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Ground-based assessment of (merged) limb ozone profile data records used by ESA's Climate Change Initiative

Since the 1980s, limb and occultation sensors have monitored stratospheric ozone changes, requiring long-term stability better than ~2% per decade for reliable trend detection. In support of APARC/LOTUS and the 2026 WMO/UNEP ozone assessment, we evaluated bias, dispersion and stability of 17 ozone profile records against ground-based observations by ozonesonde, lidar and microwave radiometer networks (NDACC, GAW, SHADOZ). This work contributed to the quality assessment of the data records used and generated by ESA's ozone CCI project and ECMWF's operational climate change service C3S.

This presentation is an update and extension of earlier analyses of Level-2 ozone profile data (Hubert et al., 2016 and later) and includes a new sensor (OMPS-LP on NOAA-21, UBR v1.1), an additional Level-2 retrieval algorithm (UBR v4.1 for OMPS-LP/SNPP), and updated data versions (e.g., OSIRIS v7.3, Aura MLS v5.0, OMPS-LP/SNPP USASK v1.3.0, SAGE III/ISS v5.3). Another recent addition is the analysis of LIMB-HIRES v1 (FMI), a new gap-free gridded ozone profile data product by the ozone CCI team. Owing to its high sampling resolution (daily, 1° latitude by 1° longitude) and its gap-free nature it co-locates with every single ground-based observation. This allows us to take the best possible advantage of the reference data to constrain e.g. the stability of LIMB-HIRES. At the same time, such an ideal co-location sample allowed us to evaluate the lower limit of drift precision that can be achieved with ground-based networks. We conclude by reflecting on the validation needs and challenges for the planned and proposed future limb missions.

Topic

Current and past limb and occultation instruments: algorithms, products, validation

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