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## Effects of increased aerosol emissions over Asia on global sea-surface temperatures

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Recent studies have revealed biases in sea surface temperature trends in CMIP6 between about 1970 and 2015, and other studies have suggested a possible lack of aerosol emissions over Asia in the same period. Motivated by these findings, we investigate the effect of doubling anthropogenic aerosol emissions over Asia from 1950 onward on sea surface temperatures in NorESM2-LM. While the perturbation of historical aerosol emissions does not yield a robust improvement in modeled sea surface temperature trends, we discover other changes which are worthy of further investigation:

- We find that the ocean heat transport decreases significantly in the Northern Hemisphere extratropics, which is counter-intuitive given the increasing temperature gradient between the tropics and the polar regions due to the enhanced aerosol emissions.
- When doubling SO<sub>2</sub> emissions, we find increases in Southern Hemisphere sea surface temperatures in contrast to cooling in the Northern Hemisphere.

Furthermore, we compare the fully-coupled simulations to atmosphere-only simulations where historical sea surface temperatures are prescribed and the same perturbation of aerosol emissions over Asia is imposed. The atmosphere-only simulations show much weaker changes in cloud cover compared to the fully-coupled simulations. Hence, sea surface temperature changes – possibly caused by changes in the oceanic circulation – must play an important role in setting the atmospheric response.