

EEJ、CEJ とプラズマバブルの関係

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The relationship between plasma bubbles and EEJ, CEJ

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Plasma bubble is one of the ionospheric disturbance phenomena occurring after sunset in the magnetic dip equator. The plasma bubble causes amplitude and phase fluctuation (scintillation) of received radio waves from satellite and resultant communication troubles and positioning error of signal receivers. It is known that plasma bubbles are generated due to Rayleigh-Taylor instability, so eastward electric fields are required for the development of plasma bubbles. EEJ (equatorial electrojet), which is unique phenomenon in the magnetic equator, enhances the eastward current at the dayside ionospheric E region, and may be related to plasma bubble development. It is also supposed that generation of plasma bubbles is suppressed when CEJ (counter electrojet) which makes westward electric field near sunset occurs. Therefore, in this study, we analyzed the EEJ and the plasma bubble incidence. In addition, we analyzed events that occurs CEJ and plasma bubble on the same day, and investigated the characteristics of magnetic field fluctuation.

In this study, we used EE-index which is suitable for investigation of morphology of EEJ as magnetic field variation. We use the station not only at Langkawi (Malaysia) in Southeast Asia, but also at Huancayo (Peru) in South America, and we tried to analyze the longitudinal dependence of features.

As a result, we found that plasma bubbles tend to occur as the total current amount of EEJ is larger. In the previous study, the relationship between the equatorial enhanced component of EEJ and plasma bubbles were investigated and there was no correlation between them [Uemoto et al, 2010]. So, it may be necessary to consider the EEJ including Sq current. In addition, when the CEJ and plasma bubble occurred on the same day, it was found that the magnetic field variation after the CEJ tends to fluctuate northward. This may suggest that an eastward electric field like pre-reversal enhancement was generated. Furthermore, we found that the CEJ when the plasma bubbles occur is mainly due to the lunar tidal effect. We could say that the tidal effect is an important factor in the generation process of plasma bubbles.