# 2022 Workshop: Meteoroids and Space Debris

Long title
Meteoroids and Space Debris
Conveners
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Description

A meteoroid is defined as a small, solid extraterrestrial object. Upon entry into a planet’s atmosphere, it heats and ablates off particles that then collide with the background neutrals, forming a dense plasma that extends around the meteoroid as well as behind it. These plasmas, referred to as meteors, have been studied for well over a century, yet many outstanding questions remain. In addition, space debris, also known as orbital debris, space junk, and space waste, is the collection of objects in orbit around Earth that were created by humans but no longer serve any useful purpose. These artificial meteors/Debris and meteoroids of astronomic origin are a long-standing threat to satellites, and both contribute to the flux 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 impacts effects on the atmosphere, ionosphere, and satellites. We also encourage presentations that address the engineering techniques for observing and characterizing the meteoroid and debris population, including any observational (i.e. lidar, radar, satellite and optical) or modeling method.

Agenda

**Meteoroids and Space Debris Workshop CEDAR 2022, Tuesday, June 21, 13:30 – 15:30 CDT**

**Join in-person or virtual via Zoom.**

**The Zoom link is**
**https://psu.zoom.us/j/99995976431?pwd=akZNcnh3U09DK1JJN25ESDdMOWVFdz09**

**Meeting ID: 999 9597 6431**

**Passcode: 244041**

13:30 - 13:35 Overview & Welcome, Julio Urbina – Penn State/Sigrid Close – Stanford University

13:35 - 14:05 How does Nature Create a Meteor: Evolution from Femtoseconds to Minutes?, Meers Oppenheim – Boston University

14:05 - 14:20 Optical Persistent Trains in Association with Meteor Radio Afterglows (MRAs), Kenneth Obenberger– Air Force Research Laboratory

14:20 - 14:35 Peculiarities of Non-Specular Meteor Radar Echoes, Jorge (Koki) Chau - The Leibniz Institute of Atmospheric Physics (IAP), Meers Oppenheim – Boston University, Kenneth Obenberger– Air Force Research Laboratory

14:35 - 14:50 Space Object Identification with Measurements of Orbit-Driven Waves (SOIMOW), Paul Bernhardt – University of Alaska

14:50 - 15:00 Cost-Effective Spacecraft Drag Sail for Satellite Reentry, Robert Perezalemany – United States Military Academy

15:00 - 15:10 Sporadic Micro-meteoroid Source Radiant Distribution Inferred from the Arecibo 430 MHz Radar Observations, Li, Yanlin; Julio Urbina; Tai-Yin Huang, The Pennsylvania State University, Zhou, Qihou; Miami University

15:10 - 15:25 Concurrent Observations of Meteor Head Echo Populations at Multiple High-Power Radar Facilities, Trevor Hedges, Nicolas Lee, and Sigrid Elschot – Stanford University.

15:25 - 15:30 Discussion

15:30 Adjourn

Justification

These plasmas, referred to as meteors, have been studied for well over a century, yet many outstanding questions remain. In addition, space debris, also known as orbital debris, space junk, and space waste, is the collection of objects in orbit around Earth that were created by humans but no longer serve any useful purpose. These artificial meteors/Debris and meteoroids of astronomic origin are a long-

standing threat to satellites, and both contribute to the flux of macroscopic particles into Earth's atmosphere. Several recent network of multi-static meteor radars, a regional network of radar systems, and regional optical instruments have recently been funded. In addition, there are new efforts worldwide in developing lower cost radar systems that can enable new research and discovery, broadening the participation of underrepresented communities.

Related to CEDAR Science Thrusts:
Explore processes related to geospace evolution
Develop observational and instrumentation strategies for geospace system studies
Workshop format
Short Presentations
Keywords
meteor radar, optical, satellite, modelling
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