

Study of multi instrument observation of ionospheric response to 26 December 2019 solar eclipse

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The response of the ionosphere to 26 December 2019 solar eclipse on the equatorial and low latitude ionosphere has been investigated using ground and space based observations. The high resolution Ionosonde observations at Tirunelveli, GPS TEC observations from a chain of GPS receivers along and across the eclipse path, TIMED-SABER and Ionospheric connection explorer (ICON) satellites were utilized to investigate the eclipse induced variations in electron density and thermospheric cooling. Tremendous increase in bottom side altitude of F-region resembling Pre-Reversal Enhancement (PRE) was observed. Near eclipse maximum, strong blanketing sporadic E layer was observed at Tirunelveli with top frequency 18MHz for 1 hour 26 minutes. Additional ionogram traces known as satellite traces (ST) and 'U' shaped ionograms were noticed for the first time over Tirunelveli during eclipse maximum and eclipse ending respectively. Presence of 'ST' and 'U' shaped traces in the ionograms indicate the short period gravity waves or TID type of wave perturbations over Indian region. A maximum of ~5 TECU decrease in TEC is observed on the eclipse day. Periodogram analyses of TEC data showed the presence of wavelike structures with periodicities of 18-24 min for different stations. Simultaneous observations from ICON satellite showed increase and decrease in hmF2 and NmF2 which matches well with ionosonde at Tirunelveli respectively. The temperature profiles from TIMED-SABER and ICON satellites showed a reduction and enhancement in the lower and upper E region respectively during eclipse.

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