Geophysical Research Abstracts
Vol. 19, EGU2017-11909, 2017
EGU General Assembly 2017

Retrieval of Atmospheric Thermodynamic Sate from Synergistic Use of Radio Occultation and Hyperspectral Infrared Radiances Observations

Chian-Yi Liu, Gin-Rong Liu, and Tang-Huang Lin
National Central University, Center for Space and Remote Sensing Research, Taoyuan, Taiwan (cyliu@csrsr.ncu.edu.tw)

Atmospheric temperature soundings derived from satellite-based advanced infrared (IR) sounder radiance measurements tend to have higher uncertainty in the upper troposphere. In contrast, radio occultation (RO) measurements have high accuracy and high vertical-resolution for atmospheric sounding in the upper troposphere and lower stratosphere. It is anticipated that the best estimation of atmospheric thermodynamic state can be obtained by synergistic use of RO and IR radiance measurements. A physical-based algorithm accounting for the significant geometric difference between the two observing systems, has been developed to combine RO refractivity and Atmospheric InfraRed Sounder (AIRS) radiances for atmospheric temperature and humidity vertical profiles. Comparisons between RO/AIRS and AIRS-alone derived profiles showed that the impact of RO observations to be most apparent in the upper troposphere between 100 hPa and 300 hPa, where the root-mean-square difference (RMSD) of estimated temperature is reduced by 24% (0.36 K) to 35% (0.66 K). In addition to having improved temperature profile retrievals in the upper troposphere, the humidity retrievals are also improved; the RMSD below 100 hPa was reduced by 22.4% (0.298 g/kg) when compared with radiosondes observations. Results indicated that the humidity profiles retrieved using this method were overall better than the infrared-only retrievals in all of the comparisons, and the temperature profiles improved upon the infrared-only retrievals most notably in the upper troposphere. These improvements are more significant using a three-dimensional (3D) slant-path collocation procedure.