A Meteor Wind Radar Measurement Campaign Using the Colorado Software Defined Radar With Meteor Trial Echoes Interpreted Under a Modern Diffusion Theory

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This talk presents various interesting characteristics within data collected during a recent campaign using the Colorado Software Define Radar (CoSRad) system. First, a brief system description illustrates how CoSRad is configured for interferometric meteor wind radar mode, where nearly all echoes originate from specular meteor trails. A schematic showing the primary CoSRad hardware setup provides context in interpreting the continuously-recorded data in RTI format. A visualization depicting CoSRad's all-sky specular echo detection strategy prepares us to examine a number of echoes observed during a recent campaign at Platteville, CO (Aug 20 - Sep 1). After a brief look at the canonical meteor trail echo, a number of ostensibly geophysical non-meteoric echoes are presented. In addition to their scientific interest, these echoes convey CoSRad's system capabilities. We first investigate non-specular echo occurrence rates as a function of **k**-vector geometry with respect to the earth's magnetic field (Oppenheim et. al. 2000, Close et. all. 2000). Next, specular trail echoes are interpreted with respect to Dimant and Oppenheim's (2006) theory predicting depletions in the background plasma surrounding meteor trails. Unlike earlier theories of meteor trail evolution, Dimant and Oppenheim consider the trail's interaction with the existing background ionosphere plasma. Their theory predicts that background plasma is drawn into the trail edges resulting in an electron depletion region around the trail. A number of echoes are presented containing a clear electron depletion region around the trail echo's perimeter. Instrumental effects are discussed and shown to be independent of the observed depletion regions. Finally, we show the depletion phenomenon's correlation with height and time of day. The talk concludes with how the CoSRad architecture has enable these measurements, and touches on how rapid and reconfigurable deployment enables CoSRad to perform similar measurement campaigns using many existing systems around the world.