A COMPREHENSIVE STUDY OF PLASMA DENSITY OF SPORADIC E LAYER AND ITS ASSOCIATION WITH METEOR ACTIVITY OVER AHMEDABAD

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Abstract:

The variation in plasma density of the E layer is highly irregular and is not a smooth function of solar zenith angle. Because of irregular variations in the plasma density, this layer is more commonly known as sporadic E layer or Es layer. Sporadic E layer plays vital role in radio communications. It is generally believed that Sporadic E layers are formed by the compression of the metallic ions (Fe+, Na+, K+ etc) of meteoric origin by the wind shear mechanism. In the present study an attempt is made to identify the periods of unusually high plasma density of ES-layer by using the hourly ES values recorded at Ahmedabad (23.01 oN, 72.36 oE), which is an important ionospheric station near the northern crest of Equatorial Ionization Anomaly (EIA) in the India. Data has been analyzed for a period of 1978 – 2002 with a view to see the effect of low, medium and high solar activity and also the seasonal effects. Special emphasis has been given to the periods of Leonid Meteor showers.The Leonid meteor shower is known to have strong activity every 33 years, which is the period of Tumpel - Tuttle, the parent comet of the shower. A meteor outburst of Leonid was observed in November 1994 and strong meteor shower was predicted to occur in 1998 or in 1999. A strong event of meteor burst was observed at the time of the descending node of the comet at 1331 hrs (UT) on 17 November 1998. Special rapid radio soundings (every minute during expected peak of the shower and every five minutes otherwise) were made over Ahmedabad to study the effects of the Leonid meteor shower on the ionosphere during 16 - 20 November of the years 1998, 1999 and 2000, 2001.Hourly Ionospheric data recorded over Ahmedabad for the years 1993-2001 indicate a distinct increase in the occurrence of Sporadic-E during the Leonid shower days. The daily mean percentage occurrence of Sporadic-E is peaking in the year 1998. Considering the days from 17-19 November only, the percentage occurrences are 15%, 40% and 40 % in 1994, 15 %, 20% and 50% in year 1995, 40%, 50% and 35% in 1996, 50%,60% and 20% in 1997, 75%,80% and 40% in 1998,10%,50% and 10% in 1999 and 22%,58% and 55 % in year 2000 and even less during 2001. The occurrence of Sporadic-E, presence of multiple traces, magnitude of foEs and fbEs are rather low in year 1999, 2000 and 2001 than in year 1998.

A comparison with other prominent meteor showers event data indicates that the high values of Es are mostly correlated with the meteor shower activity. The variation of plasma density of Es layer with meteor activity during this period will also be presented.