Impact of quasi-stationary waves on European weather and extreme events and their connection to sea surface anomalies

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Abstract

Large-scale, quasi-stationary atmospheric waves (QSWs) have long been known to be associated with weather extremes such as the European heatwave in 2003. There is much debate in the scientific literature as to whether QSW activity may increase under a changing climate, providing a strong motivation for developing a better understanding of the behavior and drivers of QSWs. In this talk I will present a robust objective method for a simple identification and characterization of these waves, their connection to European weather and extreme events as well as a basic QSW climatology. Further we identified the most dominant QSW patterns, their relevance for European weather and how they are associated to large scale atmospheric circulation indices (NAO, AO, Niño3.4).
To identify possible large-scale drivers of such wave patterns, a maximum covariance analysis technique is applied between QSW and sea surface anomalies (temperature and ice cover). The two most dominant connections are linked to the El Niño Southern Oscillation and the North Atlantic Oscillation. They confirm the expected relationship between QSWs and anomalous surface conditions in the tropical Pacific and the North Atlantic. The third connection however occurs between late winter to early spring Atlantic sea ice concentrations and anomalous QSW patterns in the following late summer to early autumn. This new finding offers a pathway for possible long-term predictability of late summer QSW occurrence.