NEXT-GENERATION AURA/OMI NO_2 AND SO_2 PRODUCTS

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ABSTRACT

The measurement of both SO_2 and NO_2 gases are recognized as an essential component of atmospheric composition missions. We describe current capabilities and limitations of the operational Aura/OMI NO_2 and SO_2 data that have been used by a large number of researchers. Analyses of the data and validation studies have brought to light a number of areas in which these products can be expanded and improved. Major improvements for new NASA standard (SP) NO_2 product include more accurate tropospheric and stratospheric column amounts, along with much improved error estimates and diagnostics. Our approach uses a monthly NO_2 climatology based on the NASA Global Modeling Initiative (GMI) chemistry-transport model and takes advantage of OMI data from cloudy scenes to find clean areas where the contribution from the trop NO_2 column is relatively small. We then use a new filtering, interpolation and smoothing techniques for separating the stratospheric and tropospheric components of NO_2, minimizing the influence of a priori information. The new algorithm greatly improves the structure of stratospheric features relative to the original SP.

For the next-generation OMI SO_2 product we plan to implement operationally the offline iterative spectral fitting (ISF) algorithm and re-process the OMI Level-2 SO_2 dataset using a priori SO_2 and aerosol profiles, clouds, and surface reflectivity appropriate for observation conditions. This will improve the ability to detect and quantify weak tropospheric SO_2 loadings. The new algorithm is validated using aircraft in-situ data during field campaigns in China (2005 and 2008) and in Maryland (Frostburg, 2010 and DISCOVER-AQ in July 2011). The height of the SO_2 plumes will also be estimated for high SO_2 loading cases (e.g., volcanic eruptions). The same SO_2 algorithm will be applied to the data from OMPS sensor to be launched on NPP satellite later this year. The next-generation NO_2 and SO_2 products will provide critical information (e.g., averaging kernels) for evaluation of chemistry-transport models, for data assimilation, and to impose top-down constraints on the SO_2 and NO_2 emission sources.