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Northern Hemisphere atmospheric blocking simulation in present and future climate

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We present a comprehensive analysis of the representation of winter and summer Northern Hempishere atmospheric blocking in global climate simulations in both present and future climate. Three generations of climate models are considered: CMIP-3 (2007), CMIP-5 (2012) and CMIP-6 (2019).
All models show common and extended underestimation of blocking frequencies, but a reduction of the negative biases in successive model generations is observed. However, in some specific regions and seasons as the winter European sector, even CMIP-6 models are not yet able to achieve the observed blocking frequency. For future decades the vast majority of models simulates a decrease of blocking frequency in both winter and summer, with the exception of summer blocking over the Urals and winter blocking over Western North America. Winter predicted decreases may be even larger than currently estimated considering that models with larger blocking frequencies hence generally smaller errors - show larger reduction. Nonetheless trends computed over the historical period are weak and often contrasts with observations: this is particularly worrisome for summer Greenland blocking where models and observation significantly disagree. Finally, the intensity of global warming is related to blocking changes: wintertime European blocking is expected to decrease following larger global mean temperatures, while Western Russia summer blocking is expected to increase.