

NSO to use Venus transit to fine-tune search for other worlds

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A century ago, scientists chased transits of Mercury and Venus in an effort to size up our solar system. Next week, they will use the last Venus transit for a century to learn how to size up other solar systems as we search for life in the universe.

“Astronomers in the 18th and 19th centuries observed transits of Mercury and Venus to help measure the distance from Earth to [Sun](#),” said Dr. Frank Hill, director of the National Solar Observatory’s Integrated Synoptic Program. “We have that number nailed down now, but transits are still useful. This one will help us calibrate in several different instruments, and hunt for extrasolar planets with atmospheres.”

NSO will carry out a variety of scientific measurements and make available on the Internet near-real time images of the last transit of Venus to be visible from Earth for over a century on 5-6 June 2012. NSO will use telescopes in Arizona, New Mexico, California, Hawai’i, Australia, and India. Live imagery and more will be available at venustransit.nso.edu

NSO facilities have observed recent transits of Mercury, but this will be the only time a transit of Venus will be seen by telescopes at Kitt Peak, AZ, and Sacramento Peak, NM. Venus’ thick [atmosphere](#) makes this transit event valuable for understanding Venus’ outer atmosphere. Observing the transit of a planet with a known atmospheric composition will provide a benchmark for studying details of exo-planet transits (planets around stars other than the Sun).

In like manner, a scientist on the Moon could learn about Earth's atmosphere as it filters sunlight during a lunar eclipse. For a transit, though, the effect is much smaller, requiring greater precision and care in the measurements.

NSO facilities will obtain complementary measurements of the structure of the atmosphere of Venus. These facilities will all look at the strong spectral signatures produced by the abundant CO₂ in the atmosphere of Venus.

The transit will be visible at four of the six telescopes of the NSO Integrated Synoptic Program (NISP) Global Oscillation Network Group (GONG) helioseismic network that circle the Earth, as well as the NISP Synoptic Optical Long-term Investigations of the Sun (SOLIS) on Kitt Peak. Images and movies from these sites will be processed within minutes of acquisition and available for public viewing on the NSO website.

Using the NSO's largest telescope, the McMath-Pierce Main (McMP), also at Kitt Peak, scientists will map the carbon dioxide atmosphere of Venus at infrared wavelengths using spectropolarimetry. Winds in the atmosphere of Venus will be examined using the Doppler shifts of the CO₂ spectral lines, and the polarization of the light from the Venus atmosphere will be used to study particle sizes. Using the McMP West telescope, the linear polarization from the [Venus](#) atmosphere will be mapped 25 times a second at different visible colors. Finally, at the McMP East telescope, un-imaged sunlight will be examined with a high-resolution spectrograph in order to duplicate data from night-time observations of exoplanets around other stars.

At the 76 cm Richard B. Dunn Solar Telescope (DST) on Sacramento Peak, NM, related observations of CO₂ lines in the visible and infrared wavelengths will be obtained with spectrographs, imaging spectrometers,

and high-speed imaging systems provided by a variety of partners and international institutes. The powerful adaptive optics system at the DST will correct atmospheric distortions and allow the instruments to capture some of the highest resolution images possible of the transit.

In addition to scientific studies, the transit will provide information that will be used to improve the overall quality of NSO observations. For example, these images can be used to calibrate the amount of scattered light and the exact orientation of the cameras within instruments such as the NISP Full Disk Patrol.

The transit will occur in late afternoon in the continental US and will be easily visible with the proper filters or projection techniques.

More information: CAUTION: Do not look at the Sun without the right equipment. It is incredibly dangerous. Blindness or painful, permanent eye damage will result.

Provided by National Solar Observatory

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