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Studies of recent tropospheric ozone trends and their attribution using the UKCA chemistry climate model

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A grand challenge in the field of chemistry-climate modelling is to understand the connection between anthropogenic emissions, atmospheric composition and the radiative forcing of trace gases and aerosols. The AerChemMIP model intercomparison project, part of CMIP6 and due to begin in 2018, focuses on calculating the radiative forcing of gases and aerosol particles over the period 1850 to 2100.

We present an analysis of the trends in tropospheric ozone burden in the UM-UKCA from the recent forerunner to AerChemMIP, the Chemistry-Climate Model Intercomparison project, CCMI, focusing on the REFC1SD and REFC1 simulations over the recent historical period. We discuss these trends in terms of chemical production and loss of ozone as well as physical processes such as transport and deposition.

Observational data provide important constraints on ozone and its precursors, as well as other radiatively important gases such as methane. Data are available from a variety of platforms, spanning a range of spatial and temporal scales covering the past 40 years. Recent work has highlighted the discrepancy in model and observations concerning surface ozone at key stations and the trend in tropospheric ozone levels over the past 50 years.

We will present a comparison between modelled ozone and recent observational products, such as the TOAR database and flight data from the UK ACSIS campaigns and investigate how such data may be used to assess and to validate chemistry-climate models such as UKCA, and so improve the uncertainty regarding key forcing agents such as methane, ozone and aerosols. We discuss how these observational data may also be used to understand the origin of model biases.