A NEARSIDE LUNAR GEOPHYSICAL NETWORK WITH BENEFITS. J. E. Gruener, NASA Johnson Space Center, Mail Code KX, 2101 NASA Parkway, Houston, Texas, 77058, john.e.gruener@nasa.gov

Introduction: The recent National Research Council (NRC) Planetary Science Decadal Survey, Vision and Voyages [1], listed the top priority lunar science missions as 1.) South Pole-Aitken Basin sample return, and 2.) Lunar geophysical network. Since Golden Spike missions are constrained to the nearside of the Moon, this leaves the geophysical network as the highest priority science investigation. However, the selection of locations for the network stations could also address high-ranking science concepts from the NRC's Scientific Context for the Exploration of the Moon (SCEM) report [2]. Specifically, the highest rated concept, understanding the bombardment history of the Moon and inner solar system, and the concepts concerning, crustal diversity and lunar volcanism could be investigated.

Geophysical Network: In 2008, the National Aeronautics and Space Administration's (NASA) Science Mission Directorate formulated the International Lunar Network (ILN) concept and established a Science Definition Team (SDT) to better define the concept and the needed instrumentation for a lunar geophysical network [3]. The SDT recommended that the geophysical stations be located no closer than approx. 2000 km apart, and stated that a minimum of three stations would be required to locate deep moonquakes. While it is desirable to place a fourth station on the lunar far side, it is possible to meet these minimum requirements using stations located only on the nearside of the Moon. The three locations suggested in this abstract for a geophysical network that would also provide a better understanding of the geologic history of the Moon include: 1.) lava flows just south of Aristarchus Plateau, 2.) dark halo craters near Orientale Basin, and 3.) impact melt deposits of the Nectaris Basin.

Oceanus Procellarum: The mare deposits immediately to the south of the Aristarchus Plateau have been mapped by Hiesinger et al. [4] as the youngest lava flows on the Moon, with a modeled age of 1.2 Ga. Collecting samples of these lavas and returning them to earth for laboratory analyses would substantially increase our understanding of the duration of volcanic activity on the Moon (age dating) and constrain how basaltic processes evolved over time (chemistry/mineralogy). Much of Hiesinger's mapped unit (P60) is overlain by impact ejecta from Aristarchus crater. Aristarchus crater has been mapped as a Copernican crater by Wilhelms [5]. Analyses of samples of Aristarchus crater ejecta containing impact melt could determine the absolute age of the impact and the geologic nature of the Aristarchus plateau materials. To increase the chances of sampling both young lavas and Aristarchus ejecta, a landing location should be chosen sufficiently far from Aristarchus crater, but still within the crater's discontinuous ejecta deposit.

Oriental Basin: Orientale basin is thought to be the youngest impact basin on the Moon [5]. Samples of Orientale ejecta containing impact melt could be analyzed to determine the basin age, representing the end of the late heavy bombardment period on the Moon. Within Orientale ejecta deposits are so-called dark halo craters [6]. The ejecta of these craters were shown by Bell and Hawke [7] to be exposures of mare basalt. These types of lava flows are referred to as cryptomare [8], as they have been obscured from view by subsequent emplacement of lighter materials, such as impact ejecta. Thus, these cryptomare units are older than the impact that created the Orientale basin, but is not known how old. Samples of these lava flows would yield information to better understand the magmatic history of the Moon. One such dark halo crater, Inghirami W (44.4 °S, 67.4 °W), lies within the continuous ejecta deposits of Orientale and represents the type of landing site that could address multiple scientific questions.

Nectaris Basin: The Nectaris Basin is a major stratigraphic marker on the lunar near side, and determining its absolute age is critical to understanding the duration of the late heavy bombardment [9]. Landing locations that target possible Nectaris melt sheet remnants could yield samples that would allow the age-dating of this important basin. Mapping of these melt sheet remnants and other Nectaris geologic units is currently in progress [10]. Suggested locations include west of Fracastorius crater and east of Bohnenberger F crater [8] and in the Montes Pyrenaeus [11].

References: [1] NRC Planetary Science Decadal Survey (2011). [2] NRC Scientific Context for the Exploration of the Moon (2007). [3] NASA ILN Final report (2009). [4] Hiesinger H. et al. (2003) *JGR, 108,* E7, 1-27. [5] Wilhelms D. (1987) U. S. G. S. Professional Paper 1348. [6] Blewett D. et al. (1995) *JGR, 100,* 16959–16977. [7] Bell J. and Hawke B. *JGR, 89,* 6899–6910. [8] Head J. and Wilson L. (1992) *Geochim Cosmochima Acta, 56*, 2155-2175. [8] Spudis P. and Smith M. (2013) *LPSC XXXXIV,* Abstract #1483. [10] Smith M. and Spudis P. (2013) *LPSC XXXXIV,* Abstract #1248. [11] Taylor G. and Spudis P. (1990) NASA Conf. Pub. 3070.