"D-region Ionosphere Dynamics as Inferred from Narrowband VLF Observations During 22 July, 2009 Total Solar Eclipse"

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Solar eclipses are the rare events to observe and understand its effect on Earths geosphere for scientific community. An extremely long duration total eclipse of the Sun, greatest during the century happened to be observed on 22 July, 2009 from the narrow corridor on the Earths eastern hemisphere. The Moons umbral shadow began on western coast of India, moved through middle India, Nepal, Bhutan, China and after crossing mainland ended in Pacific Ocean. As understood, blocking of solar radiation during eclipse decrease the level of ionization and thus affects dynamical processes in different layers of the ionosphere. But it is the D-region of the ionosphere which experiences drastic changes during eclipse. It is affected most because the principle sources of its ionization, the Lyman alpha line of solar spectrum (121.5 nm), EUV radiation (80-111.8 nm) and X-ray (0.2-0.8 nm) are blocked for the duration of eclipse. Naturally occurring ELF/VLF broadband (03-30 kHz) and man-made VLF transmitter signals provides one of the best tool for continuous monitoring of D-region ionosphere. VLF waves travel long distances in Earth-ionosphere waveguide due to multiple reflections without any appreciable attenuation. A special campaign for the observation of VLF signals was carried out at the three locations of Allahabad, Varanasi and Nainital in India. Two sites are located in the totality path and one out of the totality, suitable to study the D-region dynamics in and out of the totality region. Apart from broadband signals, amplitude and phase of the fixed frequency VLF transmitter signals were monitored. The signals monitored were JJI at 22.2 kHz, transmitting from Japan and NWC at 19.8 kHz from Australia. The path of JJI signals to sites in India is parallel to the movement of totality, whereas the NWC signal path is intersecting the totality path. The observation of JJI signal at Bushan, South Korea is also used in present study. The data analysis has revealed significant increase/decrease in amplitude and phase of the signal, signifying major change in the behavior of the D-region ionosphere. Detailed results will be discussed during the workshop.