Atmospheric Blocking: Development and Predictability for the Northern Winter Hemisphere

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The general aim of this research is to deepen understanding of the dynamical mechanisms responsible for atmospheric blocking and to evaluate the representation of these mechanisms in NWP models through the usage of the TIGGE data set.

In order to do this we have developed a range of indices based on the Pelly and Hoskins (2003) blocking index B (based on the reversal of the meridional gradient of potential temperature theta on the dynamical tropopause) The first new index indicates whether a blocking event develops as a cyclonic or anticyclonic Rossby wave-breaking event, while the second determines which of the two extrusions (the equatorward-moving high PV air or the poleward-moving low PV air) is dominant. These tools lead to a comprehensive description of all stages of blocking. We have analyzed the ERA-40 data set in order to better understand the behavior of blocking in all the different regions of the Northern Hemisphere over the 44 years available from the reanalysis.

The application of these indices to the TIGGE data set allows the possibility to look at the occurrence of blocking in different ensemble members of the same forecast, and in forecasts of different lead times. Such an approach allows to both test how forecasts could be improved - particularly for the occurrence of blocking and its duration - and to compare the skill of different NWP centres in predicting this phenomenon.

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