

The Southern Argentina Agile Meteor Radar (SAAMER): Platform for comprehensive meteor radar observations and studies

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The Southern Argentina Agile Meteor Radar (SAAMER) is a new generation system deployed in Rio Grande, Tierra del Fuego, Argentina (53°S) in May 2008 (Janches et al., 2013,2014). SAAMER transmits 10 times more power than regular meteor radars, and uses a newly developed transmitting array, which focuses power upward instead of the traditional single-antenna-all-sky configuration. The system is configured such that the transmitter array can also be utilized as a receiver. The new design greatly increases the sensitivity of the radar enabling the detection of large numbers of particles at low zenith angles. The more concentrated transmitted power enables additional meteor studies besides those typical of these systems based on the detection of specular reflections, such as routine detections of head echoes and non-specular trails, previously only possible with High Power and Large Aperture radars (Janches et al., 2014). In August 2010, SAAMER was upgraded to a system capable to determine meteoroid orbital parameters. This was achieved by adding two remote receiving stations approximately 10 km away from the main site in near perpendicular directions (Pifko et al., 2014). The upgrade significantly expands the science that is achieved with this new radar enabling us to study the orbital properties of the interplanetary dust environment. Because of the unique geographical location, the SAAMER allows for additional inter-hemispheric comparison with measurements from Canadian Meteor Orbit Radar, which is geographically conjugate. Initial surveys show, for example, that SAAMER observes a very strong contribution of the South Toroidal Sporadic meteor source (Pifko et al., 2014), of which limited observational data is available. In addition, SAAMER offers similar unique capabilities for meteor showers and streams studies given the range of ecliptic latitudes that the system enables to survey (Janches et al., 2013). It can effectively observe radiants from the ecliptic south pole to approximately 30°N, and thus enable a detailed study of showers at high southern latitudes (e.g., July Phoenicids or Puppids complex), which are unobservable from the CMOR's location. Finally, SAAMER is ideal for the deployment of complementary instrumentation in both permanent and campaign operational modes. Results from various radar meteor investigations as well as radar/optical observation campaigns will be presented in this paper.

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References: Janches, D., J.L. Hormaechea, C. Brunini, W. Hocking and D.C. Fritts, An initial meteoroid stream survey in the southern hemisphere using the Southern Argentina Agile Meteor Radar (SAAMER), (2013) *Icarus* 223 677–683; Janches, D., W. Hocking, S. Pifko, J.L. Hormaechea, D.C. Fritts, C. Brunini, R. Michell and M. Samara. Interferometric Meteor Head Echo Observations using the Southern Argentina Agile Meteor Radar (SAAMER). (2014) *Journal of Geophysical Research: Space Physics* doi: 10.1002/2013JA019241; Pifko, S., D. Janches, S. Close, J.L. Hormaechea, A. Murphy, D. O'Connor, B. Van-depeer, B. Fuller, D. C. Fritts and C. Brunini, THE SOUTHERN ARGENTINA AGILE METEOR RADAR ORBITAL SYSTEM (SAAMER-OS): A TWO-YEAR SURVEY OF METEOROID ORBITS, (2014) *Icarus*, In preparation.