

Mid-latitude E Region Irregularity Excited by Kelvin Helmholtz Instability

Yi Liu, Chen Zhou*, Xudong Gu, Binbin, Ni, Zhengyu Zhao

Department of Space Physics, School of Electronic Information, Wuhan University, Wuhan 430072,
China

1. Abstract

In the mid-latitude region, the study on the field-aligned irregularities in the ionospheric E region has been a hot spot in the past 30 years. The VHF radar based on coherent scattering is an important device to observe E region irregularities. Yamamoto et al. [1991] observed quasi-periodic echoes in the Japan mid-latitude region with MU radar. In the past decades, the Kelvin Helmholtz Instability (KHI) is considered to be an important factor in the formation of the E region irregularities in the mid-latitude region. Bernhardt [2002] simulated the process of the modulation of sporadic-E layers by KHI in the neutral atmosphere and found that KHI will modulate the ion layer to form a field-aligned quasi-periodic structure.

Analyzing the field-aligned coherent radar echoes observation in Wuhan, we present results of quasi-periodic echoes in the Chinese mid-latitude region. Combining the distribution of Es and neutral wind in Wuhan obtained by the digital ionosonde instruments and meteor radar, the observational results show that there is a close correlation between QP echoes and Es in the mid-latitude ionospheric E region. When the Richardson number is less than 0.25, the KHI is excited to destroy the Es stable structure, resulting in QP echoes in the mid-latitude region.

2. References

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