3.109 Impacts of present-day and future shipping emissions in the Barents Sea region.

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Abstract:

The Arctic is undergoing unprecedented changes due to global warming which is intensified in the region leading to reductions in summer sea-ice extent opening up the possibility for increased shipping in particular along the North-East passage traversing the north coast of Norway and Russia. Shipping emissions may lead to the production of acidic compounds such as nitrate and sulphate aerosols which are highly soluble and can be deposited to land and marine ecosystems.

In this work, carried out as part of EU-FP7 project ICE-ARC (Ice, Climate, Economics - Arctic Research on Change), we focus on the Barents Sea where there is already quite significant shipping either in the form of transit shipping to Russia or related to fishing. We examine the impacts of present-day and future shipping on trace gases and aerosols which have the potential to impact human health and ecosystems, notably ozone, nitrate and sulphate aerosols.

The mesoscale model including chemistry, WRF-Chem, has been run at high resolution with recent shipping emissions for 2012 and 2050 for a variety of scenarios for a summer period (July/August). Present-day shipping emissions used real-time satellite AIS (Automatic Information System) ship positioning data for 2012 (Winther et al., 2014) and include pollutant emissions from fishing vessels that were not included in previous inventories. We take into account different future (2050) growth scenarios, such as CLE (current legislation) and HGS (high growth scenario), to investigate possible future changes in surface concentrations, total column burden and deposition fluxes. Results indicate that deposition of acidic compounds such as nitrate and sulphate aerosols from shipping to marine ecosystems could be significant with potential impacts on marine biogeochemistry and primary productivity, in particular in the Barents Sea during summer when surface waters are depleted of nutrients.