Ocean Currents and Tidal Movements: The Real Causes

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This article lists a pretty simple, radically different from other hypotheses, proved by measurement data, universal to any place at planet mechanism of causing currents and tides.

1 Introduction

Currents are classified on the basis of:

1. The causing forces (genetic classifications);
2. Stability;
3. Depth of location in the water column;
4. The nature of movement;
5. Physical and chemical properties.

There are three groups of currents:

- Gradient currents caused by horizontal gradients of hydrostatic pressure, arising when the isobaric surfaces are tilted relative to isopotential (level) surfaces
  - Density caused by horizontal density gradient
  - Compensatory caused by wind-induced sea level tilt
  - Barogradient caused by uneven atmospheric pressure over the sea surface
  - Seiche, resulting from seiche fluctuations in sea level
  - Stock, or wastewater, resulting from the emergence of excess water in any area of the sea (as a result of the influx of continental waters, precipitation, melting ice)
- Currents caused by wind
  - Drift caused only by the enticing action of the wind
  - Wind induced by both the pulling action of the wind and the inclination of sea level and changes in the density of the water caused by the wind
- Tidal currents caused by tides
  - Rebound current

All these types of currents do not explain the main permanent global current near the equator, directed from East to West, which, in the absence of continents, would be closed in round-like dust rings as in the atmosphere of Jupiter. (The nature of the equatorial countercurrent is not considered here. You can learn about it in the book *Equatorial countercurrents in the oceans* by V. B. Shtokman Leningrad 1948 [2].) .

2 A modern view of the causes of currents and tides

Sometimes the formation of currents is attributed to the Coriolis forces, while not taking into account that these forces are not real but conditional, used to describe different linear velocities of motion for points at different distances from the center on the radius, when the body rotates. In the case of the Earth's rotation, there is no movement of water along the radius, which can cause the appearance of such forces and such a constant movement of water around the circle.

Oceanic tides in modern scientific literature are considered as the rise of water due to the attraction from the Sun and the Moon, and at the same time they constantly try, using correction factors and various models, to lead to some kind of mathematics [1], considering that the Earth is, as it were, a body with its own vibration frequency. At the same time, forgetting that any oscillations have a decay time, and the processes under consideration last for many years. In fact, without identifying the main causes of the tides, this method is no better, and even worse, due to its complexity, a simple statistical table, that is, a method that has long been successfully used in the practice of navigation.

And the difference in the forces of gravity on an interval even of several kilometers (let's say that this is the depth of the ocean) at a distance of 380 000 km from the Moon, and 150 000 000 km from the Sun, cannot be so great as to cause the rise and movement of water. And this despite the fact that the entire mass of the Earth is nearby, which is much larger than the Moon.

The emphasis on tidal forces caused by the influence of the Sun and the Moon during the rotation of the Earth is made, for example, in the article [3], where a moving "hump" of the mantle allegedly causes the movement of water (discrete-wave motion). But it is not taken into account that the hump moves at a depth, and the main flows of the current do not fall below 200 meters [2], thus such a mechanism cannot work.

The action of tidal forces directly on the body of the ocean also cannot cause such a flow, for the reason that these forces act on masses of water, first from the East, and then in the same way from the West. Even if, which is not possible, they will first shift the mass of water in one direction, then they will return it back by the same amount.

Fig. 1 shows the current map and a conventional drawing [3] showing the similarity of the structures of large-scale currents of the Pacific, Atlantic and Indian oceans.

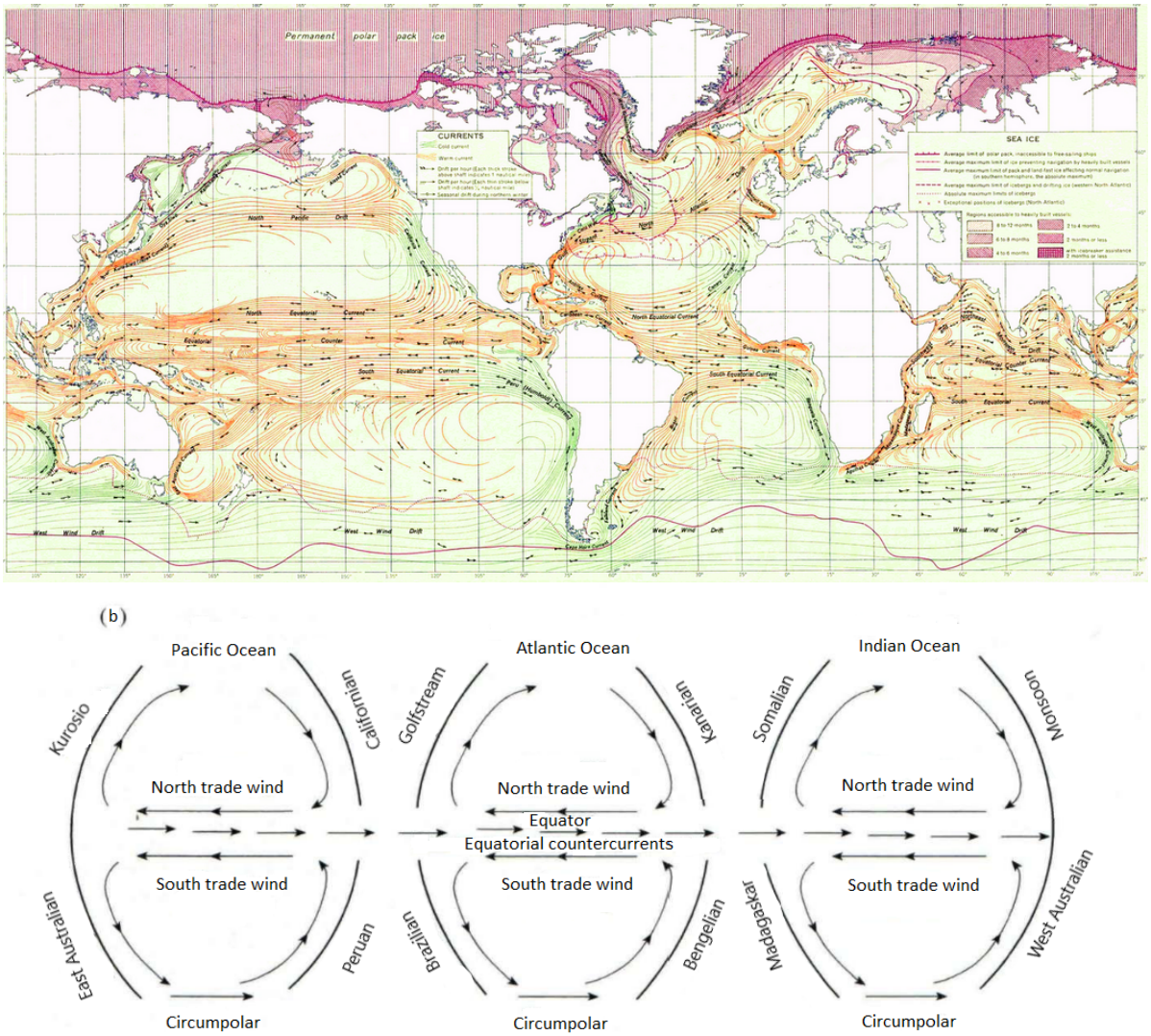

Fig. 1: Current map (1a) and a conventional drawing (1b) [3] showing the similarity of the structures of large-scale currents of the Pacific, Atlantic and Indian oceans.

3 The real reasons causing currents and tides

But there are currents and quite significant – the speed of movement is measured from 30 to 150 cm/s [2], which means there is a force that causes it. Moreover, this force is centuries old, constant direction. There are no external, observable forces. So there are internal ones.

Let's imagine the Earth as a kind of ball with a rather thin, relative to the total volume, shell, which can deform from the movement of the internal mass, if it is attracted to the external mass (Sun, Moon). Roughly it can be compared with an inflated air ball into which water has also been poured. Water, due to the force of gravity, will cause deformation of the shell, and when the ball rotates, this deformation will move in a circle. This is an analogue of the tide of a solid part of the Earth. But this is not an ocean tide! The high tide near the coast on the water will be caused by the ebb from the point of maximum rise of the mainland to the shores. If, for example, you pour water into a plastic plate and press from below, then the water will overflow to the edges. This fact is clearly visible when overlaying the graphs of the measured behavior of gravitational forces, the graph of the water level and the positions of the Sun and Moon at one measurement point.

In Fig. 2 (and also in Fig. 3), the maximum rise of water at high tides is clearly visible near the shores of the oceans. Fig. 2 shows measurement data at station "Posiet" of the Pacific coast, where

- On the horizontal axis Universal Time.
- Black is the measured force of gravity in μgal.
- Red is the Sun position.

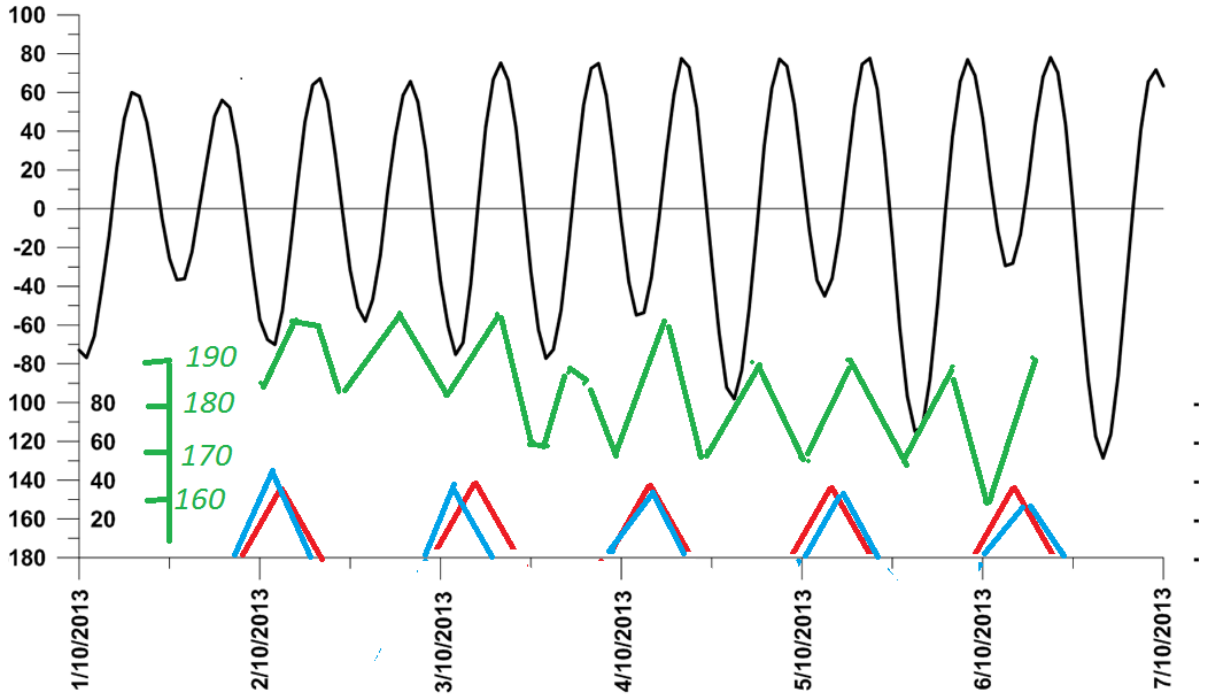

Fig. 2: Measurement data. Station "Posiet" of the Pacific coast.

- Blue is the position of the Moon in degrees above the horizon (time of sunrise, maximum position, sunset).
- Green is the ocean water level in cm.

The time interval is specially selected when the Sun and the Moon are close to the sky and at the same time affect the core of the Earth.

Measurement data of grav: the forces were provided by the staff of the laboratory of gravimetry of the POI FEB RAS. Station coordinates:

- ELLIPSOIDAL LATITUDE (DEGREE) 42.583
- ELLIPSOIDAL LONGITUDE (DEG. EAST) 131.158

Ocean level data: measurements taken at Posiet station, courtesy of the staff.

The data of the times of rise, maximum position, set and angle of ascent of the Sun and Moon were taken from the StarCalc program with reference to the station location.

It can be seen that a couple of hours before the passage of the Sun and the Moon to the zenith point, there is an ebb and flow of water and at the same time a decrease in the force of gravity, i.e. tide of the solid part of the planet. The ebb of water is also visible at night, when the tide of the mantle occurs from the departure of the planet's core to the opposite part of the Earth.

The time interval was specially selected when the Sun and the Moon are close and simultaneously affect the core of the Earth.

It is this fact that explains not the coincidence of the tides, but the coincidence of the ebb on the water with the positions of the Sun and the Moon at the zenith.

The "hump" on the mantle will change its position and size depending on:

- season (tilt of the axis of rotation);
- remoteness of the Moon and the Sun from the Earth;
- "dephasing", i.e. different positions between the Moon and the Sun;

then the tide near the coast will not be constant, but depend on these factors.

Now about the rise (tide) of the mantle on the opposite side of the globe. Unfortunately, it is difficult to demonstrate clearly, as in the first case, but even here everything is quite simple. The mass of the planet's core displaced towards the Sun and Moon will weaken the force of attraction on the opposite side of the ball in proportion to the square of the displacement distance. In the above graph, these will be the dips of the gravitational forces (black) during periods when there is neither the Sun nor the Moon above the measurement point. There is no other way to explain such a decrease in the forces of attraction, since the gravimeter reacts only to the force of attraction (mass).

In this way, multidirectional forces act on the gravimeter sensor:

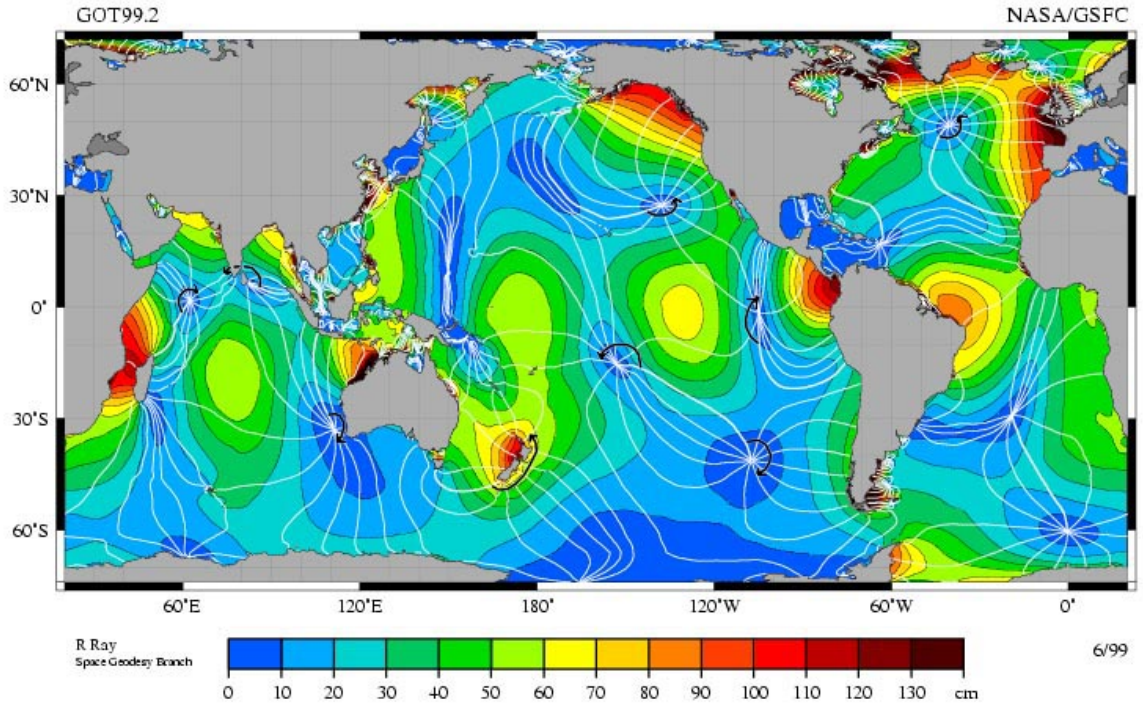

Fig. 3: Codial lines.

- attraction from the bulk of the Earth – constant force;
- attraction from the sun – variable force;
- attraction from the moon – variable force;
- attraction from the moving mass of the Earth's core – variable force, depending on the position of the Sun, Moon, season.

Based on the fact that there are many variables, mutually related quantities, calculating the mass of the moving part of the Earth's core is difficult (at least for me). When the Earth rotates, the "hump" will describe cyclic circular trajectories – this is the only observed movement in one direction, coinciding with the direction of movement of the main oceanic current [3]. The force of attraction of the mass of the moving inner core of the planet close to the water will force the mass of water to move in the same direction, but with a different force depending on the season. This is the reason for the main ocean current.

Since the bulk of the core moves in the equatorial region, the waters near the equator are also set in motion. Meeting the continents on its way, this current diverges to the sides of the equator and, since the basins of the oceans are practically closed, the water for the most part moves in a closed loop (see Fig. 1).

The change in the water level of the seas and oceans is only a demonstration of the change in the level of the solid surface of the planet. Water, due to the properties of fluidity, changes its level depending on the topography of the bottom and the coast. At the same time, the values of changes in the solid shell of the Earth depend on its structure and thickness. Mountain and continental massifs with large deep parts will naturally be less affected than lower, thinner, underwater areas. That is why the waters of the lakes practically do not change their level, since they are located on the body of massive continents and at the same time the level of the bottom of the entire reservoir changes slightly. On the plain of the oceans, amphidermal points (where there are no tides) and codial lines (lines connecting all points on the map where the crest of a tidal wave appears simultaneously, that is, points in which full water occurs simultaneously). If the tide would arise only from exposure to water, this could not be.

4 Conclusion

In addition to the processes under consideration, the movement of the planet's core leads to such consequences as the formation of the Earth's magnetic field, mountain building, continental drift, earthquakes, an astronomical shift relative to the reference time, *etc* [4].

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