by Matt Nelson
February 7, 2000

For a team of scientists at the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado, Boulder, the sun is shedding light on the future of atmospheric research.

Under Principal Investigator Gary J. Rottman, the team has been monitoring the Solar Stellar Irradiance Comparison Experiment, or SOLSTICE instrument, onboard the UARS (NASA's Upper Atmosphere Research Satellite) spacecraft.

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Designed to study the sun's ultraviolet (UV) energy, the SOLSTICE instrument has created a standard against which future monitoring of the sun may be measured. By comparing the sun's ultraviolet energy to the UV radiation of certain bright blue stars, the SOLSTICE instrument will allow for future studies of the sun's energy and its effects on the Earth's atmosphere.

Fifteenth-century woodcut.

SOLSTICE is an ultraviolet spectrometer with three channels. By looking at stars during the nighttime portion of the orbit, scientists are able to calibrate the instrument. Then, during the daylight portion of the orbit, the spectrometer measures the solar spectral irradiance of the total solar disk in the ultraviolet wavelengths from 115 to 430 nanometers.

"The idea is that the bright stars that we have selected are very stable in the ultraviolet range," said Dr. Dan Gablehouse, Program Manager for the UARS SOLSTICE Instrument. "So, 100 years from now somebody could launch a similar measuring device, look at the same stars, and compare the sun to see some of the long-term variations that occurred during that 100-year period."

By observing the behavior of the sun with the SOLSTICE instrument, the team at LASP is gaining insight on how the sun is affecting the atmosphere. Looking at everything from short-term variations such as solar flares to long-term variations such as the 11-year sunspot cycle, the SOLSTICE instrument is collecting valuable data for climate modelers and atmospheric scientists alike.

"It's a unique instrument," said Gablehouse. "Nobody has ever tried to do this before, and the results, right now, seem to be really good. Ultraviolet light is difficult to measure. You can't measure it on the ground because the atmosphere absorbs most of it, so you have to measure it from space. The hardest part is getting a long-term solar data set to figure out what is going on."

Before SOLSTICE, climate modelers only had access to short-period measurements of the sun. SOLSTICE and the upcoming second-generation EOS SOLSTICE instrument will provide a much larger data set to the Goddard DAAC, which will then be available to researchers.

For more information, visit the Goddard Space Flight Center DAAC (now named the GSFC Earth Sciences DAAC) and Laboratory for Atmospheric and Space Physics.

"Earlier spacecraft were all short term," said Gablehouse. "Before SOLSTICE there were no data sets longer than five or six years. But a solar cycle is roughly 11 years, and the only way to really be sure what you've got is to make this measurement for two solar cycles, or 25 years."

That is what the team at LASP hopes to do with a second generation SOLSTICE instrument.

The follow-on instrument for SOLSTICE has already had its funding approved by NASA and will be designed, built and operated at the LASP. Scheduled for launch in mid-2002, the new instrument will be joined by three other solar monitoring instruments aboard a spacecraft that will be designed and built by Orbital Sciences Corporation, and operated by the LASP.

"This suite of instruments will be different. We only call a portion of it SOLSTICE now," said Gablehouse. "These instruments will be on our own spacecraft and the new mission is called the Solar Radiation Climate Experiment (SORCE).

"But until the new spacecraft is launched, we want to keep the UARS instrument running. We hope to keep it going at least until after we've launched, so we can cross-calibrate between the two instruments. The instrument itself has been functioning great, so we don't see any reason to believe that the instrument is going to wear out on us.

"UARS was only supposed to be an 18-month mission," he said. "We are now coming up on eight years. We would like to keep it going."