Investigating the relationship between North Atlantic Oscillation and flood losses at the European scale

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The North Atlantic Oscillation (NAO) is Europe's dominant mode of climate variability. As a consequence, the interconnections between NAO and hydrologic extremes in the European continent have long been observed and analysed. Some of this research has been focusing on the relationship between NAO and catastrophic floods, however, the lack of extensive data-sets restricts these studies to relatively small spatial and temporal scales. This is an obvious limitation when dealing with flood risk; indeed, the highly non-linear relationships among the different physical and anthropogenic controls are responsible for strong spatial and temporal correlations that cannot be accounted for at the local scale alone. The goal of this work is to explore the relationship between the NAO signal and economic flood losses at the European scale through long term stochastic simulations. For this study we use the European flood model recently developed by RMS (Risk Management Solution Ltd). The model combines 50000 years of rainfall-runoff-inundation simulations with a high definition exposure/vulnerability model to produce simulated flood losses in 13 European countries. The correlation between rainfall fields and NAO signal is based on the last 50 years of data and discretized at the monthly level. We found significant correlations between the NAO signal and both the average annual loss (AAL) and the average seasonal loss (ASL), for all the countries analysed. Noticeably, ASL-NAO trends were always negative for summer, spring and fall seasons, while could be either positive or negative for winter seasons, depending on the country.