EGU22-10592
https://doi.org/10.5194/egusphere-egu22-10592
EGU General Assembly 2022


# Large-scale forcing of extreme African dust storms by double Rossby wave breaking

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Dust storm genesis is one of several high-impact weather phenomena that may result from Rossby wave breaking (RWB). The wave propagation into low latitudes over North Africa facilitates instability through upper-level divergence and the reduction of the static stability ahead of the cyclonic side of the wave train, and therefore modulates the low-level tropospheric conditions in dust source areas.

The analysis of three dust storm case studies that strongly impacted the Iberian Peninsula and another one impacting the Cape Verde Islands indicates that a *double* RWB process within the Polar Jet (PJ) stream over the eastern North Atlantic and western Europe is a common large-scale upper-level precursor to the formation of the large North African dust storms and subsequent transport of dust (Orza et al, 2020; Dhital et al, 2020).

The synoptic and larger subsynoptic scale features were analyzed using ERA-Interim reanalysis while mesoscale features were studied by high-resolution WRF-CHEM simulations. There are substantial differences between the case studies in the location and geometry of upper- and low-level features following the first break (Dhital et al, 2020; 2021). However, in all case studies (1) RWB within the PJ stream is observed; (2) there is a substantial poleward expansion of the upper-level subtropical ridge; and (3) the secondary RWB is amplified by nonlinear wave reflection from the first break.

Preliminary results from a larger number of cases study indicate the relevance of secondary RWB in the PJ stream. The dynamics may also result in cutoff lows and amplified low-PV ridging accompanying cyclogenesis and heatwaves, respectively, which emphasizes the need to improve our understanding of the involved processes.

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