Geophysical Research Abstracts
Vol. 21, EGU2019-17397, 2019
EGU General Assembly 2019


# Aerosols, Atlantic Overturning Circulation, and Meridional heat convergence into the Arctic

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Determining changes in ocean heat transport into the Arctic through the Atlantic Meridional Overturning Circulation (AMOC) is an important step to understanding potential changes to the Arctic heat budget in the future. While previous studies have mostly focused on the impact of greenhouse gases on the AMOC and meridional heat transport, remote impacts of changing anthropogenic aerosol emissions are, however, poorly understood. Acosta et al., 2016 used the Norwegian Earth system model (NorESM) to show that the reduction of anthropogenic sulfate emissions from Europe since the 1980s could explain a large fraction of the observed rapid rates of warming in the Arctic, and suggest that this warming might be linked to an increase in poleward Ocean Heat Convergence (OHC). Here, we further investigate this hypothesis using idealized NorESM simulations, where the regional sulfate emissions in Europe were increased to substantially higher values (7 times the emissions of the year 2000). Results reveal three distinct changes in the meridional OHC. Between 30º-60ºN, there is an increase in the meridional heat convergence, that corresponds to an increase in the strength of the Atlantic overturning. Between 60-70ºN, large shifts in the ocean heat convergence are seen due to changes in the sea-ice extent and the corresponding ocean-ice-atmosphere heat flux exchanges, which leads to a decrease in the meridional ocean heat transport into the high Arctic (north of 70ºN). The mechanistic reasons for these observed shifts and discuss the potential implications are described. Additionally, we discuss the apparent disconnect between changes in the AMOC and meridional heat transport at the mid- and high-latitudes, similar to changes observed with greenhouse gases. Finally, we investigate the extent to which these changes are model-dependent.