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Atmospheric composition changes in CMIP6 experiments over the North Atlantic region

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A grand challenge in the field of chemistry-climate modelling is understanding the connection between anthropogenic emissions, atmospheric composition and the radiative forcing of trace gases and aerosols.

The 6th phase of the Coupled Model Intercomparison Project (CMIP6) includes a number of climate model experiments that can be used for this purpose. AerChemMIP [Collins et al.2017] focuses on calculating the radiative forcing of gases and aerosol particles over the period 1850 to 2100, and comprises several tiers of experiments designed to attribute the effect of changes in emissions.

The UK Earth System Model, UKESM-1, is a novel climate model developed for CMIP6 [Sellar et al., 2019] and is a community research tool for studying past and future climate. It includes a detailed treatment of tropospheric chemistry, interactive BVOC emissions and extensive stratospheric chemistry.

The North Atlantic Climate System is an area of current interest [Robson et al., 2020] and is the focus of the UKRI 'ACSIS' project. ACSIS brings together scientists from a range of different specialisms to understand complex changes in the North Atlantic climate system. By understanding how these changes relate to external drivers of climate, such as human activity, or natural variability, ACSIS aims to improve our capability to detect, explain and predict changes in the North Atlantic climate system.

We present an analysis of the evolution of atmospheric composition over the period 1950-2015. The work is based on a recent global multi-model evaluation of tropospheric ozone for CMIP6 [Griffiths et al., 2020] , but focuses on changes over the North Atlantic region in UKESM-1. We draw on CMIP and AerChemMIP simulations to provide an initial survey of the response of this

region to changing emissions , focusing on atmospheric composition and attempting attribution from a series of targeted experiments involving perturbed emissions .

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