

Characteristics of Equatorial Spread-F (ESF) observed with GNU Radio Beacon Receiver (GRBR) in southeast Asia and Africa

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Equatorial spread F (ESF) is intense ionospheric irregularity that occurs around the geomagnetic equator. It can cause intense scintillation to satellite-ground communications, and serious error in the GPS measurements. The ESF has been a hot research topic of the equatorial/low-latitude ionosphere for long time. However, its day-to-day variability is not well understood. Now we deploy a very wide network of GNU Radio beacon receivers (GRBR) at low latitudinal regions over east Africa, southeast Asia, and Pacific region, and observe 150MHz/400MHz beacon signal from C/NOFS and other polar-orbiting satellites. In this paper, we use data from Bac Lieu, Vietnam (9.29N, 105.71E, Dip Lat. 1.67N, observations started in January 2009) and Bahirdar, Ethiopia (11.56N, 37.38E, Dip Lat. 3.93N, observations started in March 2011). We discuss relationships between day-to-day variability of ESF with ionospheric structures, i.e., large-scale wave structure (LSWS), meridional symmetry of the ionosphere density distribution, and VHF/UHF scintillation intensity. Occurrence of ESF is well correlated with enhanced LSWS events in the evening time. At Bahirdar, scintillation level is high, and very intense LSWS events are found. From statistical comparison between Africa and southeast Asia, we found that scintillation level is higher in Africa than in southeast Asia, inferring more enhanced occurrence of the ESF over African region.

Keywords: Satellite beacon experiment, Equatorial spread-F, Low-latitude ionosphere, Africa, Southeast Asia