Ionospheric Perturbations During Two Recent Solar Eclipses Observed from TEC Measurements using GPS

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Recently, two solar eclipses, one total and the other with approximately 90% obscuration occurred over the North-easten part of India on 22 July, 2009 and 15 January, 2010 respectively. The period of total eclipse on 22 July over Dibrugarh was ~4 minutes at 0630 hours and the annular eclipse on 15 January occurred for 3 hours from 1230-1535 LT with maximum coverage of the disc at 1410 hours. The possible impact of the two eclipses have been studied using total electron content (TEC) measurements made with dual frequency NOVATEL receiver over Dibrugarh (27.3°N, 94.6°E). Slant TEC data above 50 ° elevation have only been considered to eleminate the effect of multipath and minimize the time shift. TEC on control days for the July eclipse shows expected gradual build up of ionozation in the morning hours. However, on eclipsed day the TEC droped abruptly by few TEC units as the totality started. TEC then again suddenly recovered after the totality to its expected level. Modulations in the form of medium and large scale TIDs have been observed for a few hours after the eclipse. During the annular eclipse the diurnal TEC was near its peak and TIDs with magnitude of ± 3TEC units have been observed. Fluctuations with amgnitude of ~1 TEC unit were observed before and after the eclipse. The possible generation of gravity waves due to the eclipses in the troposphere which might have propagated to the ionosphere is examined using near surface and vertical profiles of meteorological parameters of interest.