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Short-Lived Climate Forcers over the Arctic between 1995 and 2015 as simulated by the GISS modelE2.1

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The Arctic Monitoring and Assessment Programme (AMAP) is currently assessing the impacts of Short-Lived Climate Forcers (SLCF) on Arctic climate and air quality. In support of the assessment, we used the NASA Goddard Institute of Space Sciences (GISS) Earth System Model (modelE2.1), with prescribed sea surface temperature and sea-ice fraction, to simulate SLCF concentrations globally between 1995 and 2015. Two simulations were conducted, using the One-Moment Aerosol (OMA) and the Multiconfiguration Aerosol TRacker of mIXing state (MATRIX) aerosol modules. OMA is a mass-based scheme in which aerosols are assumed to remain externally mixed and have a prescribed and constant size distribution, while MATRIX is an aerosol microphysics scheme based on the quadrature method of moments, which is able to explicitly simulate the mixing state of aerosols. Anthropogenic emissions from the ECLIPSE v6b emissions database were used, along with emissions from aircrafts and open biomass burning from the Coupled Model Intercomparison Project Phase 6 (CMIP6), while the natural emissions of sea salt, DMS, isoprene and dust are calculated interactively. The simulated monthly surface concentrations of sulfate (SO₄), black carbon (BC), organic carbon (OA), and ozone (O₃) are compared with observations from a set of Arctic stations, extracted from the EBAS and IMPROVE databases, as well as a few additional locations. Simulated aerosol optical depths (AOD) are also compared with Advanced Very-High Resolution Radiometer (AVHRR). The study will present the evaluation of the modelE2.1 in simulating SLCF levels over the Arctic using different aerosol schemes, along with observed and simulated trends of SLCFs over the Arctic between 1995 and 2015.