Geophysical Research Abstracts
Vol. 19, EGU2017-13400, 2017
EGU General Assembly 2017

A Bayesian spatial model for utilising precipitation gauge observations and runoff observations for annual runoff predictions

Thea Roksvåg (1), Ingelin Steinsland (1), and Kolbjørn Engeland (2)

(1) Department of Mathematical Sciences, Norwegian University of Science and Technology, Trondheim, Norway, (2) The Norwegian Water Resources and Energy Directorate, Oslo, Norway

The objective of this work is to perform spatial predictions of annual runoff in ungauged basins. We have two observation types of different spatial support available: Annual runoff data (area observations) and annual precipitation data (point observations) from nearby catchments. In this study, we suggest a Bayesian model for annual precipitation and runoff where we combine these observation types. We utilise observations of precipitation and runoff from several years together with a model for evaporation to perform spatial predictions of runoff. Each year of observations is regarded as a replicate of the underlying statistical model. The statistical model includes a Gaussian spatial component representing the spatial variability of precipitation caused by climatic variations in the study region. This component enables us to gain knowledge of the underlying climate in the catchment of interest, and it provides valuable information about the annual runoff we can expect in the future with corresponding uncertainty estimates. Thus, we have a model that can be applied both for spatial predictions of annual runoff, and for gaining knowledge about future annual runoff.

To reduce the computational complexity of the model, we utilise a stochastic partial differential equation (SPDE) formulation of the Gaussian field. This makes it possible to apply Laplace approximations to generate faster predictions. Through cross-validation we evaluate the predictive performance of the model by using a dataset of 10 years of annual precipitation and runoff from the Voss region of Norway. The results are supported by simulation studies. We conclude that in this area, the climate is strong and decides whether the resulting runoff predictions are accurate or not: Typically, we are doing the same systematic error in the predictions every year as long as the climate is stable and the same observation design is used.