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TITLE: Observational constraints on aerosol indirect effects and controlling processes

ABSTRACT: A large intermodel spread in global estimates of aerosol indirect effects (AIEs) from climate models continues to challenge our understanding. A number of different observational estimates of these effects tend to produce values that are, on average, smaller than those from the climate models. Since AIEs are typically defined as the contrast between present day and preindustrial radiative flux associated with anthropogenic aerosol impacts on clouds, observational estimates necessarily make assumptions (implicit or explicit) about what conditions were like prior to anthropogenic perturbations. In addition, they use correlations in the current climate between aerosols and cloud properties to produce AIE estimates that are not necessarily causal. Further, it is quite straightforward to show that in many regions, a strong Twomey effect can occur even though the aerosols in question are below the detection limit of even the current round of active spaceborne sensors. This presentation will explore some of these challenges and offer ideas for potential solutions.