2022 Workshop: Understanding solar eclipse’s effects in the geospace

Long title
Understanding solar eclipse’s effects in the geospace
Conveners
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Description

This session will address science questions related to how the geospace system responds to the impulsive reduction of solar irradiation during solar eclipses. Previous studies show that the solar eclipses lead to changes in the photochemistry and the energetics and dynamics in the ionosphere-thermosphere (I-T) system. Since the 2017 great American eclipse, numerous solar eclipses have been observed, including two polar eclipses. Some of the challenging science and observational questions are how eclipses induce/affect the atmospheric and ionospheric waves, photoelectron variations, hemispheric conjugate effects, and polar region magnetosphere-ionosphere-thermosphere (MIT) coupling. The session plans to address these 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).

Agenda

10:00-10:10 Saurav Aryal (CU-LASP), **Introduction to the session**

10:10-10:25 Nathaniel Frissell

10:25-10:40 Shunrong Zhang (MIT Haystack Observatory): **Conjugate ionospheric observations at Millstone Hill during the Dec 10 2022 Antarctic**

solar eclipse

10:40-10:55 Joe Huba: **SAMI3 ECLIPSE STUDIES**

10:55-11:10 Sebastijan Mrak (CU-SWx TREC)

11:10-11:25 Shibaji Chakraborty: **Coordinated Investigation of Antarctic Total Solar Eclipse (TSE) using SuperDARN HF Radars**

11:25-11:40 Tong Dang (Zoom): **Magnetosphere-ionosphere-thermosphere response to the 10 June 2021 solar eclipse**

11:40-11:55 Junjie Chen (Zoom): **The Response of Geomagnetic Daily Variation and Ionospheric Currents to the Annular Solar Eclipse on 21 June 2020**

Link to the slides at the end of the page.

Justification

Since the Great American Eclipse on August 21, 2017, eclipse-induced ionosphere-thermosphere (I-T) variations have drawn renewed community interest. An impulsive reduction in solar irradiation triggers changes in photo-ionization, photo-absorption and heating as the Moon shadow super-sonically traverses through the Earth's atmosphere at fixed locations. New insights into the unique eclipse effects on the geospace system through commonly known fundamental coupling processes have been achieved. These effects include eclipse induced ionospheric and 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 occurred in the Arctic and Antarctic regions during polar summers. These provided 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, and [2] Plan for field campaigns and scientific endeavors for the upcoming North American eclipses in October 2023 and April 2024

File upload
SAMI3 ECLIPSE STUDIES (6.01 MB)

The Response of Geomagnetic Daily Variation and Ionospheric Currents to the Annular Solar Eclipse on 21 June 2020 (3.39 MB)
Coordinated Investigation of Antarctic Total Solar Eclipse (TSE) using SuperDARN HF Radars (1.46 MB)
Related to CEDAR Science Thrusts:
Encourage and undertake a systems perspective of geospace
Develop observational and instrumentation strategies for geospace system studies
Keywords
Solar eclipse geospace
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