Contributions of Anthropogenic Aerosols and Multidecadal Internal Variability to Mid-20th Century Arctic Cooling

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Abstract

We developed the Meteorological Research Institute Earth System Model version 2.0, MRI-ESM2.0, which was one of the models that participated in the Coupled Model Intercomparison Project Phase 6 (CMIP6), contributing to the IPCC sixth assessment report, and the Arctic Monitoring and Assessment Programme (AMAP) short-lived climate forcers (SLCFs) assessment. MRI-ESM2.0 generally provides realistic reproduction in both mean climate and interannual variability. MRI-ESM2.0 also reproduces well the sulfate concentrations observed in ice cores in Greenland. In this presentation, we introduce our recent studies on aerosols and climate using MRI-ESM2.0 and CMIP6 multi-model analysis. Observations showed the Arctic surface cooling during the mid-20th century (1940–1970), followed by ongoing rapid warming since 1970. We conducted a multi-model analysis using the CMIP6 Detection and Attribution Model Intercomparison Project (DAMIP) historical simulations, suggesting that human-related external factors could contribute to the high-latitude surface cooling observed in 1940–1970. Our analysis shows that both increased anthropogenic aerosols and multidecadal internal variability are major contributors to the 1940–1970 Arctic surface cooling. Since anthropogenic sulfur emissions and sulfate aerosols will decrease in any future scenarios of shared socioeconomic pathways, Arctic warming will continue over the near-term future even under strong cooling fluctuations generated by internal variability.

Early Career Scientist

NO, I am not an early career scientist.

IGAC Activities

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