The potential of predicting low flow periods for the central European rivers with a special focus on summer 2018

Monica Ionita-Scholz

Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Paleoclimate Dynamics, Bremerhaven, Germany (monica.ionita@awi.de)

During the last decades several low flow periods, at European level, occurred with severe impacts not only on the river itself but also on the civil society. Low flow periods affect navigation, hydropower production and the environment. A hot, dry 2018 summer has left the central European rivers and lakes at record low water levels, causing chaos for the inland shipping industry, environmental damage and billions of euros (dollars) in losses. Similar to floods, low flows are natural events which can considerably restrict different uses and functions of the river and impact water quality and the aquatic ecosystem. Moreover, it is expected that climate change will to lead to drier summers in Western Europe and therefore possibly to more frequent and more severe low flows in rivers in the future. The results presented here show that the summer 2018 low flow situation, over the Rhine river, could have been predicted one season ahead using previous months sea surface temperature, sea level pressure, precipitation, mean air temperature and soil moisture. Moreover, the statistical model was able to predict more than 85% of the water levels for August 2018 one month ahead. The lagged relationship between the monthly and/or seasonal streamflow and the climatic and/or oceanic variables vary between 1 month (e.g. local precipitation, temperature, and soil moisture) up to 6 months (e.g. sea surface temperature). Given that all predictors used in the model are available at the end of each month, the forecast scheme can be used to predict extreme events and to provide early warnings for upcoming low flow periods.