CLPS LANDING SITE AT A YOUNG THRUST FAULT SCARP CLUSTER. T. R. Watters[1], R. C. Weber[2], N. C. Schmerr[3], C. L. Johnson[4,5] C. R. Neal[6], M. S. Robinson[7], M. E. Banks[8], L. S. Schleicher[9], M. T. Bensi[3]. [1]Smithsonian Institution, Washington, DC, USA, watterst@si.edu, [2]NASA Marshall Space Flight Center, Huntsville, AL, USA, [3]Univ. of Maryland, College Park, MD, USA, [4]Univ. of British Columbia, Vancouver, BC, [5]Planetary Science Institute, Tucson, AZ, USA, [6]Univ. of Notre Dame, Notre Dame, IN, USA, [7]Arizona State Univ., Tempe, AZ, USA, [8]NASA Goddard Space Flight Center, Greenbelt, MD, USA, [9]Independent Geophysicist, USGS, Menlo Park, CA, USA.

Introduction: High resolution images from the Lunar Reconnaissance Orbiter Camera (LROC) have revealed thousands of contractional landforms described as lobate scarps (Fig. 1). They are formed by thrust faults that displace crustal materials up and over adjacent terrains [1-3]. These fault scarps are broadly distributed throughout the lunar highlands [3-5], are some of the youngest landforms on the Moon, and are likely tectonically active today [5]. Four seismometers placed at the Apollo 12, 14, 15 and 16 landing sites recorded 28 shallow moonquakes (SMQs) [6]. It has been suggested that the source of some the recorded SMQs are the young lobate scarp thrust faults [5]. Some of the SMQs recorded were very strong, with body wave magnitudes >5.5 [6, 7]. A CLPS landing site at a lobate scarp cluster offers the opportunity to: 1) directly measure relief and slope and detect secondary structures, 2) explore the subsurface to determine the geometry of the underlying fault, 3) examine recently exposed fresh or redistributed boulders, rocks, and regolith, 4) establish a geophysical station at lobate scarp cluster.

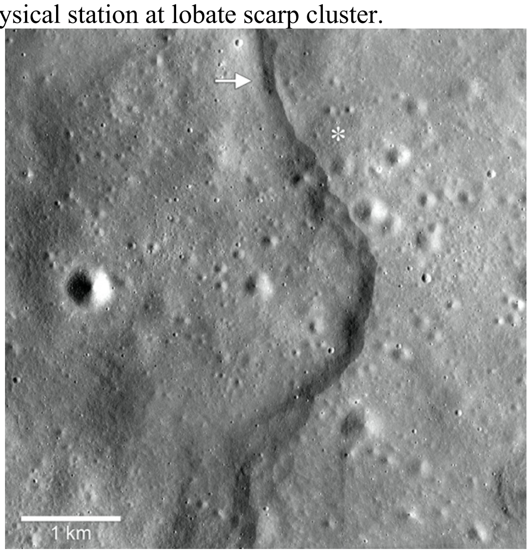

Figure 1. LROC Narrow Angle Camera (NAC) mosaic of a lobate scarp in the Korolev cluster. Asterisk marks a proposed landing site with access to multiple points of approach to the scarp and a boulder field on the scarp face (white arrow).

Lunar Fault Scarp CLPS Site: The Korolev basin is one of the proposed landing sites of the Lunar Geophysical Network (LGN) located at -2.4°, -159.3° [8]. Less than 100 km outside the northwest rim of Korolev is a prominent cluster of young lobate thrust fault scarps that extend north in the highlands for over 140 km (Fig. 1). The scarps have a maximum relief of ~90 m. The slope on scarp faces vary from <10° to >20°. Relatively rare scarp boulder fields occur on some steeply sloping scarp faces. A proposed landing site with access to multiple points of approach to the scarp and a scarp boulder field is located at ~2.78°, -164.63° (Fig. 1). The Korolev cluster is near the tidal axis where compressional stresses are predicted to be a maximum [5], and thus this location might be a locus of seismic activity from fault slip events.

Capabilities - Lander and Rover: Direct measurements of relief and slope of the scarp face would be used in forward mechanical modeling to constrain the fault geometry and depth of faulting. A search for secondary, small-scale structures undetected in LROC NAC images in the back-scarp terrain might provide additional insight into the kinematics and mechanical properties of the deformed materials. The geometry of the near-surface fault could be characterized by a rover traverse of a scarp(s) with a ground penetrating radar (GPR) instrument using a frequency range down to about 100 MHz. Active seismic surveys would enable imaging of the fault and highland stratigraphy to greater depths [see 9]. The lander could support a geophysical package that includes seismometers (long period and short period) capable of detecting small magnitude SMQs, and acquiring horizontal and vertical components of ground motion [see 10, 11]. The ability to survive the lunar night would allow observations over a longer period. Seismic observations collected in the farside highland terrain would enable comparison with the near-side terrains where the Apollo-era seismometers were located, and the Farside Seismic Suite (FSS) site in Schrödinger basin. The deployment of seismometers near a fault scarp in the farside highlands and near a proposed LGN site could provide valuable data for establishing the seismic characteristics of the Korolev basin region. The data is also essential for accurately characterizing seismic sources and hazards.

Traceability to Community Documents: The detection of globally distributed young, and likely active lunar thrust faults has changed our view of the Moon. The study of lunar tectonics is a key goal in the "Advancing Science of the Moon" report and the "ARTEMIS III Science Definition Team Report."

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