

Simultaneous observations of plasma bubbles by the Equatorial Atmosphere Radar and the SEALION ionosonde network

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Two joint observation campaigns of plasma bubbles were conducted from March 5 to April 3 and from October 4 to 18, 2004. The Equatorial Atmosphere Radar (EAR) operating at 47 MHz located at Kototabang (0.2S, 100.3E), West Sumatra, Indonesia, was operated to detect ionospheric plasma bubbles. In the same magnetic meridian, three FM-CW sounders (ionosondes) were operated at Kototabang, Chumphon (10.7N, 99.4E), Thailand, and Chiang-Mai (18.8N, 98.9E), Thailand. In the March-April campaign, only two of the FM-CW sounders, Kototabang and Chumphon, were in operation, while all the sounders were in operation in the October campaign.

The EAR observed plasma bubbles in 12 nights in the March-April campaign and 3 nights in the October campaign. Plasma bubbles were observed often in the descending phase of the ionosphere measured by the virtual height of the bottom side of the F-region ($h'F$) at 2.5 MHz. $h'F$ variation at Chumphon near the dip equator showed clearer correlation with plasma bubble occurrences than $h'F$ at Kototabang.

Plasma bubbles were observed when the prereversal enhancement (PRE) was strong. However, plasma bubbles were not always observed when the PRE was strong. There must be another source of triggering the plasma bubbles.

The range-type spread-F measured by FM-CW sounders, which are supposed to be a signature of plasma bubbles, were quite asymmetric between Kototabang and Chiang-Mai. This suggests that the range-type spread-F may not be a good measure of plasma bubbles or small scale irregularities in a plasma bubble do not fill the entire magnetic flux tube of a plasma bubble.