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Assessing the radiative forcing from sea-spray geoengineering using a composition-climate model with an aerosol microphysics scheme

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Marine Cloud Brightening (MCB) is one of several suggested solar radiation management geoengineering schemes proposed to counteract changes in climate resulting from anthropogenically increased greenhouse gas concentrations. Such changes include precipitation changes, increasing global average temperatures and an associated reduction in sea ice cover.

In contrast to most previous climate model studies of MCB which quantify the climate impacts of imposed changes to the cloud droplet number concentration. In this work we explicitly resolve the injection of a size-resolved source of sea salt aerosol into the boundary layer.

We use the UK Chemistry and Aerosol (UKCA) composition-climate model which is an extension of the UK Met Office Hadley Centre Global Environmental Model (HadGEM) and includes the GLOMAP-mode aerosol microphysics scheme coupled to a mechanistic cloud droplet activation module.

In this study, we quantify the aerosol direct and 1st indirect forcings from MCB without applying the aerosol radiative effects to the atmosphere model, ensuring identical meteorology in the control and perturbation experiments, consistent with the IPCC defined forcing. We carry out several sensitivity runs seeding several different regions of persistent marine stratocumulus clouds with soluble sea salt aerosol of varying radius.