Spatial conditional extreme models for heavy precipitation

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According to the sixth IPCC assessment report, there will be an increase in extreme precipitation and flooding due to future climate change. Hydrological simulations are important tools for assessing the consequences of floods, which can allow us to better prepare for future natural hazards. However, in order for the simulations to be usable, they must be based on realistic input values of variables like precipitation and temperature. We aim to create realistic simulations of extreme precipitation that can be used as input in hydrological models for assessing the risk of floods.

Recently, the conditional extremes model has gained much attention in the field of extreme value theory. This model allows for a more flexible description of asymptotic dependence classes than most classical models for spatial extremes. It also has the potential of being less computationally demanding, and easier to sample from. We employ the conditional extremes model for modelling observations of extreme hourly precipitation from a weather radar in Norway. The framework of Simpson et al. (2020) is adopted, which allows for fast inference using INLA and the SPDE approach.

Model evaluation of spatial extreme models is a complicated problem that has not received much interest in the literature. A thorough simulation study is performed, where we present several methods for evaluating different properties of the model fit of the spatial conditional extreme model. Finally, these methods are used in assessing the fit of our model to precipitation data in Norway.

References

Simpson, E. S., Opitz, T., & Wadsworth, J. L. (2020). High-dimensional modeling of spatial and spatio-temporal conditional extremes using INLA and the SPDE approach. *arXiv:2011.04486*.