

Study of low-latitude *E*-region irregularities related to the background ionosphere and neutral wind field with the Equatorial Atmosphere Radar

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In the equatorial ionospheric *F*-region, equatorial spread *F* (ESF) frequently with field-aligned irregularities (FAI) occurs in the nighttime. Since the bottomside of the equatorial *F*-region couples to the low-latitude *E*-region through the geomagnetic field, the low-latitude *E*-region has a significant effect on the equatorial and low-latitude ionosphere. In this study, we studied the relationship between *E*-region FAI (*E*-FAI) and neutral wind based on the data from Equatorial Atmosphere Radar (EAR), meteor radar and ionosondes. Observations were conducted in March - August 2005. National Institute of Information and Communications Technology operated three ionosondes located along the geomagnetic meridian including the EAR site.

Comparing data between the EAR and meteor radar, zonal velocities of FAI were found to agree quite well with the neutral winds below 94km. We also found that *E*-FAI echoes were frequently observed in association with the occurrence of sporadic *E* (*Es*) layers. Altitudes of their co-occurrence were different in time.

FAI echoes were observed in the low latitude valley region (120km~140km) between the upper *E*-region and the lower *F*₁-region. We compared altitudes of the echoes mapped to the dip equator and the height of the bottomside of the ESF. These two altitudes agreed quite well each other (See Figure1). We estimated downward electric fields from the zonal velocities of *E*, *F*-FAI, and found similar values 1~3 mVm⁻¹ in all regions. As a result of this investigation, we could quantify the several aspects of the *E* - *F* coupling processes in the geomagnetically low latitude ionosphere.

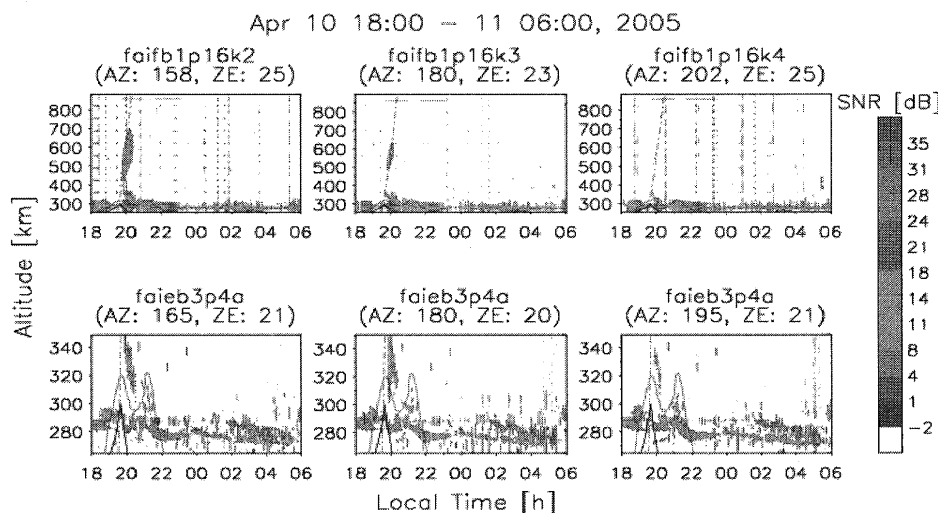


Figure 1: Time-height (after mapping to dip equator) cross-section of FAI echoes observed with the EAR during 18-06LT on April 10, 2005 and time variation of the bottom of *F*-layer.

REFERENCES

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