**In-Situ Environmental Monitoring and Science Investigations Enabled by the Deep Space Gateway.** P.E. Clark[1], M.R. Collier[2], and W.M. Farrell[2] [1]Jet Propulsion Laboratory/California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109, pamela.e.clark@jpl.nasa.gov, [2]NASA/Goddard Space Flight Center, 8800 Greenbelt Road, Greenbelt, MD20771.

**Overview:** Within a decade, NASA intends that the Deep Space Gateway would provide routine low-cost opportunities to deliver state-of-the-art instrument packages to locations that previously had very limited access. The Gateway's placement in a family of long-term lissajous lunar orbits, similar to those utilized by the ARTEMIS mission, would facilitate SmallSat access to similar orbits or Lagrange point halo orbits, enabling, for the first time, a network providing a true hazard monitoring capability for the space environment around the Moon and Earth.

**Benefits:** A distributed network of instrument packages in an ARTEMIS-like orbit would serve as the much-needed basis for on-going monitoring of cislunar environmental dynamics, critical for a successful human presence on the moon. A spatially and temporally distributed network would assure frequent crossings of the Earth's magnetosheath, bow shock, plasma sheet and tail lobes enabling full characterization of the moon’s varying plasma environment. Proximity to the moon’s terminator, wake, and poles would reveal how the moon responds to the measured input, closing the loop by providing the necessary data to predict and respond to environmental hazards.

**Strategic Knowledge Gaps (SKGs):** Such investigations support human health and safety in space and respond to NASA Human Exploration Strategic Knowledge Gaps II (Understand the lunar environment and its effects on human life) and III (Understand how to work and live on the lunar surface). These networks could form the basis for an early warning system for potentially dangerous conditions, such as those resulting from solar mass ejections, as well as provide a thorough knowledge of the lunar plasma environment at all times, lunar “situational awareness.” Deployment to halo orbits of Earth-Moon Lagrange points also might be possible, where visual and infrared imagers would detect potentially dangerous incoming asteroids.

**Instrument Complement:** Instruments of particular interest for cislunar environment monitoring would take advantage of more compact, advanced versions of instruments like those flown on the ground-breaking ARTEMIS mission, including fluxgate and VHS magnetometers, search coils (radio wave), electric field probes, and particle analyzers covering a broad range of energies and species from thermal through galactic cosmic ray. In addition, the network would work in conjunction with current ground- and space-based assets that already alert us to potentially dangerous conditions in the near-Earth environment.

**Requirements:** In this concept, each 6 to 12U deployable cubesat-scale package would consist of two to three of the instruments described above and have a mass of <25 kg. Each package would carry its own deployable power generation and storage system, and require deployment via a standard deployer (analogous to cubesat deployment on ISS) by the crew. A minimum of four packages would be deployed. The goal would be periodic communication with the Earth via the DSN but, depending on package orbits, frequency of close proximity to the Gateway, and the Gateway's communication system (UHF and X-band preferred), communication via the Gateway might be advantageous.