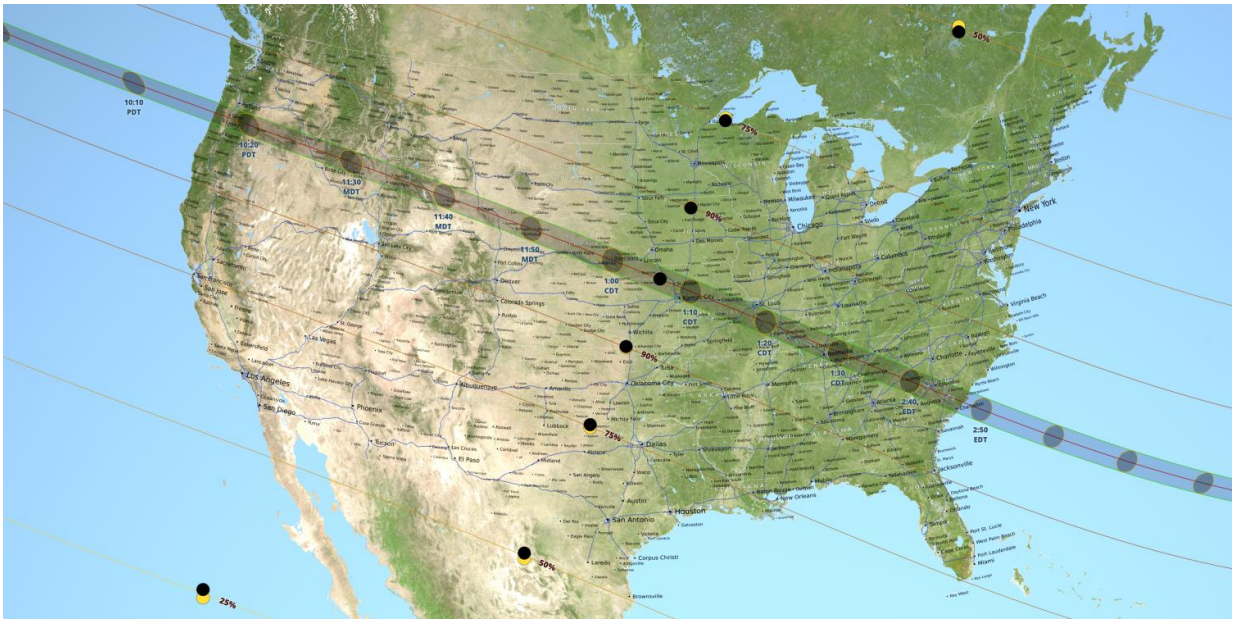
Eclipse 2017: NASA supports a unique opportunity for science in the shadow

February 3 2017, by Sarah Frazier



The total solar eclipse of Aug. 21, 2017, stretches across the US from coast to coast, providing scientists with a unique opportunity to study the eclipse from different vantage points. Credit: NASA's Scientific Visualization Studio

The first total solar eclipse in the continental United States in nearly 40 years takes place on Aug. 21, 2017. Beyond providing a brilliant sight in the daytime sky, total solar eclipses provide a rare chance for scientists to collect data only available during eclipses. NASA is funding 11 scientific studies that will take advantage of this opportunity.

"When the moon blocks out the sun during a total eclipse, those regions of Earth that are in the direct path of totality become dark as night for almost three minutes," said Steve Clarke, director of the Heliophysics Division at NASA Headquarters in Washington, D.C. "This will be one of the best-observed eclipses to date, and we plan to take advantage of this unique opportunity to learn as much as we can about the sun and its effects on Earth."

The August 2017 total solar eclipse will provide a unique opportunity to study Earth, the sun, and their interaction because of the eclipse's long path over land. The path of the total eclipse crosses the U.S. from coast to coast, so scientists will be able to take ground-based observations over a period of more than an hour to complement the wealth of data provided by NASA satellites.

The 11 NASA-funded studies cross a range of disciplines, using the total solar eclipse to observe our sun and Earth, test new instruments, and even leverage the skills of citizen scientists to expand our understanding of the sun-Earth system. The studies are listed below, followed by the name of the principal investigator and their home institution.

Studying the sun

During a total solar eclipse, the moon blocks out the sun's overwhelmingly bright face, revealing the relatively faint solar atmosphere, called the corona. Scientists can also use an instrument called a coronagraph - which uses a disk to block out the light of the sun - to create an artificial eclipse. However, a phenomenon called diffraction blurs the light near the disk in a coronagraph, making it difficult to get clear pictures of the inner parts of the corona, so total solar eclipses remain the only opportunity to study these regions in clear detail in visible light. In many ways, these inner regions of the corona are the missing link in understanding the sources of space weather - so total

solar eclipses are truly invaluable in our quest to understand the sun-Earth connection.

The sun-focused studies are:

- Exploring the Physics of the Coronal Plasma through Imaging Spectroscopy during the 21 August 2017 Total Solar Eclipse (Shadia Habbal, University of Hawaii)
- Testing a Polarization Sensor for Measuring Temperature and Flow Speed in the Solar Corona during the Total Solar Eclipse of 2017 August 21 (Nat Gopalswamy, NASA's Goddard Space Flight Center)
- Chasing the 2017 Eclipse: Interdisciplinary Airborne Science from NASA's WB-57 (Amir Caspi, Southwest Research Institute)
- Measuring the Infrared Solar Corona During the 2017 Eclipse (Paul Bryans, University Corporation for Atmospheric Research)
- Citizen Science Approach to Measuring the Polarization of Solar Corona During Eclipse 2017 (Padma Yanamandra-Fisher, Space Science Institute)
- Rosetta-stone experiments at infrared and visible wavelengths during the August 21 2017 Eclipse (Philip Judge, University Corporation for Atmospheric Research)

Studying Earth

Total solar eclipses are also an opportunity to study Earth under uncommon conditions. The sudden blocking of the sun during an eclipse reduces the light and temperature on the ground, and these quick-changing conditions can affect weather, vegetation and animal behavior.

The Earth-focused studies are:

- Solar eclipse-induced changes in the ionosphere over the continental US (Philip Erickson, Massachusetts Institute of Technology)
- Quantifying the contributions of ionization sources on the formation of the D-region ionosphere during the 2017 solar eclipse (Robert Marshall, University of Colorado Boulder)
- Empirically-Guided Solar Eclipse Modeling Study (Gregory Earle, Virginia Tech)
- Using the 2017 Eclipse viewed by DSCOVR/EPIC & NISTAR from above and spectral radiance and broadband irradiance instruments from below to perform a 3-D radiative transfer closure experiment (Yiting Wen, NASA's Goddard Space Flight Center)
- Land and Atmospheric Responses to the 2017 Total Solar Eclipse (Bohumil Svoma, University of Missouri)

Provided by NASA's Goddard Space Flight Center