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Influence of the a priori profile on CO_2 total columns at Paris during pollution episodes

Dmitry Koshelev (1), Yao Té (1), Pascal Jeseck (1), Irène Xueref-Remy (2), François Ravetta (3), and Christof Janssen (1)

(1) LERMA-IPSL, Sorbonne Université, CNRS, PSL Research University, Observatoire de Paris, 75005 Paris, France, (2) OSU Pytheas, Station Maritime d'Endoume, 13007 Marseille, France, (3) LATMOS/IPSL, UPMC Univ. Paris 06 Sorbonne Université, UVSQ, CNRS, Paris, France

Ground-based Fourier transform spectrometry (FTIR) using solar absorption spectroscopy is a powerful tool for monitoring atmospheric trace gases and validate satellite measurements. The Total Carbon Column Observing Network (TCCON) is an international FTIR network operating in the near-infrared spectral region and dedicated to the retrieval of greenhouse gases. Accurate and precise column-averaged abundances of atmospheric constituents like CO_2, CH4, CO, N2O, HF, H_2O and HDO are provided on a routinely basis. These data are linked to the WMO reference scale and used to validate satellite data worldwide.
Only two TCCON instruments are operated in megacities that globally are important sources of anthropogenic CO_2: one instrument is located in Pasadena, California (United States) and the other one in Paris, France. Paris is the third European megacity. We address the question in as much a priori CO_2 profiles provided by GFIT (TCCON retrieval algorithm) are suited to retrieve CO_2 abundances during pollution episodes in Paris. CO_2 a priori profiles from GFIT, as provided by the standard TCCON retrieval algorithm, yield typical surface volume mixing ratios (VMR) of CO_2 between 385 and 415 ppm, while in situ measurements at the ground can easily values as high as 450 ppm. From complementary in-situ CO_2 and LIDAR measurements at the TCCON-Paris station, we construct improved a priori profiles that comply with the local conditions at the ground. These new a priori profiles are then incorporated into the GFIT code to study their influence on the retrieved total column of CO_2. The presentation will give an overview of the method and discuss the sensitivity of the retrieved XCO_2 to the improved a priori profile.