(55-240329-C) **Sensitivity of Modelled Ozone to Methane Emissions and Halogen Chemistry, Comparison with NDACC, Satellite Retrievals, and NASA ATom**

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As nations seek to develop strategies to manage their carbon emissions, capabilities of quantifying, verifying, monitoring, and reporting local-to-global carbon sources and sinks (or budget) are necessary for informed policy decisions. Attributing methane (CH_4) sources is exacerbated by its strong coupling with atmospheric chemistry via its loss to hydroxyl radical (OH) reaction, which is the main oxidizing agent in our atmosphere. While attention has been focused on estimating the sources of atmospheric CH_4 based on available surface and recent satellite observational constraints of CH_4, the uncertainties in atmospheric CH_4 sink estimates remain significant and is closely link to ozone (O_3) chemistry. The most recent halogen chemical scheme strongly impacts both O_3 and the CH_4 lifetime and could be key in reconciling the CH_4 budget estimates, including its isotopic fractionation trend. We run the Community Atmosphere Model with chemistry (CAM-chem) with prior and posterior CH_4 emission fluxes from the Global Carbon Project as well as the NOAA Carbon Tracker CH_4. We also perform sensitivity simulations with prior and posterior NOx and CO emissions. We compare simulations with standard chemistry and with the recently updated and detailed treatment of very short-lived halogen representation.

We will focus the evaluation on the inter-annual and seasonal cycle variability and on the longitudinal gradients of CH_4, CO and O_3 as observed by in-situ observations, satellite retrievals, and the NASA Airborne Atmospheric Tomography Mission (ATom).

A particular focus will be placed on the comparison with ground-based remote sensing of O_3, CO and CH_4 by the international Network for the Detection of Atmospheric Composition Change (NDACC). We present improved CH_4 retrievals over Boulder, with updated spectroscopy parameter, validated against CH_4 profiles obtained from aircore observations.