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Using system theory to analyse the dynamics relationship between Sun and Earth

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Abstract

Using the viewpoint of system theory to analyse the Sun system, the author discovered that there objectively exist two kinds of natural physical coupling mechanism (function combination) between the Sun and the Earth as follows: 1) The function combination, which makes the Earth crust to be under the “rolling” state, is formed by the Sun radiation (solar pressure) the Earth rotation on its own axis and the Earth revolution round the Sun. Following this discovery of the physical coupling mechanism, the question of the force source (energy source) of the Earth crust movement has been clearly explained. 2) The function combination, which makes the Earth rotation axis to “wobble” relatively to the Earth crust, is formed by the Sun radiation (solar pressure), the Earth rotation on its own axis and the Earth revolution round the Sun, the existence of crossed angle between the ecliptic and the quator, the Earth delamination structure and the disequilibrium distribution of superficial area of continent on south and north hemisphere etc. The discovery results in totally new scientific explanation of several dynamics issues such as the 〈polar shift〉, 〈the

seasonal changes of Earth autorotation speed) and (the heat source within the Earth) etc, which have remained as puzzles in the subjects of “Earth rotation on its own axis” and “geophysics” for more than one century. Indeed, the discovery of above two kinds of natural physical coupling mechanism (function combinations) has been acquired under the guidance of the theory of the interaction of (solar pressure) repulsive forces (Song Guanyi, 2012).

Keywords: system theory, solar system, relationship between the Sun and the Earth, physical coupling mechanism, interaction of (solar pressure) repulsive forces

0 preface

System science is defined to study the relationship between system structure and its function, , system evolution and system control rules. It is a newly emerging comprehensive and interdisciplinary subject. Taking complicated systems of different scientific domains as studying subjects and in terms of integrated view of system, it reveals the common characters of different systems, the common rules followed by during the evolution period of systems, and the methods of their development, optimization and control.

The core thought of the system theory is its holistic concept of viewing things. It emphasizes that any system is an organic entity, and it is not an entity of simply cumulating and mechanical combination of units. The whole function of a system has the characters, which each individual component element of the system does not have under its isolation status. Every component element in the system does not exist in loneliness. It is located at a certain place and plays some certain role in whole system. The relevancy among elements constitutes an undividable whole entity. The element is one of the whole entity. If one element is separated from the whole system, it will lose function as an element.

Relying on the system theory, this paper is to explain the dynamic relationship between Sun and Earth, and to reveal the secrets of naturally formed physical coupling mechanism in dynamics, including the theory of interaction among (solar

pressure) repulsive forces (Song Guanyi,2012).

1 Identification of the system range where the Earth is situated

Since 1980s, as a newly burgeoned Earth system science (geoscience), its system range zoning choices are as follows: to put atmosphere, hydrosphere, geosphere (lithosphere, mantle, Earth core) and biosphere into one independent evolutionary system, and to study the correlation among subsystems, which compose the Earth system, and the dynamic mechanism among subsystems, how to control the changing mechanism of systems and the rules of inner evolution of the system.

All system range zoning mentioned above still has the fundamental thinking characters of traditional geoscience, i.e since the Earth was born, the evolution of Earth and biosphere, crustal movement, seismic and volcanic movement etc are mainly caused by “the inner dynamic geological process of the Earth” Even if we know the existence of “outside dynamic process (such as solar radiation)”, but, that process was only thought as the less important.

Actually, since the Earth was born, only a little bit energy (too little, compared with the energy received from the Sun) is conserved within the Earth. The energy includes rotation energy, gravity energy, heat energy from radioactivity decay and crystallization energy, etc. Except that a little bit energy was released, much energy is still deposited within the Earth. With such energy, the Earth can not even keep its own “body temperature” warm, how could it be able to have the huge energy source (force source) conservation to support different kinds and many cycles of Earth crust movements and structure movements?!

By now, it appears that the above mentioned system range where the Earth is situated is too small. The range of the Solar system is the correct choice, where the Earth is situated. The reasons are as follows:1) The energy amount of Solar radiation is huge. Based on measurement, the Sun radiation energy releasing to outer space per second is about 3.82×10^{26} J. Since the Earth was born, the total energy, which the Earth has received from the Sun radiation, is about 10^{34} J, which is equivalent to the total radiation energy from the nuclear reaction within the Sun for a whole year and which is much bigger than the total energy reserved within the Earth for three orders of magnitude. 2) The radiation energy(force source) from the Sun inside comes from the nuclear reaction there. The mechanism of nuclear reaction can be described by the

mass-energy formula of A Einstein as follows: $E=mc^2$. The solar mass provides enough energy storage for the Sun to radiate huge amount energy (momentum). 3) The natural energy (momentum) coupling physical mechanism exists between the Sun and the Earth (Song Guanyi, 1991,1999, 2006).

The relationship among the Sun, the planets and other objects within the solar system depends not only on the process of gravity law, which holds the Sun(as a chief) and its members together, but also on the energy (momentum) process of Sun radiation, which maintains the more intimate “mother and son” style relationship between the Sun and its members.The “whole life” course of the Earth (including the aerosphere) depended on the nurture of the Sun’s energy (momentum). (Song Guanyi, 2008).

Therefore, when using the system theory to research the Earth science, the best and correct way to rereveal the secret of the Earth dynamics force source (energy source) is to take the solar system(fixed star) for a relatively independent, self-evolutional system, which has “life” charactors.

2 The macroscopical force existing within the Solar system

During researches on evolutive function and characters of any natural system, there are two key tasks which have to be done. One is to confirm the systemic range; another is to make a complete and accurate identification on the functions of every component within solar system. Taking an example as follows: if we only know the gravity force interaction in solar system, and we do not know the other macro natural force—(solar pressure) repulsive force interaction, then it is in vain to make an actual progress to research the inner evolution rules within the solar system and the kinetic coupling relationship between the Sun and the Earth.

2.1 Gravity force interaction

In 1687, I. Newtown’s “The mathematic principles of natural philosophy” was formally published, and it brought forward “the law of gravity”, which was the earliest natural law summarized by mankind with physical conception and in mathematical format. Its characters are as follows: 1) It exists among all things; 2) Attraction force only, 3) Being long-range force, 4) Medium particle, gravitation particle (not verified so far); 5) At the normal situation, it is not significant unless at

least one of the involved objects has the mass with astronomical significance.

Since then, during 300 years after Newton's discovery, mankind discovered in succession other three kinds of interaction as follows: electromagnetic interaction, strong interaction and weak interaction. The electromagnetic interaction reflects the reciprocal action relationship among electric particles inside the object (celestial body), and at different situation, it can show as a repulsive force, and it can also show as a gravity force. Among macrocosmic objects, the electromagnetic interaction appears very weak. Strong interaction and weak interaction are discovered only after the research of physics goes into the atom kernel and the fundamental particle. The discovery reveals the issues of quantum physics in micro world. Among macro objects, the strong interaction and weak interaction can be neglected.

So far as the domestic and abroad scientific circles generally acknowledge that there are only four kinds of interaction in natural world, in which only the gravity force interaction is suitable to macro physics, and is considered to act as decisive role in macro phenomena, such as in celestial movement and celestial evolution.

2.2 Repulsive force interaction

2.2.1 The philosophy thought on objective existence of repulsive force interaction in the material world

According to the speculation from three great natural laws of philosophy, during the celestial evolution process, there can not be only one natural force with only one single function. There must be another natural force with the contrary function, which acts as a counterweight to the former. This is just like the relationship between Yin and Yang in ancient Chinese philosophy. Otherwise, it is impossible to form such an incomparably huge, relative stable and harmonious natural world.

2.2.2 The theory and practice preparation before the proposal of (solar pressure) repulsive force interaction

In 1901, Russian physicist H.H.Леведев and American physicists E.F.Nichols and G.F.Hull measured light-pressure on the irradiated object surface using of precise instrument. This experiment of light pressure did not arouse the enough attention in the scientific world at that time. Some scientists only considered that it was just to prove that the electromagnetic wave (light), firstly put forward by J. C. Maxwell, has the material character.

In 1905, Einstein wrote a paper named as “On the electrodynamics of moving objects” and created the special relativity theory, that proposed two basic principles, i.e the principle of relativity and invariability of light speed.

During 1916--1917, Einstein brought forward the hypothesis of photons, in which he endowed photons not only energy, but also momentum i.e the formula $P=hv/C$. Then, the analysis results of Compton effects (A.H. Compton) verified completely in 1923 that the photon is the substantial particle entity with both of energy and momentum, which Einstein' theory advocates.

Shortly afterward, Einstein published his article “On the electrodynamics of moving objects”, and then he researched the loss of radiation energy with his special relativity theory, and discovered an important result, that is, the mass is equivalent to energy. In September of the same year in the thesis “Does the inertia of an object have relation with its energy?” Einstein firstly published the formula, which is shown in modern textbook as $E=mc^2$.

That is so called the mass-energy relation formula, wherein E is energy, m is mass, c is velocity of light. This formula indicates that the energy and mass are equivalent to each other. The only difference between them is the constant c^2 . Such formula supplies a theoretical support for resolving the following two issues: the storage of huge amount energy(force) source, which is long-time and continuously radiates from Star inside, and dynamic source of star evolution. Therefore, the special relativity theory should belong to one of the fundamental theories of macro-scope physics domain.

Both the measurement of light-pressure and the establishment of the special relativity theory provide the theory preparation for put-forward of (light-pressure) repulsive force interaction (Song Guanyi, 2017).

2.2.3 Put-forward of the theory of (light pressur) repulsive force interaction

Along with the measurement of light-pressure and the logic thought of Einstein's special relativity theory, Song Guanyi applied the photon momentum characters to the dynamic coupling relationship among macro objects within Star system, and discovered and testified that the light pressure of solar radiation is the excitation source of some macromotion such as polar shift and changes of self rotation velocity of the Earth (Song Guanyi, Yang Tonglin, 1991, Song Guanyi, 1992a, Song Guanyi,

1992b, Song Guanyi, Wang Jiyi, et al., 2006, Song Guanyi, Cao Zhicheng, et al., 2007, Song Guanyi, 2008a, Song Guanyi, 2008b, Song Guanyi, 2009, Song Guanyi, 2011). And the author put forward the theory of (light-pressure) repulsive force interaction in 2012.

In 2016, Song Guanyi published the mathematic expression in his works 《Philosophic thought and mathematic principle established in the theory of (light pressure) repulsive force interaction》 as follows:

$$F = (1 + K) \frac{3JS}{4\pi R^3}$$

Therein, F represents the repulsive force on an object by the radiation of the Star in its system; J is the energy radiated from Star itself per second; S is light radiation surface area on the object; R is the distance from the Star to the radiated object; K is the average reflectivity of superficial area of radiated object relative to photon; π is circumference ratio. That means any star can generate (light pressure) repulsive force onto the objects within the system. The magnitude of the repulsive force has positive correlation with the product between the radiated energy generated from Star itself per second and the surface area of the radiated object, and has a negative correlation with the volume of sphere with the radius (distance) between the Star and the radiated object. Also, the repulsive force is relative to average photon reflectivity on the object surface. But it is not relative to the magnitude of masses, the physical status, and the chemical structure of both objects. .

The main characters of (light pressure) repulsive force interaction are as follows: 1) Photons radiated from Star are the energy source of repulsive force interaction, which can irradiate to any object in universe; 2) The way of Star energy radiation outward is by body diffusion. The radiation velocity is that of light; 3) There exists only repulsive force (vector), the direction of which is from the Star center outward along the line between the Star and the radiated object; 4) Photon is medium particle; 5) The way of interaction to object is by collision, which is commonly just to act on the object surface; 6) The repulsive force is a long-range force (to infinite distance according to the theory); 7) Normally, the force only plays significant roles on objects within Star system (Song Guanyi, 2012b, 2014, 2015, 2016).

The (light pressure) repulsive force interaction is a stage product during the process of

star formation and its evolution. Its formation and extinction are constrained by the rules of quantitative change and qualitative change. In the (macro) basic relationship among subjects in the Protostar phase of Solar system, only gravity force interaction existed among inner-system objects. It is the only macro natural force, which makes the interstellar materials to be condensed and agglomerated to form a huge volume, huge amount and high density framework of Protostar. However, when the Sun evolved into the phase of Main Sequence Star, because of qualitative changes of the partial inertial mass through nuclear reaction within the Sun, the fundamental relationships among planets inside Solar system have qualitative changes accordingly. Therefore, a kind of natural force—the repulsive force comes into being between Star and other objects inside Star system. However, the direction of the repulsive force interaction is opposite to gravity force interaction. The co-existence of repulsive force interaction and gravity force interactions is the basic indicator to verify whether a star evolves to mature stage or not, and it is also the force origin and momentum for the development and change of Star system after the formation of the Main Sequence Star phase. The contradiction and unification between repulsive force and gravity force interactions dominate the whole evolution process of Star system both at the Main Sequence Star phase and afterward at Red giant phase. At the extinction phase of Star, the extinction indicator is the “shut-off” of nuclear reaction and, subsequently, the die-away of the repulsive force interaction. And only the gravity force interaction remains in the basic relationship among macro objects (Song Guanyi, 2016, 2017).

3 To explain the energy (momentum) coupling physical mechanism between the Sun and the Earth by using system theory

3.1 Solar radiation (light-pressure), earth rotation and revolution constitute the function combination of “to-be-rolled mechanism” of Earth crust

3.1.1 Discovery of “to-be-rolled mechanism” of Earth crust

Song Guanyi (1991) discovered that the solar radiation (light-pressure), earth rotation and evolution constitute a set of natural “rolling machine”, the structure of which has the completely same structure with the “vertical rolling” rolling structure in the typical metal plasticity physical processing.

This general structure of “rolling machine” are as follows:

(1) “Roller”. There are two ballistic rollers—“rollerA” and “rollerB”, which are paralleled with each other, but have contrary rotating direction. “Roller A” is the Earth. Its rotating direction is from west to east with period of one day; “Roller B” is geometric elliptic globe bounded in earth revolution orbit, which formed the elliptic globe, (the globe looks like empty, but is full of photons). The rotation direction of “rollerB” is oppositely to the Earth rotation direction (from east to west). Its rotation period is one year (tropical year).

(2) “Rolled piece”. “Rolled piece” means the Earth crust surface layer, which is generally divided by Moho Discontinuity. The earth crust locates between two “rollers” and is brought into “rolling gap” because of Earth rotation. Its advancing direction(that is the direction of Earth self-rotation) is vertical to Earth rotation axis (along with horizontal direction of the crust surface). Interface of “roller B” and the rolled piece (Earth crust) is that of seamless “occlusion” (such coupling mode can not artificially done because of the surface roughness and extremely irregular distribution of mass on the Earth).

(3) Force source for maintaining the “rolling machine” rotation: The force source of “roller A” come from Earth self-rotation,while the force source of “roller B” from the Earth evolution round the Sun. The positive pressure (rolling pressure) between “roller A” and “roller B” is actually the repulsive force (light-pressure) to Earth crust, which comes from the Sun radiation.

Since the Earth formation, with the help of the bodiless “rolling mechanism”, such kind “rolling machine” has been naturally, effectively and continuously transferring the radiation repulsive force (light-pressure) into horizontal stress, that impells the internal Earth crust material to move (deform and displace).(Song Guanyi, 1995, Song Guanyi, 1999)

The discovery of rolling-type physical mechanism of the energy (momentum) direct coupling between the Sun and the Earth thoroughly changed the previous cognition of the Earth-notion in geoscientific field:

(1) Former scientists thought all-along that the Earth’s rotation on its axis and revolution roud the Sun are its own natural characters, and the type and rules of Earth movement are as a kind of isolate natural phenomenon. They did not know there

exists the necessary connection between them. By now it seems that the Earth's rotation and revolution are the natural and necessary functional factors for survival and evolution of earth itself (This is similar with a set of variety functional organs of animals and plants on Earth). The above functional factors and the Sun radiation (light pressure) together constitute a set of 'rolling' type functional organism. This is so called as one of the most simple, primitive and colossal organic structure in the vast lifeless world.

(2) The Solar system is an organism body (cell), that has the virtue of comparative independent evolution and has the "life" character, while the Earth is one component part of this system. The Earth's formation and its evolution are not isolate and self-systematic. The whole "life" course of the Earth has participated in the formation and evolution process of the Solar system, which has greater scale and much higher and relatively independent evolutionary function, and has been controlled by the Solar evolution rules. (Song Guanyi,2008 b).

(3) If the Earth is "rolled", the "rolling extending" effect must be formed (Song Guanyi,1991). And the strong horizontal stress in the Earth crust has been produced by such "rolling"-type coupling physical mechanism between Sun and Earth (Song Gunayi, 1999). All countless changing geotectonic movements (micro and macro) within the Earth crust are related to this simplest and effective "rolling-type" coupling physical mechanism, which is built up by solar radiation energy (momentum) , Earth rotation on its axis and its revolution round the Sun.

(4) "Rolling-type" coupling physical mechanism is probably the commonly existing energy (momentum) coupling mechanism in other star systems and their planets in the vast space. .

3.1.2 The evidence of the objective existing "to-be-rolled" mechanism of the Earth crust

The practice is the only criterion for testing the truth. In order to verify the objective existence of the crust "to-be-rolled" mechanism, Song Guanyi put forward the theory of the Earth "rolling extending" effect (Song Gunayi, 1991),which is based on his discovery of naturally existing "rolling-type" coupling physical mechanism between the Sun and the Earth, and then deduced the key factors of the seismic energy release,which are controlled by the total continent surface area in each latitude belt.

(Song Gunayi, 1991, 1999).

Figure 1 is a devised illustration used to verify the conclusion mentioned above (only global powerful seismic data formally published in China before 1985 was collected). During 1901--1985 ($\cong 60$ years), the distribution curve along with latitude of the released strong-seismic energy in each latitudinal belt is almost the same (to be strongly correlated) with that of the continent surface area .in the same latitudinal belt. It appears that the continent surface areas (fixed with the time) within each latitudinal belt looks like a kind of “magic cover” that quantitatively controls the amount (changing with the time) of the released strong seismic energy in each latitudinal belt.

The following statistical informations can be concluded from Fig.1:

(1) There truly exists a kind of planet-level natural “rolling machine” between Sun and Earth, which makes the Earth crust into a continuous and repeated “to-be-rolled” status. Photons radiated from the Sun provide huge amount of energy source (force source) for the crust movement (deformation and replacement).

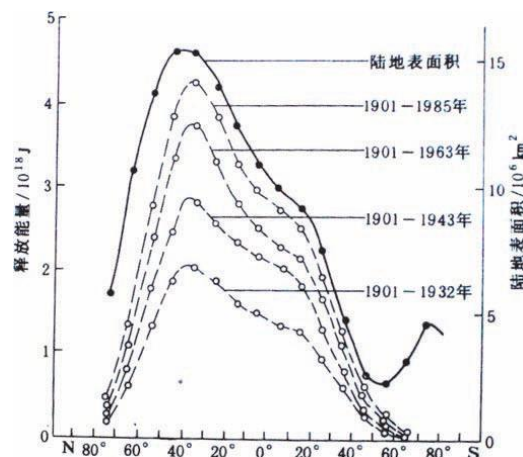


Fig.1 Correlation curves of latitudinal distribution of energy release of global strong earthquakes ($M_s \geq 7.0$)

at different time internals with the distribution of the continent surface area along with latitude (Song Guanyi, 1991,1999)

(2) To thoroughly change the traditional conception of geoscience theory, that believes the seismic energy possibly comes from the inner Earth. In fact, the solar radiation is the real cause of earthquakes.

(3) Statistic data during 1901--1985 ($\cong 60$ years circa) show that the distribution of global earthquakes released energy on earth surface is well ordered and under control;

and the amount of the energy released along with earth latitude belt is restricted by the size of continent surface area along with the same belt..

(4) The period of global seismic activity (frequency and released energy) is about 11 years, which is mainly induced by the solar activity period with 11-year-cycle. The seasonal changes of the global seismic activity are caused by light-pressure (P_1+P_2) (Song Guanyi, 2006), which acts on the Earth rotation axis. And after the axis has been excited for one tropical year, it begins to periodically wobble (polar shift), that causes the Earth rotation inertia to change.

3.2 Function combination, formed by Solar radiation (light pressure), Earth rotation and evolution, existence of crossed angle between ecliptic and equator, Earth delamination structure, and disequilibrium distribution of Earth continent surface area in south and north hemisphere, can trigger the Earth rotation axis to “wobble”

3.2.1 Function combination to trigger the periodic “wobble” of the Earth rotation axis

Song Guanyi (1992a, 2006) discovered that the function combination formed by solar radiation (light-pressure), Earth rotation and evolution, existence of crossed angle between the ecliptic and equator, Earth delamination structure, and disequilibrium distribution of continent surface area in south and north hemisphere etc caused the periodical “wobble” of the Earth rotation axis relative to the Earth interior structural position. The main force source of such “wobble” comes from the repulsive force interaction of Solar light-pressure, which is essentially different from the “wobble” (precession and nutation) of the Earth rotation axis in space. The later “wobble” is caused by the gravitation among the moon, the Sun and planets.

3.2.2 The evidence of objective existence of “wobble”-type function combination

(1) The polar shift issue

According to the analysis of 200 years’ observational data earlier than that time, S.Chandler, an American astronomer calculated 2 main periods of the polar shift in 1891: one is about 12 months, the other is close-by 14 months. In order to remember Chandler’s discovery, scientists call this 14 months period as “Chandler wobble” period.

The discovery of Chandler period aroused extreme interest of scientists all over the world. They have discussed for a long time in different aspects and different levels about the possible existing excitation function (factors) inside the Earth, and have got the following points: the period of about 12 months is a passive wobble period, which is excited by the seasonal redistribution of atmosphere, ocean, surface and underground water with changed mass. Because there exists a good correlation between the period acquired from actual observation data based on aforementioned excitation factors and the period of 12 months, most scientists thought it to be true. Afterward seldom people questioned or further discussed it again. As for the Chandler period, because of its strange period length (close-by 14 months) and its changing period (between 425 and 440 days), which obviously violate the dynamics laws, many well-known astronomers, physicists, oceanologists, meteorologists, seismologist, geoscientist and geophysicist were attracted to pay great attention to this issue at those times. However, after a hundred years research of the issue, its genetic mechanism remains blurry and specious. Just as the famous Australian physicist K.Lambeck pointed out in 1988: “Although the excitation source of Chandler period has not been confirmed, we can still assure that it is an irregular excitation factor with the annual period and it is a continuing excitation movement for a long long time.” Therefore, the genesis issue of “Chandler wobble” is left behind from 20th century and we expect the issue can be solved in 21th century.

Why does the issue of the excitation source of polar shift remain unsettled in more than one century?. The author realizes there are two main causes as follows: One is the mistake classification about the system range. Most of the former scholars, who researched polar shift, have taken Earth as an independent and self-evolved system, and they’ve reckoned that the polar shift is mainly caused by inner factors of the Earth (including atmosphere), and has nothing to do with (or little correlation to) outer factors outside the Earth. The other is lacking of support of new physics theory. Even if the system range was correctly selected, it is impossible to resolve the polar shift issue without bringing forward the theory of (solar light-pressure) repulsive force interaction (Song Guanyi, 1991, 2012a) and the discovery of the Sun-Earth “wobble”-type physical coupling mechanism (Song Guanyi, 1992, 2006).

In 2006, Song Guanyi discovered that after solar light radiates on Earth surface, because of the notable differences of reflecting coefficient between the Earth surface

continent and the ocean (average reflecting coefficient of ocean is about 1% and that of continent is about 30%), the whole solar pressure will be immediately decomposed into two parts: P_1 and P_2 . P_1 represents the equivalence light-pressure received on the continent and the ocean of Earth crust surface, and P_2 represents the light-pressure difference between the Earth crust continent surface and the ocean surface (the difference exists only on the continent surface).

The discovery of P_1 and P_2 immediately resulted in uncovering of the “mysterious purdah”— the puzzle of polar shift issue, which has been covered for a long time.

Let us look at the following calculated results by using the impulsive moment method. If the solar light-pressure P_1 acts on the Earth rotation axis for one tropical year, the “wobble” cycle of the Earth self-rotation axis relatively to its crust is 365.53 days (12 month circa); If the solar light pressure P_2 acts on the Earth rotation axis for one tropical year, the wobble of the Earth rotation axis relative to the Earth crust only finishes for 0.8 cycle. Therefore, its cycle is 427 days (14 months circa) (Song Guanyi, 2006). Actually, the astronomically observed polar shift is co-triggered by P_1 and P_2 . If the solar light-pressure (P_1 and P_2) acted together on the Earth rotation axis for one tropical year, then the wobble of the Earth rotation can only finishes 0.92 cycle. Thus, its cycle is calculated to be 395 days (13 month circa) (Song Guanyi, 2006). Therefore, the bypass viewpoints of astronomic and geophysical world on the annual cycle excitation factors (factors such as seasonal redistribution of masses inside and among atmosphere, ocean, surface and underground water etc) are also wrong.

As for some issues relating to the polar shift such as its genetic mechanism, and the reason of variation of Chandler period, which changes from 425 to 440 days instead of a fixed time. Similarly, the cycle of polar shift track movement also changes from 13 to 13.3 month instead of a fixed period. Song Guanyi has had detailed explanations in his two published papers: 《Explanations on the period changes of astronomically observed polar shift movement》 and 《Solutions on the left-behind puzzles about the Earth rotation subject》, published in 《Progress in Geophysics》 in 2009 and 2014 respectively.

(2) Issue of seasonal changes of the Earth rotation speed

Changes of the Earth rotation speed are represented as the changes of the length of day (L.o.d.). The astronomical observation value usually means the L.o.d, but not the

Earth rotation speed. Therefore, usually the change of L.o.d represents the change of the rotation speed. The changes of L.o.d include the long-term change (accumulation of centurial periods and geochronological times), the decade change, seasonal change (biyearly and annually and half-year times) and shorter period change. Among above changes, the most obvious change is seasonal.

Since 19th century, during the study on the Earth rotation, the following research issues: 〈The axial precession and nutation〉, 〈polar shift〉 and 〈seasonal changes of the Earth rotation speed〉 have been listed as three key subjects to study. However, through 200 years' collective research of scientists in different countries, except that the 〈axial precession and nutation〉 was solved by gravity force interaction theory, the excitation factors of the 〈polar shift〉 and the 〈seasonal changes of earth rotation speed〉 still remain in specious and ambiguous status. Through the review of several years' studies on the 〈seasonal changes of earth rotation speed〉, China astronomer, Ye Shuhua and his research group pointed out that “all so called excitation factors of seasonal changes of the Earth rotation speed, which were thought to be main ones in the past, appear not main factors at present (Yu Zhiying, 1974). Therefore, both issues of 〈polar shift〉 and 〈seasonal changes of the Earth rotation speed〉 are listed as scientific puzzles, which are expected to be solved in the 21th century.

Actually, excitation sources of these two puzzles are congenetic. However, their come-into -being is in different sequence. Without prior solution on 〈polar shift〉 issue, the 〈seasonal changes of the Earth rotation speed〉 issue can not be solved. In 2006, Song Guanyi's “Genesis of polar shift and the characteristics of its movement” was published. Then the issue of 〈seasonal changes of the Earth rotation speed〉 was solved at once (Song Guanyi, 2007, 2011).

(3) Issue of heat source inside the Earth

The issue of heat source inside the Earth has been a fundamental issue that geoscientists focus on. Until now, it is recognized that heat source inside the Earth might come from three parts: 1) Heat energy comes from the disintegration of radioactive elements, 2) Heat energy transformed from potential energy of gravity because of sinking of inner earth materials, 3) potential heat, released from constant crystallization and solidification of liquid in outer core of the Earth.

The abovementioned three sources of heat energy exist indeed according to the theory. But, the summation of the heat does not match with that released from the inner Earth since the Earth was formed. Thus the heat source inside the Earth still remains to be an enigma.

Photons, irradiated on the Earth surface from the Sun, not only have energy, but also have momentum (Einstein, 1916 to 1917). Heat energy obtained by the Earth surface substances means that photons have energy indeed. And the **solar** radiation (light pressure), together with Earth rotation and evolution, existence of crossed angle between ecliptic and equator, Earth delamination structure, and disequilibrium distribution of Earth continent surface area in south and north hemisphere, has formed the function combination, which can trigger the Earth rotation axis to periodically “wobble” relatively to the inner structure position of the Earth.

In fact, the Earth rotation axis has been in “wobble” status along with the time. There probably also exists another one in the excitation sources, which makes the Earth rotation axis to “wobble” with the excitation cycle of one day and night. So, the polar shift, formed by this way, can be called as “instantaneous polar shift” (Song Guanyi, 2014). According to the genetic mechanism of polar shift (Song Guanyi, 2006, 2014), the polar shift is the shift of the Earth crust and mantle layers relative to Earth core. The friction force on the interface between the Earth crust-mantle and its core is transformed into heat energy ($Q=fd$, f is friction force; d is relative displacement between crust and mantle layers and earth core). The heat energy is released from the interface between mantle and Earth core, and forms a huge heat energy storeroom, which continuously releases energy outward.

4 Conclusions

The Solar system is an organic body (cell) with independent evolutionary function. The Earth is a component part of the organic body. It does not have the ability of self-evolution and survival independently. But it is a kind of natural organic system, which is formed relying on the respective and special function factors combination between the Sun and the Earth, and it has the “life” character. Through the inner function combination organism, the system naturally and effectively transfers solar energy source (force source) to the Earth and provides the huge, constant and

continuous energy source (force source) for the Earth's survival and its evolution.

The presentation of the theory of (light-pressure) repulsive force interaction is a carrying-forward and development of the "special relativity", and it is a new achievement after Einstein's discovery of photons and their momentum characters. In generally speaking, the quantum theory deals with physical issues in microworld. However, the photon mechanical characters not only belong to the physical issue in micro world, but also belong to the physical issue in macro world. The presentation of the theory of (light-pressure) repulsive force interaction provides the theoretical support for explaining the kinetic coupling relationship among the Sun, planets and other objects within solar system by using the viewpoint of system theory, and has changed the former notion that only single gravity force interaction theory is used to explain the Earth kinetics issues. The (light-pressure) repulsive force interaction and gravity force interaction are two main macro dynamical sources, which are objectively existent in the physical world and have contrary functions with each other. The opposition and unification of the two macro dynamical sources play a decisive role in the evolution process of stars and more galaxies in universe.

Using the traditional thinking model, some geoscientists recognised that the force sources (energy source) of the Earth crust movement (including different kinds of geological structure activities), and the excitation sources of the polar shift and the seasonal changes of earth rotation speed etc unquestionably come from the Earth inside. However, after 200 years' continuous probing by geoscientist community, the above issues are still left there without progress. Now, using the system theory to study the Earth dynamics, we discover there are natural energy (momentum) coupling relationship existing between the Sun and the Earth, which leads to the direct solution of the abovementioned issues. Therefore, some of the basic notions of traditional geoscience need to be reconfirmed.

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