

CRATER CABEUS AS POSSIBLE COLD TRAP FOR VOLATILES NEAR SOUTH POLE OF THE MOON. Kozlova E.A., Lazarev E.N., Sternberg State Astronomical Institute, Moscow University, Russia, Moscow, Universitetski pr., 13, 199992. katk@sai.msu.ru, zhecka@inbox.ru

Introduction: Crater Cabeus has been chosen by NASA as a target for impact experiment of LCROSS mission [1]. In the cloud formed after the impact of Centaur stage and LCROSS there have been discovered traces of water appearance. In 1998 in Polar districts of the Moon there have been found regions with excesses of hydrogen that were registered by means of neutron spectrometer of Lunar Prospector [2]. Significant parts of such places coincided with impact craters. Enhanced content of hydrogen has also been found in the neighborhood of crater Cabeus where it was equal to 129 ppm (the average level of hydrogen content in the Moon's soil is equal to 50 ppm). Therefore this crater began to be considered as one of the possible "cold traps" for volatiles on the Moon.

Crater Cabeus is situated near South Pole of the Moon and looks like truncated cone with diameter of 98 km. The average depth of the crater is equal to 4 km, the angle of walls' slope is equal to 10-15°, the diameter of flat bottom is equal to 60 km. Fig. 1 shows a topographical model of Cabeus generated on basis of data from LALT (Laser ALTimeter) on Japanese spacecraft KAGUYA [3]. In the west part of the crater there is a small crater with diameter of 10-11 km.

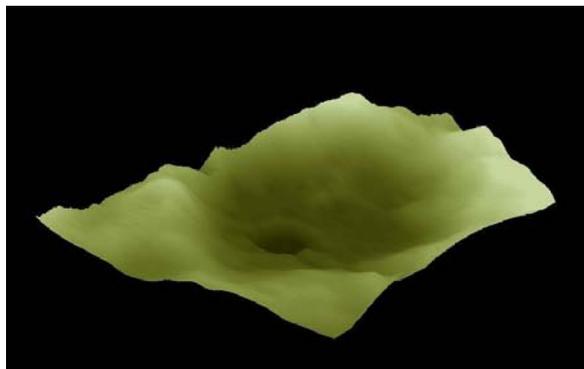


Fig.1. Cabeus 3D model

We investigated illumination conditions in crater Cabeus. For our calculations we used KAGUYA data with -1° step in longitude and $-0,25^\circ$ step in latitude. Fig. 2 shows the illumination map for crater Cabeus. The main part of the

crater is illuminated during 25% of the Moon's day. The inner walls of the crater are illuminated by direct sunlight during more than 30% of the Moon's day. The constantly shadowed area of the crater is situated in the west part of the crater and coincides with small impact crater on the bottom of Cabeus. The time during which this area is illuminated by direct sunlight is equal to no more than 15% of the Moon's day.

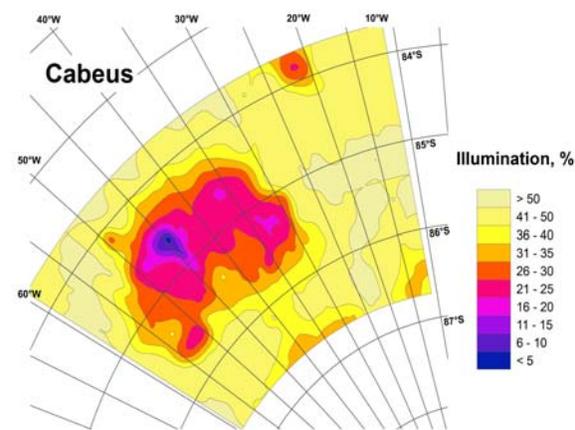


Fig.2. The illumination in the Cabeus.

On the basis of topographical data from KAGUYA we made a diagram of average temperature distribution in crater Cabeus (fig. 3). In the north part of the crater there is a vast area where average temperatures are not exceed 110 K (that is the upper limit for stable existence for such volatile compound as water). At the same time maximal temperatures in this area significantly exceed 110 K and amount to 150 K. At such conditions there is necessity to consider the possibility of existence of volatile compounds that are situated under the layer of regolith because of such a layer significantly lower temperature variations.

References:

- [1]. http://www.nasa.gov/mission_pages/LCROSS.
- [2]. Feldman W.C. et al. (2001) *JGR.*, V. 106, p. 23231-23252.
- [3]. <https://www.soac.selene.isas.jaxa.jp/archive>.

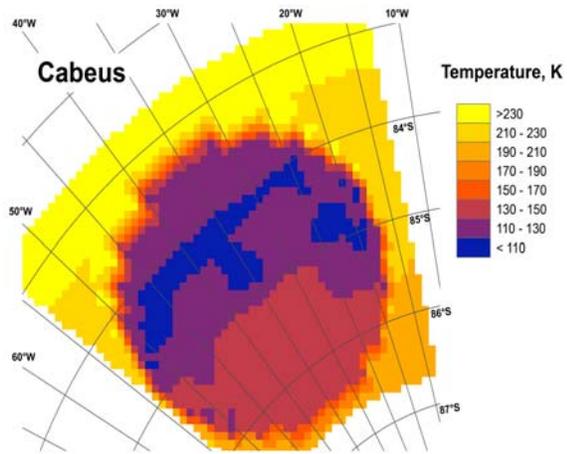


Fig. 3. The distribution of average temperatures in Cabeus.