Development of a method for estimating mesosphere temperature at 85 km altitude using OH airglow observation data from the ISS

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In this study, we developed a method for estimating the large-scale temperature structure of the OH airglow layer near 85 km altitude at night using multi-wavelength observation data of OH airglow around 828 nm by ISS-IMAP VISI. It is known that the temperature of OH can be calculated from multi-wavelength spectrum data of OH airglow. Research on calculating the temperature from multi-wavelength spectral data of OH emission has been used for ground observation data and limb observation data from satellites. The data used for the analysis in this study have wide observation fields in the latitude and longitude directions, and it has become possible to estimate large-scale mesospheric temperature structures that have not been obtained so far. This is a pioneering attempt at the ICON (Ionospheric Connection Explorer) mission and the AWE (Atmospheric Waves Experiment) mission, which are the mesosphere and ionosphere observation projects currently being promoted by NASA. ISS-IMAP VISI is not an observation device specialized in estimating the temperature of the OH airglow emitting layer, so its resolution in the wavelength direction is inferior to that of conventional ground observation data. Therefore, in order to perform analysis with higher accuracy, the data is added in the spatial direction and the time direction, the spectrum diagram is interpolated by the Gaussian function, and the inverse calculation is performed using the spectrum diagram created in advance, and the temperature is calculated. We have developed a method for estimating. The temperature distribution is compared with numerical simulation models GAIA (Ground-to-topside model of Atmosphere and Ionosphere for Aeronomy) and SABER (The Sounding of the Atmosphere using Broadband Emission Radiometry) observation data, and the calculated temperature validity and temperature distribution are used to discuss the irregular structure of the obtained ionosphere. As a result of the analysis, several irregular mesospheric temperature structures were obtained, indicating the presence of atmospheric gravity waves, tides, and ionospheric disturbances. The wavy structure seen in the created temperature distribution map shows a structure similar to the result of numerical simulation by the GAIA model. A correlation was also found between the airglow emission intensity and the temperature distribution.

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