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Solar activity and latitude dependence of plasma bubble occurrence in South-East Asia

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To reveal the solar activity and latitude dependence of plasma bubble occurrence, a statistical study of the rate of TEC change index (ROTI) and the radio wave scintillation was made by using GPS and beacon receiver networks in the South-East Asia (SEA) region. It is known that the growth rate of plasma bubble is large if the ionosphere is high in altitude. The more it grows the more small-scale fluctuations inside the plasma bubble affects radio signal from satellites to ground-based receivers. To clarify the altitudinal structure of the plasma bubble, and its solar activity dependence, the plasma bubble height on the dip equator (HODE) was studied using GPS and beacon receiver networks. The receivers were distributed from 20N to 10S and 98E to 109E in the geographic coordinates. The data from 2008 to 2011 are used. During this period, the solar activity increased gradually. Plasma bubble was frequently observed during the equinox seasons. In 2010 and 2011, which is in relatively high solar activity period, plasma bubble was detected at all stations from 20N to 10S. In 2009, it was detected at latitudes lower than 12N. It was the case in the September equinox in 2008. No plasma bubble was observed in the March equinox in 2008. These results indicate that the height of the plasma bubble on the dip equator depends on the solar activity. During the low solar activity period, plasma bubble cannot raise up to high altitude. In addition to these radio receivers' data, ionosondes were used to detect the occurrence of the equatorial spread-F, and the Equatorial Atmospheric Radar was used to capture the shape of the plasma bubble.

Keywords: Plasma bubble, TEC, ROTI, South-East Asia, Digital Beacon Receiver (DGBR), Equatorial Atmosphere Radar (EAR)