2025 Workshop: Meteor, Meteoroid, and Space Debris

Long title
Advances in Meteor, Meteoroid, and Space Debris Science and Engineering
CEDAR Regular Workshop
Conveners
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Description

As meteoroids enter the Earth’s atmosphere, their kinetic energy converts into intense heat, generating a blazing plasma that envelops their form. These plasmas, commonly referred to as meteors, have captivated scientific inquiry for well over a century, yet numerous enigmas persist. Concurrently, the proliferation of space debris—also known as orbital debris, space junk, or space waste—consists of defunct human-made objects orbiting Earth that no longer serve any useful purpose. These artificial meteors and debris, alongside their celestial counterparts, pose enduring hazards to satellite infrastructure, increasing the influx of macroscopic particles into Earth's atmosphere.
To address the outstanding questions currently under investigation in the field of meteor, meteoroid, and debris science and engineering, we invite presentations on the physics of meteoroid and debris particles and their impact on the atmosphere, ionosphere, and satellites.
We welcome presentations exploring engineering methodologies for observing and characterizing meteoroid and debris populations, encompassing various observational techniques such as lidar, radar, satellite-based instruments, and optical methods, as well as modeling approaches.
We also welcome presentations that utilize emerging AI and machine learning techniques to study all types of meteor echoes and space debris,

Justification

These plasmas, commonly referred to as meteors, have been studied for well over a century, yet many outstanding questions remain. Additionally, space debris—also known as orbital debris, space junk, or space waste—consists of human-made objects orbiting Earth that no longer serve any useful purpose. These artificial meteors and meteoroids of astronomical origin pose a long-standing threat to satellites, contributing to the influx of macroscopic particles into Earth's atmosphere. Several recent networks of multi-static meteor radars, regional radar systems, and optical instruments have received funding. Moreover, ongoing efforts worldwide aim to develop lower-cost radar systems, facilitating new research and discovery and training both undergraduate and graduate students in space science research. Furthermore, the utilization of AI and machine learning in meteor and space debris research has the potential to open new frontiers in space science.

Related to CEDAR Science Thrusts:
Explore processes related to geospace evolution
Develop observational and instrumentation strategies for geospace system studies
Workshop format
Short Presentations
Include a virtual component?
Yes
Keywords
meteors, satellite, modelling, AI
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