

Mesospheric Temperature Retrieved from FORMOSAT-3/COSMIC Data and Meteor Trail Echoes Observed by the Chung-Li VHF Radar

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Abstract

In this report, we compare mesospheric temperatures measured from meteor trail echoes detected by the Chung-Li VHF radar and retrieved from bending angles of GPS rays observed by FORMOSAT-3 by using radio occultation technique. To estimate the mesospheric temperature from the diffusion of the meteor trails echoes, we operate the Chung-Li VHF radar to determine the arrival angles of the meteor trails by using interferometry method, in which the phase differences between different pairs of the receiving channels are measured. The decay time of the amplitude of the under-dense meteor trail echoes, which is defined as the time that the amplitude of the meteor trail echoes exponentially decay to $\exp(-1)$ of the peak amplitude, is employed to calculate the corresponding diffusion coefficient. As a result, the mesospheric temperature can be computed from the diffusion coefficient, provided the air density is known. It should be noted that the mesospheric temperature retrieved by FORMOSAT-3 may be contaminated owing to the existence of the electron density, especially during the daytime. With the use of the radar-measured temperature, the error in the FORMOSAT-3/COSMIC temperature affected by the mesospheric electron density can be estimated and removed. We will quantitatively discuss the effect of the mesospheric electron density on the radio-occultated mesospheric temperature.