ARTEMIS, A TWO SPACECRAFT, PLANETARY AND HELIOSPHERIC LUNAR MISSION. V. Angelopoulos[1], R. Lillis[2], D. G. Sibeck[3], J. Halekas[2], G.T. Delory[2], K. Khurana[1], C. T. Russell[1], J.P. McFadden[2], J. Bonnell[2], D. Larson[2], [1]Institute of Geophysics and Planetary Physics, UCLA, Los Angeles, CA 90095, vassilis@ucla.edu; [2]Space Sciences Laboratory, University of California, Berkeley, CA 94720, rlillis@ssl.berkeley.edu; [3]NASA Goddard Space Flight Center, Greenbelt, MD 20771.

Introduction: The Acceleration, Reconnection, Turbulence, and Electrodynamics of the Moon's Interaction with the Sun (ARTEMIS) mission is a spin-off from NASA's Medium-class Explorer (MIDEX) mission THEMIS, a five identical micro-satellite (hereafter termed "probe") constellation in high altitude Earth-orbit since 17 February 2007. By repositioning two of the five THEMIS probes (P1 and P2) in coordinated, lunar equatorial orbits, at distances of ~55-65 R_E geocentric (~1.1-12 R_E selenocentric), ARTEMIS [1] will perform the first systematic, two-point observations of the distant magnetotail, the solar wind, and the lunar space and planetary environment. Specifically, ARTEMIS will make accurate remote measurements of lunar surface electrostatic potentials, enabling a better understanding of the near-surface plasma sheath. ARTEMIS will measure electric fields and plasma flows in situ, thus fully defining the macroscale electric field environment around the Moon, which will control the motion of any charged dust that leaves the lunar surface. ARTEMIS will also measure pickup ions, including reflected solar wind protons, sputtered ions from the surface, and ionized constituents of the tenuous lunar exosphere. By utilizing its unique two-probe capability, ARTEMIS can thus simultaneously measure both the drivers and products of exospheric source and loss processes, allowing us to constrain the importance of each process and obtain information about the structure of the lunar exosphere and its coupling to the surface. ARTEMIS is synergistic with concurrent NASA missions LRO and LADEE and the impending deployment of the International Lunar Network. The heliophysics science objectives of the mission are to study from unprecedented vantage points and inter-probe separations how particles are accelerated at reconnection sites and shocks, and how turbulence develops and evolves in Earth's magnetotail and in the solar wind. Additionally, the mission will determine the structure, formation, refilling, and downstream evolution of the lunar wake and explore particle acceleration processes within it. It is expected to be a key element in the NASA Heliophysics Great Observatory and to play an important role in international plans for lunar exploration.

The two spacecraft have already began their journey to the moon. After a series of Lunar flybys in December 2009 - February 2010, they will arrive at the Earth-Moon Libration points in October 2010, and will be commanded to enter lunar orbit in April 2011. Initial results from the lunar flybys, presented in this paper, demonstrate the mission capability and permit instrument calibration and mission planning for the upcoming Lunar orbit phase.

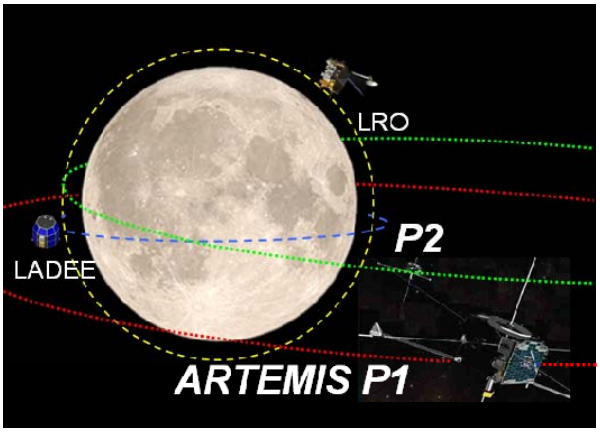

Figure 1: ARTEMIS will study with two identical, cross-calibrated spacecraft lunar exospheric ions and dust, crustal magnetism, and the lunar interior. One probe will measure the pristine solar wind driver, while the other will study the lunar environment's response. ARTEMIS extends the SELENE/Kaguya results into the next decade, providing synergy with LRO, LADEE, and the International Lunar Network.

References:

[1] Angelopoulos, V. (2008), The ARTEMIS Mission, *Space Sci. Rev., submitted*.