COSMOQUEST MOONMAPPERS: CATALOGING THE MOON. S.J. Robbins[1,2], I. Antonenko[3], C. Lehan[4], J. Moore[4], D. Hui[4], and P.L. Gay[4]. [1]LASP, UCB 392, University of Colorado, Boulder, CO 80309. (stuart.robbins@colorado.edu) [2]Southwest Research Institute, Suite 300, 1050 Walnut Ave., Boulder, CO 80309. [3]Planetary Institute of Toronto, 197 Fairview Ave. Toronto, ON M6P 3A6, Canada (PlanetaryInstituteofToronto@yahoo.ca) [4]The STEM Center, Southern Illinois University Edwardsville, Edwardsville, IL 62026. (pgay@siue.edu)

Introduction: CosmoQuest is a virtual research facility designed for the public that provides learning and citizen science opportunities. It launched January 2012 [1], with several citizen science projects going live shortly thereafter. Among these is the lunar-oriented MoonMappers (beta launch January 9, version 1 launch March 20). MoonMappers crowd-sources the data-gathering process by asking volunteers to annotate craters and other features. The resulting catalog would be next to impossible for a single researcher or research group to create manually. We have been using the collected data to study the *Apollo* landing sites and explore the central South Pole-Aitken Basin (SPA).

Science Objectives: MoonMappers seeks to provide a large, scientifically robust, and geographically broad catalog of lunar craters and other features. Specifically, to identify, catalogue, classify, and analyze features including: small impact craters (10-1000 m in size), atypical impact formations (*e.g.*, elliptical craters, exogenic dark-haloed craters, bright rays, ejecta exclusion zones), volcanic structures (*e.g.*, vents, endogenic dark-haloed craters, rilles), and other interesting geology that can be used to help answer fundamental lunar science questions. These questions and the process of how volunteers use MoonMappers is detailed in [2].

SPA is one of the oldest basins on the Moon and so may contain some of the oldest volcanic deposits, hidden beneath impact ejecta. Studies of craters in this area will help identify such cryptomare deposits and provide their relative ages.

Lunar Reconnaissance Orbiter is the first craft to image a planetary location multiple times under multiple lighting angles at high resolution. The *Apollo* regions' coverage provides an unprecedented opportunity to explore the effects of solar incidence angle on crater detection and reassess the small crater counts on key terrain used for calibrating the lunar isochron system – a system used as the foundation for crater age-dating across the solar system.

Data Reduction: MoonMappers has community members (CM) identify craters in two different interfaces. The first, "Simply Craters" (SC), is basic crater identification. The second, "Man vs. Machine" (MvM) gives users the same interface as the first, but the image is seeded with craters that were identified by an automated crater detection code [3].

CMs' classifications are assigned a confidence based on their accuracy score from random tests against experts. The latitude, longitude, diameter, and confidence are then read into a modified DBSCAN clustering code [4] that groups craters by size and location. Weighted mean and standard deviations are saved for each crater. Other features marked by CMs are grouped similarly for later analysis.

Early Results: Analysis of CMs' site behaviors shows they spend an average of 10±20 seconds per image, regardless of interface. During beta, CMs evenly preferred SC and MvM by image and crater counts, but since we have gone live, 80% of the images looked at have been through SC while only 20% have been through MvM. This change is due to a few highly active users who almost exclusively used MvM during the beta phase. CMs have viewed a median of 8 images each with large variation (38% of CMs ≥10 images).

In comparing users' craters (per-image) with ones identified by Robbins, 94% of Robbins' craters were identified. There was a 17% false positive rate and an 11% false negative rate. The higher false positive rate is likely due to Robbins' more conservative crater identifications which will be taken into account in later analysis.

Preliminary analysis of the incidence angle results shows a significant difference between crater detection when the sun is high versus closer to the horizon. CMs identify more craters when the sun is low on the horizon, likely due to the larger shadows making rim detection easier. These results are based on limited data that will continue to be refined, but they agree with the findings of previous researchers [5]. Meanwhile, we continue to gather data on small crater counts in the *Apollo* and SPA regions.

Discussion: MoonMappers is a nascent project as of this writing. By mid-July, it will have been gathering data for four months in "live" phase plus have data for the two months in public beta. We will present updated results of the solar incidence angle analysis, MvM work, and report on early results of cryptomare findings within the center of SPA.

References: [1] Gay *et al.* (2012), this vol. [2] Robbins *et al.* (2012), *LPSC 43*, #2856. [3] Burl *et al.* (2001) *Int. Symp. Artif. Intell. Robot. & Autom. Space*. [4] Ester *et al.* (1996) *Proc. 2nd Int. Conf. on Knowl. Disc. & Data Mining.* [5] Ostrach *et al.* (2011) *PCC 2*, #1107.