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The German Drought Monitor

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Soil moisture droughts reduce the amount of water available to plant growth potentially leading e.g. to crop failure or increased forest fire risk. The threat of human livelihoods in developing countries and large economic losses in developed ones are severe consequences of these events. Monitoring the current state of soil water content allows to improve water management to mitigate the associated damages.

Since summer 2014, the German Drought Monitor (GDM, available at: www.ufz.de/droughtmonitor) has been established using an operational hydrological modeling system, which consists of 3 steps:
(1) the daily download of meteorological forcing data, consistency check and interpolation of this data, (2) running the mesoscale Hydrologic Model (mHM; Samaniego et al. 2010) and saving the state variables at the end of the model run as restart-file for the next days run, and (3) calculation of the soil moisture index (SMI, Samaniego et al. 2013, JHM) and visualization of the drought data.

The hydrological model mHM was used to generate daily soil moisture fields for the period 1954–2013 over the entire area of Germany at a high spatial resolution of 4 x 4 km^2. The model requires daily precipitation, temperature, and potential evapotranspiration as forcing. A three-layer soil scheme was used to model the soil moisture dynamics over the entire root zone depth. Based on the 60 year simulation of soil moisture, the frequency distributions have been calculated for each grid cell to derive the soil moisture index.

In this beta version, we do a monthly online update of the SMI. Furthermore, a trend analysis of drought events for 69 German subregions since 1954 was conducted. It showed that for most parts of Germany, the frequency of abnormally dry conditions increased while the stronger drought situations with SMI<0.2 decreased at the same time. For the coming year, a stakeholder consultation is planned. The aim is to clarify for whom a drought monitor would be useful, what kind of information and indicators shall be provided, and how the information and data shall be presented and distributed.