Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10743, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10743
EGU General Assembly 2008

Model of annual variation of oblateness of Mars and possible annual oscillation of its pole

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The model of directed annual redistribution of masses of the Earth as a material point on its surface with harmoniously varied mass has been used effectively for dynamic interpretation and an explanation of observable annual oscillation of the Earth pole and variations of coefficients of the second harmonic of a geopotential (Barkin, 2007). The similar model with the purpose of interpretation and explanation of an annual variation of coefficients of the second and third zonal harmonics of the gravitational potential of Mars (Mars potential) **dJ2** and **dJ3**, for a prediction of annual variations of other coefficients of the second harmonic of marsopotential, and also for the description of the possible phenomenon in rotation of Mars - the annual oscillation of its pole. The basis of research is the geodynamic model of the forced swing and wandering of the core and the mantle of the Earth under of a differential gravitational attraction of external celestial bodies (Barkin, 2002). On our geodynamic model observable constant displacement of the centre of mass of Mars relatively to geometrical centre (on distance of **2.85 km** in direction of a geographical point **57 N, 82 E**) there is a result of dynamic evolution of system of the core-the mantle. The identical displacement of the Mars core in same northern direction corresponds to displacement of the centre of mass of Mars (on preliminary estimations it can make **20-25 km**). Evolutionary displacement of the core and a gravitational attraction of its superfluous mass have determined observable geodetic features of Mars. In particular the Mars bipolarity is one of the main dynamic consequences of offered model (Barkin, 2002). On Mars seasonal asymmetric rearrangement of polar ice caps from **CO2** is observed. The seasonal variation of mass of northern cap is estimated by values **3.7x10 (15) kg - 8.6x10 (15) kg** (Yoder et al., 2003). The seasonal variation of mass of a southern cap on **30-40 %** is more than of northern cap. Air masses also asymmetrically distributed in southern and northern hemispheres of Mars. So in the winter the difference of air masses of northern and southern hemispheres makes about **4x10 (15) kg** (Yoder et al., 2003). As well as in case of the Earth, we admit, that redistribution of atmospheric masses between hemispheres of Mars substantially is determined and directed by the polar oscillations of superfluous mass of the core which are caused by gravitational influence of the Sun on eccentric core. We expect that the core is displaced in winter to the north (here we have some analogy with the annual motion of the Earth core). The general seasonal asymmetric redistribution of masses of Mars we shall model by system of two points with cyclically varying masses located on the Mars surface at poles of geocentric axis **OP**, directed to the pole **P** with coordinates **57 N, 82 E** (Barkin, 2001). Let due to redistribution of masses of the top spherical layer the masses of points change harmoniously under the law **m1 = 10.81 sin (g+180) x10 (15) kg**, **dm2=8.72sin (g+180) x10 (15) kg**, where g is a mean anomaly of Mars orbit. According to our model variations of coefficients of the second harmonic of geopotential **J2, C21**, **S21** and coefficient of third zonal harmonic **J3** of Mars potential have made: **dJ2=1.81x10 (-9) sin (g)**, **dC21=2.07x10 (-9) cos (g-180)**, **dS21 = 1.48x10 (-9) cos (g-180)**, **dJ3 =-6.69x10 (-9) sin (g)**. Variations **dJ2** and **dJ3** coincide with their values obtained by modeling constructions of changes of Mars caps and on the basis of the satellite data (Yoder et al., 2003). On the values of annual variations of products of inertia of Mars obtained here the annual variations of coordinates of a pole of an axis of rotation of the Mars have been estimated: **dp/w=49.7x10 (-8) cos (g-126)**, **dq/w=49.9x10 (-8) cos (g-125).**

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