



Cassini's motions and resonant librations of some satellites of Uran and Neptune

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In the given work the motions of some synchronous satellites of Uran and Neptune under Cassini's laws are studied and estimations of the periods of resonant librations of these satellites are given. Some from considered satellites are modeled or as the homogeneous ellipsoids (with the known data on their forms and the sizes: <http://www.nasa.gov>), or as ellipsoidal models of hydrostatic equilibrium state of synchronous satellite on the Goldreich, Peale results (1968). Earlier the resonant librations have been investigated for some satellites of the Jupiter and Saturn modeled by homogeneous ellipsoids (Barkin, 1981). In the given work four parameters of the resonant motions of each from considered satellites of Saturn are determined: the value of the average angle of inclination of rotation axis of the satellite relatively to normal to the orbital precessing plane, the period of resonant librations in longitude, the period of the pole wobble and the period of spatial precession. For estimations of the specified parameters the known (and advanced) analytical formulas of the theory of resonant librations of synchronous satellites have been applied (Barkin, 1978, 1979). The determined values of the specified parameters (in brackets after the name of the appropriate satellite, in the specified sequence) are resulted below. Values of Cassini's angles are given in arc seconds, and the values of periods, accordingly, in day or years. For hydrostatic models considered satellites of Uranus the specified parameters have values:

Miranda (83''6, 5.70 d, 51.8 d, 34.7 d) **Ariel** (1''40, 18.2 d, 295.6 d, 198.8 d) **Umbriel** (8''83, 49.04 d, 3.59 yr, 2.43 yr) **Oberon** (177''4, 1.42 yr, 122.8 yr, 141.6 yr) **Titania** (36''3, 13.3 yr, 743.9 yr, 560.1 yr) For Miranda and Ariel models in the form of ho-

mogeneous ellipsoids the similar values of parameters of resonant motion have been obtained:

Miranda (72°3, 5.05 d, 53.9 d, 30.0 d) **Ariel** (2°05, 19.6 d, 2.40 yr, 290.2 d) For the hydrostatic model of the Triton and for homogeneous ellipsoidal model of Proteus (satellites of the Neptune) the values of studied parameters consist, accordingly:

Triton (495°4, 77.2 d, 6.28 yr, 4.20 yr) **Proteus** (0°184, 2.93 d, 10.8 d, 9.18 d).

The given values of parameters of synchronous motions of satellites of Uranus and the Neptune have been obtained for their simple models. The consideration of real properties of shells of these celestial bodies should result in the certain corrective amendments of the obtained results. The new data on gravitational fields and an internal structure of satellites of major planets will be necessary for this purpose in the future. The fulfilled studies on rotation of synchronous satellites have been supported by Russian-Japanese grant N 07-02-91212.

References.

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