

# A SYNTHESIS OF THE LOW LATITUDE OFF ELECTROJET E-REGION ELECTRON DENSITY IRREGULARITIES.

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## **Abstract:**

Although significant progress has taken place in understanding the electrojet and mid-latitude E region FAI, it is only recently that observations are made from low latitudes just outside the electrojet and far below the mid latitudes. The observations are found to be remarkably different from those at either equator or at mid-latitudes. For example, the echoes are weaker and the occurrence probability is least during noontime when the electrojet echoes are stronger. While the EEJ FAI are related to the EEJ strength, the mid-latitude FAI are closely related to the sporadic E (Es) activity. The mechanisms that are responsible for the generation of irregularities are mainly gradient drift instability (GDI), two-stream instability and Kelvin Helmholtz instability (KHI). For low latitudes outside the EEJ, since the electric fields are small as compared to the EEJ and also sporadic E activities are remarkably less as compared to mid-latitudes, the instabilities that come to mind are GDI and KHI. KHI, however, requires proper wind shear for the region to be unstable. While GDI is commonly considered to be responsible, for the low-latitudes, where both electric field conditions and Es activities are low, a proper evaluation of GDI in terms of thresholds on the electric field and electron density gradient are essential. In this paper, we present the generation mechanism of the irregularities observed by the Gadanki MST radar based on measured electron density gradients observed in the past rocket flights from Sriharikota and the realistic electric fields applied to low latitudes. It is shown that for this latitude, the conditions are extremely stringent for the growth of electric field driven GDI. Accordingly, for the observed FAI at Gadanki, it is proposed that suitable winds or wind shear are very much essential for the observed features. The required wind estimated for the growth of the instability is found to be quite similar to that observed elsewhere, although their existence at this location needs to be confirmed. A critical evaluation of the irregularities in terms of their generation mechanism is presented and discussed in this paper.