



Aspects of Northern Hemisphere Blocking

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Atmospheric blocking is one of the most intriguing phenomena of the mid-latitude climate. Its onset is accompanied by the sudden breakdown of the mid-latitude westerly flow, while the storm activity deviates to the north and to the south of the blocking anticyclone. The arrival of blocking is associated with extremely cold weather in the winter and droughts in the summer. The basis of this study is the compilation of a comprehensive Northern Hemisphere climatology of blocking, with the aid of a dynamically based blocking index and the new ERA-40 dataset. This climatology then allows us an investigation of the dynamics of blocking in regional sectors. Finally, the relationship of blocking with the well-known North Atlantic Oscillation (NAO) is explored.

Abundant blocking is identified over the Atlantic, Europe, central and eastern Pacific, and central Asia regions, downstream of the main jets and their associated storm tracks. A composite study of blocking evolution suggests that the process of wave breaking is central to its formation. A jet located at a more northerly (southerly) position favours anticyclonic (cyclonic) wave breaking that eventually results in blocking development. For winter European blocking, evidence is provided concerning the prior existence of increased upstream synoptic activity, and for a planetary scale preconditioning that favours the poleward migration of the Atlantic jet and storm track.

The occurrence of simultaneous blocking between widely separated sectors is shown not to be more frequent than expected from climatology and random occurrence. However, evidence for a lagged relationship is found. A robust winter correlation pattern between the NAO and blocking is established. An upward trend in winter NAO index is detected, and the spatial pattern of trends of observed blocking frequency is consistent with the relationship between them.