# Floods during the last millennium – what are the trends and how exceptional was the Storofsen flood in 1789 ?

**J. Håvardslien[1], K. Engeland[1,2], L. Li[3] O. Silantyeva[1] L. M. Tallaksen[1]**
*[1]Department of Geosciences, University of Oslo*
*Sem Sælands vei 1, 0371, Oslo – Norway*
*[2]NVE, Oslo - Norway*
*[3]NORCE, Bergen - Norway*

**ABSTRACT**

Floods are natural disasters that destroy infrastructure and sometimes claim human lives. Future flood events are predicted to become larger and more frequent. To plan for the future, it is valuable to have knowledge about the past. The largest known flood occurring in Norway during historical time is the infamous Storofsen in late July, 1789. In this study we investigated the hydrometeorological conditions creating Storofsen and placed this extraordinary event into the context where the evolution of floods during three historical time periods: Medieval Warm Period (MWP), Little Ice Age (LIA) and Industrial Time (IT) is analyzed. This study focus on two catchments in south-eastern Norway (Lam and Elverum) where the 1789-flood caused large impacts and the actual flood levels are known. The hydrological modelling framework Shyft was used to simulate discharge and key water balance components. Paleo climate output from the Norwegian Earth System Model (NorESM1-F) for the three period MWP, LIA and IT was used as model forcings to establish a dataset of simulated floods from the past millennium. The same model was used to establish precipitation events capable reproduce Storofsen. The results show that (i) there are slightly higher and more frequent floods during the LIA as compared to MWP and IT (ii) the flood seasonality is consistent for all three periods, where the annual maximum floods occur in May/June at Lalm and May at Elverum. Furthermore, none of the simulated floods occurred in late July, confirming that the Storofsen flood was exceptional. Several of the simulated floods exceeded the Storofsen flood with up to 100% within each of the periods, however, we believe that these simulated peaks are unrealistic. Peak mean precipitation required to cause a simulated flood with the magnitude of Storofsen was found to be 612 and 93.6 mm/day for Lalm and Elverum, respectively.

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