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From local to global classification of atmospheric circulation patterns associated with some European floods

B. Merz (1), F. Cioffi (2), E. Rus Peres (3), R. Purini (4), J. Reusser (1), and U. Lall (5)

(1) Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, Section 5.4 Hydrology, Potsdam, Germany (bmerz@gfz-potsdam.de), (2) Department of Civil, Structural and Environmental Engineering,University of Rome ' La Sapienza ', Italy, (3) Department of Civil and Environmental Engineering, University of Cantabria, (4) Institute of Atmospheric Sciences and Climate ISAC-CNR, Italy, (5) Department of Earth and Environmental Engineering, Columbia University,New York

There is increasing evidence that extreme mid-latitude floods are associated with large scale transport of tropical moisture through stationary and transient planetary waves. Understanding the mechanisms, frequency and surface boundary conditions associated with the persistent rainfall events associated with such floods is of considerable interest as one considers an assessment of the impact of climate variability and change on flood incidence. Here, we use a long daily time series of regional weather type classification for Europe, together with rainfall and flood data sets from Germany, Italy and France to explore how these weather types correspond to extreme regional floods, and in turn the large scale circulation mechanisms that are associated with the frequency and intensity of a particular combination of weather type, rainfall and flood event across the region. The analysis focuses largely on instrumental data, but for the recent period we also examine satellite data on circulation and moisture transport and the 20th century re-analysis data (NCAR V.2) for insights into the mechanisms associated with the floods, their frequency of occurrence and spatial expression. Implications for climatic phenomenon such as the NAO and ENSO are also explored to form a potential causal chain of explanation. The application of the analysis for climate change projections is discussed.