



Independent and interacting wet-dry extremes in Great Britain within a multivariate dependence model

Paolo De Luca (1), John Hillier (1), Gregor Leckebusch (2), and Rob Wilby (1)

(1) Geography Department, Loughborough University, UK (p.deluca@lboro.ac.uk), (2) School of Geography Earth and Environmental Sciences, University of Birmingham, UK

Extreme wet and dry events pose a significant threat to global economy and society, however they are commonly investigated as independent perils. Hence, possible (long-term) interacting processes are a priori excluded and this may limit the understanding of physical mechanisms driving the coupled hazards. We propose a novel multi-hazard (i.e. extreme wet-dry) nationwide multivariate extreme value analysis by using Great Britain (GB) as pilot area, river flows and Standardized Precipitation Index (SPI) time series within the 1980-2014 period. The analysis is firstly performed for wet and dry extremes independently by choosing the Thames (England), Wye (Wales) and Tay (Scotland) river basins and SPI hydrometric areas (HAs) as the model's conditional variables. Secondly, the interactions between wet and dry extremes have been investigated by using the 3 HAs conditioned to monthly maxima river flows. Results for extreme wet events generally show stronger dependence within nearby basins that decreases with distance from the conditional one. A similar and even stronger pattern is found for dry events, where SPI dependences are mostly positive within the studied area and tend to show different climate's characteristics between the north and central/south GB. Wet-dry interactions show a generally negative dependence throughout the area with some positive patterns detected for SPI 12- and 24-month, again increasing with distance.