Experimental evidence for a close relationship of sporadic E layers and quasi 5-day period planetary waves at Wuhan

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Indeed the wind shear theory is the most successful explanation for the generation of the mid-latitude sporadic E layers(Es). Even though, researches suggested several new mechanisms. Recently a possible link between the Es formation and the atmospheric planetary waves(PW) absorbed the attention of many authors. In this paper we analyze the time series of both neutral wind and the sporadic E critical frequency(foEs) observed at Wuhan(30.54N, 114.34E)in the period from April 23 to September 5, 2003. The wind data are obtained from a meteor radar at Wuhan, and foEs data are from a Digisonde at same station. We noticed that quasi 5-day period PW oscillations seem appear in both wind and foEs time series. With the period time spectrograms (PTS) analysis obtained by wavelet transform it is shown from the wind data that a dominant quasi 5-day period oscillation is present and persists about 30 days from the end of April to the end of May. The band(T=4-7days) pass filtered outputs of both the meridional and the zonal component at every altitude also indicate that the largest amplitude appears during the whole May. At the same time, We analyzed the daily occurrence of Es layers (foEs$>$5MHz) at Wuhan. It is found that the Es occurrence also manifests a strong quasi 5-day periodicity during May, being agreement with that of neutral wind MLT measurements. The quasi 5-day band-pass-filtered Es occurrence has the same character with that of the neutral wind. The present results provide direct evidence that PW play an important role in the formation of mid-latitude sporadic E layers. This implies that a new driving force mechanism might be considered to explain Es seasonal morphology besides the classic wind shear theory. This is of significance since PW are confined inside a limited altitude range in the MLT region but have very large horizontal scales.