to the different representation of SSS in the satellite measurements and model, particularly with regard to vertical processes. It will be informative to compare the bias estimates using this technique and the one used by Mercator-Ocean.

**Observing System Experiment design**

A common approach to the Observing System Experiments (OSEs) will be used at the Met Office and Mercator-Ocean, but using different ocean forecasting systems, and assimilating different resolution SSS products. The period for the experiments will be Jan 2014 to Mar 2016. SMOS data are available throughout this period, Aquarius data will be used up to June 2015, and SMAP data from early 2015. A common set of metrics will be used to assess the impact of the satellite SSS data from both systems, and an Observation Impact Report will be prepared to provide recommendations for satellite SSS data requirements from GODAE OceanView.

**References**