Geophysical Research Abstracts
Vol. 12, EGU2010-5369, 2010
EGU General Assembly 2010

Gravitational mechanism of active life of the Earth, planets and satellites

Yury Barkin

Sternberg Astronomical Institute, celestial mechanics and gravimetry department, Moscow, Russian Federation
(barkin@inbox.ru, 07-495-9328841)

Abstract. From positions of geodynamic model of the forced gravitational swing, wobble and displacements of shells of a planet are studied and fundamental problems of geodynamics, geology, geophysics, planetary sciences are solved etc.: 1) The mechanism of cyclic variations of activity of natural processes in various time scales. 2) The power of endogenous activity of planetary natural processes on planets and satellites. 3) The phenomenon of polar inversion of natural processes on planets and satellites. 4) Spasmodic and catastrophic changes of activity of natural processes. 5) The phenomenon of twisting of hemispheres (latitude zones or belts) of celestial bodies. 6) Formation of the pear-shaped form of celestial bodies and the mechanism of its change. 7) The ordered planetary structures of geological formations. 8) The phenomena of bipolarity of celestial bodies and antipodality of geology formations.

Mechanism. The fundamental feature of a structure of celestial bodies is their shell structure. The most investigated is the internal structure of the Earth. For the Moon and wide set of other bodies of solar system models of an internal structure have been constructed on the basis of the data of observations obtained at studying of their gravitational fields as a result of realization of the appropriate space missions. The basic components for the majority of celestial bodies are the core, the mantle and the crust. To other shells we concern atmospheres (for example, at Venus, Mars, the Titan etc.) and oceanic shells (the Titan, the Earth, Enceladus etc.). Shells are the complex (composite) formations. Planets and satellites are not spherical celestial bodies. The centers of mass of shells of the given planet (or the satellite) and their appropriate principal axes of inertia do not coincide. Accordingly, all their shells are characterized by the certain dynamic oblatenesses. Differences of dynamical oblatenesses results in various forced influences of external celestial bodies on shells of the given body. Dynamical oblatenesses of shells, thus, characterize the endogenous activity of a planet by external celestial bodies. Other important factor of endogenous activity of a planet is a eccentric position of the centers of mass of the shells (for example, of the core and the mantle). The eccentricity of the shells is inherited during geological evolution of a planet as system of shells (Barkin, 2002).

Consequences of exitation of the Earth system. The new tides (Barkin, 2005) are caused by relative displacements of the core and mantle. These displacements are reflected in variations of many natural processes due to gravitational action of the core. The displacing core causes deformations of all layers of viscous-elastic mantle. In the given work from more general positions the mechanisms of excitation of a system of shells of the Earth under action of a gravitational attraction of the Sun, the Moon and planets, the phenomena of their relative swings, translational displacements and turns relatively from each other, and the wide list geodynamical consequences of the specified excitation of the Earth are studied. At once we shall emphasize, that the developed geodynamic model has allowed to carry out the important dynamic researches of displacements of shells of the Earth, their deformations and changes, and variations of its natural processes and for the first time to explain the nature of such fundamental phenomena and processes in geodynamics, geology and geophysics as: cyclicity of natural processes and its mechanism; power of processes in various time scales; unity of cyclic processes and universality of their frequency bases; synchronism of geodynamic, geophysical, biophysical and social events; inversion, contrast and opposite directed changes of activity of natural processes in opposite hemispheres of the Earth; step-by-step variations of natural processes, sawtooth course of activity of natural processes in various time scales; orderliness in an distribution of geological formations on the Earth, planets and satellites; existence of antipodal formations on planets and satellites; the phenomenon of twisting of hemispheres of bodies of solar system, twisting of layers and latitudinal zones of shells of celestial bodies including inner layers and shells, etc. All the specified phenomena from the

resulted list to some extent are discussed in the given work and illustrated on the basis of modern researches in Earth's sciences and the researches executed by means of space missions. In a complex, the executed researches have shown universality of discussed mechanisms and their important role in dynamics and geoevolution of planets and satellites in other planetary systems, and also stars and pulsars with the systems of planets (Barkin, 2009).

Cyclicity. The excitation on the part of external celestial bodies of the system core-mantle depends from relative positions of external celestial bodies, from particularities of their perturbed orbital motions and from rotary motion of the planet. The specified motions have a cyclic nature which is shown in various time scales. Hence, and excitation of shells and their layers will have also cyclic character and to be shown in various time scales. Hence, cyclic variations of all planetary natural processes in all the variety widely should be observed, as takes place in reality. The periods of variations are characterized by extremely wide range - from hours up to tens and hundreds millions years. If the core makes slow secular drift relatively to the mantle all layers and shells of the Earth test secular deformation, thermodynamic and other changes. The cavity of the core and its flows are changed slowly that results in secular variations of a magnetic field (Barkin, 2002, 2009).

Inversion and asymmetry of cyclic and secular variations of natural processes. The essence of it rather wide distributed phenomena is, that activity of natural processes varies in an antiphase in opposite hemispheres of the Earth (first of all in northern and southern hemispheres). Told concerns to all geodynamic and geophysical processes, to variations of physical fields, to tectonic and geodetic reorganizations of layers of the Earth, to redistributions of atmospheric, oceanic and other fluid masses of the Earth. The certain asymmetry of displays of processes in northern and southern hemispheres on the other hand is marked. So secular trends of some processes are contrast in northern and southern hemispheres, i.e. velocities of secular changes are essentially different. All described phenomena are caused first of all by cyclic oscillations and secular drift of the core to the north (in present epoch). In longer time scales the similar phenomena of inversion, dissymmetry also have place and determine a nature and style of displacements of continents and lithospheric plates, planetary magmatic activity and plume tectonics as a whole, formation of mountains, elevations and depressions, systems of lineaments and cracks, regressions and transgressions of sea level (Barkin, 2002).

Synchronous steps of activity of natural processes. "For an explanation of observably step-by-step variations of geodynamic and geophysical processes the mechanism of sharp sporadic relative displacements of the core and the mantle and deformations of the mantle in the certain periods of time (the phenomenon of "galloping of the core") is offered. Apparently, this mechanism results in spasmodic variations of axial rotation of the Earth, causes gallop in value of a phase of Chandler motion of a pole, to sharp changes of the intense condition in zones of catastrophes" (Barkin, 2007; p. 61). According to geodynamic model the step changes first of all should to be observed in motion of a geocenter as it reflects relative displacement of the centers of mass of the core and the mantle. A gallop of natural processes in northern and southern hemispheres is characterized by the certain asymmetry. In result the step changes are tested by trend components of secular changes of parameters. In another words and activity (intensity) and trends of its secular changes test synchronous certain steps. In a separate class of the phenomena produced by spasmodic displacements of the core relatively to the mantle, it is possible to allocate spasmodic and synchronous changes of activity of natural processes both global, and occuring in opposite hemispheres of the Earth. It is natural, that the similar phenomena will be found out in due course on other celestial bodies as in solar and others exoplanet systems. We have been studied a class of the similar step-phenomena on the Earth, occurred in 1997-1998 (Barkin, 2009). According to geodynamic model the step changes first of all should to be observed in motion of a geocenter as it reflects relative displacement of the centers of mass of the core and the mantle. A gallops of natural processes in northern and southern hemispheres is characterized by the certain asymmetry. In result the step changes are tested by trend components of secular changes of parameters. In another words and activity (intensity) and trends of its secular changes test synchronous certain steps.

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