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Status of the TEMPO total ozone and ozone profile data products: A comprehensive validation using various satellites and ground-based observations

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The Tropospheric Emissions: Monitoring of Pollution (TEMPO) is part of the global geostationary air quality monitoring constellation. It is the first satellite instrument in geostationary orbit dedicated to monitor air pollutants across North America. Its observational coverage extends from Mexico City to the Canadian oil sands and from the Atlantic Ocean to the Pacific, with hourly measurements at a resolution approaching neighborhood scale. Following its successful launch in April 2023, TEMPO began nominal operations in October 2023. TEMPO L2 data products (NO2, HCHO, Cloud and total ozone) were made publicly available in May 2024, following the release of Level 1 data in February 2024. As of December 2024, these products have been classified as the Provisional maturity level.

This presentation highlights the evaluation of the TEMPO total ozone (O3TOT) product and introduces improvements to the TEMPO ozone profile (O3PROF) product. We present a comparative analysis of total ozone columns (TOCs) from TEMPO observations against data from other satellite instruments, such as OMPS, OMI, and TROPOMI, as well as ground-based measurements from Pandora, Brewer, and Dobson instruments. Additionally, we present enhancements to the TEMPO O3PROF algorithm, particularly the empirical correction, which is scheduled for release this year. Furthermore, we compare TEMPO tropospheric ozone columns with those from EPIC, OMI, and TROPOMI satellites. Lastly, the TEMPO O3PROF product is evaluated using ground-based observations, including data from the Tropospheric Ozone Lidar Network (TOLNet) and ozonesonde observations.

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