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*Supplement of*

## **Source attribution of Arctic black carbon and sulfate aerosols and associated Arctic surface warming during 1980–2018**

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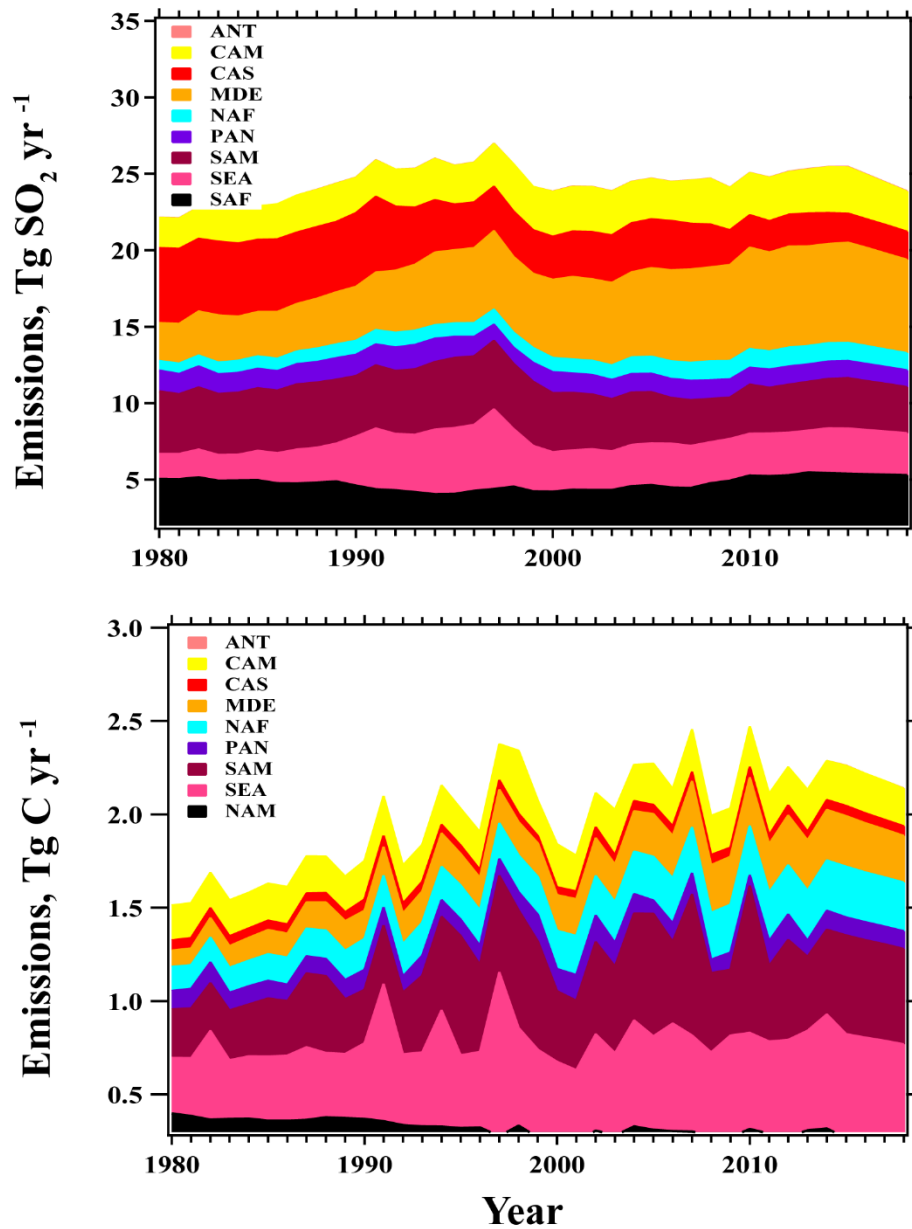
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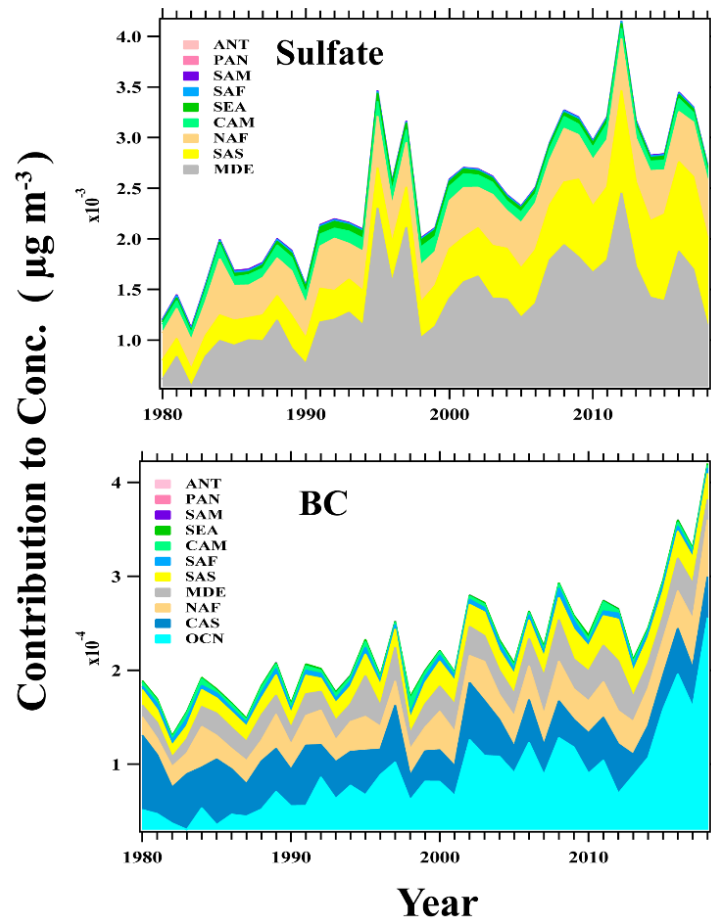
Figures S1 to S4

## **Introduction**

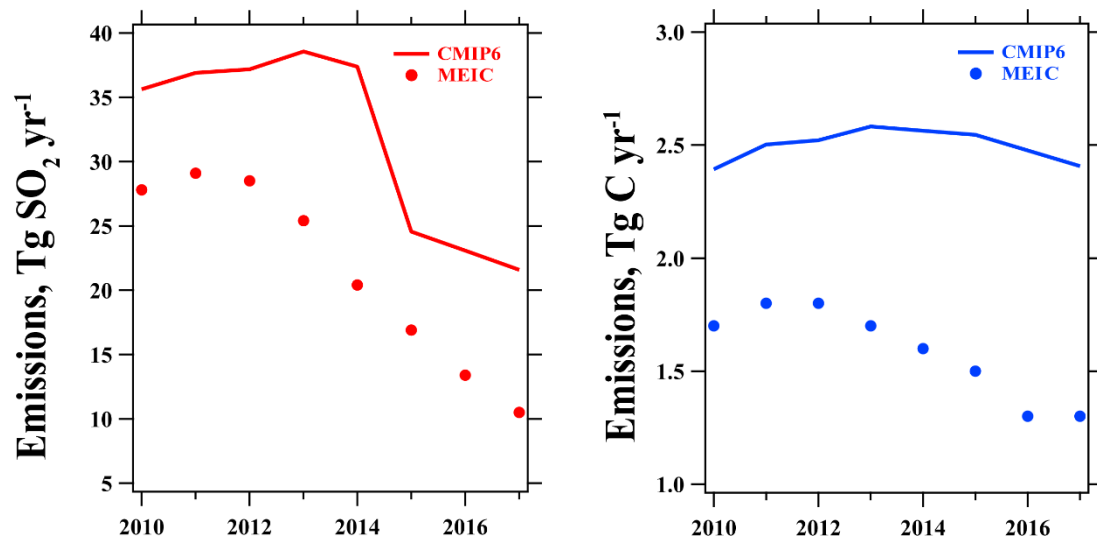
This auxiliary material contains supporting figures for source attribution of Arctic black carbon and sulfate aerosols, associated Arctic surface warming and emissions.



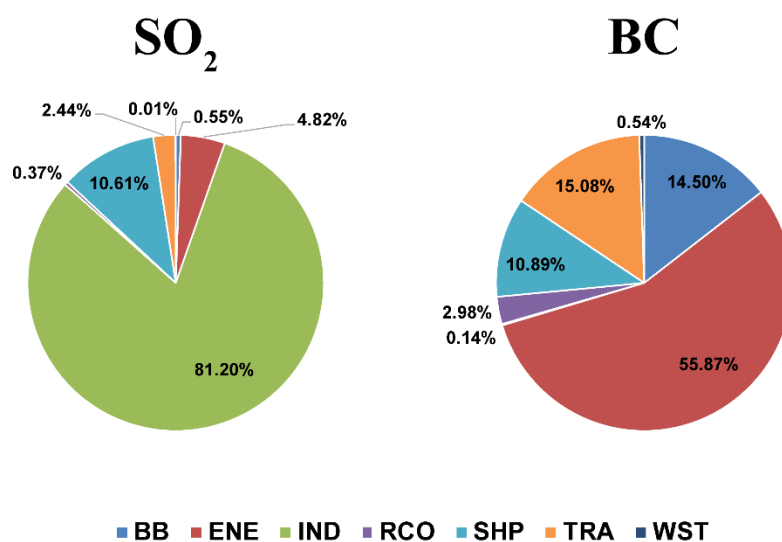
**Figure S1.** Time series of annual anthropogenic (top) SO<sub>2</sub> (Tg SO<sub>2</sub> yr<sup>-1</sup>) and (bottom) BC (Tg C yr<sup>-1</sup>) emissions from other regions of Fig. 2 individually.



**Figure S2.** Time series (1980–2018) of absolute (left,  $\mu\text{g m}^{-3}$ ) contributions of emissions from OTH source regions to the simulated annual mean near-surface sulfate and BC concentrations averaged over the Arctic.



**Figure S3.** Annual anthropogenic emissions of SO<sub>2</sub> and BC in China from CMIP6 (solid lines) and MEIC (dotted lines).



**Figure S4.** Annual mean of SO<sub>2</sub> and BC emissions from individual sectors in the Arctic during 2010-2014. BB: biomass burning, ENE: energy, IND: industry, RCO: residential, SHP: international shipping, TRA: transportation, WST: waste treatment.