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Oral
During the summer of 2023, NASA Langley's High-Altitude Lidar Observatory (HALO) methane and aerosol lidar was deployed on the NASA Gulfstream-III aircraft as a part of the STAQS – Synergistic TEMPO Air Quality Science campaign. For the STAQS campaign, HALO employed the Differential Absorption Lidar (DIAL) and Integrated Path DIAL (IPDA) techniques at 1645 nm for column and multi-layer measurements of XCH4, and the high spectral resolution lidar (HSRL) technique at 532 nm for retrievals of aerosol extinction, backscatter, and planetary boundary layer (PBL) heights. The addition of the HSRL channels provides context to the airborne CH4 measurements, elucidating the layered structure of the atmosphere by giving vertical mixing and PBL height estimation, and provides a critical capability to validate aerosol and cloud induced biases from passive space-borne retrievals of column CH4.

In this presentation we will provide a brief overview of the HALO instrument capabilities and present on city scale sampling during the STAQS campaign across the different measurement domains and atmospheric conditions (morning vs afternoon, through heavy biomass burning plumes, through broken cloud fields, etc.). We will also present synergistic comparisons with NASA DC-8 in-situ observations as well as MethaneAir passive measurements over New York City.

As HALO serves as an airborne simulator and technology testbed to evaluate the performance of, and advance technologies for a future space-based greenhouse gas DIAL instrument, we will also present on the Atmospheric Boundary Layer Lidar Pathfinder (ABLE) smallsat mission concept for cross-cutting and simultaneous measurements of surface weighted XCH4, XH2O, high vertical resolution profiles of water vapor, aerosol and clouds, and distributions of PBL heights, all of which are capabilities drawn from HALO. Through novel laser transmitter technology advancements, the ABLE concept will enable very high spatial resolution columnar observations (<1km (100 measurement average)) as well as the potential for swath mapping by transmitting multiple beams across track. Enabling technologies for the ABLE lidar will be discussed along with a path TRL-6 and future mission opportunities.
Meeting homepage
IWGGMS-20 Workshop
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