EPSC Abstracts
Vol. 5, EPSC2010-234, 2010
European Planetary Science Congress 2010

Dynamics of relative movements in the Sun-Earth-Moon system and structural features of geosphere

N. Bulatova
Schmidt Institute of Physics of the Earth of Russian Academy of Sciences, Moscow. n.p.bulatova@mail.ru

Abstract

Applying of Spatio-Temporal Technology (STT) developed by the author in 1996-2000, to astrometry database, made possible a study of the dynamics of Sun and Moon movements in relation to the Earth for the period from 1982 to 2008. Spatio-Temporal Technology consists of the Earth's 3D model with classic – spherical, Cartesian and geographical – network of coordinates and the Moving-Source Method (MSM), which represents the shifting of Earth – celestial body vectors in time.
The dynamics of the celestial bodies – the Sun and the Moon - movements was analyzed as 1) a change of the celestial bodies' angular distance with respect to the Earth's equatorial plane, and 2) a change of the Sun-Earth distance. The study revealed new data regarding the orbital motion of the Earth-Moon system's barycenter around the Sun.
For the Moon: from 1953 until 2009, the type of the dependence of $\Delta\delta/\Delta T$ on time T was revealed, which repeats every 18.6 years in accordance with the moon cycle. It was found out that in each such cycle: a) the dynamics of the Moon's periodic deviation from the equatorial plane are very much different for two phases of the cyclic change of T-dependent $\Delta\delta/\Delta T$ with declination amplitudes: A) from 28° to –28°, and B) from 18° to –18°.

1. Introduction

The need to integrate contemporary astronomical and geophysical data into one system prompted the author to develop Spatio-Temporal Technology (STT). Based on the Ptolemaic geocentric ideas about a stationary Earth. This STT consists on 3D model of the stationary Earth and "The Moving-Source Method " (MSM) [Bulatova, 1998-2000]. In MSM, the movement of the celestial bodies in relation to the Earth is presented as a progressive movement upwards and downwards with respect to the equatorial plane and as a cork-screw movement in relation to the axis of revolution OZ. This movement may be presented geometrically, in the spherical coordinates of the Earth, as shifting of radius-vectors, which connect the center p. 0 (origin of coordinates) of the Earth with the celestial bodies performing aforementioned movements in accordance with the astronomy data [1], [3]. It was found out that in each such cycle: a) the dynamics of the Moon's periodic deviation from the equatorial plane are very much different for two phases of the cyclic change of T-dependent $\Delta\delta/\Delta T$ with deviation amplitudes A) from 28° to –28°, and B) from 18° to –18°. b)

2. Research result

The graphically presented collected data regarding cyclic deviation for $\Delta\delta/\Delta T$ and $\Delta^2\delta/\Delta T^2$ for <0 and >0 zero line are very different, although the cyclic deviations of T dependent angular distance $\delta(T)$ in relation to the equatorial plane are symmetrical. This result may mean that different dynamics of the Moon's movement over the North and the South hemispheres are connected to the structure of the geosphere of the Earth.
Application of the Spatio-Temporal Technology (STT), which was offered by the author in 1996-2000 , towards the base of astrometry data for 1982-2006 made it possible to study the dynamics of the movement of the Sun and the Moon in relation to the Earth [1,2]. The areas of the dynamics data for $\delta(T)>0$ and $\delta(T)<0$ differ and show different dynamics of change for angular distance over time in the Northern and Southern Hemispheres.
Taking into consideration the dynamics of change of the length and direction of the said vectors, [1]

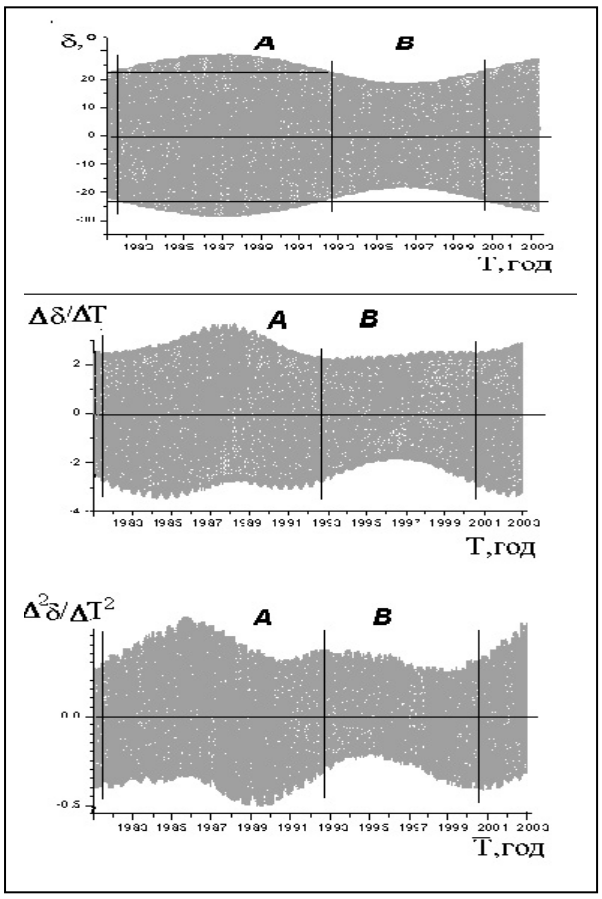

Figura 1. Graphic representation of the changes in a) the value of the Moon's declination δ as a function of time T; b) the increase of the rate of change of the Moon's visible declination $\Delta\delta/\Delta T$ (degree/day) from 1982 until 2002; and c) the increase of the Moon's visible declination acceleration δ: $\Delta^2\delta/\Delta T^2$ (degree/day2) as a function of time T from 1982 until 2002.

STT makes it possible to study the dynamics of change of the celestial bodies' effects on heterogeneities of the Earth (geological, geophysical, etc.), Spatio-Temporal distribution of seismicity for a group of a number of earthquakes selected in accordance with the following criterion: the time of the earthquake coincides with the time when the Moon is located in the equatorial plane (δ=0), where N for 1985-2002, for latitude ±90o, for groups with magnitude M=3-9.2. The latitudinal position of the two extreme (external) ridges (Fig.) coincides in latitude with the horizontal projections of the borders of the outer core on the surface of the Earth.

4. Summary

Such a presentation of the observed data made it possible to study the dynamics of the relative movements in the celestial bodie-Earth system (as an example in the Sun-Moon-Earth here) and to receive particular information about the celestial bodies' movements in Northern and Southern hemispheres

References

[1] Bulatova N.P. To the problem of the neutrino tomography of the Earth: the scanning geometry. Izvestiya Physics of the Solid Earth, V.35, №2. pp. 150-160, 1999.

[2] Bulatova N.P. The latitude distribution of terrestrial seismicity in relution to the locations of the Sun and Moon// Volcanology and Seismology, N2, pp..57-78, 2005.

[3] Bulatova N.P. On the universal spatio-temporal system co-ordinates for coherent astrophysical and geophysical studies, "The Earth's Planet" System: interdisciplinary scientific seminar 15-years (1994-2009), Moscow, Russia, 2009.