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Spatial interpolation and dissemination of climate variables using GIS and OGC web services

Raymond Sluiter
KNMI, R&D Information and Observation Technology, De Bilt, Netherlands (raymond.sluiter@knmi.nl)

Environmental changes, such as global warming, force governments to develop policy to counter any adverse effects. Hydrological models are part of the tool set used to develop and evaluate policy. Running hydrological models requires gridded maps of meteorological parameters such as rainfall, temperature and potential evaporation. KNMI has ongoing projects to generate such gridded maps using point data as a basis. The main goal is to obtain the optimal interpolation method for each meteorological parameter and to disseminate these interpolated maps to the users using OGC web services.

In this particular study we focus on the parameters potential evaporation, temperature and precipitation needed for the national project "Nationaal Hydrologisch Instrumentarium (National Hydrological Toolbox)". Prior to 1990 most parameters were measured on 5 to 16 weather stations. After 1990 these parameters were measured on about 30 automatic weather stations scattered around the Netherlands. The limited number of measurements poses great challenges for interpolation of 30 year time series as needed by retrospective and future climate studies. Therefore, we tested several methods including inverse distance weighted interpolation, multiple linear regression, thin plate splines and kriging. Quality information of the datasets is provided to the users in the form of cross-validation results and kriging variance. In the project we use R for statistical computing and graphics, including the gstat package.

To provide the climatic datasets we developed an "INSPIRE ready" infrastructure based on OGC web services: Web Mapping Services (WMS) for online visualization and Web Coverage Services (WCS) for downloading raster data with NetCDF support. Integration of the interpolation techniques with the data provision services was done in an early stage of the development of the GeoSpatial Interpolation Environment (GSIE): both the internal interpolation facility and external data provision services use OGC web services for visualization.

On the conference I will present the research results with special focus on the provision of data and metadata using OGC web services and on connecting the interpolation processing chain to these web services within the GSIE.