LANDSCAPE INTERPRETATION OF VARIOUS AGE LUNAR CRATERS. S. M. Kyryliuk[1] and O. V. Kyryliuk[2], Yuriy Fedkovych Chernivtsi National University, Department of Physical Geography, Geomorphology and Paleogeography, 2 Kotsubynskogo Street, 58012, Chernivtsi, Ukraine (s.kyrylyuk@chnu.edu.ua), Yuriy Fedkovych Chernivtsi National University, Department of Hydrometeorology and Water Resources, 2 Kotsubynskogo Street, 58012, Chernivtsi, Ukraine (o.kyryliyk@chnu.edu.ua).

Introduction: Landscape modeling of craters Pomortsev (Dubiago P), Yerkes, Picard and Menelaus has carried out in the framework of the project "Landscape map of the Moon" (Figures 1, 2, 3). For mapping, we have applied the landscape-axiomatic method, which based on three concepts: the anaglyphonosphere concept, the axiomatic concept, and the landscape concept with the use of the axiomatic method. Their detailed output, description and application are discussed in [1]. Lunar topographic orthophotomaps were used as base for the creation of landscape models of these craters [2-6].

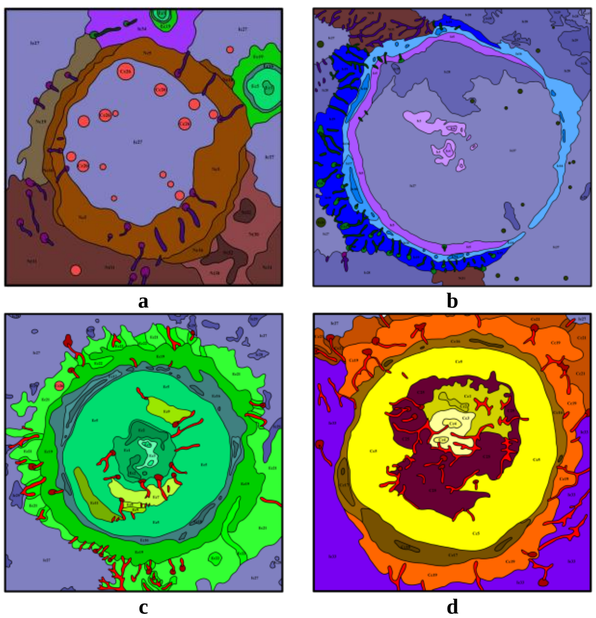

Figure 1. Landscape models of craters Pomortsev (Dubiago P) (a), Yerkes (b), Picard (c) and Menelaus (d)

Pomortsev (Dubiago P) (Figures 1a, 2a, 3)**.** Pomortsev Crater is located to the east of Mare Spumans and is lay between the terra materials in the south and the marine area in the north (Mare Crisium). The northern edge of the crater intersects with the fourth Crisium basin ring of the Mare Crisium. The diameter of the Pomortsev crater reaches 20-25 km. It has all the signs of prolonged weathering, which provided a crater of smoothed appearance – the inner crater slopes are fairly flat, with a few number of old scree depressions. The bottom of the crater has not preserved the original structure, and within it, to date, there are no cones of scree and coluvial deposits from the inner crater's slope. The bottom was subjected to significant modifications during the Imbrian period and was completely filled with lava. External crater slopes, as well as rim in general, are fully destroyed and expressed only fragmentary. The crater was subjected to partial modifications during the Eratosthenian period, when two small craters have formed, and during the Copernican period many small craters have formed, mostly concentrated within its bottom.

Yerkes (Figures 1b, 2b, 3)**.** Yerkes Crater is located in the south-west of Mare Crisium. The crater is almost entirely located within the limits of the Imbrian time materials, and only in the north and south its edges touch upon the terra materials of the Nectarian time, which in turn are also fragmentary against the background of the Mare Crisium. The diameter of Yerkes is about 40 km. The morphostructure of the crater is asymmetric, due to the almost complete destruction of the eastern shaft of the crater during the active processes of marine formation. All other parts of the crater are well preserved, especially in the western part of its periphery. Dense system of scree depressions and the presence of a significant number of cone and the take-off and large moving bodies within the soles of external crater slopes are confirmed on preserved crater slopes activated by weathering processes. The bottom of Yerkes is filled with marine materials, but the central peaks fragments are preserved in the central part. In general, the crater does not have significant violations that would be caused by the relief formation in the later periods of lunar history.

Picard (Figures 1c, 2c, 3)**.** Picard Crater is located in the south-west of Mare Crisium to east of Yerkes Crater. The crater is completely included in mare materials. The diameter of the crater Picard is 30 km. The morphostructure of the crater is well-defined. Picard has all of the main structural parts typical for impact craters. The crater has all the signs of relative youth. In most of its structural parts, the aforementioned processes of weathering are manifested in the formation of a dense system of scree with the depressions and on the appearance of a significant number of cones and displacements in the lower parts of both the outer and inner craters slopes. The three-dimensional crater simulation emphasizes the activity of landslide processes within the inner craters, leading to the formation of a landslide terrain system. The crater practically did not undergo further transformations caused by the formation of craters in the earlier history period of the

Moon. There are only a few small craters of Copernican period within it. In general, Picard has a much clearer morphostructure than Pomortsev and Yerkes, and a more diverse landscapes structure.

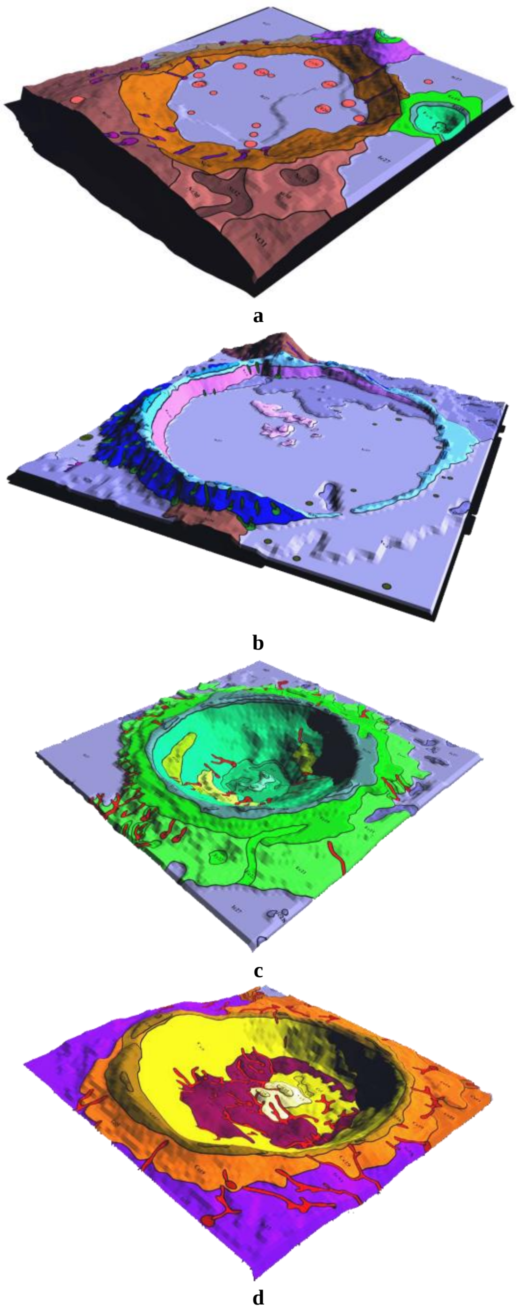

Figure 2. Landscape models of craters Pomortsev (Dubiago P) (a), Yerkes (b), Picard (c) and Menelaus (d) in 3D

Menelaus (Figures 1d, 2d, 3)**.** Menelaus Crater is located in the southern part of Mare Serenitatis. The crater is completely inscribed in marine formations and in the formation of Fra Mauro. The diameter of the crater Menelaus is more than 25 km. Its morphostructure is well-defined. Almost everyone parts of the crater structure are present in Menelaus. Active weathering processes are pass within all structural parts of the crater. They are particularly strong in the interior of the crater slopes, where powerful landslides, and scree depressions are formed. They turn leads to the accumulation of coluvial material in lower part of the crater as landslide's body. The appearance of Menelaus does not have such a distinct morphostructure because it was formed in a very rugged terrain unlike the Picard Crater and despite its youngest age. The morphostructure of the formation of Fra Mauro has not allowed the development of certain structural parts of Menelaus, in which the largest part of the crater has inscribed. Menelaus has not undergone the latest transformations associated with the formation of new craters and other relief structures. Only a few small craters of the Copernican period formed within its boundaries.

Type of landscapes	PRE-IMBRIAN	IMBRIAN	ERATOSTHENIAN	COPERNICAN
Bottoms of craters	Nc1	Ic1	Ec1	Cc1
Depressive bottoms of craters	Nc2	Ic2	Ec2	Cc2
Slopes of the central peaks	Nc3	Ic3	Ec3	Cc3
Convex tops of the central peaks	Nc4	Ic4	Ec4	Cc4
Inner crater slopes	Nc5	Ic5	Ec5	Cc5
1st inner crater's terrace	Nc7	Ic7	Ec7	Cc7
Ledge of second inner crater's terrace	Nc8	Ic8	Ec8	Cc8
2nd inner crater's terrace	Nc9	Ic9	Ec9	Cc9
3rd inner crater's terrace	Nc11	Ic11	Ec11	Cc11
Ascending swells	Nc16	Ic16	Ec16	Cc16
Slopes of ascending swells	Nc17	Ic17	Ec17	Cc17
Convex tops of ascending swells	Nc18	Ic18	Ec18	Cc18
External crater slopes	Nc19	Ic19	Ec19	Cc19
Convex rim of craters	Nc21	Ic21	Ec21	Cc21
Depressed rim of craters	Nc22	Ic22	Ec22	Cc22
Scree depressions	Nc23	I23	E23	C23
Scree deposits	Nc24	I24	E24	C24
Landslides bodies	Nc25	I25	E25	C25
Small craters	Nc26	Ic26	Ec26	Cc26
Mare surface	Nm27	Ic27		
Convex mare surface	Nm28	Ic28		
Depressed mare surface	Nm29	Ic29		
Continental surface	Nt30	It30		
Convex continental surface	Nt31	It31		
Depressed continental surface	Nt32	It32		
Fra Mauro formations		Ie33		
Crisium basin ejecta		Ie34		

Figure 3. Legend for figures 1, 2

References: [1] Kyryliuk S. and Kholiavchuk D. (2017) Open Astronomy, 26 (1), 48–61. [2] Lunar topographic orthophotomap of Auwers (1974), NASA, LTO60A2(250). [3] Lunar topographic orthophotomap of Curtis (1974), NASA, LTO62A2(250). [4] Lunar topographic orthophotomap of Menelaus (1974), NASA, LTO42D3(250). [5] Lunar topographic orthophotomap of Pomortsev (1974), NASA, LTO62C3(250). [6] Lunar topographic orthophotomap of Yerkes (1974), NASA, LTO62A1(250)