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The effects of reduced Atlantic and Pacific land-sea thermal contrast on the extratropical circulation

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In the Northern-Hemisphere mid latitudes the winter land-sea thermal contrast is expected to decrease with increasing CO_2 in the atmosphere, due to a faster warming of the continents with respect to the oceans. Moreover, the reduction of the winter thermal contrast is basin dependent, as it is influenced by regional warming patterns specific of the Atlantic and Pacific sectors, e.g. by the North-Atlantic Warming Hole.
In this work we run a set of idealised perpetual-winter numerical experiments made with the simplified atmospheric circulation model SPEEDY where the extratropical land-sea thermal contrast is reduced by means of warm temperature anomalies over the continents. The reduction of the thermal contrast is performed first over the whole Northern Hemisphere, then over individual basins - Atlantic and Pacific - by warming, in turn, the land temperature of East Asia and North America. The impact of the reduced winter contrast on the mid-latitude tropospheric circulation is analysed with a focus on stationary planetary waves, the jet streams and the associated storm tracks. From the individual-basin approach we find that the Pacific land-sea thermal contrast is particularly important for the shape and amplitude of the stationary planetary waves and that it affects the whole Northern-Hemisphere circulation, reaching the North Atlantic storm track and jet. The role of the stratospheric pathway in the tropospheric response to reduced thermal contrast is also investigated, and shows nearly opposite features with respect to reduced Atlantic or reduced Pacific thermal contrast.