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Comparison of MAX-DOAS profiling algorithms during CINDI-2 - Part 2: trace gases

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The second Cabauw Intercomparison campaign for Nitrogen Dioxide measuring Instruments (CINDI-2) took place at the Cabauw Experimental Site for Atmospheric Research (CESAR; Utrecht area, The Netherlands) from 25 August until 7 October 2016. CINDI-2 was aiming at assessing the consistency of MAX-DOAS slant column density measurements of tropospheric species (NO_2, HCHO, O_3, and O4) relevant for the validation of future ESA atmospheric Sentinel missions, through coordinated operation of a large number of DOAS and MAXDOAS instruments from all over the world. An important objective of the campaign was to study the relationship between remote-sensing column and profile measurements of the above species and collocated reference ancillary observations. For this purpose, the CINDI-2 Profiling Task Team (CPTT) was created, involving 22 groups performing aerosol and trace gas vertical profile inversion using dedicated MAX-DOAS profiling algorithms, as well as the teams responsible for ancillary profile and surface concentration measurements (NO_2 analysers, NO_2 sondes, NO_2 and Raman LIDARs, CAPS, Long-Path DOAS, sunphotometer, nephelometer, etc). The main purpose of the CPTT is to assess the consistency of the different profiling tools for retrieving aerosol extinction and trace gas vertical profiles through comparison exercises using commonly defined settings and to validate the retrievals with correlative observations.

In this presentation, we give an overview of the MAX-DOAS vertical profile comparison results, focusing on NO_2 and HCHO, the aerosol retrievals being presented in a companion abstract led by U. Frieß. The performance of the different algorithms is investigated with respect to the various sky and weather conditions and aerosol loadings encountered during the campaign. The consistency between optimal-estimation-based and parameterized profiling tools is also evaluated for these different conditions, together with the level of agreement with available NO_2 and HCHO ancillary observations. This comparison study will be put in the perspective of the development of a centralized MAX-DOAS processing system within the framework of the ESA Fiducial Reference Measurements (FRM) project.