
Radiance intercalibration of INSAT-3D ozone channel with MSG-SEVIRI and successive improvements in ozone optimal/ML retrieval and validations

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Abstract

Among various trace gases, ozone has a very unique vertical distribution and plays different roles at different altitudes. The useful stratosphere ozone absorbs harmful UV radiations, while tropospheric ozone, a powerful greenhouse gas adversely affects living beings and vegetations. In Asian countries, the increasing anthropogenic emissions, higher solar radiation, and water vapor further intensifying ozone photochemistry. Thus the continuous monitoring of the ozone is necessary. Nowadays ozone monitoring via satellite-based remote sensing has gained wide importance. The Indian geostationary satellite INSAT-3D/3DR is accomplishing this need for India. Apart from the meteorological sounding, it is also incorporated with a 9.6 μm strong ozone absorption channel, for ozone observations. We have assessed the INSAT-3D retrieved total ozone with respect to our ozonesonde observations. The total ozone column from INSAT-3D showed a maximum difference upto 10% with the ozone-derived total ozone column that also varies in seasons. To mitigate these deviations or errors we have checked the radiance biases in INSAT-3D/3DR observations by inter-calibration with MSG-SEVIRI for collocated pixels, and observed biases in INSAT by more than 4K. Further, in the new retrieval algorithm based on a feed-forward neural network and the optimal estimation (1D Variational assimilation) method, we have inculcated these biases and observed very significant improvements in the INSAT-3D/3DR ozone retrievals.

Keywords: Ozone, INSAT, 3D/3DR, India

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