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HORIZONS AND NEW POSSIBILITIES

OF ASTRONOMICAL SYSTEMS MEGASPECTROSCOPY

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ABSTRACT

Results from Helioseismology, periodicities spectrum of the Sun and stars - can be adequately understand and effectively interpreted only in the context of unified theoretical representations. That possibility is permitted the *Wave Universe concept* (see monograph - Chechelnitsky A.M. Extremum, Stability, Resonance in Astrodynamics., etc. and consequent publications), which comprehend the Solar and any astronomical systems as the principal *Wave dynamic systems* (WDS). Investigations with using of the theoretically calculated *Fundamental Wave spectrum of (periods)* those objects, its *Megaspectroscopy* (including the Helioseismology - for the Sun, and Asteroseismology - for the stars) lead to reconstruction of dynamics, physics, geometry of the Sun and stars (its internal and external structure).

WHAT IS BETWEEN PLANETS? SUBSTANCE AND FIELD.

In our searching century slowly, but persistently reopen the conviction that Newtonian and its generalized classical representations on the surrounding world are not completed, that as why we gradually begin to imagine the frontiers of that idealization of the real world. And again, as in Kepler's and Newton's times, the convince information and new ideas, radically changing our representations, come from areas, exploring the Heaven - the Solar system and the Universe. Obvi-

ously, that under pressure of the accumulated data of cosmic observations and experiments, with the increasing degree, we begin to understand that:

The Solar system - is not only the dynamic system of N attracting material points (or bodies), as followed from the model representation of the celestial mechanics, or

The Solar system, together with its celestial bodies, - is not only the wide arena of transitional, plasma, magnetic, eruptive processes, as it follows from the principal notions of astrophysics...

Wave Dynamic Systems.

The Solar system - that is a *wave dynamic system (WDS)*, whose, interacting, noneliminating components are both: its celestial bodies (the Sun, planets, satellites, small bodies, etc.), and interplanetary filling agents - material medium (interplanetary, cosmic plasma, electromagnetic fields. etc.), i.e., substance and field, investigated in the understandable and being connected dynamical context.

WAVE UNIVERSE. WAVE ASTRODYNAMICS.

The principle possibility of dynamical synthesis of the classical celestial mechanics and astrophysics continual aspects, follows from the *Wave Universe concept* and wave concept of the astrodynamics - the *megaquantum wave astrodynamics* (Chechelnitsky, 1980 -2000) (see Fig.1,2).

HELIOSPHERE RHYTHMS.

The Earth and cosmic phenomena rhythmicity more and more becomes the dominante of scientific observations information, inevitably acquiring universality features. According to the fundamental Nature and Cosmos conformities, we must expect also, that with time the formed "monotone" models of Sun wind will leave dominating position in astrophysics. Their place will be inevitably taken by the models which are in definite sense "nonmonotone", among which much attention is paid to the rhythms set generation, the models, that adequately explain ob-

served variations in time of important Cosmos and environment medium characteristics.

Where Rhythms are Born?

In the utmost short summary, the answer to this question may sound like this. The rhythms are born not only on Sun (Chechelnitzsky, 1986) but also in the very Solar system - in Heliosphere, in all its shells. The alternative Wave astrodynamics paradigma proceeds from the essentially different (from the formed) representations (Chechelnitzsky, 1980 - 2000).

Heliosphere - as an Cosmic Resonator.

If we imagine such wave dynamic system as Solar system such a gigantic wave resonator of astronomical size, then the rhythms, frequencies, variations of observed Solar system dynamic and physical characteristics generate only where the main excitation generator, the central energy origin - the Sun is located, but after all, are formed by cavity and by shells of gigantic cosmic resonator - the Solar system, of the heliosphere.

The details of such wave (megawave) representations are quite proofable.

Rhythms and Interaction of Cosmos and Geospheres

(Magnetosphere, Atmosphere, Ocean)

The well - known in the astrogeophysics wide spectrum of periodicities (in particular, the cycles of the Solar activity, Solar oscillations, orbital and rotational motions of celestial bodies, cycles of geospheres - magnetosphere, atmosphere, ocean, tectonosphere, etc.) is represented in the framework of the Wave Universe concept and Wave astrodynamics (Chechelnitzsky, 1980-2000).

This is a set of rhythms, whose genesis depends on the wave structure of the Solar system and the existence of a large length and great periods of waves in the cosmic plasma. The researches show that this spectrum belongs to the theoretically calculated *Fundamental spectrum (of periods) of the Solar system*, namely to its *megaspectroscopy* (of Wave periods [Fig.3], Keplerian periods [Fig.4]).

Fundamental Wave Spectrum of the Solar System.

The scheme of astrodynamics levels (Fig. 3) is deliberately represented in the form resembling the scheme of spectroscopic levels of hydrogen-like atom (Bohr - Grotrian diagram). By analogy with the well-known radiation (*wave*) series - *terms* and intercombinations in an atom (Lyman, Balmer, Paschen, etc.series), in the scheme there are series of τ *wave periods* (d - days, a - years) of the Solar system - *terms* and their intercombinations between astrodynamics (elite) *dominant* levels, corresponding to the planets (the asteroids series - of Ceres - is given conventionally).

Wave resonance.

The concept of the *wave resonance* (Chechelnitsky, 1983, 1986, 1992 b, c, d) of the *Wave astrodynamics* indicates a tendency of commensurability of τ *wave periods* (represented in the Fundamental wave spectrum of the Solar system) with T periods of (Keplerian) orbital, spin, precession - nutation motions and also with numerous well-known rhythms of astro-geophysics - with rhythms of Cosmos and geospheres (magnetosphere, atmosphere, ocean, tectonosphere, etc.).

The periodical components of the Fundamental wave spectrum of the Solar System are found in numerous phenomena of the Solar system - from differential spin of the Sun (commensurability with wave periods $\tau = 27^d.277 - 31^d.713$), variations of the neutrino flow (Sacurai, 1971) from the Sun ($T = 2^a.212$), Mercury's own spin ($T = 58^d.68$), variations of the interplanetary magnetic field (IMF) ($T = 27^d.277 - 31^d.7$) - to variations and "seasonal" effects on the Earth's orbits and cycles (near month, half - year, year, Chandler term, long terms, etc.) of geospheres - magnetosphere, atmosphere, ocean, tectonosphere (commensurability with wave periods

$$\tau = 27^d.277-31^d.713, 184^d.299, 366^d.613, 443^d.317, 2^a.212, 10^a.194, \text{ etc.})$$

The *megaspectroscopy* (that is understood in wide sense and connected with the Fundamental wave spectrum of Solar system) discovers the new possibility in investigation and interpretation of rhythms genesis and interaction of Cosmos and geospheres (magnetospheres, atmos-

phere, ocean, tectonosphere).

WAVE COSMOGONOMY.

In light of accumulated information it becomes evident that wide complex of Wave astrodynamics representations can be promote to the new comprehension of not only special problems of astrodynamics and of celestial mechanics.

The wide set of problems not only of astrophysics, but also of Earth sciences, including biosphere, anthropology sciences, can be comprehended in the frameworks of the Wave Cosmogonomy - that is of the science about Cosmos and Earth, its interaction. Some representation about its principles, and constructive content following assertions give (Chechelnitsky, 1992 b,c,d).

Thesises (of the Wave Cosmogonomy).

(1) *The Cosmogonical Induction*. Dominate (and, it seems, endogenic) processes taking place in all shells of Earth (including - in the Biosphere), in the significant degree, are controlled by the located out of Earth *cosmogonical* factors.

(2) *Wave Channel*. The material channel of the short-range action, the energy, impuls, momentum impuls carrier, that realizes the interaction between processes following in Earth shells and in the Solar system, and thus realizes the interaction of endogenic and cosmogenic factors, is the *wave channel*.

(3) *Fundamental Spectrum and Wave Resonance*. The rhythmic of astrophysical, geophysical, biological and another natural processes corresponds to the rhythmic of the wave processes in the Solar system, and thus the dominate frequencies spectrum of astrophysics, geophysics, chronobiology *belong to the Fundamental Spectrum of the Solar system* [see Fig. 3, 4; τ wave periods indicate in days (d). years (a)].

(4) *Spectroscopy - Unity and Universality*. The spectroscopy (and megaspectroscopy), corresponding to this Fundamental Spectrum of the Solar system, is the *dynamic basis* of existence of observing spectrums of the cosmogonomy (astrophysics, geophysics, chronobiology),

of theirs *unity and universality*.

MEGASPECTROSCOPY AND HELIOSEISMOLOGY (ASTEROSEISMOLOGY)

Experimental Helioseismology and Asteroseismology raises a number of questions whose answers are required for understanding how seemingly ordinary star actually operates (Science, 1996). Some of these answers, information about variability and the internal structure of the Sun (and stars) can be obtained through the theoretical representation of Wave Universe concept, Megaspectroscopy of the Sun (and stars).

Internal Structure of Celestial Bodies. Megawave Tomography.

"Inside - as Outside".

The G[s] *Shells hierarchy* (Chechelnitsky, 1985b, 1986a), that is continued with use of the recursion by χ *fundamental hierarchy parameter* – *Chechelnitsky Number* $\chi=3.66(6)$ (and due *Shells isomorphism*) in the direction of decrease of its sizes, inevitably leads to the border, when the description of internal regions of celestial body ($a < R_{\odot}$) begins (R_{\odot} - radius of the Sun).

* Is such analytical extension correct?

* Have the real sense received by such manner *shells and elite states inside* the celestial body? Evidently, that the any formal mathematical argumentation can't seem convincing in the problem, that is essentially physical. The decisive criterion of the true can be only observations and experiments. Till there is a sense to state the expectations in the form of following suggestion (see Fig.5,6).

The Suggestion.

* Investigating in seismology of celestial bodies physically distinguished levels and Shells (as the core, mantle, nucleus or convection zone) have the *megawave* sense.

* Its are the *Shells and the elite levels*, that possess properties of *discreteness, quantization "in the Large"* - *megaquantum effects* of radial, azimuthal distances quantization and the quantization of the *velocity and sectorial velocity (circulation)*.

* The well-known in seismology tendency to separate the internal structure of celestial bodies

to the core, the mantle and the nucleus, etc. really has in its fundamental basis the *shell structure and elite levels* in the standard sence of the Wave astrodynamics.

We suggest also that the boundary convection zone of the Sun determine by the distinguished level (Transsphere $TR_*^{[0]}$) at the radius

$$a_*^{[0]} = K_{\odot} / (C_*^{[0]})^2 = 0.595 R_{\odot},$$

where K_{\odot} - gravitation parameter of the Sun, R_{\odot} - radius of the Sun.

In known cases Transspheres open (in external direction) *perturbing zones* (In particular, Transsphere $TR_*^{[1]}$ with radius $a_*^{[1]} = 8R_{\odot}$ open the *perturbing zone* of Solar wind 8 - 12 R_{\odot} in the Solar system).

Due to limits of this summary we can not cite the argumentation to the expressed assertions.

Therefore, there is a sence to examine this summary as proposal and reason for the conducting of special theoretical and experimental investigations (Science, 1996; Gough, 1996a,b; Kosovichev, 1997; etc.) in the area of the *Megawave seismology and Megaspectroscopy*.

There is no sence also to discuss specially the perspectives that are discovering such analytical introspection of celestial bodies structure in the case of correctness of the fundamental basis of theory [Chechelnitzsky, 1999].

The last reason - at the observations, comparison with space experimental data.

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