

# 2021 Workshop: 2021 Eclipses

Long title

Progress in understanding solar eclipse effects on geospace

Conveners

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Description

Since the Great American Eclipse on August 21, 2017, the eclipse-induced ionosphere-thermosphere (I-T) variations have drawn renewed community interest. These variations are caused by a sudden reduction in solar irradiation (and therefore in photo-ionization and photo-absorption rates) as the Moon shadow sweeps through the Earth's atmosphere at a supersonic speed. New insights into the unique eclipse effects on the geospace system through commonly known fundamental coupling processes have been achieved. These effects include, to list a few, excitation of ionospheric bow waves and other waves, thermospheric waves, ionospheric density variations associated with irregular EUV sources on the solar disk, electrodynamic disturbances and eclipse-time tidal wave modulation at low and equatorial latitudes, ionospheric disturbances in the conjugate hemisphere, etc. In 2021, two solar eclipses will occur in the Arctic and Antarctic regions during polar summers. These will provide rare opportunities for the community to study geospace responses to the polar eclipses in a comparative sense. We invite the community members to [1] report new progress in understanding geospace disturbances during recent and past solar eclipse events (especially in high latitudes), and [2] discuss and coordinate observational and modeling efforts for the forthcoming polar eclipses: June 10, 2021 and December 4, 2021.

Agenda

**Tong Dang**, M-I-T simulation

**Joe Huba**, SAMI3 simulation

**Saurav Aryal**, GOLD results for June 10 and other eclipses

**Xueling Shi**, SuperDARN

**Ingemar Haggstrom**. EISCAT results for the June 10 eclipse

**Larisa Goncharenko**: Millstone Hill ISR

**Shunrong Zhang** [Ionospheric disturbances in GNSS TEC and MH ISR data]

**Kristina Collins**, HamSci

**Sebastijan Mrak**, Solar EUV effects

**Ningchao Wang**, SABER analysis

**Michael Hartinger**, Polar eclipses 2021

Justification

This session will address science questions related to how the upper atmosphere system responds to the rapid reduction and recovery of solar irradiation during solar eclipses. Previous studies show that the transient solar irradiation variations during eclipses lead to changes in not only ionospheric photochemistry but also the energetics and dynamics in the upper atmosphere, all of which are fundamental CEDAR themes. Some of the challenging science and observational questions include eclipse caused atmospheric and ionospheric waves, photoelectron variations, hemispheric conjugate effects, and polar region magnetosphere-ionosphere-thermosphere coupling. The session will address these and other relevant questions and discuss coordinated community observational and analysis plans. This session will address CEDAR Strategic Thrust #2: Explore Exchange Processes at Interfaces and Boundaries (Characterize sources and sinks internally and externally to the SAIR and their possible variations due to the coupling and complexity of the Sun-Earth system).

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