



Arctic influence on mid-latitude weather and climate: recent progress and future prospects

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Because of the strong decrease of Arctic sea ice cover in recent decades a multitude of studies has been spurred investigating the influence of this decrease on mid-latitude weather and climate. However, already well before the period of strong Arctic sea ice decline, sea ice reduction/removal experiments have been carried out with atmosphere-only models. It is only very recently that some facts have been established from both observational and modeling studies (such as reduction and southward shift of the jet stream as a response to Arctic sea ice decline and intensification of the Siberian High as a response to Barents Sea / Kara Sea sea ice decline). Especially it has been noted that the region of Arctic sea ice changes plays a role for the atmospheric response and that atmosphere-ocean feedbacks are important calling for coupled model simulations which have been performed more and more during the recent decade. Traditionally the role of Arctic sea ice has been explored. While the strongest temperature increases in the Arctic atmosphere have indeed occurred close to the Arctic sea ice in the boundary layer in the last decades, also in higher altitudes substantial warming has taken place not only due to the Arctic sea ice loss but also due to transport from lower latitudes. Therefore, recently model experiments have been designed and carried out within the EU project APPLICATE to explore the influence of the Arctic atmosphere rather than the Arctic sea ice on the mid-latitude weather and climate. Furthermore, to overcome the issue of different experiment set-up, the coordinated Polar Amplification Model Intercomparison Project (PAMIP) endorsed by CMIP6 has been established, where a set of experiments is defined to be performed by different modeling centers of the CMIP6 community. The dataset of coordinated well-defined experiments which will be created as a result of this project will for the first time enable the research community to perform a multi-model analysis on polar – mid-latitude linkages, not only in the direction of polar to mid-latitude but also in the maybe even more important direction of mid-latitude to polar.