Cloud Masking and Atmospheric Correction Inter-comparison Exercises

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Abstract

Free and open data policy allows access to a big volume of remote sensing data, which together with the advanced cloud computing services, facilitate significantly the analysis of long time series. The consistent study of land surface though implies the correction of the atmospheric impacts when optical observations are involved. However the user communities request nowadays Analysis Ready Data (ARD), meaning already pre-processed and corrected satellite data to a set of requirements for immediate analyses with minimum user effort. Consequently, several entities have already started to generate, or they plan to generate in the short term, ARD at a global scale for Landsat-8 (L-8) and Sentinel-2 (S-2) missions using suitable atmospheric correction (AC) approaches. To that end, European Space Agency (ESA) and National Aeronautics and Space Administration (NASA) initiated the Atmospheric Correction Inter-comparison eXercise (ACIX) in the frame of CEOS WGCV (Committee on Earth Observation Satellites, Working Group on Calibration & Validation). The first ACIX experiment started in June 2016 with the aim to bring together the developers of state-of-the-art AC processors and to study the variations among the different algorithms. The input data were L-8 and S-2A products over various sites of different land cover types around the world, i.e. agricultural, deserts, urban, snow and coastal areas. The description and the conclusions of this first experiment are summarised in Doxani et al. (2018). All the inter-comparison results can be found in the dedicated to ACIX I web page (http://calvalportal.ceos.org/projects/acix). ACIX I was completed in February 2018, but the improved versions of the participating processors and the increasing interest of AC developers to be part of the experiment stimulated the continuation of ACIX and its second implementation (ACIX II).

Following the recommendations of ACIX participants and other Earth Observation data users, an additional inter-comparison of cloud masking assessment was decided to be performed in parallel with ACIX. Cloud masking is a crucial step of the radiometric pre-processing of optical remotely sensed data and an important contributor to the retrieval of accurate SR within an AC process. Therefore, it was considered essential to analyse these two processing chains together. The test sites of the exercises are redefined and more representative cases concerning land surface and atmospheric conditions, e.g. land/water, land cover, aerosols. Particular attention will be given also to aquatic sites, i.e. coastal and inland waters, which will be analysed as a separate sub-category. All the exercises, i.e. CMIX,

ACIX-Land, and ACIX-Aqua will run in parallel and follow the same timeline. In this presentation we will focus mainly on ACIX-Land.

In particular, 13 AC developer teams from six countries participate in ACIX II-Land, out of 32 teams in total for both ACIX II-CMIX exercises. All the participating processors should run operationally without requiring parametrization when applied on different areas. Therefore, the performance study will be carried out over all the AERONET sites with available measurements in the study time period. Around 130 sites have been identified to fulfil this requirement and the experiment involves approximately 5000 L-8 and S-2 (2A and 2B) image scenes. The detailed description of ACIX II-Land implementation will be given in this presentation including the protocol, i.e. test sites, input data, inter-comparison metrics, and some preliminary results. In continuation of the first ACIX experiment's achievements, the outcomes of the second one are expected to provide an enhanced standardised approach to inter-compare AC processing products, i.e. Aerosol Optical Thickness, Water Vapour and Surface Reflectance, and quantitatively assess their quality when in situ measurements are available.

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