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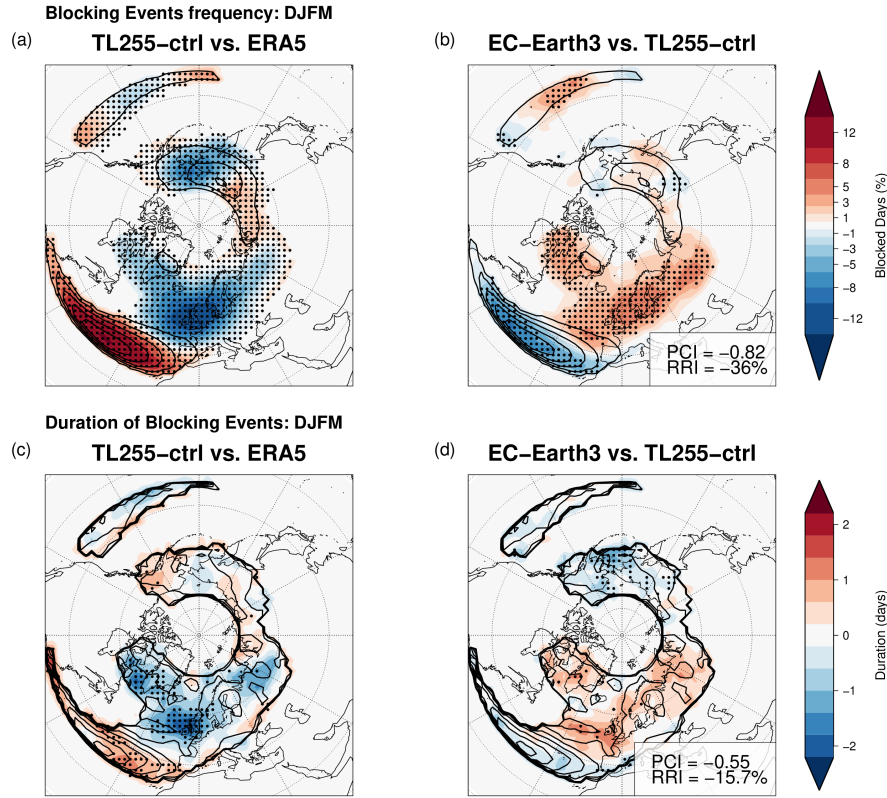
*Supplement of*

## **Orographic resolution driving the improvements associated with horizontal resolution increase in the Northern Hemisphere winter mid-latitudes**

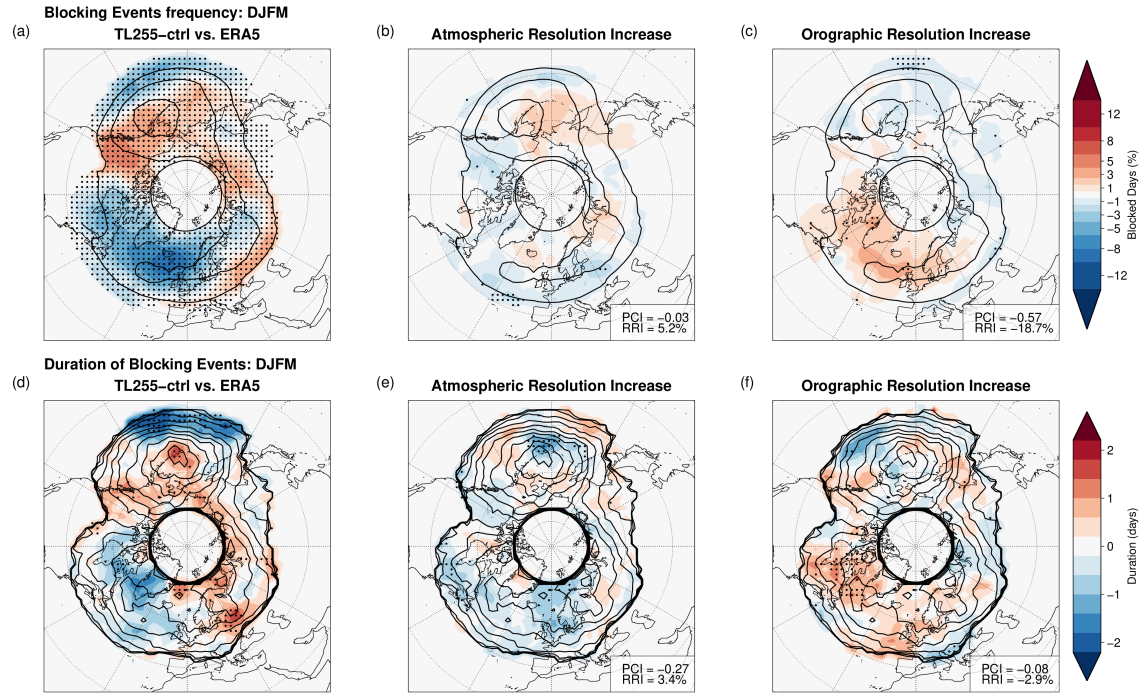
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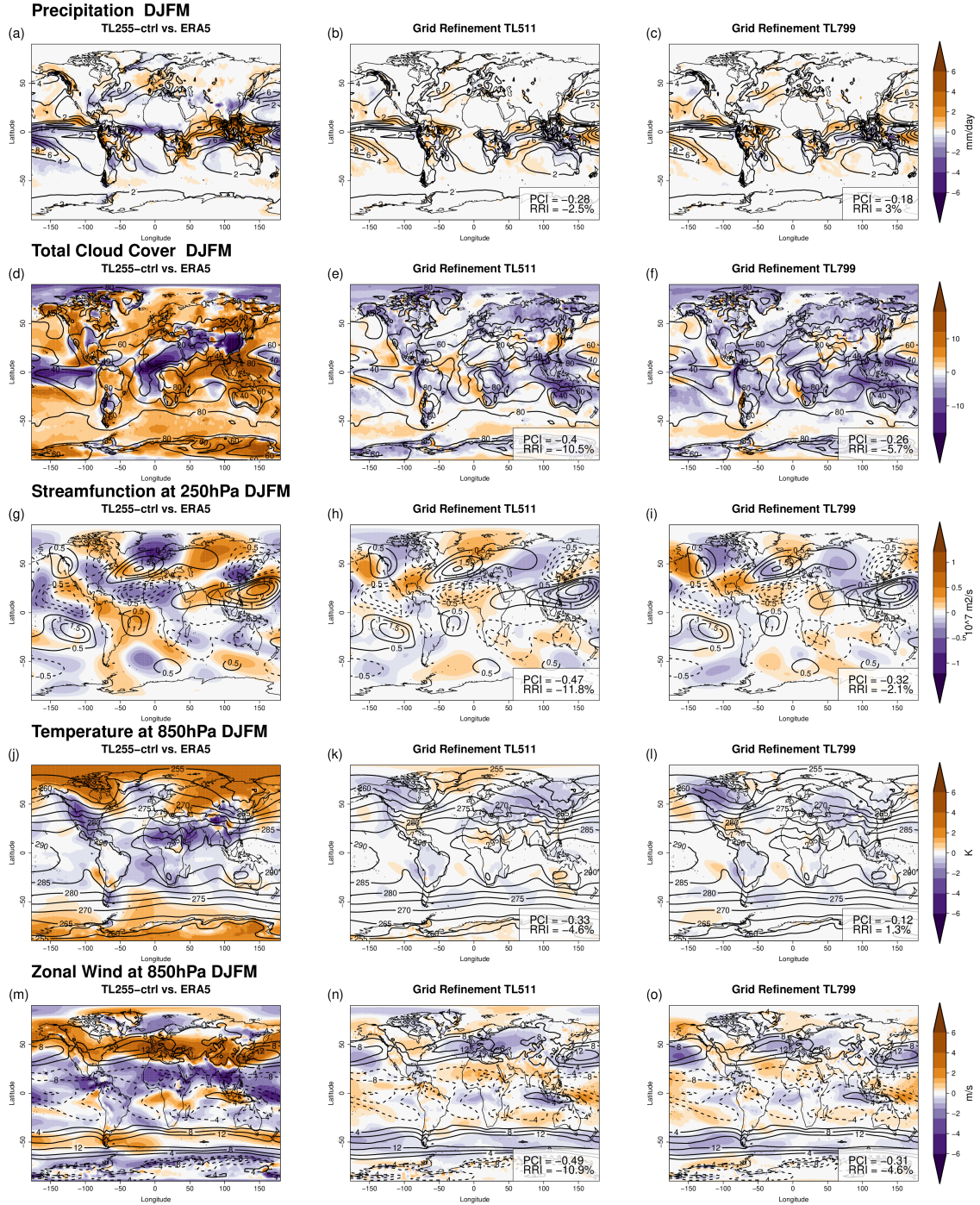
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**Figure S1.** DJFM blocking events frequency (top row) and blocking events duration (bottom row) for (a,d) EC-Earth3 TL255-ctrl bias with respect to ERA5 (b,e) changes induced by the activation of the orographic parametrizations at TL255. For blocking frequency, contours are drawn every 5%. For blocking duration, contours are drawn every 0.5 days.

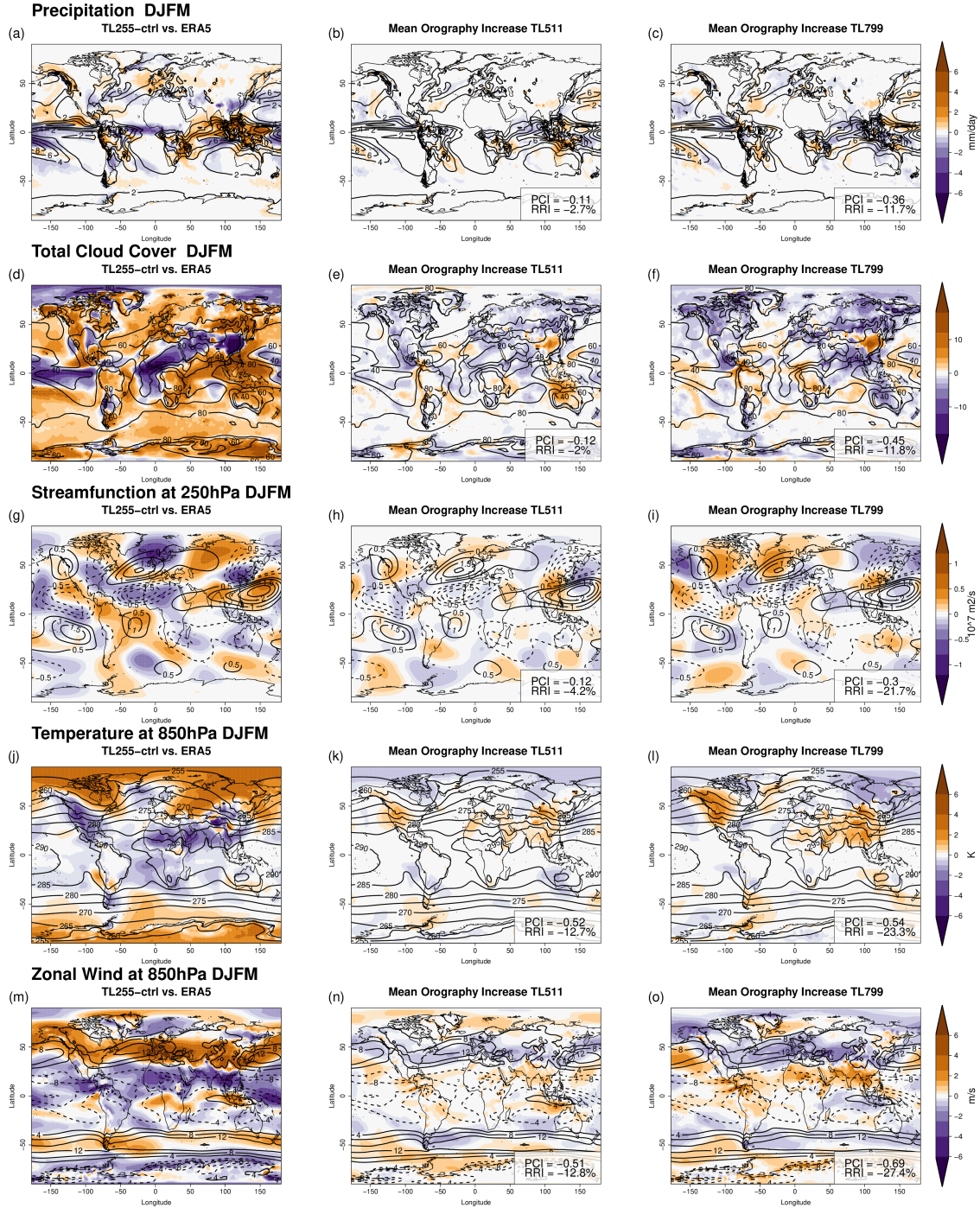


**Figure S2.** As Figure 5 from the main manuscript, but using an instantaneous blocking index based on Schwierz et al. (2004)



**Figure S3.** As Figure 2 from the main manuscript, but for showing the impact of grid refinement at TL511 (i.e. TL511-orog255 minus TL255-ctrl) and TL799 (i.e. TL799-orog255 minus TL255-ctrl) for precipitation, total cloud cover, streamfunction at 250hPa, temperature at 850hPa and zonal wind at 850hPa.





**Figure S4.** As Figure 2 from the main manuscript, but for showing the impact of orography refinement at TL511 (i.e. TL511-ctrl minus TL511-orog255) and TL799 (i.e. TL799-ctrl minus TL799-orog255) for precipitation, total cloud cover, streamfunction at 250hPa, temperature at 850hPa and zonal wind at 850hPa.