First results of a SMOS data assimilation experiment with the Mercator Ocean forecasting system.

Results from the SMOS experiment, i.e. an experiment with the data assimilation of the current network (SLA, SST, in-situ T/S profiles) and the data assimilation of SSS from SMOS SSS (18-day products sampled at 25km resolution provided every 4 days from SMOS ¹CATDS-CEC-OS LOCEAN) are shown.

These results are evaluated in terms of data assimilation verification scores, e.g. the root mean square of the SSS innovations (observation - 7-day forecast), see Figure 1.

Figure 1: rms of SSS innovation (pss) averaged over the global domain for the REFERENCE (top) and SMOS (bottom) experiments from January 2015 to March 2016.

¹ The L3_DEBIAS_LOCEAN_v2 Sea Surface Salinity maps have been produced by LOCEAN/IPSL (UMR CNRS/UPMC/IRD/MNHN) laboratory and ACRI-st company that participate to the Ocean Salinity Expertise Center (CECOS) of Centre Aval de Traitement des Donnees SMOS (CATDS). This product is distributed by the Ocean Salinity Expertise Center (CECOS) of the CNES-IFREMER Centre Aval de Traitement des Donnees SMOS (CATDS), at IFREMER, Plouzane (France).
The Figure 1 shows the comparison between the REFERENCE experiment (without any SSS assimilation) and the SMOS experiment over the global domain. Only the SMOS SSS after a bias correction (grey line) has been assimilated.

The RMS of SSS innovations shows that (i) the bias correction is useful (grey line) (ii) the assimilation of SSS allows for a significant reduction (up to 25%) of the rms for all SSS products (the assimilated SSS (grey) is close to the rms of in situ innovation), (iii) the 8-day running mean SMAP V4.0 data are too noisy compared to the 7-day running mean AQUARIUS V4.0 data.

The TAO moorings have not been assimilated (data withdrawal) and can be considered as independent data. The comparison to two different experiment (REFERENCE and SMOS) (Figure 2) with the TAO SSS (1 m below the sea water) shows that assimilation of satellite SSS data can be efficient.

Figure 2: Time series of SSS at two different TAO salinity obs. moorings (black) compared to 2 different experiments, REFERENCE (without SSS assimilation: green), SMOS (with weekly SSSSMOS L3P: red). Period: JFM 2015