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On the impact of microwave observations on analysed soil moisture and turbulent fluxes

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For most applications in hydrology and meteorology root zone soil moisture is of fundamental interest, since the spatial distribution of this parameter determines evapotranspiration and consequently the water and energy exchange between the land surface and the atmosphere. Current operational soil moisture analysis schemes rely on observations of screen level parameters, namely 2m temperature and humidity. The analysis increments, i.e. the differences between the modelled fisrt guess field and the analysed soil moisture fields, have been compared against the forecast increments, i.e. the differences between two consecutive analysis time steps. It has been found that the analysis increments are a sizeable part of the water budget in large parts of the world. Although assimilating screen level parameters has proved its efficiency to improve the turbulent atmospheric fluxes, the realism of the resulting soil moisture is not sufficient for hydrological applications.

In the framework of the European Land Data Assimilation Study (ELDAS) the potential of the combined assimilation of screen level parameters and passive microwave brightness temperatures through an Extended Kalman Filter has been investigated. The data assimilation experiments were based on the single column version of the ECMWF forecast model and observations obtained during the Southern Great Plains Hydrology Experiment 1997 (SGP97). It has been found that the combined assimilation of screen level parameters is most promising for atmospheric applications. For hydrological applications, it might be sufficient to assimilate brightness temperatures. However, the impact of the observations strongly depends on the systematic and random errors assigned to the model and the observations. The presentation will give an overview of the error analysis performed in ELDAS.

At present, low frequency microwave observations from space are not available. How-

ever, the 11 GHz measurements from the TRMM Microwave Imager have been used together with North America LDAS data to derive a five year soil moisture data set for the southern United states. The differences between this satellite derived data set and the operational ECMWF fields, which can be regarded as potential analysis increments, will be compared against the real increments to quantify the potential impact of this new type of observation on the analysed soil moisture fields.