



Development of a harmonised multi sensor retrieval scheme for HCHO within the Quality Assurance For Essential Climate Variables (QA4ECV) project

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One of the main goals of the QA4ECV project is to define community best-practices for the generation of multi-decadal ECV data records from satellite instruments. QA4ECV will develop retrieval algorithms for the Land ECVs surface albedo, leaf area index (LAI), and fraction of active photosynthetic radiation (fAPAR), as well as for the Atmosphere ECV ozone and aerosol precursors nitrogen dioxide (NO₂), formaldehyde (HCHO), and carbon monoxide (CO).

Here we assess best practices and provide recommendations for the retrieval of HCHO. Best practices are established based on (1) a detailed intercomparison exercise between the QA4ECV partner's for each specific algorithm processing steps, (2) the feasibility of implementation, and (3) the requirement to generate consistent multi-sensor multi-decadal data records.

We propose a fitting window covering the 328.5-346 nm spectral interval for the morning sensors (GOME, SCIAMACHY and GOME-2) and an extension to 328.5-359 nm for OMI and GOME-2, allowed by improved quality of the recorded spectra. A high level of consistency between group algorithms is found when the retrieval settings are carefully aligned. However, the retrieval of slant columns is highly sensitive to any change in the selected settings. The use of a mean background radiance as DOAS reference spectrum allows for a stabilization of the retrievals. A background correction based on the reference sector method is recommended for implementation in the QA4ECV HCHO algorithm as it further reduces retrieval uncertainties. HCHO AMFs using different radiative transfer codes show a good overall consistency when harmonized settings are used. As for NO₂, it is proposed to use a priori HCHO profiles from the TM5 model. These are provided on a 1°x1° latitude-longitude grid.