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Radio and optical observations of equatorial ionosphere and thermosphere in Indonesia

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In order to understand the coupling processes between the tropospheric activity and ionospheric disturbances and irregularities over the equatorial region, we have been operating optical instruments, VHF radar and GPS receivers at Kototabang Indonesia since 2002. Based on the observations using these instruments, following results were obtained. (1) A comparison between GPS scintillation and Earth's brightness temperature suggests that plasma bubble occurrence over Kototabang can be related to tropospheric disturbances over the Indian Ocean to the west of Kototabang. (2) Quasi-periodic poleward-propagating waves were observed in the 630-nm airglow images. These waves could be caused by atmospheric gravity waves propagating from mesosphere or lower atmosphere. (3) Following the large earthquake that occurred near Sumatra Island in Indonesia on December 26, 2004, we observed TEC variations propagating from the epicenter. These TEC variations could be caused by acoustic waves launched from the epicenter. (4) Continuous observation of the Field-Aligned irregularities (FAIs) with a VHF radar reveals that the F-region FAIs frequently occur at post-midnight between May and August during a solar minimum period.

Fabry-Perot interferometers were installed at Kototabang and its geomagnetic conjugate point, Chiang Mai in Thailand on February and June 2010, respectively in order to measure the thermospheric neutral winds at the geomagnetic conjugate points in northern and southern hemispheres. In 2009, five additional receivers for the VHF radar were installed to make radar imaging observations of the E- and F-region FAIs. We also installed three GPS receivers at Pontianak, Indonesia to measure the GPS scintillation drift velocities and compare them with the results obtained at Kototabang. We present the recent results obtained by using these instruments.

Keywords: ionosphere, thermospshere, equatorial region, plasma bubble, airglow, ionospheric disturbance