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The 2004/05 winter drought in Portugal: dynamical structure

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The 2004/05 winter in Portugal was abnormally dry and led to the development of an extreme or severe drought episode throughout the country with major impacts on the water resources, crop yields and forest fires. This specific episode was due to a strong perturbation in the long-term mean stationary wave pattern over the North Atlantic. This perturbation was manifested by an exceptionally strong enhancement of the climate-mean North Atlantic ridge, which was accompanied by rather strong anomalies in the geopotential heights, vorticity and temperature fields over the North Atlantic. One of the most striking changes in the large-scale flow was the blocking of the westerlies and the consequent northward shift in the axis of maximum moisture transports over the North Atlantic. As a result, during most of this winter, the main track of the low-pressure systems associated with the developing baroclinic disturbances was far enough from Portugal to hamper the development of rain-generating conditions. This dynamical aspect is corroborated by the pattern of the mean transient eddy humidity transports. Therefore, almost all winter days were keyed to two dry weather regimes, previously isolated by a K-means clustering analysis for the precipitation in Portugal. These two regimes are basically linked to anticyclonic circulation, easterly winds and anomalously low specific humidity over Portugal.