

SYNOPTIC METEOROLOGY AND DROUGHT IN EUROPE

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Hydrological droughts are regional phenomena with a strong influence on society and environment. The analysis of the synoptic meteorological driving forces not only sheds light on the processes causing large-scale droughts in Europe but also has forecasting potential. In this study, the influence of the North Atlantic Oscillation Index (NAOI) and the 'European Grosswetterlagen' (classified circulation patterns (CP)) on serious streamflow anomaly periods were investigated. From the European Water Archive (EWA), the database of the FRIEND project, a dataset of daily streamflow records from 1962 to 1990 was available for 602 catchments across Europe. To define streamflow anomaly in terms of a negative deviation from the seasonal normal streamflow range, a varying threshold approach was applied. Cluster analysis classified the historic series of the resulting event-indicators into groups, which were found to be spatially coherent and homogeneous. Regional drought indices (RDI) for each cluster then provided the basis for the correlation with the NAOI and the analysis of the associated CPs. For the winter half-year (Nov-Apr), the RDIs of most European regions show a significant negative correlation with the NAOI. Only streamflow anomaly in Spain is inversely correlated. For the summer season, significant correlations with the NAOI were found only for the Nordic countries and Spain. The anomalies of CP frequencies and persistency during streamflow anomaly periods show many similarities but also distinct regional and seasonal differences across Europe. In summer for instance, the CP describing a high-pressure ridge above Europe shows a positive frequency anomaly for all regions except Norway and the northeast Europe. Finally, a model relating the RDI to preceding CP group frequencies was tested. Depending on the region, up to 65% of the event days can be correctly simulated. Consequently, the relationship found is valuable to be included in regional drought prediction and forecasting systems.