HIGH RESOLUTION METEOR OBSERVATIONS USING THE 50MHZ JICAMARCA RADAR

Meers M. Oppenheim[1], Jorge L. Chau[2], Elizabeth N. Bass[1]
[1]Center for Space Physics, Boston University, 725 Comm. Ave, Boston MA 02215
[2]Jicamarca Radio Observatory, Instituto Geofsico del Per, Apartado 13-0207, Lima 13 - Peru

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High-power, large-aperture (HPLA) radars frequently observe two types of signals resulting from meteors. First, they measure head echoes, short duration echoes with large Doppler shifts created at the leading edges of ablating meteoroids. Later, they may detect non-specular trails, echoes which persist for a period lasting from a few 100ms to over 10minutes. These occur only in a limited altitude range and only if the radar wave is propagating nearly perpendicular to the geomagnetic field. In July, 2005 we recorded many hours of measurements using the large 50MHz antenna at the Jicamarca Radio Observatory near the magnetic equator in Peru. These observations were made with the shortest possible pulse period (sub-microsecond) for this radar in order to give us the maximum time and range resolution. The radar was configured to return separate signals from three sections of the radar, allowing us to use interferometry to locate the positions and velocities of the echoes within the beam.

These measurements immediately revealed two interesting features of such observations. First, as in the highly resolved ALTAIR measurements, they typically showed distinct head echoes followed by a short period of little to no signal, and then were sometimes followed by a non-specular trail signal lasting for up to many minutes. These measurements strongly suggest that the gap between head and trail echoes will appear in nearly all observations with sufficient time and range resolution. Second, these measurements show a dramatic difference in the frequency and altitude range of non-specular echoes between daytime and nighttime. During nighttime, meteors generate far more non-specular trails over a far broader altitude range then during daytime.

In this talk, we will discuss these measurements and present statistics generated from thousands of head echoes and trails. We will compare our results to earlier observations. Additionally, we will interpret these observations in terms of both earlier theories of non-specular meteor trails and the recent theoretical work of Oppenheim and Dimant (presented at this meeting).

1. (a) Meers Oppenheim
Center for Space Physics
725 Comm. Ave
Boston, MA
02215 US
meerso@bu.edu
(b) 617-353-6139
(c)

2. G - Ionospheric Radio and Propagation

3. (a)

4. I - Invited Paper, Program chair: Dimant & Mathews

5. No special instructions