ON THE NATURE OF LUNAR MASCONS. B.A.Okulessky, Shirshov Institute of Oceanology, and G.A.Burba, Vernadsky Institute of Geochemistry and Analytical Chemistry, Academy of Sciences of the USSR, Moscow

For decision of the question of deep or near surface nature of mascons one must to take into account the contribution of relief and dense layer of mare basalts into the picture of gravitational field over the lunar maria, i.e. Bouguer reduction. The existent maps of lunar gravitational field (1,2) show an anomal value of gravitational field without Bouguer reduction. The latter for the Moon is (0.188 H - 0.042σH), where H is altitude of the surface over the datum (in m) and σ is density of intermediate layer (in g/cm^3). Bouguer reduction shows that (when altitudes from the datum surface are thousands of meters) there is negative background of gravitational field in high regions and positive one - in low regions because of relief only. The value of this background is to be subtracted from the value which is shown on existent maps.

To estimate value of this background values of Bouguer reductions for regions with mascons (Maria Nectaris, Tranquillitatis and Serenitatis) and for region with a small gravitational anomalies (southern Oceanus Procellarum) were calculated. Topographic lunar maps (3,4) and maps of thickness of basalts, estimated by degree of craters' flooding (5,6) were the base data for calculations. As there are no estimations of thickness of basalts in Mare Serenitatis two values of maximal thickness and configuration of the layer as shown on Fig.1 were chosen. The sphere with 1735.4 km radius, centered in the center-of-mass of the Moon, was chosen as datum surface. Mean density of intermediate layer (i.e. from datum to physical surface) was taken to be 3.0 g/cm^3. Calculations were made for two values of superfluous density of basalts $\Delta\sigma$: 0.5 and 1.0 g/cm^3.

The results, corrected to 100 km altitude over the datum are shown on Fig.1-3 in comparison with experimental data (1,2). Curves on Fig.1 and 2 shows that calculated and experimental data are well comparable over mascons maria. This permits to do conclusion that mascons are created in the main by summary effect of low relief and layer of more dense rocks (mare basalts) on the surface of this lowlands, i.e. mascons clearly have near surface character.

The peculiarities of gravitational field in comparatively smooth region, where role of relief is small, are created, in the main, by dense basaltic layer (Fig.3). Maximum in the right part of experimental curve reflects a deep positive anomaly, which is shown also by the map of global gravitational field (Fig.4). The map was compiled by averaging techinque, basing on

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map by Sjogren et al. (1). The map on Fig.4 shows that after averaging the large positive anomalies over the ringed maria dissapeared and extensive negative anomalies, which have deep character, appeared on those places. This once more shows near surface nature of mascons. At the same time small in amplitude positive anomaly in the southern Oceanus Procellarum which was mentioned above is remained, i.e. it has deep nature.

Conclusion about near surface nature of mascons is close to representation of mascons as large near surface disks of dense rocks (7). However, thickness of this disks, taken for Mare Nectaris to be 5 km (8) is considerably greater than photogeologic estimations (5). Observed values of anomalies are in the main the result of summary effect of thinner (then 5 km) layer of basalts and low relief, as it was shown above.

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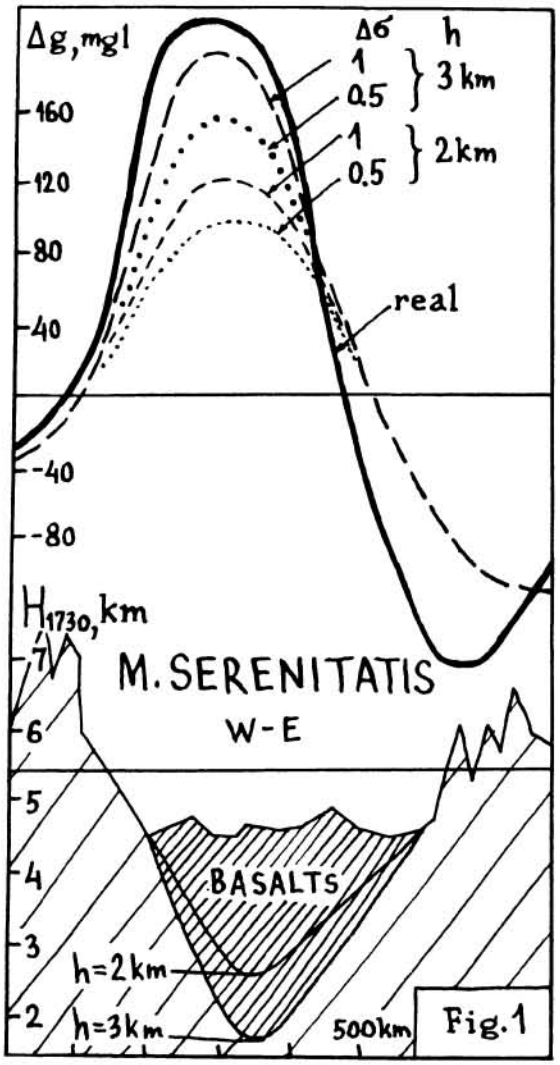

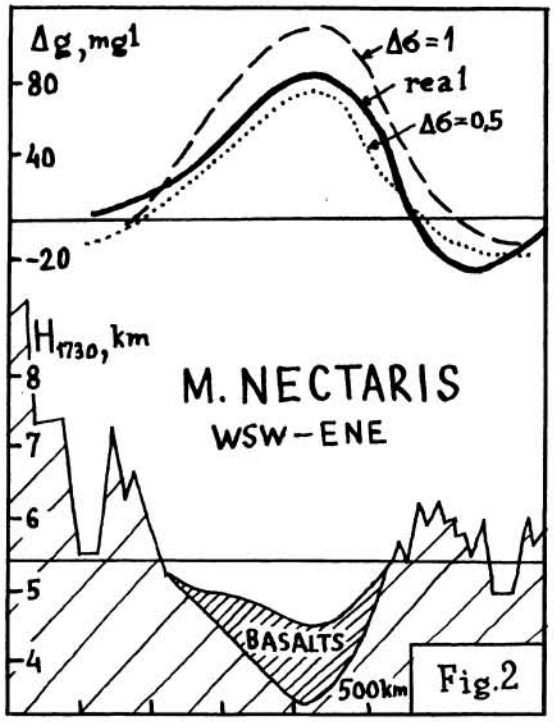

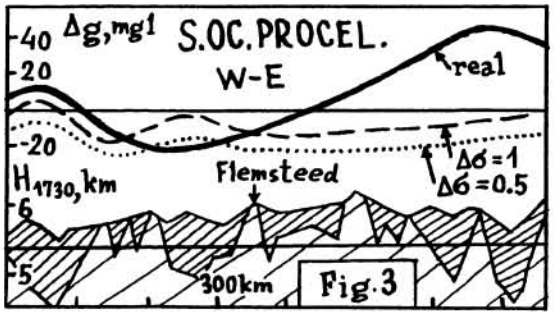

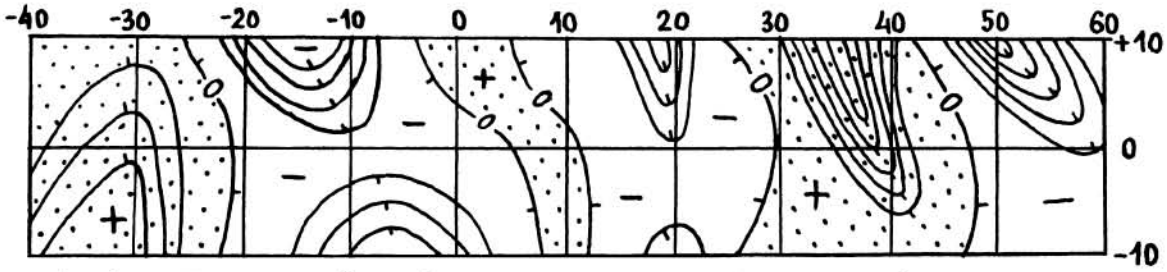

Fig.4 The map of global gravitational field of the Moon (anomalies > 500 km)