Application of the "genRE" approach to spatial interpolation of precipitation gauge data for the Suir River Basin

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Operational near real-time flood forecasting relies heavily on adequate spatial interpolation of precipitation forcing which bears a huge impact on the accuracy of hydrologic forecasts. In this study, the generalized REGNIE (genRE) interpolation technique is examined. The genRE approach was shown to enhance the traditional Inverse Distance Weighting (IDW) method with information from existing observed climatological precipitation data sets (Van Osnabrugge, 2017). The successful application of the genRE method with a re-analysis precipitation data set, expands the applicability of the method as detailed re-analysis data sets become more prevalent while high density observation networks remain scarce.

Here, the approach is extended to use climatological precipitation data from the Met Éireann's Re-Analysis (MÉRA). Investigations are carried out using hourly precipitation accumulations for two major flood events induced by Atlantic storms in the Suir River Basin, Ireland. Alongside genRE, the following techniques are comparatively explored: Inverse Distance Weighting (IDW), Ordinary Kriging (OK) and Regression Kriging (RK). Cross-validation is applied in order to compare the different interpolation methods, while spatial maps and correlation coefficients are utilized for assessing the skill of the interpolators to emulate the climatology of MÉRA. In the process, a preliminary intercomparison between the observed precipitation and MÉRA precipitation for the two events is also made.

In a statistical sense, cross-validation results verify that genRE performs slightly better than all three interpolation techniques for both events studied. Overall, OK is found to be the most inadequate approach, specifically in terms of preserving the original variance in observed precipitation. MÉRA manages to reproduce the temporal variations of observations in a good manner for both events, whereas it displays less skill when considering spatial variations especially where topography has a major influence. Finally, genRE outperforms all other interpolators in mimicking the climatological conditions of MÉRA for both events.

Van Osnabrugge, B., Weerts, A.H. and Uijlenhoet, R., 2017. genRE: A method to extend gridded precipitation climatology data sets in near real-time for hydrological forecasting purposes. Water Resources Research, 53(11), pp.9284-9303.