



On the extraordinary winter flood episode over the North Atlantic Basin in 1936

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Drawing on long-term flow-discharge series, historical archives and tree-ring records of past floods in the North Atlantic Basin, here we analyse the linkage between atmosphere-ocean mode and winter flood variability over the 20th century in the North Atlantic Basin (NAB). The most extreme winter floods occurred in 1936 and had strong impacts on either side of the Atlantic. We hypothesize that the joint effects of Sea Surface Temperatures (SSTs) over the Atlantic and Pacific Oceans and the North Atlantic Oscillation (NAO) play a significant role when describing flood variability in North America and Europe since 1900. Statistical modelling supports the assumption that the response of flood anomalies over the NAB to NAO phases is subsidiary of SST phases. Thus, the flood activity over the NAB could be enhanced by the coupled occurrence of positive AMO phases and negative AO/NAO phases. Besides, we shed light on the extraordinarily winter flood of 1936 with a large geographical imprint over NAB. The record-breaking flood episode of winter 1935/36 is indeed in agreement with the simultaneous occurrence of very positive AMO and PDO phases and very negative AO / NAO phases, to a degree that has not been observed at any other moment of the 20th and early 21st centuries. This outstanding winter flood episode was most likely characterized by stratospheric polar vortex anomalies, which can usually be linked to an increased probability of storms in W and SW Europe and increased snowfall events in E North America. By assessing the flood anomalies over the NAB as a coupled atmosphere-ocean function, one could indeed further the understanding of such large-scale events and presumably improve anticipation of future extreme flood occurrences.