Exploring the coupled assimilation of sea surface salinity derived from SMAP radiances in ECMWF-IFS

Nils Risse, Alan Geer, Philip Browne, Tracy Scanlon, Niels Bormann

ECMWF

Abstract

Sea surface salinity is a key parameter influencing ocean dynamics and is closely linked to the water cycle through evaporation, precipitation, and river discharge. In situ observations provide highly accurate estimates of the vertical distribution of ocean salinity but offer only sparse spatiotemporal coverage near the surface. In contrast, L-band microwave radiometers provide estimates of sea surface salinity with daily global coverage. Here, we explore coupled data assimilation of sea surface salinity derived from Soil Moisture Active Passive (SMAP) L1b radiances in the ECMWF Integrated Forecasting System (IFS).

Sea surface salinity is retrieved from SMAP radiances within the atmospheric data assimilation system at the observation locations and subsequently assimilated into the ocean system as a pseudo-observation. Quality control and bias correction are therefore performed in radiance space, benefiting from the latest information on the ocean and atmospheric state. The quality control includes screening for radio-frequency interference, while the bias correction scheme has been adapted for SMAP to account for residual errors in the observations and surface emissivity model. Using this preliminary configuration, we assess the impact of assimilating satellite-derived sea surface salinity on ocean analyses and forecast skill.

The activities aim at improved exploitation of observations from current and upcoming missions (e.g., CIMR) and were supported by ESA's Data Assimilation and Numerical Testing for Copernicus Expansion Missions (DANTEX) initiative.