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Forecasting the weather
- ensemble techniques
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The Model SNOW 4 - a Tool to Operationally Estimate Precipitation Supply

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The model SNOW 4 simulates snow cover accumulation and depletion on a regular grid. The model core consists of a set of equations which describe the snow cover energy and mass balance. Available melting heat is calculated based on the snow surface energy balance as a result of the radiation balance and heat fluxes between atmosphere, soil and snow cover. Melting of snow or freezing of liquid water within the snow layer takes place depending on this available melting heat. Retention, aging and regeneration are taken into consideration.
Regionalised observations are used both to define the initial state for a 30-hour analysis and force the model. Hourly measurements of air temperature, water vapour pressure, wind speed, global radiation and precipitation are interpolated to the model grid. For a forecast period of up to 3 days, SNOW 4 obtains the required input data from the operational products of the COSMO-EU weather forecast model.
The size of a grid box is approximately 1km2, and the model area covers a surface of 750x1000km2 centred over Germany (including most parts of the catchment areas of the rivers Rhine, Moselle, Danube and Elbe). The internal time step is set to 1 hour. Once a day, the compliance between model and regionalized snow cover data is assessed. If discrepancies exceed certain thresholds, the model must be adjusted.
The model computes hourly snow cover water equivalents and precipitation supply from snow melt and rain falling into the snow layer.
The model simulations are updated every six hours based on the most recent observations and weather forecasts.
The model has been pre-operationally tested during the winter 2009/2010. A comprehensive evaluation focussing on water equivalent gave evidence for a good overall performance and an added value compared to the driving COSMO-EU model.
For the first time, SNOW 4 is applied fully operationally between October 2010 and June 2011.
SNOW 4 products have so far been in use at the German Federal Institute for Hydrology, the flood forecasting authorities of ten German Länder and the Government of the Austrian Federal Land of Vorarlberg. These customers make use of SNOW 4 results as input for flood warning and short-term forecasting systems.