Coupling of Reactive Chemistry in the Atmosphere with Global Climate

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The reactive chemistry of the atmosphere has changed substantially since the preindustrial era resulting from human activity and climate change. In turn, climate change has influenced atmospheric composition through perturbations of natural processes, leading to complex feedbacks across a range of spatial and temporal scales. Here, I present some ongoing projects aimed at characterizing the interface between atmospheric chemistry and Earth's climate system in the past, present and future. First, I explore how uncertainty in reactive nitrogen chemistry and hydrocarbon oxidation mechanisms in the atmosphere contribute to uncertainties in chemistry-climate feedbacks, and ongoing efforts to evaluate these processes in global models through the ongoing NASA Atmospheric Tomography airborne mission. Second, I present new simulations aimed at constraining and understanding the processes that control variability in global hydroxyl abundance using surface observations of methyl chloroform (CH_3CCl_3) an ^{14}CO. Finally, I explore the coupling between the primary atmospheric oxidants OH and ozone with the production of reactive nitrogen oxides (NO_x) from lightning, and the subsequent impacts on surface air quality and long-term climate.

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EARTH SYSTEM SCIENCE PROGRAMME

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