R005-15
B 会場 ：11/4　PM2 （15:45-18:15）
17:45〜18:00

短波ドップラー観測と全天大気光観測を組み合わせたプラズマバブルの研究

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Simultaneous observations of plasma bubbles with HF Doppler sounding system and all-sky airglow imager in Taiwan

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Plasma bubbles are regions of electron density depletion in the equatorial ionosphere appearing at altitudes above 200 km. Plasma bubbles, that develop to higher altitudes near the magnetic equator, are observed at low latitude regions 10-20 degrees away from the magnetic equator. Plasma bubbles are known to cause disruptions of global navigation satellite systems and/or degradations of their positioning accuracy. For this reason, various studies have been conducted on plasma bubbles. Chum et al. (2016) conducted a statistical study of Doppler spectrograms obtained from HF Doppler sounding systems in Taiwan, and suggested that plasma bubbles can be detected as oblique spreading structures in the Doppler spectrograms. However, it is not known what properties of plasma bubbles reflect the microstructure (striated structure) of the disturbances that are caused by the plasma bubbles (the oblique spread structures) in the Doppler spectrogram.

The purpose of this study was to analyze striated structure of the oblique spread structures in the Doppler spectrogram by simultaneous observations with an all-sky airglow imager in Tainan, Taiwan and an HF Doppler sounding system in Taiwan.

As a result, it was confirmed that branch structures of the plasma bubble have striated structures corresponding to the time when the branches reach the intermediate reflection point and that the number of branch structures and the number of striated structures coincide approximately with each other. This suggests that striated structures of the oblique spread structures in the Doppler spectrogram corresponds to the branch structures of the plasma bubbles.

On the other hand, four of the six branches reached the latitude of the intermediate reflection point, which did not match the six branches of the striated structure. This is inconsistent with the fact that the Doppler spectrogram reflects only data from reflections at intermediate reflection points. This suggests that the Doppler spectrogram does not reflect only the reflection data at the intermediate reflection point, but also the scattering data from other scattering points. Therefore, I analyze not only the intermediate reflection points but also the scattered points to determine whether the oblique spread structures in the Doppler spectrogram reflects reflection or scattering.

The change in Doppler shift due to the change in the position of the plasma bubble was determined to determine if it was reflection or scattering. The calculation method was based on the velocity and position of the plasma bubbles calculated from the keogram, and the Doppler shift was calculated from the change in radio propagation distance. In addition, the reflection altitude was estimated by comparing the calculated Doppler shift with the measured Doppler shift. By comparing the estimated reflection point with the scattered point, I intend to confirm whether the scattered data is reflected in the Doppler spectrogram.