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A 55-year Northern Hemisphere blocking climatology

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Mid-latitude climate is determined by the eastward circulation of extra-tropical cyclones. However, this mean configuration is usually interrupted by persistent and quasi-stationary large-scale anticyclonic systems in the middle troposphere called blocking. These areas are characterized by a strong meridional wind component and a weaker jet stream, disrupting the regular eastward progression of mid-latitude disturbances. As a result, they present significant local and regional impacts over the regions located upstream and downstream of the anticyclone area.

This abstract summarizes the results obtained in a new 55-year (1948-2002) Northern Hemisphere blocking climatology. A new algorithm provides a complete characterization of blocked flows by means of several parameters such as the location of the blocking centre, its intensity and extension. In order to avoid some concerns linked to traditional detection methods, a new tracking procedure detecting coherently persistent blocked patterns (blocking events or episodes) has also been performed.

Applying this objective method, the longest known Northern Hemisphere blocking climatology has been obtained and compared with previous studies. Global blocking features are described and new four independent regional blocking sectors are presented based on the seasonal preferring distributions of blocking formation: Atlantic (ATL), European (EUR), West-Pacific (WPA) and East-Pacific (EPA). Long-lasting events and greater extensions and intensities are found in the oceanic sectors, especially in cold seasons, while episodes are relatively more frequent in continental sectors and transition margins in warm seasons.

Northern Hemisphere blocks present a significant trend toward weaker and short-lived events. Also, WPA (EUR and ATL) episodes show an increasing (decreasing) annual frequency, essentially confined to the spring (winter) season. It has been found that

teleconnection patterns exert a limited influence on blocking parameters and occurrence. Their main signal is confined to wintertime, when regional patterns explain more than 15% of blocking frequency variance, except in WPA sector. Thus, regional blocking occurrences and durations over ATL, EUR, WPA and EPA are sensitive to regional patterns affecting these sectors. Unlike of previous works, no ENSO signals have been found in blocking frequency. These differences could be attributable to the ENSO influence in determining preferred blocking locations (with LN phases favouring westward displacements over the Pacific) as well as a higher spatial resolution in the new proposed blocking sectors. Also, ENSO modulates blocking intensities showing more intense blocking events during LN phase, especially over the EPA sector.