

Relationship between the receptions of VHF broadcast waves from Southeast Asia and the positions of equatorial plasma bubbles

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We have observed VHF radio waves (47.5 - 76.0 MHz) at Tateyama observatory, Japan (34.9 N, 139.8 E). Broadcast radio waves transmitted from Southeast Asia (i.e., the Philippines, Thailand) are frequently received around midnight in equinox seasons. Simultaneously with the reception of these radio waves, equatorial plasma bubbles (EPBs) are observed by all-sky imagers at Sata, Japan (31.0 N, 130.7 E) and Darwin, Australia (12.4 S, 131.0 E). Using a 2-dimensional ray-tracing calculation, it is shown that the VHF radio waves transmitted from the Philippines reach to Tateyama due to the plasma bubbles. However, the ray paths of radio waves from Thailand to Tateyama is not revealed by the calculation. The purpose of this study is to determine the ray-path of the radio waves from Thailand using a realistic 3-dimensional ray-tracing calculation.

The result of the calculation shows that the VHF radio waves transmitted from the north of Thailand can reach to Tateyama due to equatorial plasma bubbles. It is also shown that VHF radio waves transmitted from Thailand and the Philippines reach to Tateyama when plasma bubbles are located at 117E - 125E and 122E - 135E, respectively. In 8 cases out of 10 cases where the VHF radio waves are received at Tateyama, however, the signal intensities of VHF radio waves from the Philippines and Thailand enhance simultaneously. This is because equatorial plasma bubbles are generated at around 122E.