VHF RADAR OBSERVATIONS ON METEOR INDUCED TURBULENT PLASMA IRREGULARITY LAYERS

Raman Selvamurugan (1) and D Narayana Rao(2)
(1) Indian Institute of Geomagnetism, Plot #5, Sec-18, Kalamboli highway, Panvel, Navi Mumbai – 410 218 India
(2) National MST radar Facility, P.Box. No.123, Tirupati, 517 502, AP, India.

Abstract:

Appearances of dense meteor trail of ionization during enhanced meteor shower activity have exhibited a tendency of such strong meteor trails to transform as plasma irregularity layer structures similar to the sporadically generated blanketing Es-layer. The spectral haracteristics of such strong trails obtained using Indian MST radar show that the thin trail of plasma was tending to become unstable with time generating plasma turbulent irregularities setting within its trail region resembling a layer of irregularity structures. The thickness of this plasma irregularity layer is found to be very thin as the echoing regions are confined to two or three range bins (<3 km) in the height range of ~93 km with a height resolution of 1.2 km. The behavior of thin layer formation is in particular the characteristic of a normal blanketing type Es-layer with a thickness being normally a few hundred meters. The ionized plasma irregularity layer found in the present observation persisted for sufficiently a long duration in comparison to the short-lived specular echoes scattered from meteor trails observed during the same experiment. The signal-to-noise ratio of the signal obtained from this plasma irregularity layer using the MST radar at Gadanki (13.5° N, 79° E) is in the range of ~6 dB. The strength of the signal is found to be sufficiently strong and the echo power is of the order of the power normally found with blanketing Es type of layers with ionospheric measurements over Gadanki. Conversely, the signal strength is relatively weaker compared to the specular echoes from meteor trails which are of the order of ~30 dB that were recorded during the same period. However, the blanketing Es-layer can appear and persist for relatively a longer period compared to the one observed in the present case, provided, the background ionization, wind shear and most importantly the ambient electric field are conducive to the existence of the layer.