Remote sensing constraints on aerosol sources and impacts

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Remote sensing of aerosols and their gas-phase precursors affords several new opportunities for improving our understanding of their sources and impacts. To begin with, we present recent work examining constraints on sources of black carbonaceous aerosol using MODIS aerosol optical depth and absorbing aerosol optical depth from the OMI instrument. Different approaches for reconciling differences between the remote sensing algorithms' representation of aerosol and the assimilation model (GEOS-Chem) are discussed. We show that several recent emissions inventories for SE Asia appear to be broadly underestimated. We next consider top-down constraints on ammonia from current (TES and IASI) instruments. Such satellite constraints indicate large underestimates of ammonia emissions in California, consistent with constraints from airborn field campaigns. We also consider the potential to learn more about the mechanisms driving ammonia fluxes from new (CrIS) and future (geo-stationary) retrieval opportunities. Lastly, we present a novel application of MODIS aerosol optical depth for improving our estimate of human exposure to fine aerosol, and show that the combination of this technique with adjoint sensitivty modeling provides a valuable perspective on the health burden associated with emissions of aerosols and their precursors.