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Spatial interpolation of meteorological variables for snow and hydrological modelling

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The presented activity relies on the long-lasting collaboration between the Norwegian Meteorological Institute (MET) and the Norwegian Water Resources and Energy Directorate (NVE) aimed at implementing and continuously improving an operational system for supporting the avalanche, landslide and flood risk forecast services, as well as for the production of snow maps and as a support for hydro-power production planning.

The presentation will provide an overview of the operational system, next version, which includes the availability of sub-daily meteo- and hydrological fields as the main new feature while the previous version was designed for the production of daily aggregated fields (see seNorge.no). In particular, we will focus on the indirect validation of the meteorological gridded datasets by comparing snow and hydrological model outputs with the correspondent observations.

The meteorological fields for temperature and precipitation are obtained from the METs network of weather stations through spatial interpolation by using Bayesian statistical methods. The in-situ observations -aggregated both at daily and hourly time resolutions- are interpolated on a 1x1 km2 regular grid covering the Norwegian mainland.

The quality of the gridded meteorological datasets is routinely monitored by cross-validation methods. Furthermore, for selected periods of time the daily mean temperature and daily accumulated precipitation fields have been evaluated indirectly against snow and river discharge observations by applying the gridded data as input for snow and hydrological models. The seNorge snow model outputs are compared with snow observations of: ground-based point observations of snow depth, snow water equivalent, bulk snow density; satellite-based images of the fraction of snow-covered area. The DDD hydrological model outputs are evaluated against runoff observations for 77 Norwegian catchments.

In this application-dependent quality assessment the two meteorological fields are tested simultaneously. As a result of this evaluation, specific post-calibration statistical techniques for the meteorological fields are currently under development taking into account additional geographical information.

The meteorological gridded dataset is also utilised in several other activities, such as climate-related analyses and research, and its quality assessment is therefore of primary interest for both MET and NVE.