

A Study of Planetary wave link with sporadic E layers by modulating atmospheric tides

Guangxin Zhao(1,2,3), Libo Liu(1), Weixing Wan(1), Baiqi Ning(1)

(1) Division of Geomagnetism and Space Physics, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, 100029, China, (2) Wuhan Institute of Physics and Mathematics, CAS, Wuhan, 430071, China, (3) Graduate School of the Chinese Academy of Sciences (zhaogx@mail.iggcas.ac.cn)

Abstract: The diurnal and semidiurnal atmospheric tides are known to be very important in the formation of sporadic E layers according the vertical windshear theory. Also recent studies suggested that planetary waves (PW) play a role on sporadic E generation as well. In this paper, we investigate the relationship of planetary wave and the sporadic E critical frequency (f₀Es) by observations of a meteor radar and a digital ionosonde installed at Wuhan (114.4°E, 30.6°N). A large-amplitude, 5.7-day planetary wave is observed by Wuhan meteor radar during May 1-20 2003. When the 5.7-day peak in periodgram of hourly mean zonal wind series is above 15 m/s, and a concomitant strong spectrum peak of 5.7-day is observed in f₀Es periodgram. Two obvious secondary peaks which have frequencies of the sum of 5.7-day planetary wave and diurnal and semidiurnal tides are found beside the 24-hour and 12-hour peaks in the wind spectra, respectively. We further analyze the periodgram of hourly diurnal and semidiurnal tidal amplitudes that calculated by using a 24-h window incremented through the dataset in 1-h steps. Strong peaks are also observed in these tidal amplitude spectra. Our results provide an important evidence of the suggestion that Es is affected indirectly by the PW through strongly modulating the diurnal and semidiurnal tidal amplitudes.