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Global Soil Moisture Analysis at DWD

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Small errors in the daily forecast of precipitation, evaporation and runoff accumulate to uncertainties of soil water content and lead to systematic biases of temperature and humidity profiles in the boundary layer if no corrections are applied.
A new soil moisture assimilation scheme has been developed for the global GME model and runs operationally since March 2011. As many other variational schemes implemented at NWP centers (e.g. Canadian Met Service, DWD, ECMWF,, Meteo France) the scheme is based on minimisation of screen level forecast errors by adjusting the soil water content implicitly correcting the partitioning of available energy into latent and sensible heat.

The original method proposed by Mahfouf (1991) and described in Hess, 2001 requires at least two additional model forecast runs to calculate the gradient of the cost function i.e. the sensitivity dT2m/dwb with T2m as 2m temperature and wb as the soil water content of the respective top and bottom soil layers. To overcome this computational costly approach in the new scheme the sensitivity of screen level temperature on soil moisture changes is parameterized with derivatives of analytical relations for transpiration from vegetation and bare soil evaporation as motivated by Jacobs and De Bruin (1992). The comparison of both methods shows high correlation of the temperature sensitivity that justifies the approximation. The method will be described in detail and verification results will be presented to demonstrate the impact of soil moisture analysis in GME.

Hess, R. 2001: Assimilation of screen-level observations by variational soil moisture analysis. Meteorol. Atmos. Phys. 77, 145-154.
Jacobs, C.M.M. and H.A.R. De Bruin, 1992: The Sensitivity of Regional Transpiration to Land-Surface Characteristics: Significance of Feedback. J. Clim. 5, 683-698.
Mahfouf, J-F. 1991. Analysis of soil moisture from near-surface parameters: A feasibility study. J. Appl. Meteorol. 30: 1534-1547.