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Editors: An official kick-off celebration of the MMS mission will occur Monday, June 6, at 2 p.m. in the second floor atrium of Morse Hall. Roy Torbert will provide an overview of the mission, and he and others involved in the mission will be available to answer questions.

DURHAM, N.H. – The University of New Hampshire has received the largest, single research award in the history of the institution – $38 million from NASA to build instruments for the space agency's Magnetospheric MultiScale (MMS) mission. As part of an international team from 12 institutes, space scientists at UNH's Institute for the Study of Earth, Oceans, and Space (EOS) will construct instruments for MMS' four identical solar-terrestrial probes, which will study little understood, fundamental processes in the Earth's magnetosphere – the magnetic shield that protects the Earth from solar and cosmic radiation.

Over the next eight years, UNH scientists, engineers, graduate and undergraduate students will help construct two Electron Drift Instruments, (EDI) for each of the four spacecraft. EDI is designed to measure electric fields and electron drifts using a controlled beam of electrons. In addition, UNH will construct the central electronic controls for all the instruments being built to measure the spectrum of electromagnetic fields around the spacecraft. This "FIELDS" instrument suite will be comprised of six sensors per spacecraft.

"The expertise of the UNH Space Science Center in space instrumentation was critical to forming our excellent international FIELDS team on MMS, which will contribute many of the new observations for this exciting mission," says physics professor Roy Torbert, director of the EOS Space Science Center and UNH's principal investigator for the mission.

James L. Burch of the Southwest Research Institute in San Antonio, Texas, is leading construction of the mission's $140 million instrument suite. The MMS spacecraft are slated to launch aboard an 86-foot, 225,000-pound Delta II rocket in July 2013.

The mission is designed to explore the plasma processes that govern the interaction of the Earth's magnetic field with the highly charged solar wind. Plasma is a highly ionized gas sometimes described as the "fourth state of matter." Plasmas occupy 99 percent of the observable universe. However, only in the Earth's magnetosphere – a multilayered, comet-shaped magnetic shield that, in its tail, extends as far as 60,000 kilometers away – are these important plasma processes readily accessible for sustained study through in situ measurements.

One of those processes is magnetic reconnection, in which magnetic fields reconfigure themselves and release energy. Reconnection, a main focus of the MMS mission, is the basic mechanism by which energy from the sun and the solar wind is transferred into the Earth's magnetospheric system. Reconnection is widely believed to play a crucial role in space and astrophysical phenomena such as magnetospheric substorms and solar flares. It is a crucial process to understand in order to be able to predict "space weather" conditions. For example, a blast of this energy from substorms or solar flares can affect satellites, Earth-based instruments and power grids, shower astronauts and aircraft flying over the Earth's poles with deadly radiation, and light up the sky with aurora.

"In a sense, MMS represents a culmination of the extensive work done in space science at the university," Torbert says. "It is based on previous successful NASA and European Space Agency missions in which UNH has participated, such as the CLUSTER, SOHO, ACE, WIND, and POLAR satellites, as well as our theoretical and numerical simulation work, where the process of reconnection has been observed and simulated, but never studied as rigorously as will be done on MMS."

Other plasma processes that MMS will study include charged particle acceleration, and turbulence in key boundary regions of the Earth's magnetosphere. Along with magnetic reconnection, these processes control the flow of energy, mass, and momentum within and across plasma boundaries, occur throughout the universe, and are fundamental to our understanding of astrophysical and solar system plasmas.

Despite four decades of study, beginning with the early Sputnik and Explorer spacecraft, much about the operation of these processes remains unknown or poorly understood. MMS and its multiple spacecraft approach will provide a much more detailed picture of the region. Each of the four satellites, flying together as a tightly coordinated fleet through the magnetosphere, will carry identical instruments and will thus be able to gather a multi-dimensional view of these processes that have eluded previous studies.

Along with UNH, co-investigators include the NASA Goddard Space Flight Center, the Applied Physics Laboratory at Johns Hopkins University, the Austrian Academy of Sciences, the French Center for Terrestrial and Planetary Environments, the Swedish Royal Institute of Technology, the Technical University of Braunschweig, the University of California at Los Angeles, the University of Colorado at Boulder, and the University of Iowa.