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DURHAM, N.H. -- Every three years since 1980 a competition has taken place for funding from NASA's Sun-Earth Connections Theory Program. Each time the University of New Hampshire's Solar-Terrestrial Theory Group has emerged as a winner.

This year proves no exception, as the group received another $1.2 million over three years to fund its investigations of phenomena produced by the sun. Another half million dollars annually from other NASA and NSF programs provides funding to the group, as well.

Joseph Hollweg, professor of physics at UNH's Institute for the Study of Earth, Oceans, and Space and lead member of the group, explains, "Why do we continue to receive this award when there are a lot of other bright people out there? Simply put, the Solar-Terrestrial Theory Group is working on relevant problems and we've made significant progress."

In the realm of space science, the group's members are considered leading experts on coronal studies, solar wind and cosmic rays, and have consistently progressed over the 22 years of their pursuit to understand these processes. In this time, they have turned around disbelief in the scientific community and been the first group to investigate what are now the leading theories for several solar phenomena that have been mysteries for decades.

At any instant of time, the sun is encircled in one

million high-speed jets of gas. Solar gas continually outflows into interplanetary space. The region just below the sun's visible surface is filled with sound waves impulsively releasing energy. Complex configurations of magnetic fields in the solar atmosphere are in a constant state of agitation. The sun's atmosphere, also called "the corona," is heated to several million Kelvins, and some of this thermal energy enables gas to be accelerated to high speeds and escape the sun's gravity, forming the solar wind. The Solar-Terrestrial Theory Group is in pursuit of understanding this world of burning temperatures and explosive energies, and it is asking big questions.

For example, the group is investigating what makes the sun's atmosphere so hot. In doing this research it found that waves generated along magnetic fields in the corona cause the sun's atmosphere to get really hot, which in turn enables winds of gas to escape from the sun. "For a long time people didn't believe our theories for heating the corona and accelerating the solar wind," says Hollweg. "The surprise came in 1995 when the Solar and Heliospheric Observatory (SOHO) satellite came up with data which pretty much verified our predictions."

Regarding his own interest in this kind of research, Hollweg responds, "It is like solving a puzzle. NASA has made a lot of observations about things that nature is doing, and we simply didn't understand how nature was doing it. The questions we are asking, such as what makes the corona hot, are no different then asking what makes the sky blue and what produces a snowflake."

However, these studies are not esoteric. Events on the sun often have real, tangible impacts for Earth. For instance, explosive events on the sun, called "coronal mass ejections," can reach Earth and cause power black-outs, communication problems and satellite damage. Radiation from cosmic rays can be unsafe for astronauts and high altitude planes. The electric fields generated by these events can also damage long-distance power lines, communication cables, and gas and oil pipelines. Better understanding of these processes in space and events on the sun may allow scientists to predict when they will occur, and therefore prevent such problems.

The UNH Solar-Terrestrial Theory Group includes six faculty scientists, Joseph Hollweg, Martin Lee, Terry Forbes, Philip Isenberg, Bernard Vasquez and Yuri Litvinenko; one staff scientist; and two graduate students. Collaborators include the University of St. Andrews in Scotland and the Harvard Smithsonian Center for Astrophysics.

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