A relationship between 630-nm airglow intensity and total electron content in the ionosphere

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F region TID structures seen on GPS-TEC maps are very similar to those on 630-nm (OI) airglow intensity maps. This is very reasonable because 630-nm intensity is closely related to electron density distribution. In this paper, using modeled altitude-profiles of electron density, O+ density and neutrals, we calculate 630-nm volume emission rate profile, airglow intensity on the ground and TEC, and then their fluctuation amplitudes due to TIDs. The calculated fluctuations of the airglow intensity and TEC are consistent with the observational ones.

It was found from the FRONT campaign in May 1998 that F region TID structures seen on GPS-TEC maps over Japan were very similar to those on 630-nm (OI) airglow intensity maps. This is very reasonable because 630-nm intensity is closely related to electron density distribution. Ground-based TEC and airglow observations, however, cannot generally tell altitude profiles of electron density and airglow, respectively, which are very essential for the study of physical processes associated with ionospheric disturbances like TIDs and geomagnetic storms. In this paper, using modeled altitude-profiles of the electron density, O+ density and neutrals, we calculate 630-nm volume emission rate profile, airglow intensity and TEC on the ground, and their fluctuation amplitudes due to TIDs. The calculated fluctuations of the airglow intensity and TEC are consistent with the observational ones.