



Combining LWA Observations of MRAs with a SIMONE Radar and Optical Cameras

K.S. Obenberger^{*(1)}, J.M. Holmes⁽¹⁾, J.L. Chau⁽²⁾, L. Cordonnier⁽³⁾, and G.B. Taylor⁽³⁾, S.S. Vaghese

(1) Air Force Research Laboratory, Kirtland AFB, NM

(2) Leibniz Institute of Atmospheric Physics, Kühlungsborn, DE

(3) University of New Mexico, Albuquerque, NM

(4) SETI Institute, Mountain View, CA

Discovered in 2014, meteor radio afterglows (MRAs) [1], have been the subject of much speculation and intrigue. The primary question pertains to the emission mechanism responsible for their enigmatic glow. The emission is characterized by broadband glow in the high frequency (HF, 3-30 MHz) and very high frequency (VHF; 30 - 300 MHz) bands that generally lasts for tens of seconds to a few minutes [2]. The light curves are typically smooth in time and follow a fast rise and slow, exponential decay. MRA emission is generally limited to altitudes above 90 km, indicating a suppression by electron neutral collisions [3]. Our current hypothesis is that hot electrons generated by oxidizing anions produce resonant transition radiation (RTR) as they move through the turbulent plasma trail. See [4] for details on (RTR). Long exposure optical observations with the Widefield Persistent Train Camera (WiPT) have confirmed that MRAs are accompanied by exothermic chemical reactions, and modeling of the chemical processes indicates that enough hot electrons should be produced for RTR [5]. While these initial results relied on only four events over a few months, ongoing studies with WiPT are investigating the statistics of many more events across all seasons.

While co-observations with optics have yielded significant results, no simultaneous radar measurements have been made with MRAs. Such observations are necessary to confirm that the trails are indeed highly turbulent. To remedy this observational deficiency two research campaigns are underway, one in northern Europe combining the Low Frequency Array Radio Telescope (LOFAR) with the Spread Spectrum Interferometric Multistatic meteor radar Observing Network (SIMONE) and the second in New Mexico combining the Long Wavelength Array (LWA) and a new SIMONE system currently being built at Kirtland AFB nearby. The focus of our presentation will be on the status and progress of the New Mexico project.

References

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