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The short-term response to a warming Arctic with a coupled model

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The Arctic region warms faster than the others regions of the globe which is known as the Arctic Amplification. The Arctic warming (AW) is expected to have impacts on the mid-latitudes Northern Hemisphere (NH) climate. It is essential to better understand theses teleconnections to predict future climate. The AW teleconnections and the related ocean-atmosphere interactions are investigated with the coupled model IPSL-CM5A-LR. We compare three ensembles of 10 members each that only differ by the Arctic sea ice configuration: one ensemble uses present day control conditions and the other two used modified sea ice parameters to reproduce the Arctic sea ice extent corresponding to a warming of +1.5 °C. We constrain the Arctic sea ice by reducing the thermal conductivity or albedo of the sea ice in Northern Hemisphere only. For both method, reducing the Arctic sea ice leads to an Arctic Warming which propagates all over the globe, while no major tropical warming is found as a La Niña oriented response is simulated. A rapid weakening of the AMOC of about 0.7-0.8 Sv is seen for both methods. When we compare the results from the two methods, the albedo ensemble shows more intense surface heat flux anomaly in the Arctic sea ice region and a poleward shift of the mid-latitudes jets. The mechanisms behind the response of AW in these simulations will be investigated with the diagnostics of the energy and freshwater budget driven by the AW.