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On the use of Very Low Frequency transmitter data for remote sensing of atmospheric gravity and planetary waves

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Abstract

Continuous ground-based monitoring of Very Low Frequency (VLF) transmitter signals are an efficient remote sensing tool for studying of the lower ionosphere (60 to 90 km). Here, we present the use of VLF radio data to study short-period (\sim min to hrs) atmospheric gravity waves and long-period (\sim days) planetary waves. We analyse VLF data from several receiving stations obtained by ICSP-VLF network during the total solar eclipse of July, 2009 to show the existence of short-period atmospheric gravity waves. We find dominant wave periods range from 10 minutes to 1 hour around the time of maximum eclipse phase which could be associated with atmospheric gravity waves excited due to the eclipse. We also analyse VLF amplitude data of 2007 received at ICSP, Kolkata from VTX (18.2 kHz) transmitter for planetary wave-type oscillations in the mesosphere-lower ionosphere system. Fourier and wavelet analysis show presence of periodic structures with periodicity in the range of 5-27 days. We compare VLF planetary spectrum with spectrum obtained from total column density of Ozone and mesospheric average temperature data which may indicate vertical coupling between the stratosphere and ionosphere in winter to early spring time.

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