3-years Occurrence Variability of Concentric Gravity Waves in the Mesopause Observed by IMAP/VISI

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We report a study of 3-years occurrence variability of concentric gravity waves (CGWs) in the mesopause observed by IMAP/VISI instrument. CGWs are fascinating to be studied because of its unique characteristic that shows the direct coupling between lower and upper atmosphere. The Visible and near-Infrared Spectral Imager (VISI) of the IMAP mission was launched successfully on July 21, 2012 with H-IIB/HTV-3 and installed onto the International Space Station (ISS). IMAP/VISI is now operated in the night side hemisphere with a range of +/- 51 deg. in geographic latitude and measuring three airglow emissions of OI (630 nm), OH Meinel (730 nm) and O_2 (762 nm) with the typical spatial resolution of 16 – 50 km in the nadir direction. In this study, we analyzed 3 years data taken by IMAP/VISI from October 2012 to June 2015. We found total 172 CGWs events in the O_2 (762nm) airglow emissions out of 4853 data paths in 2013, 92 events out of 4809 data paths in 2014 and 46 events from 2112 data paths in 2015. The monthly occurrence probability shows a similar trend for each year, a clear seasonal dependence with the peak around March-April and August-September. The weak background winds in the middle atmosphere during the equinoxes are likely responsible for the seasonal dependence. We calculated the horizontal wavelength and radius maximum by fitting the circular wavefronts to a circle. The source of CGWs then identified from meteorological satellite data around the estimated center. The horizontal wavelength was found varying from 44-300 km and radius maximum up to 3000 km, showing that CGWs can affect large area in mesopause. In most cases, the CGWs appeared as arc-like shape instead of full circle. It indicates that the background wind filter allows the wave to propagate in a particular direction and filter out the other directions. The detailed discussion on horizontal wavelength distribution, the sources and background profiles influence on the variability of the CGWs occurrence will be presented in the seminar.

References

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