FEATURES OF THE HYDROGEN DISTRIBUTION AROUND LUNAR CRATERS PROCLUS AND KEPLER. M.P. Sinitsin, V.V. Shevchenko, Sternberg Astronomical Institute, Moscow University, Moscow, 119992, Russia shev@sai.msu.ru

Introduction. The Lunar Prospector Neutron Spectrometer measured neutron fluxes of thermal (0.001-0.3 eV), epithermal (EN) (0.3 эB-500keV) and fast (500keV-8MeV) energies. In result of analysis of the data Lawrence and Feldman constructed the hydrogen distribution on the lunar surface [1]. That analysis was based on the fact that hydroxyl groups (OH) are major absorbers of EN. However, the authors shown, that EN flux data features may be explained by other element abundance in the lunar soils, namely: Si, Ca, Gadolinium (Gd), Samarium (Sm) and Fe. Taking into account these elements, it's possible to explain EN absorption features and specific distribution character of the implanting hydrogen in equatorial regions.

Crater Proclus. Using of the Feldman's interpretation of the Lunar Prospector data [8], we constructed hydrogen distribution map (Fig.1). It shows that the hydrogen abundance increases up to 110 ppm just interior crater.

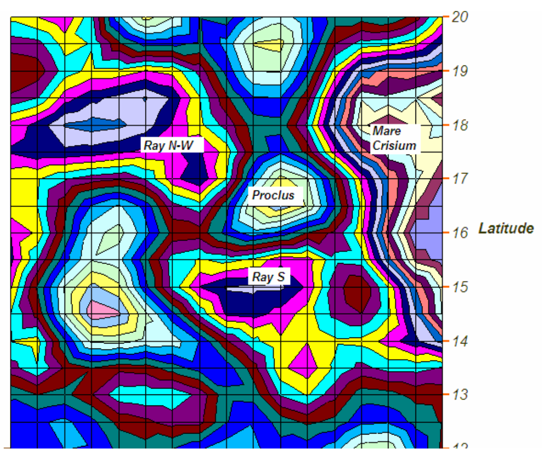

Fig. 1

The large value of the hydrogen abundance is difficult to explain, taking into consideration the exceptional soil immaturity inside of the Proclus (spectropolarimetric maturity index I_S = 1.82 [2]). Such character of the maturity properties of the crater is confirmed by evident decreasing of hydrogen abundance in the north-east and south crater rays (*Ray N-W and Ray S* in Fig. 1). According to Maurice and Feldman [3] most immature formations of the equatorial area have hydrogen contents from 0 to 30 ppm. Mature surface formations contain about 70 ppm of hydrogen. Therefore, anomalous high abundance of hydrogen into crater Proclus requires more attentive study.

Using Lunar Prospector NS data Johnson and Mourice [4] established quit negative correlation between EN flux and maturity. So, EN flux is back proportional of hydrogen abundance. Authors examined the average value of the hydrogen count corresponded to the ground with size of 2.3 diameters of crater size. They shown that Copernican craters have biggest EN flux and lowest hydrogen contents of accordingly. However, hydrogen abundance in the Proclus interior does not agree with these results. In addition, Jonhson [5, 6] shown very interesting correlation between low flux of EN (and high hydrogen contents accordingly) and immature soil regions!

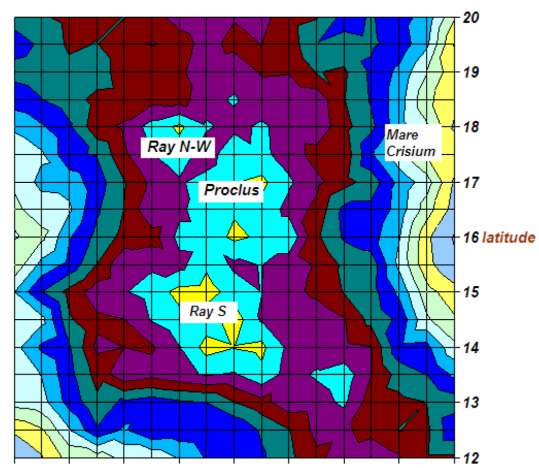

Fig. 2

On the map of iron content from LP data (Fig.2) we can see some features, which quit correspond to hydrogen abundances (Fig. 1) and correlate with relief features of the

Proclus region. However, iron abundance in the crater area has decreasing tendency. Concerning Mare Crisium, it is clear tendency to the east from crater on the both maps. It has low hydrogen (0-10 ppm) and high iron (15-17 ppm) abundances. This results quit correspond to analysis of EN flux.

Crater Kepler. Crater Kepler is Copernican too, but it has more old exposition age (I_S = 1.32 [2]). Therefore, we can see no good H and Fe distribution correlations with relief features of the region on maps in Fig. 3 and 4.

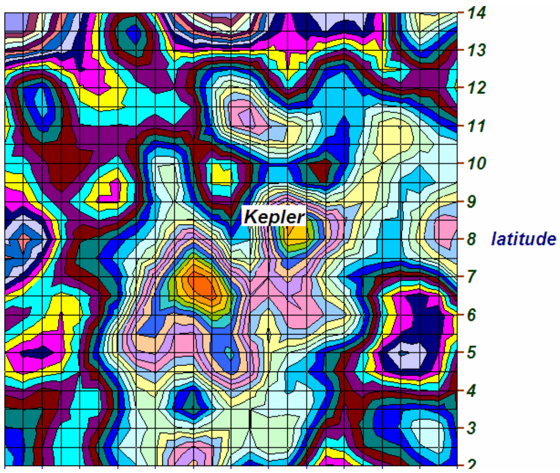

Fig. 3

Like example mentioned above, we can see high abundance of hydrogen (up to 90-100 ppm) just interior crater (Fig. 3). This fact confirms observed tendency to deposition of the hydrogen into interior of immature crater material that is not explained now.

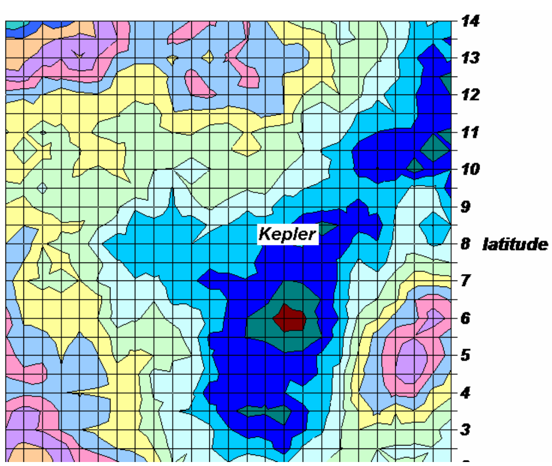

Fig.4

Other possibility is not correct interpretation of the EN flux decreasing. Iron distribution (Fig. 4) corresponds to crater location exactly enough. But it has noticeable decreasing of the iron abundance accordance to the surface soil of the background territory.

Interpretation.

Possibly, observed hydrogen peaks into crater interior are not real and they are a consequence of the incorrect interpretation of LP-NS flux EN data. It means, that other element accounts with considerable absorption cross section influence of EN energy (see above) is not enough took into consideration. Meanwhile low hydrogen abundance in Proclus bright rays (Fig. 1) quite corresponds to extraordinary young expositional age of these objects.

Concerning Mare Crisium region, as it was shown by Staruhina [7], established hydrogen saturation level strongly depends of diffusion coefficient and activation energy of the surface soils in the region . It means, that mature surface soil of the Mare Crisium region would be have low concentration of the hydrogen.

Conclusions. From analysis of the considered hydrogen distributions, we can see that hydrogen abundance correlates with relief features in crater regions with immature surface soils. In case of more mature crater inner soils it is considerable splitting of hydrogen concentration character, and therefore correlation of the hydrogen abundance with relief features is noticeably less. Nominated tendency of the hydrogen abundance increasing for interior young craters requires more attentive examination. Moreover, it shows on possible incorrect using the flux EN interpretation method.

References. [1] Lawrence D.J. et al., (2006) LPS-37; [2] Shevchenko V.V. at al., (2003) Solar System Res. 37, 1-22; [3] S.Maurice et al. (2003) LPS-34; [4] Johnson J.R. et al. (2001) LPS - 32; [5] Johnson J.R. et al. (2001) LPS-32, 1440;[6] Johnson J.R. et al.(2001) JGR, 107, 10.1029,002 [7] Staruhina L.V., LPS-30.