EMS Annual Meeting Abstracts
Vol. 14, EMS2017-82, 2017

A new precipitation and meteorological drought climatology based on weather patterns

Douglas Richardson (1), Hayley Fowler (1), Chris Kilsby (1), and Robert Neal (2)

(1) School of Civil Engineering & Geosciences, Newcastle University, Newcastle upon Tyne, UK (d.richardson2@newcastle.ac.uk), (2) Department of Weather Science, Met Office, Exeter, UK

Weather-pattern, or weather-type, classifications are a valuable tool in many applications as they characterise the broad-scale atmospheric circulation over a given region. An analysis of regional UK precipitation and meteorological drought climatology with respect to a new set of objectively defined weather patterns is presented. This classification system, introduced last year, is currently being used by the Met Office in several probabilistic forecasting applications driven by ensemble forecasting systems. The classification consists of 30 daily patterns derived from North Atlantic Ocean and European mean sea level pressure data. Clustering these 30 patterns yields another set of eight patterns that are intended for use in longer-range applications. Weather pattern definitions and daily occurrences are mapped to Lamb Weather Types (LWTs), and parallels between the two classifications are drawn. Daily precipitation distributions are associated with each weather pattern and LWT. Drought index series are calculated for a range of aggregation periods and seasons. Monthly weather-pattern frequency anomalies are calculated for different drought index thresholds, representing dry, wet and drought conditions. Persistence properties of the classification are also explored by identifying runs of different combinations of patterns. Annual frequencies of the new weather patterns largely agree with their respective LWTs and there is broad agreement between changes in these frequencies over time. The set of 30 weather patterns is shown to be adequate for precipitation-based analyses in the UK, although the smaller set of clustered patterns is not. Furthermore, intra-pattern precipitation variability is lower in the new classification compared to the LWTs, which is an advantage in the context of precipitation studies. Six of the new weather patterns are associated with drought over the entire UK, with several other patterns linked to regional drought. Sequences of the less frequent patterns are more persistent than the more frequent patterns, which may have useful consequences for predicting high-impact weather events.