MONTANA STATE UNIVERSITY

MSU joins worldwide effort to better understand the sun

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BOZEMAN – Montana State University will be a major player in a new international program to better understand solar activity and its effect on the Earth, according to a press release from the group that launched the program.

This graphic shows the early evolution of the Earth's surface and atmospheres. The upper left photo shows the impact of a very heavy object on early Earth. The resulting debris orbited around the Earth and later coalesced, creating the moon. The upper right photo shows the inhospitable environment that followed because of meteors, asteroids and comets bombarding the Earth for a prolonged period. The bottom right photo shows the surface of the Earth after the bombardment subsided. The bottom left photo shows the "Snowball Earth," a paradox that Piet Martens and his team are studying.

High-Res Available

MSU solar physicist Piet Martens is one of the leaders of a team that will investigate a solar paradox, extreme solar events and solar dynamo activity. One of the other two co-chairs is Dibyendu Nandi, a former MSU researcher who continues to collaborate with the MSU Solar Physics Group. He is now Dean of Science at the Indian Institute of Education and Research in Kolkata.

“I am pretty sure that this is the first time that MSU has been involved in this worldwide scientific effort that includes yearly summer schools for graduate students from developing countries, as well as regular international meetings in geographically diverse locations to encourage participation from various regions,” Martens said. "It is my intent to organize one of the meetings in Bozeman."

The new five-year program, “Variability of the Sun and Its Terrestrial Impact (VarSITI),” was launched Jan. 13 by the Scientific Committee on Solar Terrestrial Physics. A press release from the group said VarSITI will focus on the declining solar cycle activity, with the current cycle being the weakest in 50 years. The program will involve scientists and students from around the world working on four main projects, each with a different theme.

The group led by Martens, Nandi and Vladimir Obridko from IZMIRAN, a renowned space weather prediction center near Moscow, will research “Solar Evolution and Extrema.”

Solar evolution refers to a paradox he is studying with MSU graduate student Ricky Egeland, Martens said. Calculations about the evolution of stars show that the sun must have been 30 percent less luminous 4 billion years ago than today. As a result, Earth should have been frozen solid. It would have been “Snowball Earth,” Martens said. However, the geophysical and biological record shows that the Earth, if anything, was warmer than now.

"Scientists have been looking at a greatly enhanced greenhouse effect to explain this," Martens said. "But now that the Mars rovers have indicated that Mars, too, had oceans of liquid water billions of years ago, the idea has emerged that the sun must have been much brighter than previously thought, explaining both the warm climate on Mars and Earth."

A possible explanation is that the sun, for most of its past, had a much stronger solar wind than now, Martens said. To see if that was true, his team will put together a timeline for the evolution of the sun. They can do that, in large part, by studying stars like the sun, but younger.

"Extrema" – the second focus of Martens' group -- refers to extreme solar events. For this, the team will try to find out the very largest flares that have happened on the sun, Martens said. One example is the 1859 Solar Superstorm, also called the Carrington Super Flare. The largest known solar storm created brilliant auroras even in the tropics. It interfered with telegraph systems around the world, shocking operators and burning telegraph paper. A committee of the national Space Studies Board estimated in 2008 that if such a flare occurred today, it could wipe out the entire U.S. power grid for months, resulting in several trillions of dollars in economic damage.

"Obviously, it is important that we get good estimates of how often such large flares occur and learn how to predict them," Martens said. "That is the second goal of our team by investigating large flares in the past, for example from fossil tree rings."

The Scientific Committee on Solar Terrestrial Physics (SCOSTEP) is an interdisciplinary body of the International Council for Sciences. SCOSTEP focuses on the science of sun-Earth connections that are relevant to life and technology on Earth. The sun, for example, affects climate change, as well as satellites used for navigation and communication.

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