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Atmospheric blocking and the contribution of transient waves to its onset, decay and maintenance

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A full understanding of the dynamical behaviour of atmospheric blocking is still lacking, despite the influence of blocking towards hazardous mid-latitude weather extremes. Using geopotential height anomalies, relative to the zonal mean flow and persistent longitude-dependent eddies, and an objective feature tracking algorithm, the climatologies and lifecycles of anticyclones that contribute to blocking events are explored. Case studies and a climatology for blocking are presented using this process, and results show that this method performs favourably in relation to existing block detection methods since most blocking configurations are successfully detected. Then, blocking events are classified according to location of occurrence and persistence, and characteristics including intensity and areal extent are examined. The anticyclonic features contributing to blocks are also studied in terms of their genesis and lysis regions, along with anomaly strength and speed. It is found that many of the anticyclonic features that enter a block form a long way upstream, before travelling along the Rossby wave guide and intensify in the block. Furthermore, anticyclonic features that leave a block can then proceed to re-intensify further downstream and be part of a further blocking episode in a new location. This shows that there is an inherent interaction between transient waves and stationary blocks, and these results provide evidence for the previously-proposed selective absorption mechanism (SAM) for block maintenance.