4.062 How do short-lived climate forcers affect climate?.

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Abstract:

Between now and the middle of the century the largest changes in forcing agents are likely to be in chemically reactive short-lived species such as ozone and aerosols, as emissions of these are expected to reduce dramatically due to air quality legislation. The relative importance of short-lived species is further increased if CO2 emissions are reduced under Paris negotiations. Mitigation of some short-lived climate forcers is also needed to meet the Paris goals. However (unlike CO2) the short-lived species are not uniformly distributed but are concentrated near the regions of highest emissions such as the northern mid-latitudes. The temperature effects of these uneven agents will also be uneven, with larger effects locally, but also remote implications.

I will explore the progress being made to quantify the overall effects of short-lived climate forcers through understanding how their forcing patterns induce rapid adjustments in meteorology either amplifying or dampening the forcing; and how these forcing patterns lead to temperature changes that may have a different climate sensitivity than that for CO2.

The impacts of short-lived climate forcers on precipitation patterns are even more complex than the impacts on temperature. The latest research shows that on a global scale the precipitation effects, for instance from changes in tropospheric or stratospheric ozone, can be understood from the global atmospheric energy balance.

The science behind the effects of short-lived climate pollutants is relatively new and is advancing rapidly. Research to understand these, and to identify whether there are robust relationships that can be quantified, is at the cutting-edge of climate science. The experiments in the AerChemMIP project as part of CMIP6 will provide valuable data from a large number of chemistry-climate models to allow us find the answers to some of these important questions.