Harmonic dynamic of the Earth (A)

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Abstract. The harmonic motion phenomenon of the earth is introduced through experiments: Under the combined action of tidal force and the earth's rotation, continental unit body segments, like caterpillars, actively crawl westward on the mantle. Instead of passively disorder-drifting. The Earth is a natural harmonic reducer, which push the driving force of continental drift and is the output torque after amplified by the Earth's rotational resistance torque. Based on the force analysis of the Earth motion process and the generalized hooke's law, the harmonic motion equation and the crustal motion equation of the Earth are derived. The velocity field of the crustal latitudinal movement is calculated, and compared with the measured value of ITRF2000 station. From the perspective of kinematics, it is proved that the harmonic motion of the Earth is the basic dynamic mechanism of the crust and inside of the Earth movement. The degree of dominance which this dynamic process to the continental drift is 72% to 97.4%. It's energy comes from the rotation energy of the Earth. Using the results of motion calculation to was reconstructed the ancient continent, that was it moment of started cracked at before 250 million years. It is pointed out that the velocity direction of ITRF2000 is the movement direction relative to the "no net rotation" datum of the earth's surface. rather than the direction of motion of the crust relative to the mantle.

1 Introduction

In 1912, German scientist A. L. Wegener proposed the theory of continental drift. In explaining the driving forces of continental drift, this theory suggests that under the gravitational pull of the sun and moon, continents will lag behind the overall rotation of the Earth. However, people at that time believed that the tidal force was too small to drive the continent to drift long distances.

At present, in explaining the driving force of crustal movement, the mantle convection of A. Holmes is still a dominant hypothesis.

In 1994, the author noticed when studying machines in nature that the Earth and other celestial bodies were actually some huge harmonic reducers. When the solid tide propel on these celestial bodies, the inner layers of the celestial bodies will relative to move each other due to different elastic modulus. At the beginning of 1996, the author made a brief introduction to the harmonic motion principle of the Earth and its application in the form of patent application, "zero increment line method Earthquake prediction system" (application no. : 96101651.5 public no. : CN 1134554A).

Harmonic motion is a very common physical phenomenon, such as creep move, roll squeeze, etc. Not only the caterpillars use harmonic motion to move, humans have even made hula hoops, rolling mills, harmonic reducers, etc. toys and equipment. However, before 1994, no one paid attention to and systematically studied the basic laws of this kind movement. Also no one has noticed that tectonic movement is the harmonic motion of the Earth. The principle of harmonic motion of the Earth ended humans long-term guess on the process of Earth's internal movement. Proves the theory of continental drift is correct. The precise quantitative relationship between the velocity field of the Earth's crust and the variables of the dynamic process of the Earth's interior is established. It has laid a new theoretical foundation for the development of geodynamics, geophysics, geology and palaeogeography, as well as the realization of Earthquake prediction technology. Especially in terms of plate motion, the driving force of continental drift, and the cause of earthquakes, the principle of the earth's harmonic motion will have a profound impact on traditional ideas.

The Earth's harmonic dynamic process will be discussed in three papers:

(A) The harmonic motion phenomenon was introduced through experiments, the equation of harmonic motion of the Earth was derived, and the latitudinal motion of the crust and the Earth's interior was calculated.

(B) This paper introduces the driving force amplification mechanism of the Earth's harmonic dynamic process and the calculation method of driving force distribution and energy conversion. The formation process of Earthquakes is discussed.

(C) The mathematical model of the earth's meridional motion is established, and the equation of the earth's meridional motion is derived. Using the theoretical velocity field of global continental motion, it is compared with the measured value at ITRF2000 station.

In order to make the observation data have uniqueness in the interpretation of the dynamic process.This series of papers, for the first time in the field of geodynamics use that the studying method of the dynamic process of the internal combustion engines. First, use kinematic analysis, dynamic calculation and energy conversion calculation to determine the velocity field, driving force and energy consumption of the Earth's harmonic dynamic process. Then, compare with the measured value. Determine from multiple angles numerous the observation data whether are produced by this dynamic process, and draw conclusions. Since the argument process involves multiple disciplines and the author's level is limited, welcome everybody criticism to point out mistakes.

2 Basic Principles

2.1 Harmonic motion

Harmonic motion refers to the relative movement of different media along the wave advancing direction when the wave is propelling at the contact surface of the medium (Xianwu, 2020). For example: When a deflated bicycle wheel rolls, the tire moves relative to the rim. When the body is shakening, the hula hoop moves around the waist. During the operation of the harmonic reducer, the movement of the flexible wheel relative to the rigid wheel, etc.

In the process of circle harmonic motion, the softer layer always moves faster along the advancing direction of the wave than the harder layer.

The circular harmonic motion of elastic body rigid wheel and flexible wheel in full contact along the circumference can be divided into two kinds of motion: one is geometric motion and the other is compression motion.

Geometric movement refers to the relative movement caused by the difference between the circumference of the rigid wheel, and the flexible wheel of unit radial thickness when the length of the flexible wheel is constant during the harmonic movement. Here, the geometric displacement is represented by S_1, and $\Delta l_{\max}$ represents the maximum protrusion of the flexible wheel relative to the rigid wheel. When the maximum protrusion are two points symmetric. By comparing the geometric relationship between this two wheels, we can see that:

$$S_1 = \pi \ \Delta l_{\max}$$

Compression movement is the movement caused by the rigid wheel compressing the flexible wheel to change the circumference. The compression movement is expressed in S_2, and H is the radius of rigid wheel:

$$S_2 = 2\pi H \ \Delta l_{\max}$$

The reducer can be used to reduce the speed and increase the torque. When the car is in low gear, the gearbox is a typical reducer. The small torque from the engine can push the vehicle up a steep slope after being decelerated and amplified.

The tidal force is small and the height of the solid tide is not large. But the driving force that pushes continents to drift, or form earthquakes, is the rotation drag moment after amplifies of the Earth.It is not the tidal force.

The Earth is natural harmonic reducer. The calculation results show that the solid tide advances along the equator at a velocity of 1667 km per hour under the traction of the Earth's rotational resistance moment. This causes the crust to move at a velocity of 0.000013 m/h relative to 10km below the surface. This a deceleration process has a 128×10^9 transmission ratio. In other words, the driving force that propels the movement of the continent is the output torque after the Earth has amplified the rotation resistance torque by 128×10^9 times.

In the analysis of the combined effect of tidal forces and earth rotation, Ought to pay attention to the earth's harmonic deceleration effect.

2.2 Tidal force

The tidal force of the sun, can be expressed by the vector difference $\vec{F}$ between the solar gravitation $\overrightarrow{Q_y}$ of any particle on the Earth, and the solar gravitation $\vec{P}$ when this particle is in the center of the Earth. Here, the unit body is used instead of the particle, and the latitude of the sunlight direct point is taken as ζ. When ζ =0, the solar tide force on a unit body, as shown in figure 01A. Use the three components after the small quantity was omitted, expressed as:

$F_1 \approx 2GM\rho R^{-3}H\cos\beta\sin\alpha$, (direction: $// \, y$) (1)

$F_3 \approx GM\rho R^{-3}H\cos\beta\cos\alpha$, (direction: $// \, x$) (2)

$F_4 \approx GM\rho R^{-3}H\sin\beta$, (direction: $// \, z$) (3)

G , Gravitational constant. M , Solar mass. ρ , unit body density. R , distance from the sun to the center of the Earth. H , unit body to geocentric distance. β , the angle between the line connecting from unit body to the center of the Earth, with the equatorial plane. The unit body N rotates with the Earth, as shown in Figure 01B, it is closest to the sun at point b , which is called the near point. Point d is the farthest point, called the far point. α , running angle of unit body, at $\pi/2$ before of the near point b , α =0. Axis y points to the sun, yox is the equatorial plane.

F_1 according to the sine change of angle α reach the maximum value at the near point b or the far point d . The unit body is said to be at the peak point, it's zero at the point for equal distance with this two points, which is the valley point a or c .

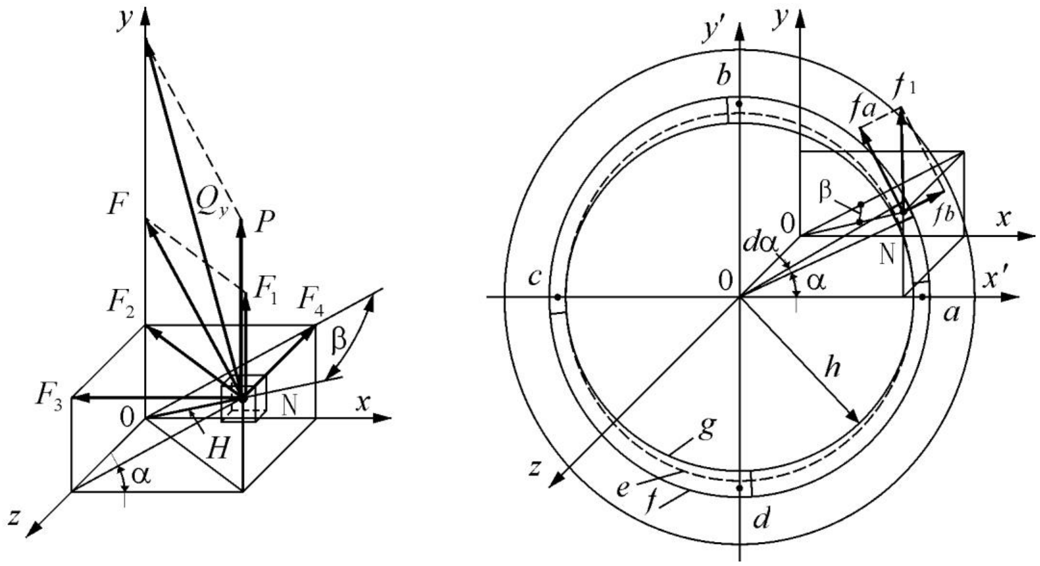
3 Analysis of the Earth's Harmonic Motion

3.1 Compression movement

First, it is assumed that the Earth will not be affected by tidal force during its operation, so, all parts of the Earth are in a state of stress equilibrium. Within the Earth, choose one fan-shaped unit body N , the length of the inner edge, the radial height and the axial thickness are all 1, its 4 the side edge extension lines, pass through and are perpendicular to the Earth axis, see figure 01B. Connect of all unit bodies located in the the same one rotation radius of the Earth, become one unit body circle layer. Then, all circle layers distributed continuously along the Earth's rotation radius is connected into a Earth slice , use the Earth slices make up the Earth. The Earth rotates under the stress state of this time, there will be no harmonic motion, and the stress of each part is regarded as zero.

Then, restore the tide force on each point of this zero-stress Earth. And the internal stress caused by these forces to research. Under the assumption that the motion resistance between the unit body circle layer is very tiny, to calculate the interstratum movement. Finally, the calculation results are corrected to the actual state.

All unit bodies of the same one depth, to form a hollow sphere with one thickness of 1. The sphere is in force equilibrium under the action of tidal forces, along the direction parallel to the y -axis. Cut this sphere with a plane parallel to xoz . A spherical shell with a space region Ω is obtained in the positive direction of the y -axis. The inner radius of the spherical shell is H_1, outer radius is $H_1 + 1$, as shown in figure 02B. Starting from the positive direction of the y -axis, connected to the circle with the average radius of the cut surface through the origin, this angle is θ_A. When we only study the role of F_1, the spherical shell is balanced by two resultants forces parallel to the y -axis and opposite to each other: One resultant



A B

Figure 01: Tidal force , the unit body circle layer movement process and force analysis.

force is the tidal force $\sum F_1$ on the spherical shell. The other is the spherical shell cut surface tensile force $\sum f_{11}$. Find $\sum F_1$:

$$\sum F_1 = \iiint_{\Omega} F_1 \cdot H \sin\theta_1 d\Phi_{11} \cdot H d\theta_1 \cdot dH \,, \tag{4}$$

$$\because 1-\cos^2\beta\sin^2\alpha = \sin^2\theta_1,$$

$\therefore$ Let $Q = 2GM\rho R^{-3}$, then $F_1 = QH\cos\theta_1$, after integral, take $\theta_A = \theta_1,\ H_1 = H$,

$$\sum F_1 = \int_0^{2\pi} d\Phi_{11} \int_0^{\theta_A} \cos\theta_1 \sin\theta_1 d\theta_1 \int_{H_1}^{H_1+1} QH^3 dH \,,$$

$$\approx \pi\ QH^3(1-\cos^2\beta\sin^2\alpha) \,, \tag{5}$$

The quantity of the unit body at the cut surface of the spherical shell is:

$$2\pi H\sin\theta_1 = 2\pi H(1-\cos^2\beta\sin^2\alpha)^{\frac{1}{2}} \,,$$

Then, on the spherical shell of the other side , the pulling force of each unit body caused by $\sum F_1$ is f_1,

$$f_1 = \frac{1}{2}QH^2(1-\cos^2\beta\sin^2\alpha)^{\frac{1}{2}}, \qquad \text{(direction: } /\!/\ y\text{)} \qquad (6)$$

On the unit body circle layer perpendicular to the cut surface of the spherical shell, see figure 01B. When the unit body N is regarded as being inseparable from the unit body below it along the radius of the circle layer, f_1 is decomposed into f_a and f_b, $f_b = f_1\sin\alpha$, along the radius direction of the unit body circle layer. $f_a = f_1\cos\alpha$, along the tangent direction. Then, the unit body N in the first quadrant, the stress σ_r caused by f_b acting alone:

$$\sigma_r = \frac{1}{2}QH^2\sin\alpha(1-\cos^2\beta\sin^2\alpha)^{\frac{1}{2}}, \qquad (7)$$

Stress σ_e caused by f_a:

$$\sigma_e = \frac{1}{2}QH^2\cos\alpha(1-\cos^2\beta\sin^2\alpha)^{\frac{1}{2}}, \qquad (8)$$

The unit body N, no force in the Z-axis direction:

$$\sigma_z = 0, \qquad (9)$$

According to Generalized Hook's Law（Hao et al., 1992）,

$$\varepsilon_e = E^{-1}\left[\sigma_e - \nu(\sigma_r + \sigma_z)\right], \qquad (10)$$

$$\varepsilon_z = E^{-1}\left[\sigma_z - \nu(\sigma_r + \sigma_e)\right], \qquad (11)$$

$$\varepsilon_r = E^{-1}\left[\sigma_r - \nu(\sigma_e + \sigma_z)\right], \qquad (12)$$

E, Elastic modulus of the unit body. ν, Poisson's ratio. ε_e, ε_z and ε_r they are the line strain in the east-west direction, along the Earth axis direction, and along the unit body circle layer radius direction. By substituting σ_r, σ_e and σ_z, we can get:

$$\varepsilon_e = \frac{1}{2}E^{-1}QH^2(1-\cos^2\beta\sin^2\alpha)^{\frac{1}{2}}(\cos\alpha - \nu\sin\alpha), \qquad (13)$$

$$\varepsilon_z = -\frac{1}{2}\nu E^{-1}QH^2(1-\cos^2\beta\sin^2\alpha)^{\frac{1}{2}}(\cos\alpha + \sin\alpha), \qquad (14)$$

$$\varepsilon_r = \frac{1}{2}E^{-1}QH^2(1-\cos^2\beta\sin^2\alpha)^{\frac{1}{2}}(\sin\alpha - \nu\cos\alpha), \qquad (15)$$

When the angle α is ωt, the length increment l_2 in the east-west direction of the unit body N is:

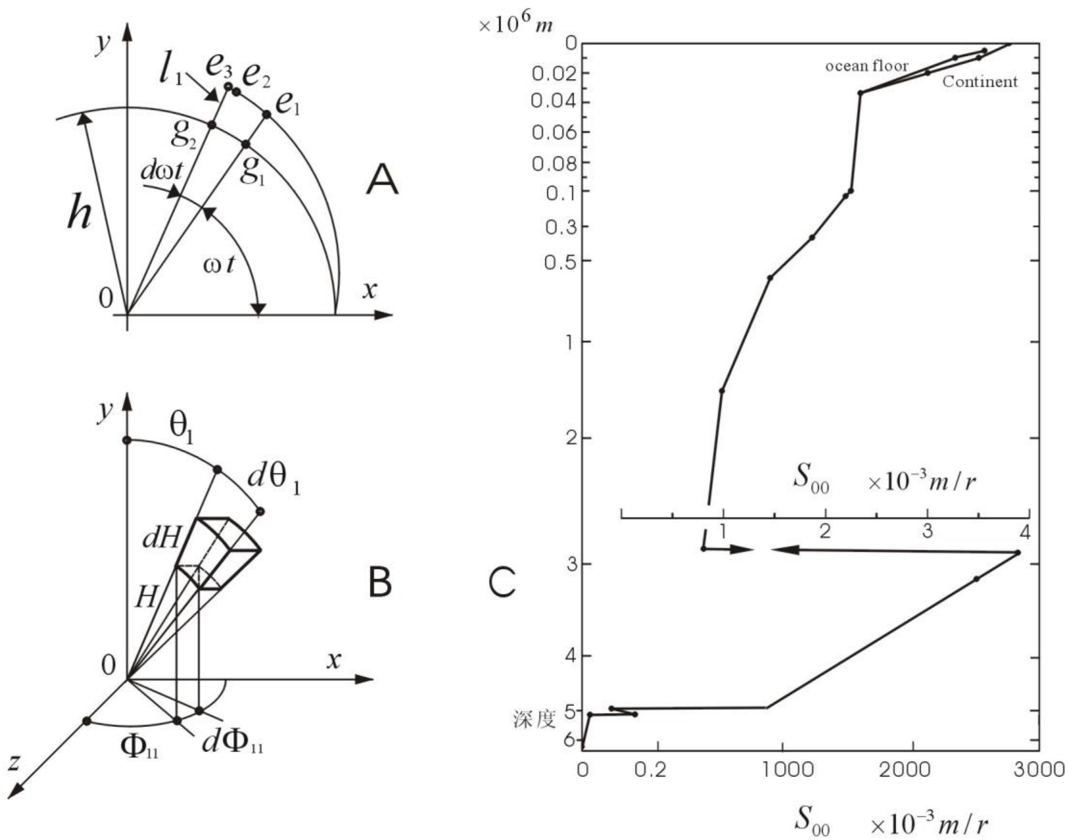


Figure 02: Motion analysis of the unit body, and the westward movement quantity distribution inside the Earth.

$$l_2 = 1 \cdot \varepsilon_e(\alpha = \omega t) - 1 \cdot \varepsilon_e(\alpha = 0),$$

$$= \frac{1}{2} E^{-1} Q H^2 \left[(1 - \cos^2 \beta \sin^2 \omega t)^{\frac{1}{2}} (\cos \omega t - \nu \sin \omega t) - 1 \right], \tag{16}$$

1 is the unit body side length. The radial length increment of N is l_1,

$$l_1 = 1 \cdot \varepsilon_r(\alpha = \omega t) - 1 \cdot \varepsilon_r(\alpha = 0),$$

$$= \frac{1}{2} E^{-1} Q H^2 \left[(1 - \cos^2 \beta \sin^2 \omega t)^{\frac{1}{2}} (\sin \omega t - \nu \cos \omega t) + \nu \right], \tag{17}$$

In the first quadrant, the compression movement quantity of the unit body N in time t relative to point a is S_{2X},

$$S_{2X} = \int_0^t 1^{-1} (-l_2) H \cos \beta \cdot \omega dt,$$

Substituting (16) into, and make the:

$$\sin\omega t(1-\cos^2\beta\sin^2\omega t)^{\frac{1}{2}}+\cos^{-1}\beta\arcsin(\cos\beta\sin\omega t)=K,$$

$$\cos\omega t(1-\cos^2\beta\sin^2\omega t)^{\frac{1}{2}}$$

$$+\sin^2\beta\cos^{-1}\beta\ \ln\left[\cos\omega t+\cos^{-1}\beta(1-\cos^2\beta\sin^2\omega t)^{\frac{1}{2}}\right]=W,$$

$1+\sin^2\beta\cos^{-1}\beta\ln(1+\cos^{-1}\beta)=U$, we can get such a result:

$$S_{2X}=E^{-1}GMR^{-3}\rho H^3\cos\beta(\omega t-\frac{1}{2}K-\frac{1}{2}\nu W+\frac{1}{2}\nu U), \quad (18)$$

3.2 Geometric movement

When the unit body, of the unit body circle layer where N is located passes through the valley point, the radial height will be reduced to the height equal to the distance between e, f. In terms of geometric movement, the underside of N should be considered to advance along e. In order to simplify the calculation, the contour g of the lower stratum unit body of N is regarded as the standard circle. At valley point a, use small angle $d\omega t$ to cut a small section of unit body with length $hd\omega t$ on g and e respectively, see Figure 01B and Figure 02A. h is the unit body circle layer radius, $h=H\cos\beta$. When these two small section of unit bodies turn from valley point a, to ωt, $d\omega t$ on g occupied the arc g_1g_2, it's the length is still $hd\omega t$. On the e, the length of e_1e_3 arc corresponding to this arc , increases to $(h+l_1)d\omega t$. Because the geometric movement refers to the movement of the unit body along the direction of motion when the length is constant, so, the unit body segment of cutting by g_1g_2 and e_1e_3 at a, its the side length, at ωt still $h\ d\omega t$. When e_1 is regarded as not moving relative to g_1, the unit body in e_1e_3 only occupies e_1e_2, and the arc length of e_1e_2 is $hd\omega t$. This means that e_1e_2 and its eastern unit body must move westward by a distance of e_2e_3 relative to its lower stratum. The length of e_2e_3 is $(h+l_1)d\omega t-h\ d\omega t$. Otherwise, the unit body in e_1e_2 will be stretched. In fact, e_1 is moving with respect to the g_1 point. The unit body in e_1e_2 also moves westward in the same way. In this way, in quadrants 1 and 3, from the unit body N of located at ωt, all the way to the unit body at point a with high friction. All small unit body segments, in the rotation of the Earth, all use this pulling moving process, relative to the below unit body, move west. In quadrants 2 and 4, moving westward relative to the below stratum, is the opposite pushing with it process. The whole process looks like g scrolling in e. In quadrant 1, When N is relative to t =0 in time t, the geometric movement quantity S_1 of the relative to its lower stratum unit body:

$$S_1 = \int_0^t 1^{-1}(h + l_1 - h)\omega dt = \int_0^t l_1 \omega dt \,,$$

$$= E^{-1} GMR^{-3} \rho H^2 (v\omega t - \frac{1}{2}W - \frac{1}{2}vK + \frac{1}{2}U), \tag{19}$$

The geometric movement quantity S_{1n} that the unit body N relative to its lower n stratum unit body.

$$S_{1n} = \int_0^t (h + \sum_{i=1}^{n} l_{1i} - h)\omega dt = \int_0^t (\sum_{i=1}^{n} l_{1i})\omega dt = \sum_{i=1}^{n} S_{1i} \,, \qquad (i = 1,\ 2,\ 3, \ldots\ldots n) \tag{20}$$

i, from the unit body N to its lower, 1, 2, 3, …… n stratum the unit body.

3.3 The equation of harmonic motion for continuous circle layer

(18) and (19) Equation shows that, when the elastic modulus of the unit body $E \to \infty$, the geometric movement quantity S_1 and the relative compression movement quantity S_{2X} of the unit body tend to be zero. So, consider the Earth axis as an axis with a radius of 1, $E \to \infty$, it can be used as a datum axis of harmonic motion of the Earth. This axis rotates with the rest of the Earth at a uniform angular velocity ω, however, in terms of harmonic motion, both S_1 and S_{2X} of the datum axis are zero. The relative compression movement quantity S_{2X} is the difference between the arc length passed of the unit body N turned in harmonic motion relative to the point a and the arc length passed of the unit body N turned without harmonic motion. Therefore, S_{2X} is also the compression movement quantity S_{20} of the unit body N relative to the datum axis. The geometric movement quantity S_1 between stratums is accumulated along the radius of the Earth slice, to the Earth axis. The result is the geometric movement quantity S_{10}. It is also the movement of the unit body N relative to the datum axis. In addition, σ_e in quadrant 4 and σ_r in quadrant 2 are the same as formulas (8) and (7), respectively, the σ_e in quadrant 2 and 3 and the σ_r in quadrant 3 and 4 are respectively:

$$\sigma_e = \frac{1}{2} QH^2 (-\cos\alpha)(1 - \cos^2 \beta \sin^2 \alpha)^{\frac{1}{2}}, \tag{21}$$

$$\sigma_r = \frac{1}{2} QH^2 (-\sin\alpha)(1 - \cos^2 \beta \sin^2 \alpha)^{\frac{1}{2}}, \tag{22}$$

Referring to the derivation method of the first quadrant S_{2X}, S_{2X} in quadrants 2, 3 and 4 can be obtained. The sum of S_{2X} in the passed quadrant and S_{2X} of the quadrant in progress, of the unit body N, it's the compression movement quantity S_{20}

of relative to the datum axis in time t. S_1 in quadrants 2, 3and 4, is also obtained by the above method. In addition, the effect of F_3 and F_4 on the harmonic motion can be compensated in the creep coefficient η, on the calculation of the drift velocity in units of years. Here, F_3 and F_4 are not considered for the time being. So, at small resistance force state, when $\zeta = 0$, Earth's harmonic motion equation :

$$S_0 = S_{10} + S_{20},$$

$$S_{10} = \sum_{i=1}^{n} S_{1i}\ , \qquad (i = 1,\ 2,\ 3,\ \ldots\ldots n)$$

$$S_1 = \Omega(2\nu\omega t - W - \nu K + U), \qquad (0 < \omega t \le \tfrac{1}{2}\pi)$$

$$= \Omega(2\nu\omega t - W + \nu K + U - 2\nu J), \qquad (\tfrac{1}{2}\pi < \omega t \le \pi)$$

$$= \Omega(2\nu\omega t + W + \nu K + U - 2\nu J - 2P), \qquad (\pi < \omega t \le \tfrac{3}{2}\pi)$$

$$= \Omega(2\nu\omega t + W - \nu K + U - 4\nu J - 2P), \qquad (\tfrac{3}{2}\pi < \omega t \le 2\pi)$$

$$S_{20} = \Psi(2\omega t - K - \nu W + \nu U), \qquad (0 < \omega t \le \tfrac{1}{2}\pi)$$

$$= \Psi(2\omega t + K - \nu W + \nu U - 2J), \qquad (\tfrac{1}{2}\pi < \omega t \le \pi)$$

$$= \Psi(2\omega t + K + \nu W + \nu U - 2J - 2\nu P), \qquad (\pi < \omega t \le \tfrac{3}{2}\pi)$$

$$= \Psi(2\omega t - K + \nu W + \nu U - 4J - 2\nu P), \qquad (\tfrac{3}{2}\pi < \omega t \le 2\pi)$$

$$\Omega = \frac{1}{2} E^{-1} GMR^{-3} \rho H^2\ ,$$

$$\Psi = \frac{1}{2} E^{-1} GMR^{-3} \rho H^3 \cos\beta\ ,$$

$$U = 1 + \sin^2\beta \cos^{-1}\beta \ln(1 + \cos^{-1}\beta),$$

$$J = \sin\beta + \cos^{-1}\beta \arcsin(\cos\beta),$$

$$P = -1 + \sin^2\beta \cos^{-1}\beta \ln(-1 + \cos^{-1}\beta),$$

$$K = \sin\omega t(1 - \cos^2\beta \sin^2\omega t)^{\frac{1}{2}} + \cos^{-1}\beta \arcsin(\cos\beta \sin\omega t),$$

$$W = \cos\omega t(1 - \cos^2\beta \sin^2\omega t)^{\frac{1}{2}} +$$

$$\sin^2\beta\cos^{-1}\beta\ln\left[\cos\omega t+\cos^{-1}\beta(1-\cos^2\beta\sin^2\omega t)^{\frac{1}{2}}\right],$$

$$(\beta\neq 0,\beta\neq\frac{\pi}{2}) \tag{23}$$

i, from the calculates unit body, along the radius of the Earth slice to 1, 2, 3, ……n stratum unit body. S_0 is the westward movement quantity of N relative to the datum axis, the rest of the symbols have the same meaning as at front.

When $\beta\to 0$, $\omega t=2\pi$, the above formula is:

$$S_0=S_{10}+S_{20},$$

$$S_{10}=\sum_{i=1}^{n}S_{1i}, \qquad (i=1,\ 2,\ 3,\ \ldots\ldots n)$$

$$S_1=2.718624(\nu+2\cdot\pi^{-1})\ H^2\rho E^{-1}\times 10^{-13}\ (m/m\cdot r),$$

$$S_{20}=2.718624(1+2\nu\cdot\pi^{-1})\ H^3\rho E^{-1}\times 10^{-13}\ (m/r), \tag{24}$$

The meaning of symbols are the same as (23). The unit of H is m, ρ is $kg\cdot m^{-3}$, E is P_a.

Equation (23) combined with the following correction method, can be used to calculate the westward movement quantity that the unit body of any latitude and depth at $\zeta=0$ state relative to the datum axis within time t, under the action the solar tidal force.

It can also be used to calculate the westward movement quantity of the unit body under the effect of the moon's tidal force. When used, The y-axis points to the moon. M the mass of the moon. R the distance from the moon to the center of the Earth. ζ, latitude of the moonlight direct point. ω is Earth the spin angular velocity relative to the moon. Equation (24) is suitable for calculating the annual average movement quantity of the unit body near the equator. The calculation results must also be corrected. The annual average movement quantity is only related to the tidal force of the moon. Because when the tidal force of the sun and the moon is superimposed, the increase in the height of the solid tide around the first and fifteenth days of the lunar calendar is roughly offset by the decrease around the eighth and twenty-third days. The annual average movement quantity is the drift velocity that people often say.

3.4 Crustal motion equation

The unit body circle layer in the Earth's crust , most of are discontinuous Ocean floor and continent alternate. As can be seen from (24), when ωt is an integer multiple of 2π, both the compression movement and the geometric movement quantity

Table 1: Westward drift velocity distribution in the deep part of the Earth.

symbol	Unit	A	B	C	D	I	J	K	L	N	P	W
E	$\times 10^{11}\mathrm{P_a}$	1.76	2.1	3.2	6	7.73			1.51	0.6	5.93	∞
ν		0.3	0.3	0.29	0.27	0.3			0.479	0.492	0.425	
ρ	$\times 10^{3}\mathrm{kg/m^3}$	3.4	3.6	4	5	9.3	9.7	12	12	12.5	12.7	
H	$\times 10^{6}\mathrm{m}$	6.24	6	5.77	4.87	3.5	3.47	3.2	1.39	1.27	1.25	10^{-6}
S_1	$\times 10^{-7}\mathrm{m/m\cdot r}$	1.916	1.572	1.049	0.487	0.375	3.297	3.297	0.466	1.031	0.097	0
S_{10}	m/r	0.908	0.866	0.836	0.767	0.708	0.702	0.613	0.016	0.007	0.006	0
S_{20}	m/r	1.520	1.199	0.773	0.307	0.167	2.288	2.110	0.076	0.153	0.015	0
S_0	m/r	2.428	2.065	1.609	1.074	0.875	2.990	2.723	0.092	0.160	0.021	0
S_{00}	$\times 10^{-3}m/r$	2.199	1.870	1.457	0.973	0.792	2708	2466	0.083	0.145	0.019	0

$\theta = \beta \to 0 \qquad \eta = 0.90555\times 10^{-3}$

are proportional to the number of spin of the Earth. In addition, the movement of each unit body segment in the same circle layer push each other, so:

$S_{ZB} = S_Z + S_B$,

$S_Z = (2\pi)^{-1}\delta S_{00}$,

$$S_B = (2\pi)^{-1}\sum_{i=1}^{n}\eta_{1i}\delta_i S_{00i} + (2\pi)^{-1}\sum_{k=1}^{k}\delta_k S_{00k} \text{ ,} \qquad (i = 1,\ 2,\ 3,\ \ldots\ldots n,\ k = 1,\ 2,\ 3,\ \ldots\ldots n) \qquad (25)$$

When 1 rotation per rotation of the Earth relative to the moon, S_{ZB} ,S_Z ,S_B , S_{00} respectively are the westward movement quantity, the automatic westward movement quantity, the passive westward movement quantity, and the actual westward movement quantity of the unit body relative the datum axis. i , is from the west side of the calculates continent or ocean floor westward, to the damping point 1, 2, 3, $\ldots\ldots n$ continent or ocean floor. S_{00i} is S_{00} of i -th continent or ocean floor. δ , center angle of the unit body segment that continent or ocean floor is calculating, on the slice of the Earth. δ_i is δ of i -th continent or ocean floor.

Table 2: Westward drift velocity distribution of mantle and crust.

symbol	Unit	continent A_1	B_1	C_1	D_1	I_1	Ocean A_2	B_2	D_2	I_2	W
E	$\times 10^{11} P_a$	0.652	0.753	1.004	1.601	1.703	(0.7357)	(0.8457)	1.601	1.703	∞
ν		0.253	0.254	0.254	0.272	0.273	0.254	0.254	0.272	0.273	
ρ	$\times 10^3 kg/m^3$	2.6	2.7	3	3.3	3.4	2.7	2.8	3.3	3.4	
H	$\times 10^6 m$	6.37	6.36	6.35	6.337	6.27	6.365	6.36	6.337	6.27	10^{-6}
S_1	$\times 10^{-7} m/m \cdot r$	3.915	3.513	2.918	2.045	1.941	3.601	3.244	2.045	1.941	0
S_{10}	m/r	0.937	0.933	0.930	0.927	0.914	0.935	0.9331	0.927	0.914	0
S_{20}	m/r	3.254	2.913	2.417	1.673	1.571	2.989	2.6902	1.673	1.571	0
S_0	m/r	4.191	3.846	3.347	2.600	2.485	3.924	3.6233	2.600	2.485	0
S_{00}	$\times 10^{-3} m/r$	3.795	3.483	3.031	2.354	2.250	3.553	3.2811	2.354	2.250	0
		3.639					3.553				

$\theta = \beta \to 0 \qquad \eta = 0.90555 \times 10^{-3}$

η_{1i} is the driving coefficient η_1 of the i-th continent or Ocean floor. k, from the damping point, westward to was calculated continent or the east side of the ocean floor, 1, 2, 3, …… n continent and ocean floor. S_{00k} is S_{00} of k-th continent or ocean floor. δ_k is δ of the k-th continent or ocean floor.

At the surface of the Earth, β is equal to latitude θ, S_{10} in the (23) , is accumulated along $H\cos\beta$. When $\omega t = 2\pi$, use $\beta = 0°$, $30°$, $60°$, $\nu = 0.3$, $\pi = 3.14$, to substitute S_{10} and S_{20} in (23). It can be seen that both S_{10} and S_{20} are approximately proportional to $\cos\beta$, so, the ratio of S_0 at latitude θ to S_0 near the equator:

$$S_0(\beta = \theta)\left[S_0(\beta \to 0)\right]^{-1} \approx \cos\theta, \tag{26}$$

4 Creep correction and movement datum

4.1 Creep coefficient

In the course of the Earth's rotation, as the wave process progresses, the position of the unit body changes under force, and

Table 3: Westward drift velocity distribution of the Earth's crust.

Name	δ	S_Z $\times 10^{-3} m/r$	$\eta_1 S_Z$ $\times 10^{-3} m/r$	S_{ZB} $\times 10^{-3} m/r$	U_L mm/a	U_N mm/a	U_A mm/a
$\theta = 60^{\circ} N$, $\eta_1 = 0.9463$							
Atlantic	68°	0.3356	0.3176	1.7809	4.2	49.3	-0.9
Americas	↓ 102°	0.5155	0.4878	1.8086	14.0	59.1	8.9
Pacific Ocean	23°	0.1135	0.1074	1.7176	-18.2	26.9	-23.3
Eurasia	167°	0.8440	0.7987	1.7629	-2.2	42.9	-7.3
$\theta = 54.5^{\circ} N$, $\eta_1 = 0.9451$							
Atlantic	49°	0.2808	0.2654	2.0683	4.8	57.3	-1.1
Americas	↓ 74°	0.4344	0.4106	2.0921	13.3	65.7	7.4
Pacific Ocean	66°	0.3783	0.3575	1.9981	-20.0	32.4	-25.9
Kamchatka	7°	0.0411	0.0388	2.0004	-19.2	33.2	-25.1
Okhotsk Sea	18°	0.1032	0.0975	2.0061	-17.2	35.3	-23.1
Eurasia	118°	0.6926	0.6546	2.0441	-3.7	48.7	-9.6
Baltic Sea	10°	0.0573	0.0542	2.0472	-2.6	49.8	-8.5
Jutland pen.	2°	0.0117	0.0111	2.0478	-2.4	50.0	-8.3
North Sea	9°	0.0516	0.0488	2.0506	-1.4	51.0	-7.3
Great Britain	7°	0.0411	0.0388	2.0529	-0.6	51.8	-6.5
$\theta = 51.3^{\circ} N$, $\eta_1 = 0.9441$							
Atlantic	48°	0.2962	0.2796	2.2287	5.9	62.3	-0.5
Americas	↓ 72°	0.4550	0.4296	2.2541	14.9	71.3	8.5
Pacific Ocean	91°	0.5615	0.5301	2.1595	-18.6	37.8	-25.0
Eurasia	143°	0.9038	0.8533	2.2100	- 0.7	55.7	-7.1
North Sea	2.4°	0.0148	0.0140	2.2108	- 0.5	56.0	-6.8
London	3.6°	0.0228	0.0215	2.2121	0	56.5	-6.4
$\theta = 30^{\circ} N, \eta_1 = 0.8778$							
Atlantic	72°	0.6154	0.5402	3.0737	3.4	81.6	-5.4
Americas	↓ 35°	0.3064	0.2690	3.1111	16.6	94.8	7.8
Pacific Ocean	123°	1.0513	0.9228	2.8594	-72.5	5.7	-81.3
Asia and Africa	130°	1.1380	0.9989	2.9985	23.2	55.0	-32.0

continent $S_Z = 3.639\,\delta \cos\theta \cdot (360^{\circ})^{-1} \cdot 10^{-3} m/r$

ocean floor $S_Z = 3.553\,\delta \cos\theta \cdot (360^{\circ})^{-1} \cdot 10^{-3} m/r$

under the combined effect of stress and temperature, the unit body creep occurs, position changes turns into permanent deformation.

Obviously, the change of position in the elastic state of the rock, will not be completely transformed into permanent deformation after creep. In order to correct the movement of the small resistance state, become the actual state, creep coefficient η is introduced:

$$\eta = S_{00} \cdot S_0^{-1}, \tag{27}$$

The actual relative movement quantity S_{00X} of a unit body with respect to its lower n th stratum:

$$S_{00X} = S_{001} - S_{002} = \eta(S_{01} - S_{02}), \tag{28}$$

The lower subscript 1 represents S_{00} and S_0 of the calculates unit body, 2 represents S_{00} and S_0 of the n th stratum. Calculated by Kauai Island drifting 540 km to northwest in 4.2 million years. Point A_2 on the ocean floor at $21^{\circ}N$, relative to point B_2 at 5 km deep in the ocean floor, the actual relative movement quantity, to northwest is $0.129m/a$. The westward component is $0.10m/a$. Remove the expansion movement quantity of the ocean floor, assume is $0.01m/a$. Then, use equation (26) to convert it to the actual relative movement quantity $0.0964m/a$ of point A_2 to point B_2 on the ocean floor near the equator, or is $S_{00X} = 0.2723 \times 10^{-3}\ m/r$. In Table 2, point A_2, $S_{01} = 3.924\,m/r$, point B_2, $S_{02} = 3.6233\,m/r$, so:

$$\eta = 0.90555 \times 10^{-3}, \tag{29}$$

S_0 caused by the moon and S_{00} calculate by (27), for the annual average movement quantity, it can be considered that the movement quantity caused by the sun has been included.

4.2 Time of continental cracking

Calculation accuracy of continental crack initiation time, with related to the measurement accuracy of the annual average movement quantity on both sides of the Atlantic on the same latitude line. In addition, the drift velocity of the mid Atlantic Ridge needs to be measured. At present, there is no special measurement data in this regard. From the results of trial calculations, when the initial time of continental cracking was taken at 250 million years, the measured value of the velocity vector of most stations in ITRF2000 has only small deviation from the calculate value of the adjacent latitude continental.

4.3 Crustal movement datum

In velocity field, the choice of motion datum affects the size and direction of each velocity vector.

Suppose there are three boats of the same mass at sea, A, B and C are arranged in order from west to east, drift westward

Table 4: Westward drift velocity distribution of the Earth's crust.

Name	δ	S_Z $\times 10^{-3}\, m/r$	$\eta_1 S_Z$ $\times 10^{-3}\, m/r$	S_{ZB} $\times 10^{-3}\, m/r$	U_L mm/a	U_N mm/a	U_A mm/a
$\theta = 5^{o} N$， $\eta_1 = 0.9002$							
Atlantic	56 °	0.5506	0.4957	3.5306	2.1	92.0	-8.1
Americas	↓ 32 °	0.3222	0.2900	3.5628	13.5	103.4	3.3
Pacific Ocean	159 °	1.5633	1.4073	3.3633	-57.2	32.8	-67.3
Sumatra, etc	23 °	0.2316	0.2085	3.3864	-49.9	41.0	-59.1
Indian Ocean	47 °	0.4621	0.4160	3.4325	-32.7	57.3	-42.8
Africa	43 °	0.4330	0.3898	3.4757	-17.4	72.6	-27.5
$\theta = 0^{o}$， $\eta_1 = 0.9046$							
Atlantic	57 °	0.5626	0.5089	3.5450	2.4	92.7	-7.8
Americas	↓ 32 °	0.3235	0.2926	3.5759	13.3	103.6	3.2
Pacific Ocean	149 °	1.4705	1.3302	3.3750	-57.8	32.5	-67.9
Sumatra, etc	30 °	0.3032	0.2743	3.4039	-47.5	42.7	-57.7
Indian Ocean	58 °	0.5724	0.5178	3.4585	-28.2	62.1	-38.4
Africa	34 °	0.3437	0.3109	3.4913	-16.6	73.7	-26.8
$\theta = 10^{o} S$， $\eta_1 = 0.9329$							
Atlantic	50 °	0.4860	0.4534	3.4945	3.6	92.5	-6.4
Americas	↓ 41.5 °	0.4131	0.3854	3.5222	13.4	102.3	3.4
Pacific Ocean	130.5 °	1.2684	1.1833	3.3711	-40.1	48.8	-50.1
New Guinea, etc	30 °	0.2986	0.2786	3.3911	-33.0	55.9	-43.0
Indian Ocean	81 °	0.7873	0.7345	3.4439	-14.3	74.6	-24.4
Africa	27 °	0.2688	0.2508	3.4619	-8.0	80.9	-18.0

continent $S_Z = 3.639\,\delta \cos\theta \cdot (360^{o})^{-1} \cdot 10^{-3}\, m/r$

ocean floor $S_Z = 3.553\delta\, cos\,\theta \cdot (360^{o})^{-1} \cdot 10^{-3}\, m/r$

under the night. A the boat velocity $3km/h$, B boat $2km/h$, C boat $1km/h$. Each boat has a compass and rangefinder, and can only see each other's lights each the boat.

Take boat A as the datum, that is, standing on boat A to observe, boat B drifts east at velocity $1km/h$ and boat C drifts east at velocity $2km/h$.

Table 5: Westward drift velocity distribution of the Earth's crust.

Name	δ	S_Z $\times 10^{-3} m/r$	$\eta_1 S_Z$ $\times 10^{-3} m/r$	S_{ZB} $\times 10^{-3} m/r$	U_L mm/a	U_N mm/a	U_A mm/a
$\theta = 12.5^{o} S$, $\eta_1 = 0.9318$							
Atlantic	51 °	0.4914	0.4579	3.4599	1.9	90.1	-8.0
Americas ↓	39 °	0.3849	0.3586	3.4862	11.3	99.4	1.3
Pacific Ocean	139 °	1.3393	1.2480	3.3397	-40.6	47.6	-50.5
Cape York	1 °	0.0099	0.0092	3.3404	-40.4	47.8	-50.3
Gulf of Carpentaria	7 °	0.0674	0.0628	3.3450	-38.7	49.5	-48.6
Arnhem Land	6 °	0.0592	0.0552	3.3490	-37.3	50.9	-47.2
Indian Ocean	80 °	0.7708	0.7182	3.4016	-18.7	69.5	-28.6
Madagascar	1 °	0.0099	0.0092	3.4023	-18.4	69.7	-28.4
Mozambique Strait	8 °	0.0771	0.0718	3.4076	-16.6	71.6	-26.5
Africa	28 °	0.2763	0.2575	3.4264	-9.9	78.3	-19.8
$\theta = 30^{o} S$, $\eta_1 = 0.9236$							
Atlantic	67 °	0.5726	0.5289	3.0781	5.0	83.2	-3.9
Americas ↓	21 °	0.1838	0.1698	3.0921	9.9	88.1	1.1
Pacific Ocean	136 °	1.1624	1.0736	2.9448	-42.2	36.0	-51.0
Australia	38 °	0.3326	0.3072	2.9702	-33.2	45.0	-42.1
Indian Ocean	83 °	0.7094	0.6552	3.0244	-14.1	64.1	-22.9
Africa	15 °	0.1313	0.1213	3.0344	-10.5	67.7	-19.3

continent $S_Z = 3.639\,\delta \cos\theta \cdot (360^{o})^{-1} \cdot 10^{-3} m/r$

ocean floor $S_Z = 3.553\delta \cos\theta \cdot (360^{o})^{-1} \cdot 10^{-3} m/r$

Standing on boat C, boat A and boat B drifted westward.

Standing on boat B and observe. Boat A drifts west and boat C drifts east. The velocity of boat B to the observer is zero. Taking westward as positive, the velocity of boat A is $+1km/h$, and boat C is $-1km/h$. The sum of the angular momentum of the three boats to Earth axis is zero. This velocity field "no net rotation".

Converting the velocity vector of the ITRF2000 station into a two-dimensional graph can make the analysis of crustal motion more intuitive, Ma zongjin and Du pinren have done this work，(Zongjin and Pinren, 2007). It can be seen from the two-dimensional graph：If we look for the alternative datum on land in the ITRF2000 velocity field, that can consider it to be

Table 6: Westward drift velocity distribution of the Earth's crust.

Name	δ	S_Z $\times 10^{-3} m/r$	$\eta_1 S_Z$ $\times 10^{-3} m/r$	S_{ZB} $\times 10^{-3} m/r$	U_L mm/a	U_N mm/a	U_A mm/a
$\theta = 33^{\circ} S$, $\eta_1 = 0.9273$							
Atlantic ocean	70.5 °	0.5836	0.5412	2.9793	4.2	79.9	-4.4
Americas ↓	20 °	0.1696	0.1573	2.9916	8.5	84.3	0
Pacific Ocean	135.5 °	1.1216	1.0401	2.8556	-39.6	36.1	-48.1
Australia	18 °	0.1526	0.1415	2.8667	-35.7	40.0	-44.2
Great Australian Bay	9 °	0.0745	0.0691	2.8721	-33.8	41.9	-42.3
Australia	9.5 °	0.0805	0.0746	2.8780	-31.7	44.0	-40.2
Indian Ocean	87.5 °	0.7243	0.6716	2.9307	-13.0	62.7	-21.5
Africa	10 °	0.0848	0.0786	2.9369	-10.8	64.9	-19.3
$\theta = 40^{\circ} S$, $\eta_1 = 0.8886$							
Atlantic, etc	206 °	1.5574	1.3839	2.7146	1.5	70.7	-6.3
Americas ↓	12 °	0.0929	0.0826	2.7249	5.2	74.3	-2.6
Pacific Ocean	109 °	0.8240	0.7322	2.5132	-69.8	-0.6	-77.6
New Zealand	2 °	0.0155	0.0138	2.5149	-69.2	0	-77.0
Tasman Sea	27 °	0.2041	0.1814	2.5376	-61.1	8.0	-68.9
Bath Channel, etc	4 °	0.0310	0.0275	2.5411	-59.9	9.3	-67.7

continent $S_Z = 3.639\,\delta \cos\theta \cdot (360^{\circ})^{-1} \cdot 10^{-3} m/r$

ocean floor $S_Z = 3.553\delta\, cos\,\theta \cdot (360^{\circ})^{-1} \cdot 10^{-3} m/r$

located near the LPGS station in South America. It is tentatively designated as 0° , $9.1 \times 10^{-7} (°)/y$ here.

In this paper, the longitude line fixed at New Zealand $40°S$, $176°E$, South Americas $33^{\circ}S$, $60°W$, and Greenwich Observatory 0° are called New Zealand datum, South Americas datum and London datum respectively.

ITRF2000 "no net rotation" velocity field or South Americas datum velocity field. Its equivalent to applying a "net rotation" of $9.03 \times 10^{-7} (°)/a$ eastward to the velocity field of New Zealand datum. If it is larger, more than $10.06 \times 10^{-7} (°)/a$, whole velocity field will appear the illusion of "all continental drift to east".

In Figure 03B, comparing the observation values of ITRF2000 stations nearby the same latitude line, overall see that: ITRF2000 velocity field is only approximate "no net rotation", continent has the problem of "eastward movement faster".

The velocity field of ITRF2000 has no correlation with any other dynamic process that we can think of such as mantle convection. At present, humans still cannot use mantle convection or similar dynamic processes to establish crustal motion equations, driving force equations, and energy conversion equations. The velocity vector direction of ITRF2000 station is only a result of artificial "no net rotation", it does not represent the real direction of the crustal movement caused by the real dynamic process.

The velocity of crustal movement is composed of the meridional velocity and the latitudinal velocity. Its size and direction will change with the relative position and latitude of ocean and continent, as well as the change of astronomical state. The velocity field of harmonic motion of the Earth is the only one derived from the physical process, and it can be compared with the measured value of ITRF2000 one by one.

The zero-drift point of the ITRF2000 velocity field is the "no net rotation" point on the crustal surface. In fact, this point is constantly drifting westward relative to the mantle and inner core. The calculation results of harmonic motion of the Earth show that, near the equator,the velocity of the westward movement of continent relative to the center of solid inner core is $3.639 mm/r$, see Figure 02, table 1 and table 2. It relative to the bottom of the lower mantle is $2.847 mm/r$, and for the top of the upper mantle is $1.285 mm/r$.

If a net rotation of $9.03\times10^{-7}(°)/a$ to the west is applied to ITRF2000, it convert to the New Zealand datum. Then, using the observation values of ITRF in each year and the zero increment line method, the crustal drift velocity change map similar to the satellite cloud map is drawn. Combined with the astronomical period of crustal movement in various places and the local Earthquake history, that will be the research direction to initially realize the high probability prediction of the global future epicenter, magnitude and earthquake occurrence time.

4.4 Datum Transformation

Choose different datum, we will get different calculation or measurement results. Let S_{ZB1} is S_{ZB} of the selected datum. S_{ZB2} is S_{ZB} of any continent or ocean floor at the calculation point. θ is the latitude of the calculation point. U_L, U_A and U_N are the drift velocities relative to the London datum, South Americas datum, and New Zealand datum, respectively. Then, the datum transformation equation can be derived from (26):

$$U_L = (S_{ZB2} - S_{ZB1}\cos\theta/\cos 51.3°)\times 354 \ , \tag{30}$$

$$U_A = (S_{ZB2} - S_{ZB1}\cos\theta/\cos 33°)\times 354 \ , \tag{31}$$

$$U_N = (S_{ZB2} - S_{ZB1}\cos\theta/\cos 40°)\times 354 \ , \tag{32}$$

For example: Calculate the drift velocity U_L at the $30°N$ in Americas relative to the London datum. Americas $S_{ZB} = 3.1111$ London's $S_{ZB} = 2.2121$, substituting (30):

$$U_L = (3.1111 - 2.2121\cos 30°/\cos 51.3°)\times 354 \approx 16.6 \ (\times 10^{-3} m/a),$$

If the result is negative, it means that the crust at this point moves eastward relative to the datum.

4.5 Drift velocity distribution inside the Earth

According to elastic mechanics, poisson's ratio ν can be determined by bulk elastic modulus κ and shear modulus μ, $\nu=(3\kappa-2\mu)(6\kappa+2\mu)^{-1}$. Elastic Modulus $E=3\kappa\nu$. For points J and K, Circle of each unit body per 1 rotation of the Earth $S_1=\pi\cdot\Delta l_y$, $S_{20}=2\pi h\cdot\Delta l_y$. $\Delta l_y=0.105\times10^{-6}m/m$ is according to the solid tide high $0.3m$ to calculate the elongation of the liquid stratum unit body along a Earth slice radius, near the equator. E, ρ, ν is from reference （Wyllie, 1978; Allen, 1976）.

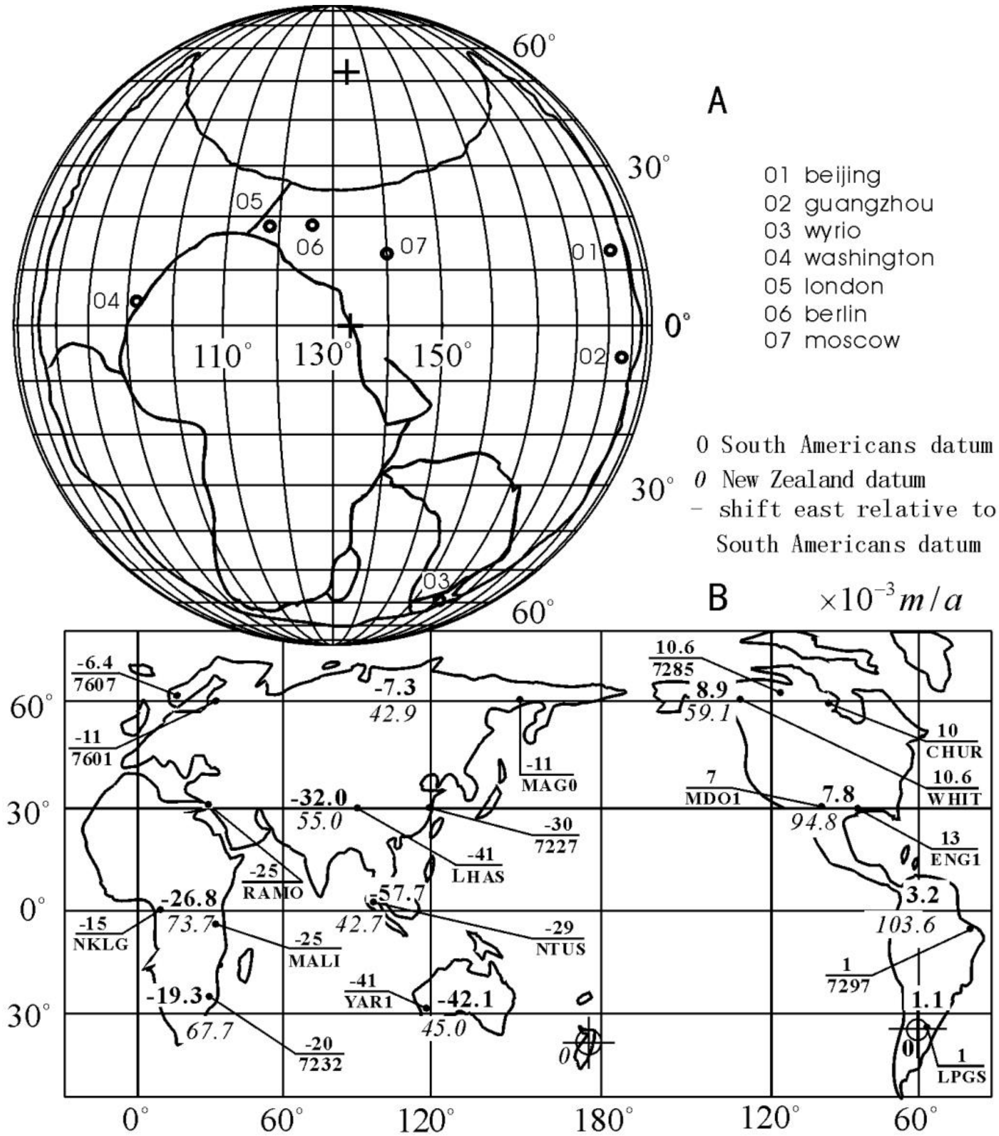
Use equation (24) to calculate S_0 at various points inside the Earth near the equator, Then make creep correction to get S_{00}. The raw data and calculation results of each point are listed in Tables 1 and 2. Figure 02C is a distribution curve of the westward movement quantity in the Earth's interior near the equator, based on tables 1 and 2. The annual movement quantity is 354 times the movement quantity per 1 rotate.

5 Horizontal distribution of crustal drift velocity

The westward movement quantity is calculated using (25). δ is measure from the World map. The unit body circle layer of calculating, it is $5km$ under continent. That is to say, the unit body circle layer is taken in the shallow stratum of the ocean floor. The connection point between the ocean crust and the continent is considered to be under the land at the coastline.

First, S_{00} near the equator is converted to S_{00} of the calculate latitude using formula (26). n is the time of continental cracking. Increasing this time will reduce the calculated value of the westward drift velocity. Results of trial calculation is that when n =250 million years, the difference between the calculated value of the crustal latitudinal drift velocity and the measured value is the relatively small. η_1 driving coefficient. It has the smallest numerical value at the bottom contact of West Americas and the Pacific Ocean. See the arrow in the table. Other locations η_1=1. The drift velocity S_{ZB} of the ocean floor or continent is the annual average velocity when the unit body segment calculate on the same ocean floor or the same continent is regarded as a whole. The ocean floor, including the mid-ocean ridges and trenches, all moves westward relative to the mantle. And in the process of moving, the ocean floor is expanding and disappearing， the continent is constantly changing.

The calculation results of the horizontal distribution of crustal westward drift velocity was listed in Tables 3, 4, 5 and 6. Each continent different locations the drift velocity S_{ZB}, at relative to the datum axis can be converted into the drift velocity U_N, U_A and U_L relative to on New Zealand datum, South Americas datum, or London datum, respectively, as shown in Figure 03B.



At the latitude line where the continental velocity is calculated, calculates The annual average movement quantity of each continent to South Americas datum, mark on the above of each latitude line. A negative value means movment to the east. The number under the latitude line is the drift velocity relative to the New Zealand datum. The black spot is ITRF2000 station near the calculates latitude. Under the semicolon is the station code. Numbers at above is of observation values taken from ITRF2000 partial station velocity vector diagram （Zongjin and Pinren, 2007）. Compare the calculated value with the observed value nearby, it can be seen that the calculated results are in good agreement with the observed results. This figure is drawn by the author with reference to the map.

Figure 03: According to the principle of harmonic motion was reconstructed Ancient continent of 250 million years ago, and gives the drift velocity distribution of current continent.

6 Analysis and discuss of calculation results

Can the following the derivation results be widely supported by observational data? Welcome to share your opinion!

In the mid-20th century, scholars have been able to calculate all elastic constants according to the distribution of seismic wave velocity and density of the Earth. Based on the change data of the elastic constant with depth, we can calculate the westward drift velocity of the Earth's inner stratums , as shown in Figure 02C. As can be seen from the figure, continental drift is only a part of the overall evolution of the Earth, and the Earth is the relatively-drifting everywhere.

The depths of the ocean floor $5km$, the depths the continent $10km$, $33km$, $100km$ and $700km$ are the depths with large differences in drift velocity between the stratums. These locations are conducive to the formation of Earthquakes, geothermal heat and magma. As shown in Figures 02C and 03B.

From the perspective of the possibility of generating magma in the harmonic dynamic process of the earth, the original earth was not necessarily hot.

Relative to the New Zealand benchmark, in 250 million years, Los Angeles in North America has drifted westward by about $176°$, and Lima in South America by about $146°$. It can be said that if there is no harmonic deceleration process that has an amplifying effect on force or moment, any other dynamic process cannot push the vast ancient continent and carry out a directional drift of nearly 20,000 km.

It can be seen from Table 3, Table 4, Table 5 and Table 6 that the east-west width of the ocean floor depends on the velocity difference between the mainland on both sides. According to the analysis of the rock creep process, after the ocean floor is formed at the ridge, it carries the early sediments to creep under the action of ocean floor pressure and temperature. The farther from the ocean ridge, the greater the depth of insertion, and the smaller the surface area, until it is covered by late-growing's ocean floor and sediments. According to the principle of harmonic motion of the Earth, not only the ocean floor expands and drifts, but mid-ocean ridges and trenches also participate in the ocean floor expansion process and move westward. The paleo-Pacific ridge has moved from the $47^{o}W$ and developed into today's Eastern Pacific Rise.

If the velocity vectors of ITRF2000 stations are changed to the opposite direction, and according to the traces left by the movement, the Asian continent and its islands are close to the Japan Trench and Mariana Trench, and Australia to the Tonga Trench and the kemadek trench. Then, after drifting for a period of time, the continent will return to a whole. See Figure 03A.

By changing all the velocity vectors in the velocity fields U_N, U_A and U_L to the opposite direction, the time required for the continents to return to convergence can be determined to be $250Ma$.

After restitution of the continent, one complete ancient continent was formed. It's shaped like the round biscuit of one part missing, as shown in figure 03A. Its position is based on the current latitude and longitude is: From $63^{o}E$ in the west to $157^{o}W$ in the East. From $59^{o}N$ in the north to $70^{o}S$ in the South. Center at $0^{o}N$, $133^{o}E$. Radius $7550km$. The center of the missing part is at $53^{o}N$, $133^{o}E$. Radius $3500km$. The position of the some important cities on the ancient continent are: Beijing $12^{o}N$, $168^{o}W$. Guangzhou $6^{o}S$, $165^{o}W$. London $18^{o}N$, $118^{o}E$. Berlin $19^{o}N$, $126^{o}E$. Washington $5^{o}N$, $92^{o}E$. Moscow $12^{o}N$, $140^{o}E$. Wyrio $60^{o}S$, $168^{o}E$.

The vast ancient Pacific surrounds this vast ancient continent. The ancient ocean ridge runs through $47^{o}W$ to $133^{o}E$. The current Western Pacific Trench is close to the eastern edge of the ancient continent, forming a long ancient trench. At that time, the Mariana Trench was located at the equator, close to the Yangtze River Estuary.

Regardless ancient continent was formed by a celestial bodies of from the universe, or formed by the substance of the Earth’s and outer space that in the process the ocean floor expansion and continental contraction, both should be make it approximately round. Moreover, the remains of ancient trenches and the ancient continent, such as Japan Islands in the western Pacific Ocean and adjacent trenches show that the drift velocity of the ancient continent before cracking was very slow, almost equal to the drift velocity of the trench. According to the principle of harmonic motion of the Earth, if the moon was a satellite of the Earth all the time, then the ancient continent would not wait until 250 million years ago to start drifting quickly. Therefore, the missing part of ancient continent is related to the moon.

It is hard to imagine that 250 million years ago, the moon rushed into the Earth's atmosphere, accompanied by a dazzling light and a lethal shock wave. Caused an Earth-shattering collision with the arctic, and sweep past. It hit shattered the ancient continent of the polar region. Lava spewed, the sea roared, and gale swept the globe. Stones and falling dust bury large coal-forming forests formed during the Carboniferous Period to form coal mines. Lakes and shallow sea was filled up, and a large number of organisms have been buried at the bottom of the water and turned into oil fields. The strong Earthquake caused the ancient continent to fall apart, and began to drift relatively in the wake of the moon enters orbit. The Dust blocked the sunlight and the global climate deteriorated, finally causing the long glacial period of the Carboniferous-Permian.

Judging from the pictures obtained by the Chang'e lunar probe, the Non positive circular boundary of the storms-ocean to indicates that the moon has Oblique collided with larger celestial bodies. Interpret it as an Earth-Moon collision that occurred 4 billion years ago, with no evidence on Earth.If it occurred at 250 million years ago, which is consistent with the calculation results of the earth's harmonic motion. There are not only indirect evidences such as continental drift and Incomplete of ancient continents, but there may be also may by find direct evidence.

7 Conclusion

The data above and below the latitude line in figure 03B are the calculation results of the continental drift velocity. It can be seen that the continents was not drifting disorderly, but drifting westward with New Zealand as the datum.

The datum transformation equation is used to transform the calculation datum into the South Americas datum. And making comparison with the velocity field of ITRF2000. It can be seen from the comparison between the calculated value and the measured value that, the actual measured values of stations LHAS , YAR1 and 7232 with the deviation rate ε that of the calculated values of adjacent latitude segments, are 28%, 2.6% and 3.6% respectively.

As a whole, the measured values of stations YAR1, MALI, 7232, LHAS, RAMO, 7227, 7601, MAGO, WHIT, LPGS, CHUR, MDO1 and so on are in good agreement with the calculated values of adjacent latitude continents. And the closer the two positions, the smaller the value deviation.

In addition, the velocity directions of all ITRF2000 stations are the same as those of the adjacent latitude segments of the continent. When ignoring the other causes of each and every deviation was produced, can use $1-\varepsilon$ expresses the degree of dominance which the dynamic process to the actual motion process.

The generalized Hooke's law is used to derive the harmonic motion equation of the Earth. Determine all the variables of the crustal movement process: the values of E, G, M, R, ρ, H, $\cos\beta$, and calculate the velocity field of crustal movement. Then compare with the actual measured value of ITRF2000 station velocity. The whole process prove from the kinematics point of view:

1. Under the joint action of tidal force and Earth rotation, each circle layer in the Earth's interior will move westward with the advance of solid tide, that is, the Earth's latitudinal harmonic motion was produced.

2. The Earth's harmonic dynamic process is the basic dynamic process of crustal movement and deep Earth movement. The degree of dominance which this dynamic process to the continental drift is 72% to 97.4%.

3. The velocity field of ITRF2000 is the movement direction of the crust relative to the "no net rotation" reference of the surface, not the movement direction of the crust relative to the mantle.

4. The motion law of crust, mantle and core follows the earth's harmonic motion equation. Instead of drifting disorderly, continents drift westward relative to the mantle.

5. The energy of the earth's harmonic motion comes from the earth's rotation energy.

6. The principle of harmonic motion of the earth is also applicable to the evolution of other planets.

8 Data availability

The research method, principle of harmonic motion, equation, and calculation results of this paper can be used to study the crust motion , as well as the structure and motion of the Earth's interior. Tables 3, 4, 5, 6 and the cracking time of ancient continent will be continuously revised as research progresses.

9 Author's contribution

The author has discovered the friction harmonic dynamic process, and the earth’s harmonic motion, and The kinematic analysis of the Latitudinal direction movement of the earth is completed. The latitudinal direction motion equation of the earth is derived. The theoretical velocity field of global the latitudinal direction continental drift is established and compared with the measured value of ITRF2000.

10 Competition for interests

The author states that this study has no conflict of interest with anyone.

11 Disclaimer

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