

EGU22-9781

<https://doi.org/10.5194/egusphere-egu22-9781>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Evaluation of anthropogenic aerosol forcing and multidecadal internal variability contributing to mid-20th century Arctic cooling — CMIP6/DAMIP multimodel analysis

Takuro Aizawa^{1,2}, Naga Oshima¹, and Seiji Yukimoto¹

¹Meteorological Research Institute, Tsukuba, Japan (taizawa@mri-jma.go.jp)

²National Institute of Polar Research, Tachikawa, Japan

In the Arctic, observed decadal mean surface air temperatures (SATs) were 0.70°C–0.95°C lower around 1970 than around 1940. Many of the state-of-the-art climate model in the Coupled Model Intercomparison Project Phase 6 (CMIP6) exhibited Arctic surface cooling trend during 1940–1970, which could be attributed to external forcings. Multimodel means of CMIP6 Detection and Attribution Model Intercomparison Project (DAMIP) historical simulations exhibited Arctic surface cooling of -0.22°C ($\pm 0.24^{\circ}\text{C}$) in 1970 versus 1940 and showed that anthropogenic aerosol forcing contributed to a cooling of -0.65°C ($\pm 0.37^{\circ}\text{C}$), which was partially offset by a warming of 0.44°C ($\pm 0.22^{\circ}\text{C}$) due to well-mixed greenhouse gases. In addition to the anthropogenic aerosol forcings, multidecadal internal variability with a magnitude of 0.47°C was the components primarily contributing to the observed Arctic cooling. The SAT spatial pattern of pan-Arctic multidecadal cooling due to the internal variability was identified by the composite analysis and resembles the observed Arctic surface cooling pattern during 1940–1970.