(“**Nearly”) 10 years of SMOS brightness temperature research at ECMWF**

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Following the successful launch of the SMOS satellite in 2009, the European Centre for Medium-Range Weather Forecasts (ECMWF) started to acquire and implement the ingestion of SMOS brightness temperatures (TB) data in the ECMWF’s Integrated Forecasting System (IFS). This work led to the Near-Real Time monitoring of the multi-polarized, multi-angular SMOS TB data since early stages of the mission.

The long-term objective was exploring the assimilation of SMOS TB in the ECMWF Land Surface Data Assimilation system and the assessment of the potential impact on atmospheric states. The challenges included the efficient use of all the huge amount of data available for use in the IFS and selection of a suitable data subsample for assimilation purposes, a technique to reduce observational noise from SMOS TB and the technical accommodation of this new type of data in the ECMWF Simplified Extended Kalman Filter for the soil moisture analysis. Most sensitivity assimilation experiments showed benefit to soil moisture states when evaluated against in-situ soil moisture observations recorded at several locations in the US, Europe and Australia. However, improved land surface conditions were not systematically translated to positive atmospheric meteorological impact. The latter pointed to the difficulties of accurately simulating complex land-near atmospheric interactions in a system mainly designed to produce accurate atmospheric forecasts. A suitable assimilation configuration for operational purposes showed a compromise between a better initialization of the soil water reservoir for atmospheric forecasts and a neutral impact on the main atmospheric variables close to the surface.

This paper will review the main steps followed in the integration of SMOS TB data in the IFS and will make a recapitulation of the main results obtained during several years of research at ECMWF.