

Concurrent Observations of Electron Density Irregularities in Ionospheric Es Region made with FORMOSAT-3 and Chung-Li 30 MHz Radar

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For the purpose of FORMOSAT-3/COSMIC project, a bistatic coherent radar operating at 30MHz was set up on the campus of National Central University located at Chung-Li City (24.9°N, 120°E). One of the scientific Goals of this new radar is to explore the characteristics of ionospheric plasma irregularities at 5-meter scale in equatorial anomaly region. It has been recognized that the gradient drift instability is the most probable mechanism to derive the bottom ionospheric irregularities observed by backscatter radars. The parameter, $L_N=N(\partial N/\partial h)^{-1}$, which is the characteristic length scale of the electron density gradient in the direction perpendicular to the geomagnetic field, is a crucial factor that dominates the excitation of the gradient drift instability. In this report, we present the observation results of the 3-meter type 2 plasma field-aligned Es irregularities made by the Chung-Li 30 MHz radar. Interferometry measurements show that the irregularities centered at height about 100 km away from the Chung-Li radar about 75-90 km geomagnetic north. Concurrent observation of the electron density profile made by FORMOSAT-3 at the location (25.6°N, 119.4°E) indicated that a sharp Es layer with peak electron density of about $4.85 \times 10^4 \text{ #/cm}^3$ located at height about 100 km. These results strongly show that the radar-measured irregularities bear a close relation to the FORMOSAT-3-retrieved sporadic E layer. In this report, with the help of the electron density profile retrieved by using the radio occultation technique, the mechanism responsible for the generation of 5-meter field-aligned irregularities is discussed.