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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Transregional Collaborative Research Centre 32: Patterns in Soil-Vegetation-Atmosphere-Systems

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The soil, vegetation and the lower atmosphere (SVA) are key compartments of the Earth, where almost all activities of mankind take place. This region is characterized by extremely complex patterns, structures and processes that act at different temporal and spatial scales. While the exchange of energy, water and carbon is continuous between the different compartments, the pertinent fluxes are strongly heterogeneous and variable in space and time. Overarching TR32 paradigm is that the characterisation of structures and patterns will lead to a deeper qualitative and quantitative understanding of the SVA system, vand ultimately to better predictions of the SVA state.

TR32 combines research groups in the field of soil and plant science, remote sensing, hydrology, meteorology and mathematics located at the Universities of Aachen, Bonn, Braunschweig and Cologne and the Research Centre Jülich study the soil-vegetation atmosphere system under the novel holistic paradigm of patterns. To understand the mechanisms leading to spatial and temporal patterns in energy and matter fluxes of the SVA system we link experiments and theory via model-observation integration. Focusing our research on the Rur Catchment (Germany), patterns are monitored since 2006 continuously using existing and novel geophysical and remote sensing techniques from the local to the catchment scale based on ground penetrating radar methods, induced polarization, radiomagnetotellurics, electrical resistivity tomography, boundary layer scintillometry, lidar techniques, microwave radiometry, and precipitation radars with polarization diversity. Modelling approaches involve high resolution numerical weather prediction (NWP; 400m) and hydrological models (few meters). Example work from the first phase includes the transfer of laboratory methods to the field; the measurements of patterns of soil-carbon, evapotranspiration and respiration measured in the field; catchment-scale modeling of exchange processes and the setup of an atmospheric boundary layer monitoring network.

In the second phase (2011-2014), the focus is on the integration of models from the groundwater to the atmosphere for both the m- and km-scale and the extension of the experimental monitoring in respect to vegetation. The general coupled modeling concept is based on the atmospheric model COSMO, the land surface model CLM and the hydrological model ParFlow. In order to bridge the scale gaps in measurements and modelling an LES model will be validated via a dedicated field campaign.