

Predawn depletion observed by GRBR and GPS networks in Southeast Asia

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Deep plasma depletion during substorm at predawn (0412-0436 LT) on 6 March 2012 was captured by GRBR network and was confirmed by sparse GPS networks in Southeast Asia. The only available low-Earth-orbit (LEO) satellite during the event is DMSPF15 with NE-to-SW overpass. GRBR network covering both hemispheres is aligned along the ~100 E meridian. GPS network including 12 GPS receivers sparsely distributes from 25 N to 1 N and from 99 E to 105 E. The supporting information includes in-situ ion density data from DMSPF15 satellite, bottomside ionospheric data from ionosonde at Chumphon (10.72 N, 99.37 E) and data from the EAR at Kototabang (0.20 S, 100.32 E). This event was recognized by GRBR-TEC as having a steep TEC gradient that can trouble in positioning error on the aeronautical augmentation system. This finding was supported by the GPS-TEC. In addition to the depletion, the GPS-TEC revealed the co-locating sub-mesoscale Medium-Scale-Ionospheric-Disturbance-like (MSTID-like) structures. Because the sparseness of the observation points has restricted the resolution of the observations, several assumptions are necessary to interpret the data, such as the neglect of the temporal variations of their structures. As a result, a deep plasma depletion event was understood as having fossil plasma bubbles and sub-mesoscale MSTID-like structures collocating. The wavefront of the plasma bubbles and the MSTID-like structures are found to be the same. This event improves the predawn ionospheric information over Southeast Asia and is significant for being the prior-knowledge for the ionospheric modeling.

Keywords: TEC, GRBR, GPS, predawn depletion, plasma bubble, Southeast Asia