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Exploring the influence of the North Pacific Ocean Rossby wave sources on interannual variability of summer precipitation and surface temperature over the Northern Hemisphere

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The influence of Rossby wave sources (RWS) emitted on the Northeastern Pacific Ocean (NePO) in the Northern Hemisphere during summer is analysed in the ERA5 reanalysis and a large ensemble performed with the EC-Earth3 model. Using extreme years composites of precipitation, surface temperature and geopotential height, we found a causal influence of the Rossby waves generated over the NePO on a global climate response. Both the reanalysis ERA5 and the EC-Earth3 large ensemble show that RWS triggers wave-like patterns arising from the upper troposphere NePO region. We show that an increased Rossby wave sources intensity is related with a) negative temperature anomalies over western North America, b) positive temperature anomalies over eastern North America, c) increased precipitation over Northern Europe during summer and d) sea-ice concentration decrease in the Arctic. We also show that the North Atlantic plays a very important role hindering or permitting that Rossby waves generated in the Pacific reach the Atlantic and modulate the atmospheric conditions over Europe. Such conditions were found in ERA5 and EC-Earth3 large ensemble during colder and icier conditions over the North Atlantic.