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Comprehensive quality assessment of GOME- and IASI-type multi-mission tropospheric ozone data records

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Tropospheric ozone plays a key role in air quality and has a significant impact on the radiation budget of the Earth, both directly and through its chemical influence on other trace gases. Assessments of atmospheric composition change and of associated climate change therefore demand accurate observations of the tropospheric ozone, both on the global and regional scales and both in the longer and shorter term. Such observations have been provided by two series of European nadir-viewing ozone profilers, namely the scattered-light UV-visible spectrometers of the GOME type, launched regularly since 1995 (GOME, SCIAMACHY, OMI, GOME-2 on MetOp-A/B/C, and the upcoming S-5p TROPOMI and Sentinel-5 missions), and the thermal infrared emission sounders of the IASI type, launched regularly since 2006 (IASI on MetOp platforms and IASI-NG on MetOp-SG). In particular, several tropospheric ozone data products have been improved and harmonised in the context of the European Space Agency's Climate Change Initiative (ESA CCI) on ozone (www.esa-ozone-cci.org). To verify their fitness-for-purpose, those tropospheric ozone datasets must undergo a comprehensive quality assessment (QA), including (a) detailed identification of their geographical, vertical and temporal domains of validity, (b) quantification of their potential bias, noise and drift and their dependences on influence quantities, and (c) assessment of the mutual consistency of data from different sounders. For this purpose we have applied to the aforementioned Ozone CCI datasets a versatile QA/validation system developed over years in the context of ESA's Multi-TASTE and CCI projects, EUMETSAT's O_3M-SAF, and the European Commission's GEOmon and QA4ECV. For both GOME- and IASI-type climate data records we report on data content studies, information content studies, and comparisons with co-located reference observations from the well established NDACC, SHADOZ, and GAW ozonesonde networks. Dependence of the tropospheric ozone data quality on major influence quantities and perspectives for the future Sentinel missions are discussed.