Long lasting meteor induced backscatter (MIB) observed at 50 MHz. Doppler spectrum characteristics and implications

C. Haldoupis (1) and A. Bourdillon (2)

(1) Department of Physics, University of Crete, Heraklion, Crete, Greece , (2) Laboratoire IETR, Université de Rennes 1, Rennes, France (chald@physics.uoc.gr / Fax: +30-2810-394201)

In addition to the specular reflections from underdense and overdense meteors, which usually last less than a second, there is also a distinct category of long-enduring meteor echoes having lifetimes from several seconds to a few minutes. Although these were known since long time, their identity became clear only the last years through observations made with VHF coherent backscatter radars at middle and equatorial latitudes. These meteor echoes, labeled here as MIB (for meteor induced backscatter), are attributable to magnetic aspect sensitive coherent backscatter from field-aligned irregularities (FAI) induced occasionally by instabilities in dense meteor trails deposited in the lower E region. It has been suggested that large polarization fields across the trail set up and combine with steep density gradients to initiate the Farley-Buneman (FB) and Gradient-Drift (GD) instabilities which lead to FAI and plasma turbulence. The lifetimes of MIB echoes are not defined by ambipolar diffusion but the strength of the instability drivers, ion recombination, and possibly the trail geometry relative to the magnetic field. In this paper we present high resolution Doppler spectrum observations of MIB observed over several years with SESCAT, a continuous wave radar experiment in Crete which observes coherent backscatter form FAI in the unstable midlatitude E region. The effort here is on defining the Doppler spectrum properties of MIB and use them to test the proposed interpretation of MIB, and in particular if there is a gradient drift effect on the direct generation of short scale (type 1) irregularities in the trail plasma. In addition, a reference will be made on a new category of long lasting meteor echoes, observed rarely with HF and VHF radars, which, however, do not classify as MIB