Mercurian Perihelion Precession
(General Relativity Not Included)

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Abstract

The problematic assumption associated with the observed precession of the perihelion of Mercury is Mercury formed as it appears today. If Mercury's origins were different from its assumed origins, then the *calculated estimate* of its density and mass would be inaccurate and this minor discrepancy would account for the precession of Mercury's perihelion. If these values are in error, then the *observed* precession of Mercury's perihelion would also be erroneous.

Asserting a Relativistic solution would require all values to be accurate and the methodology to be sufficient. And would also require ignoring the actual formation of Mercury.

Keywords: Mercury, perihelion, precession, relativity, confirmation

Formation

A simple distribution model of early formative materials in the Solar accretion disk demonstrates Mercury's formation was very different from its current appearance. Therefore, Mercury could not and did not form as it appears today.

In the early formation of the Solar system, the accretion disk featured a central bulge that would later coalesce into the Sun. This central disk likely spanned the current orbits of all of the inner planets – decreasing in volume and density over distance. This distribution would imply the planets that formed within the disk were sorted by size, density and mass from the innermost planet to the outermost planet. In descending order (density, mass and size) the early planets were Vulcan (ancient Mercury), Venus, Gaia, Theia (Gaia and Theia later collided to form the Earth and its moon), and Mars.

Being well within the central bulge of the stellar/planetary accretion disk, Vulcan was likely the largest of the inner planets and, probably remained molten during its entire existence. Therefore, a molten mantle and a metallic alloy core would have formed over time. With or without an atmosphere, the Sun's stellar radiation ("winds") would have stripped away (oblated) much of Vulcan's surface leaving behind its dense, metal-rich planetary core… modern Mercury.

So, the questions are:

1. How much more dense/massive would Mercury have to be to account for the apparent precession of its perihelion?
2. Can Mercury be that dense/massive?

To answering the second question first, yes.

As for the first question, we need to employ some basic math.

Subtracting Mercury's calculated rate of precession per year from its observed precession rate per year then divide by the actual rate of precession per year:

5.75 arcseconds (observed) - 5.32 arcseconds (calculated) = 0.43 arcseconds

%Error = 0.43 arcseconds/5.75 arc seconds (actual) = 0.7478 or 7.5%

This error is roughly 7.5%, making the true mass of Mercury closer to 3.531 10^{23} kg. Based upon the formation material distribution model, above, this discrepancy is entirely plausible. Also, the above version of Mercury's origins offers a much simpler explanation for the precession of its perihelion: its mass is slightly more than once calculated (perhaps, ~2.5% more metallic alloy, ~5% less rocky material).

And, thereby, General Relativity isn't required to resolve this anomaly.

References

[1] Taylor M 2019 *Natural Mechanics* http://vixra.org/abs/1911.0294