A POSSIBLE LUNAR SCIENCE OBJECTIVE FOR GALILEO; V.V.Shevchenko, Sternberg State Astronomical Institute, Moscow University, Moscow 119899, USSR

Galileo's trajectory to Jupiter includes two encounters with the Earth-Moon system. During of the first Earth gravity assist flyby the spacecraft will see a well illuminated hemisphere of the Moon with Mare Orientale in the middle of the hemisphere.

There is a dark ring south of Orientale for which there is no satisfied interpretation so far. For the first time this feature with diameter about 150 km was found in the pictures taken by Zond3 spacecraft in 1965 (Fig. 1). The selenocentric phase angle in relation to the spacecraft was about 15 - 20 deg. It seemed for us that the photometric analysis of Orientale region confirmed the marine nature of the feature which was named as "Mare Pacificus"[1]. This "mare" was given on all lunar far side maps published in the USSR later (Fig.2).

Then Lunar Orbiter photos showed that this dark ring didn't have typical mare morphology. Indeed, the parts of the feature overlie mountains. It was concluded that "Mare Pacificus" is not a mare region, i.e. it is not area of low dark volcanic plains but rather an unusual patch of dark mantling material like that around other lunar basins. "Mare Pacificus" has very fuzzy edges compared with the sharp outlines of Mare Veris and others individual mare parts between the outer and inner ridges of Montes Rook. A dark material drapes over the rim and Orientale ejecta on its south side and for this reason has not been given a mare designation on U.S. lunar maps [2].

"Mare Pacificus" is absent on the geologic map published in the USA [3]. On the other hand Spudis et al. supposed there is ancient ring formation in region of "Mare Pacificus" [4].

Lunar Orbiter pictures can not be utilized for accurate definition of albedo, because these photos were taken under low-sun conditions. So, the conditions of the Lunar Orbiter survey didn't allow to receive an information on albedo.The fact that "Mare Pacificus" has such a dark surface as the other maria is shown on all of the pictires of this region, that were made upon high -sun conditions - Zond-3, Zond-6 and Zond-8 pictures. The photometric investigation of the "Mare Pacificus" region was carried out with the picture, obtained by Zond-6 spacecraft. The topocentric phase angle within mare region varied from 12 to 14 deg. Thus, the influence of shadows on the observed brightness of lunar surface can be completely neglected and we can consider the brightness to depend only upon material albedo. North part of "Mare Pacificus" is covered dark material, the mean value of albedo for which is 8 %. The south part is more light. Albedo of the central area of Mare Orientale is equal 7 % in this photometric system [5].

Zond-8 stereoscopic photos show that the dark ring coincides with a ring depression (Fig. 3). According to result of photogrammetric measurements average depth of the dark area in north part of the feature is about 1 - 2 km in relation to adjacent terrain. The profile of the "Mare Pacificus" region is shown in Fig.4 [6]. So, a detailed study of this lunar unusual feature may give new important data about lunar surface evolution. "Mare Pacificus" may be proposed as a lunar science objective for Galileo.

References: [1] Lipsky Y.N. et al.(1966) Kosmicheskye Issledovaniya, v.4, 912-922 (In Russian); [2] McCauley J.F. (1977) Physics of the Earth & Planetary Interiors, v.15, 220 - 250; [3] Geologic Map of the West side of the Moon, MAP I-1034, US GS (1977); [4] Spudis P.D. et al.(1984) J. Geophys. Res., v.89, Supplement, 197-210; [5] Shevchenko V.V. (1978) Proc. LPSC-9, 2851-2855; [6] Chikmachev V.I. (1984) Trudy GAISh, v.56, 126-144 (In Russian).

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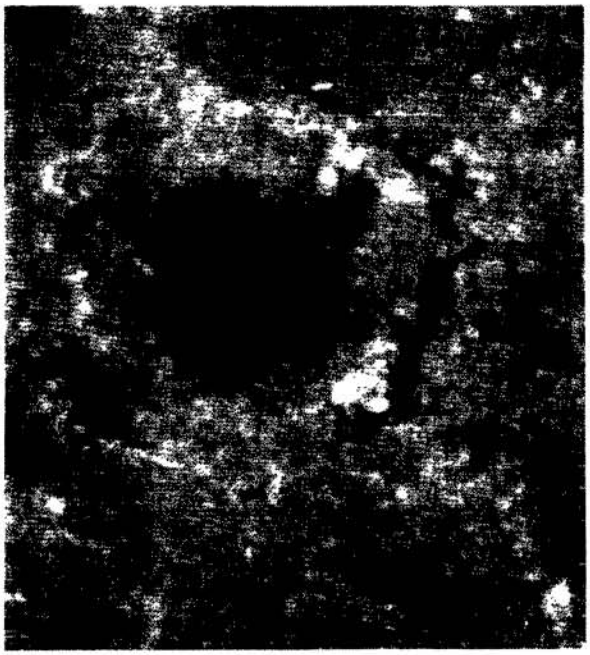

FIG.1

FIG. 2

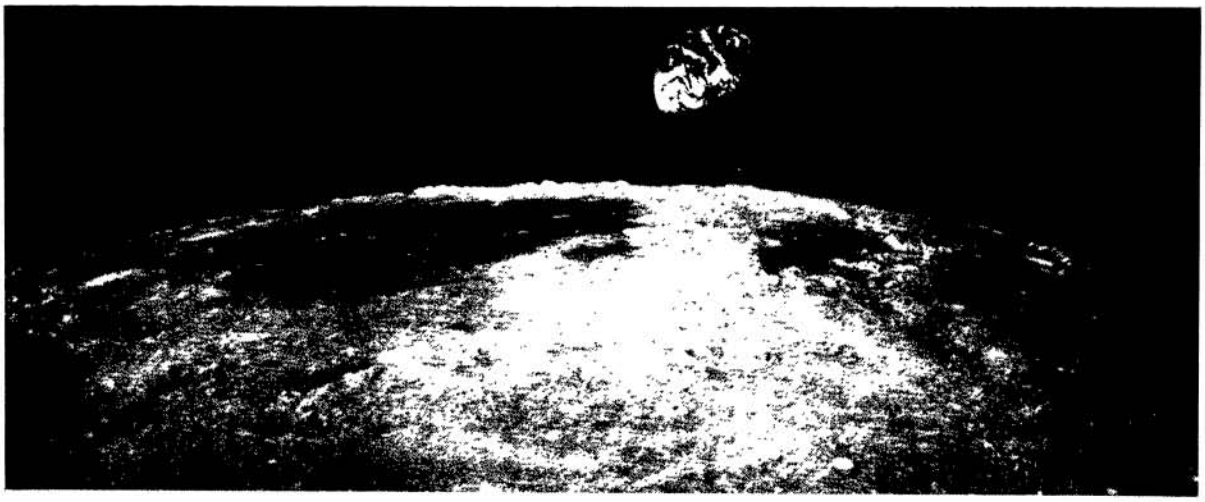

FIG. 3

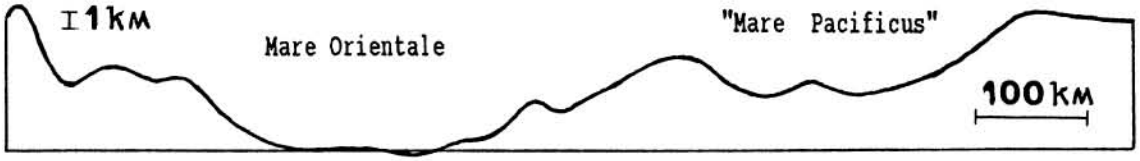

FIG.4