

A STUDY OF THE SOLAR ECLIPSE EVENTS AND THEIR IMPRINTS IN THE IONOSPHERE OVER AHMEDABAD

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Abstract:

The solar eclipses are one of the most fascinating, rare celestial events and provide a unique opportunity to study the solar surface and various geophysical phenomena in the terrestrial atmosphere. Since last five decades, regular Ionospheric observations are made by operating an Ionosonde at Ahmedabad (23.1 oN, 72.6 oE), which is an important station near the northern crest of equatorial ionization anomaly. Special observational campaigns were conducted over Ahmedabad by operating an Ionosonde during the six solar eclipse events in the last five decades. First Ionospheric study of the solar eclipse over Ahmedabad were made during the solar eclipse event of 30 June 1954, thereafter the solar eclipses during 14 December 1955, 19 April 1958, 16 February 1980, 24 October 1995 and 11 August 1999 have also been studied. These solar eclipse events occurred during different solar activity periods and during different solar zenith angles. Few of the eclipses occurred during early morning hours (close to the local Sunrise), few during afternoon and in the evening hours (local Sun set time at the ground). In view of great interest in the scientific community to study the changes in the various atmospheric parameters during the solar eclipse events, we have done a comprehensive study of the ionospheric effects associated with the solar eclipse events over Ahmedabad since 1954. A comparative study of the different ionospheric parameters has revealed very interesting features. Changes in critical frequency of F2, F1 and E layers (foF2, foF1 and foE) and in maximum electron density of these layers have been studied. Maximum electron density of E-layer was modulated by about 38%, 20%, 40 %, 57% and 15 % during the eclipse events of 30 June 1954, 14 December 1955, 16 February 1980, 24 October 1995 and 11 August 1999 respectively. There were noticeable effects in the F1 and F2 regions also. A study of changes in real and virtual height of E and F-layers, deviation of critical frequencies with magnitude of the solar eclipse has also been made. These, results are discussed in relation to the observations of

the ionizing radiation from the Sun, the eclipse function, changes in the electron density and absorption in the underlying D and E regions.