

Virtual ACOM Seminar

The Role of Earth System Interactions in the Present-Day Forcing of Climate

Fiona M. O'Connor

Met Office Hadley Centre

Date: Monday, June 28, 2021, 10:00 – 11:00 am (MT)

Link: <https://operations.ucar.edu/live-acom>

ABSTRACT

Quantifying forcings from anthropogenic perturbations to the Earth system (ES) is important for understanding changes in climate since the pre-industrial (PI) period and into the future. Here, using a range of model experiments following the protocols defined by the Radiative Forcing Model Intercomparison Project (RFMIP) and the Aerosol and Chemistry Model Intercomparison Project (AerChemMIP), we quantify and analyse a wide range of present-day (PD) anthropogenic effective radiative forcings (ERFs). Quantifying ERFs that include rapid adjustments within a full Earth System Model (ESM) enables the role of various chemistry–aerosol–cloud interactions to be investigated.

The anthropogenic perturbations analysed include changes in greenhouse gas concentrations, aerosol and aerosol precursor emissions, ozone precursor emissions, and land use. For methane and non-methane ozone precursors, their ERFs are strongly influenced by cloud adjustments through chemistry-aerosol-cloud interactions. In the case of methane, these interactions increase the magnitude of the forcing but in the case of nitrogen oxides, cloud adjustments offset the forcing from ozone. These chemistry-aerosol-cloud interactions also give rise to non-linearities in forcing when different anthropogenic perturbations are applied in combination.

A process-based understanding of these interactions will be presented and the work suggests that rapid adjustments included in ERF estimates need to include chemical as well as physical adjustments to fully account for complex ES interactions.

For more information please contact Mary Anne Cervantes mcervant@ucar.edu, phone 303-497-1484.

The National Center for Atmospheric Research is operated by the University Corporation for Atmospheric Research under the sponsorship of the National Science Foundation