GLOWIN: Global Lunar Organized Water In-Situ Network. P.E. Clark[1] W. Farrell[2], M. Collier[2], D Hurley[3], R. Killen[2], S. Li[4], D. Paige[5], D. Bugby[1], T. Livengood[6], A. Fraeman[1], L. Kerber[1]; 1 California Institute of Technology Jet Propulsion Laboratory, Pasadena, CA, 2 Goddard Space Flight Center, Greenbelt, MD, 3 John Hopkins University Applied Physics Laboratory, Laurel, MD, 4 University of Hawaii, Manoa, Hawai, 5 UCLA, Los Angeles, CA, 6 University of Maryland, College Park, MD; pamela.e.clark@jpl.nasa.gov

Global Lunar Organized Water In-Situ Network (GLOWIN) is a multi-platform mission concept that would provide simultaneous globally distributed lunar in situ spectral and particle measurements essential for wholistic understanding of volatile processes resulting from high energy particle/surface/subsurface/exosphere interactions. The concept builds on and enhances current largely spectral and remote (orbital or ground-based) data-based understanding of lunar water. The nature of in situ regolith interactions that make its apparently ubiquitous distribution possible, even below mid-latitudes, is lacking. Incorporation of a network of surface in situ measurements would provide the basis for a high-fidelity global water model, by incorporating distributed long-term observations at landing sites. Such an investigation has implications for space weathering as well as the role of volatiles in the evolution of the solar system.

The network of landed identical multi-instrument packages would be distributed at near-equatorial, mid, and near-polar latitudes, simultaneously taking measurements at their local times of day over many cycles. Lander packages would consist of instruments capable of providing the following: solar wind flux (source of H+), electrostatic analyzer most likely candidate; the state (ice, liquid, vapor) of surface adsorbed or bound OH, H2O, IR imager most likely candidate; exospheric hydrogen, energetic neutral atom imager most likely candidate; exospheric water components, THz sounder or mass spec candidates, and micrometeorite bombardment detector, with acoustic detectors as candidates. The lander packages would provide quantitative data on the water production process, as affected by insolation (time of day and latitude): 1) solar wind flux, 2) exospheric H2O, OH, or H potentially generated in situ by solar wind interactions, or from interior or exterior (micrometeorite impact) sources 3) surface water or water components from these sources bound to greater or lesser extent.

GLOWIN would take advantage of advances in modeling of surface and exosphere processes and their interactions, compact instrumentation, supporting subsystem technologies, and new options for deep space transportation and communication that have evolved since the last decadal survey. These include: 1) compact versions at TRL5 or above for most of these instruments, 2) the availability of high performance thermal/mechanical packaging capable of supporting night time operation without radioisotopes will significantly lower cost and onboard resources needed for each package, and 3) the availability of low-cost commercial landers. The most serious constraint on landing will be some control over orientation to assure the radiator is aligned away from the sun.

GLOWIN would address NASA primary science goals: 1) understanding solar system formation, and evolution of the lunar surface and atmosphere by further establishing the role of surface volatiles (Planetary Decadal Survey); 2) Using the Moon to study regolith, exosphere (including water vapor) processes on airless bodies (Scientific Context for Exploration of the Moon), Goals 7 and 8); and 3) temporal variability, spatial dynamics, quantity and distribution of surface- correlated H species, OH, H2O in regolith (HEOMD Strategic Knowledge Gaps 1-D6, 1-D7, and 1-C2). GLOWIN augments, complements, and provides a context for previous (Chandrayaan, LCROSS, LRO, LADEE) and planned (Lunar Flashlight, LunaHMap, Lunar Ice Cube) lunar volatile focused missions.