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Past, Present and Future of Arctic Based on Global Coupled Climate Models

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The response of Arctic region to an increase in atmospheric GHG concentrations simulated by climate models is investigated here using the Brazilian Earth System Model (BESM) and compared with CMIP5 models dataset. We evaluated the ability of climate models to represent the Arctic sea ice changes and climate sensitivity to the atmospheric Carbon dioxide (CO₂) forcing. To do this, we used decadal simulations (1980- 2012), Future scenarios with Representative Concentration Pathway RCP 4.5 and RCP 8.5 (2006-2100) and quadrupling of the atmospheric CO₂ concentration (2006-2300). We validated our results with satellite observations. BESM results for the Arctic sea ice seasonal cycle are consistent with CMIP5 models and observations. However, almost all models tend to overestimate Sea Ice Extent (SIE) in March compared to observations. Future scenarios show dramatic decrease in SIE as response to an increase in radiative forcing. The projected future sea ice loss is explained by the combined effects of both: the amplified warming in northern hemisphere and climate feedbacks. The quadrupling of CO₂ concentration numerical experiment shows the amplified warming as response to CO₂ forcing with strongest warming in winter and Autumn season. The interdisciplinary effects of Anthropogenic forcing in Arctic region still are considering a hot topic and lack conclusive answers.