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Correlation structure of economic losses due to floods across Europe

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Large scale climatic patterns and river network topology have an important impact on the space-time structure of floods. For example, in a recent study we showed that the effect of the North Atlantic Oscillation (NAO) is visible in the structure of economic losses at the European scale. The analysis revealed that in Northern Europe the majority of historic winter floods occurred during a positive NAO state, whereas the majority of summer floods occurred during a negative state. Through the application of a state-of-the-art flood catastrophe model, we also observed that there exists a statistically significant relationship between economic flood losses and the NAO. In this study we further advance the analysis by exploring the correlation structure of flood losses in Europe during different seasons and for different NAO states. Flood loss correlation is measured in terms of “loss synchrony scale” (LSC), a metric formalized for this study following the definition of “flood synchrony scale” in Berghuijs et al. (2019). For an individual event and an individual CRESTA region, the LSC is defined as the maximum radius around the CRESTA, within which at least half of the other CRESTA regions experience a loss due to the same event. We analyse the LSC across Europe, as produced by the loss model, and check for consistency with the data-based flood synchrony scale in Berghuijs et al. (2019). We further explore how the LSC changes between different seasons, and between NAO states. This analysis can help improve financial preparedness to catastrophic floods as a better understanding of the correlation structure of the flood events allows for a better distribution of resources as well as a more efficient application of mitigation measures.

Berghuijs W R, Allen S T, Harrigan S and Kirchner J W 2019 Growing spatial scales of synchronous river flooding in Europe *Geophys. Res. Lett.* 46 1423–8