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Tidal gravitational locking, particularly of Mercury

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Mercury, tidal locking, gravitational locking, Moon

The Summary

The so called tidal gravitational locking of gravitationally interacting bodies is a consequence of their mass asymmetry that provokes asymmetry of their gravitational properties. If a central body and its satellite body are tidally gravitationally locked and if the central body's mass is sufficiently symmetric, which is the case of Earth-Moon locking, the central body's rotation about its own rotation axis occurs with a velocity independent of that of the satellite body. If a central body and its satellite body are tidally gravitationally locked and if the central body's mass is gravitationally asymmetric, which is the case of Sun-Mercury locking, the central body's rotation velocity about its own rotation axis coordinates with that of the satellite body. The Sun's as a physical body rotation period about its rotation axis is 29.323 terrestrial days. Contrary to the officially accepted tidal gravitational locking ratio 3:2 between axial and orbital Mercury's velocities, the accounting for the Sun's axial rotation testifies that de facto the locking occurs, as in the most of known cases with the 1:1 ratio.

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The best known example of tidal gravitational locking is that our Moon is always facing us with the same side and that only as early as in 1958 the soviet cosmic ship "Luna-3" succeed to photograph its until then invisible opposite side. The nature of this phenomenon consists in that the Moon's revolving about the Earth occurs practically during the same period of time as its rotation about its own axis (the so called synchronous blocking). Scientists see the cause of such blocking in that during the orbital movement of Moon between it and the Earth do not occur any transmit of angular moment.

In my article [1] there was in particular pointed that a body's graviton receiving surfaces may be of different areas dependent on their orientation to the graviton emitting body. If to suppose that the graviton receiving area of the Moon relative to the Earth may have its maximums and its minimums there would be quite natural to suppose that the Earth's gravitational action onto the Moon had also its maximums and its minimums and that every alteration of their mutual orientation would need applying some momentum.

During many years scientists thought that Mercury similarly to the Moon is in the state of synchronized tidal locking with the Sun and that it rotates around its own axis one time for one orbital revolution,

always facing the Sun with its same side. Nevertheless radiolocation observations of 1965 have showed that the planet has to be connected with the Sun with 3:2 spin-orbital resonance, which nature would be in that while rotating about own axis 3 times the planet makes 2 revolutions around the Sun (Mercury's period of orbital revolution is 87.969 earth days, its rotation duration is 58.646 days [2]). Thinking upon this incomprehensible phenomenon scientists have made an exploration on models, which helped them to understand that Mercury had been blocked with 3:2 spin-orbital resonance as early as at the initial stage of its history 10-20 millions years since the beginning of its formation. As to physical explications of the described phenomenon, they have been never disclosed by any kind of explorations.

While searching for possible explications and grounding myself on the above reasoning about possible asymmetry of gravitational interactions, there came to me the idea that the gravitation action of the Sun has also its maximums and minimums and that these maximums and minimums are rotating with it about its axis. According to [3] the Sun depending on latitude rotates about its own axis with different angular velocities and the periods of such rotation are:

- at equator 25.05 earth days,

- at latitude 16° 25.38 days, and

- at poles 34.4 days.

Due to Mercury practically is not rotating around some point that is its center, but about the Sun as a physical body who is also rotating about this center, the periods of orbital rotation of Mercury would have be as follows:

- 87.969 - 25.05 = 62.919 days,

- 87.969 – 25.38 = 62.589 days,

- 87.969 – 34.4 = 53.569 days.

The expected result of 58.646 days must be somewhere between pole and 16°.

Another conclusion may be that the periods of Sun's rotation as physical body around its own axis have to be 87.969 - 58.646 = 29.323 earth days.

Analyzing the found data in association with the pair Earth-Moon one may conclude that the Earth is most probably physical body with approximately symmetrical gravitation properties.

On the other side, there may become clear that there, where one needs to account for planets' orbital characteristics one needs to do for the Sun's rotation around its own axis and make his or her calculations not relatively to the immobile solar center but relatively to the Sun as rotating physical body. In this connection found value of solar rotation period of 29.323 earth days might appear substantially useful.

Conclusions:

1) The so called tidal gravitational locking of gravitationally interacting bodies is a consequence of their mass asymmetry that provokes asymmetry of their gravitational properties.

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2) If a central body and its satellite body are tidally gravitationally locked and if the central body's mass is sufficiently symmetric, which is the case of Earth-Moon locking, the central body's rotation about its own rotation axis occurs with a velocity independent of that of the satellite body.

3) If a central body and its satellite body are tidally gravitationally locked and if the central body's mass is gravitationally asymmetric, which is the case of Sun-Mercury locking, the central body's rotation velocity about its own rotation axis coordinates with that of the satellite body.

4) The Sun's as a physical body rotation period about its rotation axis is 29.323 terrestrial days.

5) Contrary to the officially accepted tidal gravitational locking ratio 3:2 between axial and orbital Mercury's velocities, the accounting for the Sun's axial rotation testifies that de facto the locking occurs, as in the most of known cases with the 1:1 ratio.

Bibliography:

1) Yuri Dunaev, Hidden Masses and How Much of the 4-th Law of Newton is Really True? http://gsjournal.net/Science-Journals/Research%20Papers/View/6979
2) https://en.wikipedia.org/wiki/Mercury_(planet)
3) https://en.wikipedia.org/wiki/Sun