On the formation and evolution of radar meteor trails

Akshay Malhotra[1*], John D. Mathews[1], Julio Urbina[1]

[1] Communications and Space Sciences Laboratory, The Pennsylvania State University, University Park, PA 16802-2707, USA

The first ever multi-static, common-volume radar meteor observations were carried out at the Jicamarca Radio Observatory (JRO) in June 2007. This was accomplished using a second antenna array, of similar sensitivity to a single JRO receive module, that was constructed and operated at Carapongo, approximately 5 kilometers geomagnetically south of JRO 50 MHz radar (11.95^0 S, 76.87^0 W). The main JRO array was used for transmitting while the signal was received at both the Jicamarca and Carapongo arrays. More details regarding the construction and geometry of this multi-static system are provided in *Malhotra et al*. [GRL, In review, 2007]. These interferometric observations verify and advance the hypothesis put forward by *Malhotra et al*. [JGR, doi: 10.1029/2007JA012576, in press] i.e. if two identical radars are placed close to each other and observing a common volume, a RSTE (Range-Spread Trail-Echo) occurring at the $\mathbf{k} \perp \mathbf{B}$ region of one of the radars might be seen as a long duration event from that radar (provided the radar has sufficient sensitivity) and a short duration event from the other radar, thus lending further insights into the aspect sensitivity of meteor trails. The physical structure of the trails combined with their aspect sensitivity raises some interesting questions regarding the plasma processes driving the formation of these trails, strongly suggesting a different formation mechanism for the lower altitude trails (below ~ 95 kms) compared to the higher altitude trails.