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The GOME-type Total Ozone Essential Climate Variable – the first 20 years of an accurate global ozone data record (1995-2015)

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Within the framework of the European Space Agency's Climate Change Initiative (ESA-CCI) a coherent global climate data record of total ozone has been created that covers the past 20 years. The so-called GTO-ECV (GOME-type Total Ozone Essential Climate Variable) has been compiled from a series of European satellite instruments including GOME/ERS-2, SCIAMACHY/ENVISAT, GOME-2/MetOP-A, and OMI/AURA. They provide total ozone column information with a high degree of inter-sensor consistency which has been achieved through the application of the common advanced retrieval algorithm GODFIT_V3 and a soft-calibration approach.

Geophysical validation of the GTO-ECV data record using ground-based Dobson, Brewer and SAOZ instruments and the comparison with the SBUV data record from NASA and NOAA have has shown a remarkable agreement and long-term stability which enables us to use the data record to investigate decadal ozone variability, to disentangle the various processes involved, and to derive spatially resolved long-term trends. However, given the dominant natural variability over the last two decades we show that the expected onset of ozone recovery in the middle latitudes - as a consequence of decreasing amounts of ozone depleting substances - is not yet visible. Significant uncertainty remains as to the timing of this recovery due to complex interaction with climate change. Moreover, the GTO-ECV data record is used to verify the abilities of Chemistry-Climate Models to reproduce the observed ozone features. Thereby the strengths and the weaknesses of the models' systems can be identified which helps to improve the description of the processes relevant for the short- and long-term ozone variability in a changing climate.

The GTO-ECV data record will be extended over the next two decades with the atmospheric satellite missions Sentinel 5 Precursor (launch end of 2016), Sentinel 4 and Sentinel 5.