**RE-EXAMINATION OF LUNOKHOD SITES: PANORAMAS AND AIMS FOR LROC INVESTIGATIONS.** A. M. Abdrakhimov and A. T. Basilevsky, Vernadsky Institute, Russia, 119991, Kosygina 19, albertabd@gmail.com.

**Introduction:** Historical orbital and ground images collected in previous lunar missions contain rich information potentially useful for analyzing the lunar surface environment to identify factors influencing lunar landing missions and surface operations, as well as useful for the interpretation of the collected data for lunar scientific exploration. For instance, spatial information captured in ground images taken by lunar rovers Lunokhod 2 and Lunokhod 1 could be useful for understanding the relationship between the terrain characteristics and the productivity of particular surface operations. This understanding is critical for developing strategies of site selection and lunar surface operation.

Last decade is marked by rising scientific interest to investigations of the Moon. There were obtained new data by Clementine, Lunar Prospector, Kaguya, Chandrayan-1. Lunar Reconnaissance Orbiter (LRO) is now on its mission and a few others are coming. It is interesting to correlate new remote data and the data obtained on the Moon surface. For these purposes Lunokhod 1 and 2 panoramas have been digitized.

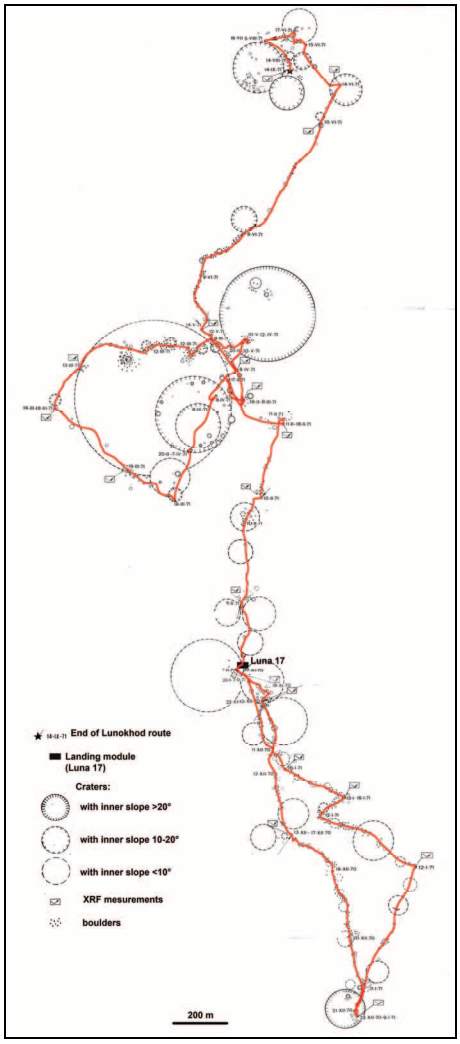


Figure 1. Schematic map of Lunkhod 1 route [1]

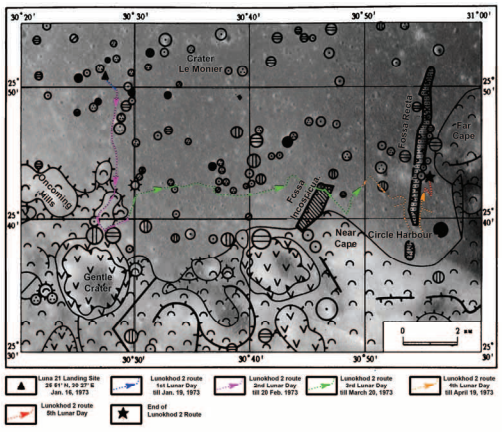


Figure 2. Schematic map of Lunkhod 2 route [2]

**Lunokhod sites:** On November 17, 1970, the spacecraft Luna 17 deposited the remotely controlled rover Lunokhod 1 in the western side of Mare Imbrium, approximately at 38°17' N, -35°00' W. Lunokhod 1 studied the lunar mare surface. The extreme breadth of investigated area is about 4 km [1]. The main purpose of the mission was the study of the lunar mare landscape. Lunokhod 1 worked for 10 months (11 lunations) and covered 10.5 kilometers. About 190 detailed panoramas were obtained during this mission.

On January 16, 1973, the spacecraft Luna 21 deposited the rover Lunokhod 2 on the eastern side of Mare Serenitatis, inside mare-filled crater Le Monnier, at 25°51' N, 30°27' E. The main purpose of the mission was the study of the transitional zone between mare and highland and the Fossa Recta graben located on the mare surface in the SE part of the floor of crater Le Monnier (Fig. 2) [2, 3].. Lunokhod 2 worked for 4 months (5 lunations) and covered 37 kilometers. 86 detailed panoramas were obtained during this mission.

The both vehicles were equipped with panoramic camera and navigation cameras, XRF spectrometer (RIFMA) and other instruments.

**Lunokhods activity:** We digitized 689 Lunokhod 2 images (prints of panorama fragments) and composed into 86 mosaic panoramas and about 900 Lunokhod 1 images composed into 193 panoramas.

*Lunokhod 1.* Lunokhod 1 began with driving south from its landing site. After two lunations it stopped at its southernmost point in a 150 m diameter crater. On the 3rd lunation it returned to the lander (Luna 17)

(Fig. 3). On the 4th lunation it moved towards the north and spent 3 lunations exploring the largest craters it encountered. It drove around the rim of a roughly 500 m diameter subdued crater during this time. Last lunations Lunokhod 1 was driven further north around a craters cluster (Fig. 4). Operations ceased when the internal radioactive heat source was exhausted during the 11th lunation. Unfortunately due to failure of laser retroreflector experiment it is not exactly known the Lunokhod 1 position. Possibly LRO high-resolution camera will help us to locate the site. The study shown that the Lunokhod 1 region is generally flat. The estimated depth of regolith of Lunokhod 1 area is 2-6 m.

*Lunokhod 2.* On the 1st lunation Lunokhod 2 moved to south on the floor of Le Monnier Crater (Fig. 5). The floor of Le Monnier appears to be a practically horizontal mare surface, with gentle undulations and peppered with small craters. The craters range in diameter from a few centimeters to several hundred meters. The depth of regolith is 1-6 m. On the 2nd lunation Lunokhod 2 reached the south rim of Le Monnier Crater and rose into the highland area (Fig. 6). The depth of regolith ran up to 10m. On the 3rd lunation Lunokhod 2 turned to the east and returned into mare area. During next two last lunations the vehicle investigated the Fossa Recta graben. The depth of Fossa Recta is 40-80 m. At the rims of the graben regolith becomes to be thinner and locally the basement rocks are seen as talus [4]. The graben slope of walls is about 30-35° (Fig. 7).

**Conclusions:** Lunokhod 1 and 2 panoramas were digitized. Analyses of panoramas could define three lunar landscape types: mare plain, highland, graben area. We hope that high resolution LRO camera will help us to locate Lunokhod 1 site and refine both rover traverses. Joint studies of Lunokhod 1-2 data with the high-resolution LRO images will give new information on the surface processes on the Moon.

**References:** [1] Peredvijnaya laboratoriya na Lune Lunokhod-1(in Russian). *Nauka.* (1977). [2] Florensky K. P. et al. (1978) *LPSC IX,* 1449-1458. [3] Florensky K. P. et al. (1976) Int. Geological Congress, XXV Session, 205-234 (in Russian). [4] Basilevsky A. T. et al., (1977) The Moon, 17, 19-28.

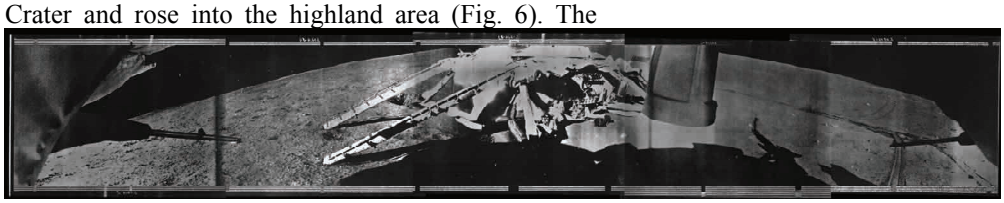

Figure 3. Lunokhod 1. Lunation 3. Session 7. Panorama 16. Luna 17 Landing site.

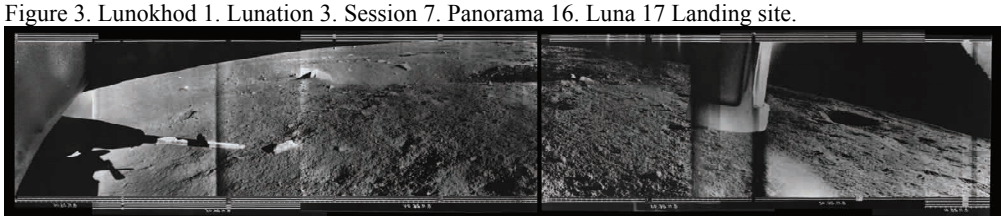

Figure 4. Lunokhod 1. Lunation 8. Session 11. Panorama 26. Typical mare landscape. Crater.

Figure 5. Lunokhod 2. Lunation 1. Session 3. Panorama 7. Luna 21 Landing site. Mare landscape.

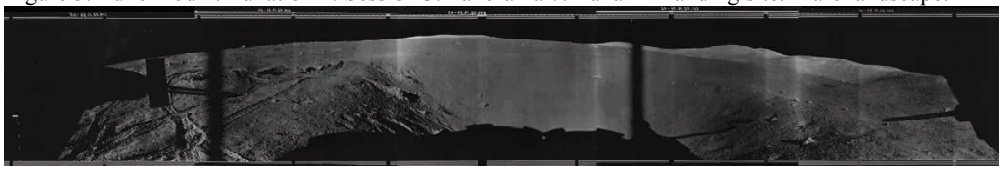

Figure 6. Lunokhod 2. Lunation 2. Session 14. Panorama 7. The rim of Le Monnier Crater. Vstrechnyehills. Highland landscape.

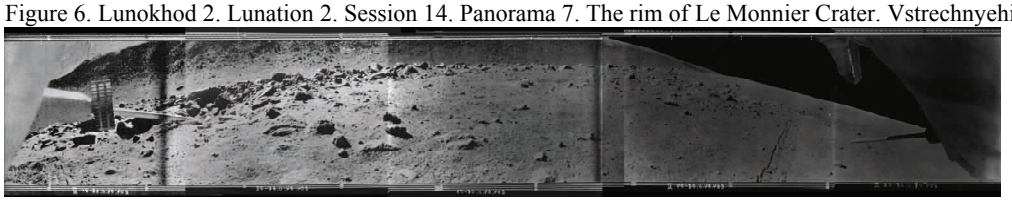

Figure 7. Lunokhod 2. Lunation 4. Session 11. Panorama 8. Fossa Recta graben.