



HCHO and NO₂ MAXDOAS retrieval strategies harmonization: Recent results from the EU FP7 project QA4ECV

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During the last decade, it has been extensively demonstrated that MAXDOAS is a useful and reliable technique to retrieve integrated column amounts of tropospheric trace gases and aerosols, as well as information on their vertical distributions. Since it is based on optical remote-sensing in the UV-visible region like nadir backscatter space-borne sensors, MAXDOAS is also increasingly recognized as a reference technique for validating satellite nadir observations of air quality species like NO₂ and HCHO. However, building up an harmonized network of MAXDOAS spectrometers requires significant efforts in terms of common retrieval strategies and best-practices definitions.

Within the EU FP7 project QA4ECV (Quality Assurance for Essential Climate Variables; see <http://www.qa4ecv.eu/>), harmonization activities have been initiated focusing on the two main steps of the MAXDOAS retrieval, i.e. the DOAS spectral fit providing the so-called differential slant column densities (DSCDs) and the conversion of the retrieved DSCDs to vertical profiles and/or vertical column densities (VCDs). Regarding the first step, the DOAS settings for HCHO and NO₂ are optimized through an intercomparison exercise of slant column retrievals involving 15 groups of the MAXDOAS community including the QA4ECV partners, and based on the radiance spectra acquired during the MAD-CAT campaign held in Mainz (Germany) in June-July 2013 (see http://joseba.mpch-mainz.mpg.de/mad_cat.htm). The harmonization of the second step is done through the application of an AMF (air mass factor) look-up table (LUT) approach on the optimized NO₂ and HCHO DSCDs. The AMF LUTs depend on entry parameters like SZA, elevation and relative azimuth angles, wavelength, boundary layer height, AOD, and surface albedo. The advantages and drawbacks of the LUT approach are illustrated at several stations through comparison of the derived VCDs with those retrieved using the more sophisticated Optimal-Estimation-based profiling method. Recommendations for both MAXDOAS retrieval steps will be given in conclusion.