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Challenges and opportunities of atmospheric composition re-analysis to represent trends of tropospheric ozone and carbon monoxide

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The emerging reanalysis data sets of global atmospheric composition (AC) present an unique opportunity to detect and understand current trends and spatial patterns of trace gases and aerosols. The AC reanalyses combine retrievals from satellite instruments, which often represent vertically integrated observations, with 3D global chemical transport modelling by means of data assimilation techniques. The AC reanalyses not only provide spatially and temporally consistent atmospheric concentrations fields but they can also be utilised to test the realism of the emission data set used in the underlying atmospheric transport models.
Following the MACC re-analysis, ECMWF produced as part of the Copernicus Atmosphere Monitoring Service (CAMS) two further AC reanalyses using the incremental 4D-VAR approach of the Integrated Forecasting System. The latest version, the CAMS re-analysis, has just been made available to users. JAMSTEC has recently produced the Tropospheric Chemistry Reanalysis (TCR) 1 and 2 based on the Chaser-DAS system, which applies a Kalman Filter approach.
We will intercompare and evaluate the tropospheric ozone and carbon monoxide field of the four reanalysis data sets with respect to biases and trends in the 2003-2016/18 period. We will report recent progress and discuss the impact of the assimilated retrieval products as well as the differences in the chemical transport modelling and data assimilation technique.