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On the influence of multi-decadal North Atlantic climate variations on drought occurrence in the European Greater Alpine Region

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The development of drought is characterized by an evolving precipitation deficit taking place on different spatial and temporal scales. As recent studies show, meteorological drought characteristics, like intensity, seasonality and severity, exhibit multi-decadal changes. Internal variations of the climate system and the associated changes of dominant weather regimes are therefore considered the main driver of these drought features. In this study we analyze the connection between drought characteristics and large scale atmospheric and oceanic modes particularly those of the North Atlantic which are heavily influencing European climate.

We use the dataset of Haslinger and Blöschl (2017) which consists of a collection of meteorological drought events occurring in the European Greater Alpine Region (GAR) over the past 210 years. Every event is determined by an extent in space and time and certain attributes as duration, intensity, temperature anomaly, region of most impact etc. In addition the monthly time series of the North Atlantic Oscillation Index (NAO) and the Atlantic Multidecadal Oscillation Index (AMO) are used.

Preliminary results show that late winter and spring droughts are associated with a positive phase of the NAO, which is particularly the case for the more continentally and Mediterranean influenced areas of the GAR. A regression analysis of the 30-year running mean NAO Index and drought intensities reveal a strong connection (r^2 = 0.7) from 1820 until 1960. However, afterwards the correlation drops significantly (r^2 = 0.3). This abrupt change might indicate a general regime shift considering long-term precipitation characteristics in the GAR.

Haslinger K. and G Blöschl (2017): Space-time patterns of meteorological drought events in the European Greater Alpine Region, in preparation for Water Resources Research.