Land Surface Data Assimilation for Numerical Weather Prediction

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Land surface processes and their initialization are of crucial importance for Numerical Weather Prediction (NWP). Current land data assimilation systems used to initialize NWP models include snow depth analysis, soil moisture analysis, soil temperature and snow temperature analysis. A range of approaches of various complexities, for example simple Cressman Interpolation, Optimal Interpolation or Extended Kalman Filters, are used by NWP centers for their surface analysis. This paper gives a review of the different approaches that are used in NWP to initialize land surface variables. It discusses the observations availability and quality, and it addresses the combined use of conventional observations and satellite data.

Based on results from the European Centre for Medium-Range Weather Forecasts (ECMWF), soil moisture and snow depth data assimilation impact on near surface weather parameters forecasts is shown [1]. For soil moisture, data assimilation of satellite observations from ASCAT (Advanced Scatterometer) and SMOS (Soil Moisture and Ocean Salinity) is addressed. Future satellites such as SMAP (Soil Moisture Active and Passive) will ensure a good continuity with the current SMOS satellite.

Both surface fields and low level atmospheric variables are highly sensitive to the soil moisture and snow initialization methods. This presentation shows that recent developments of ECMWF in soil moisture and snow data assimilation contributed to improve surface and atmospheric forecast performance [1,3].

References

