Independent a priori information for reduced intercomparison errors between TROPOMI and TCCON retrievals of methane and carbon monoxide

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Ground-based column measurements of trace gases by FTIR spectrometers within the Total Carbon Column Observing Network (TCCON) provide accurate ground reference for the validation of the nadir-viewing hyperspectral Tropospheric Monitoring Instrument (TROPOMI) on-board the ESA satellite Sentinel 5 Precursor (S-5P). In such intercomparisons of two independent remote soundings, errors can occur as the a priori profiles used in the respective retrievals are i) differing from each other, and ii) both different from the true atmospheric state at the moment of observation. In certain conditions of atmospheric dynamics, e.g. polar vortex subsidence or stratospheric intrusions, which strongly alter the shape of vertical concentration profiles, these intercomparison errors can become considerable (Ostler et al., 2014).

In our work funded by the German Space Agency DLR and performed as part of the ESA AO project TCCON4S5P, we search for potential sources of realistic common a priori profiles for S-5P and TCCON CH$_4$ and CO measurements which reduce these large errors. We examine the performance of a number of chemical transport models and data assimilation systems in reproducing dynamical effects and in minimizing intercomparison errors. In-situ profiles measured by AirCores are used as validation where they are available. We present the status and results of our ongoing work.

Reference: