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Tomographic Retrievals of Ozone with the OMPS Limb Profiler

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The Ozone Mapping and Profiling Suite (OMPS) Limb Profiler (LP) was launched on-board the Suomi NPP satellite in October 2011. The LP measures sunlight scattered by the atmosphere in the UV-VIS-NIR spectral region. Three vertical images of the atmosphere are taken with vertical resolution of approximately 2 km every 19 s (roughly 1° in latitude). The spectral measurements can then be inverted with the aid of a retrieval method and radiative transfer model to obtain vertical number density profiles of ozone in the stratosphere and upper troposphere.

Traditionally retrieval methods from limb scatter instruments have relied on the assumption of horizontal homogeneity, which states that atmospheric constituents vary only in altitude, allowing the retrieval of one vertical ozone profile from each vertical set of measurements. Horizontal homogeneity is a good assumption for many parts of the atmosphere, but is not applicable in areas of high horizontal structure, such as on the edge of the polar vortex.

In this work we describe a new two dimensional tomographic retrieval method for the LP instrument where the SASKTRAN-HR radiative transfer model is used in conjunction with a regularized Levenberg-Marquardt iterative technique to retrieve ozone simultaneously in altitude and the along orbit track dimensions. In addition, we show comparisons between the results from the new two dimensional algorithm and a traditional one dimensional algorithm. Lastly, the retrieved ozone profiles are validated by comparing to those retrieved by the Microwave Limb Sounder on-board the EOS Aura satellite.