Review of: "On the existence of precession of planets' orbits in Newtonian gravity"

Luis Acedo[1]

1 Universidad de Extremadura

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This is an interesting paper from several points of view: the foundation of physics (How physical laws change from the perspective of non-inertial frames ?), history of science (Does the search for explanations, in the context of Newtonian theory, for the anomalous precession of the perihelion of Mercury was abandoned very prematurely ?, it seems so according to the author of this paper), celestial mechanics (Are there overlooked effects in our current models of the Solar system ?).

In this paper, the author considers the extra non-inertial radial force F=-G m m/r^2 (m is the mass of the planet) that appears in the frame of reference of the centre of the Sun when the Sun-planet system is analyzed. This way the perihelion advance per revolution is found as pi m/M.

Here m is the mass of the planet and M is the mass of the Sun. This formula predicts an almost correct result for Mercury (by mere chance) but fails miserably for the other planets as it predicts larger perihelion precession rates for planets more massive than Mercury while in General Relativity the prediction for the anomalous precession rate decays with the semi-major axis of the planet.

My opinion is that this is a good paper that can motivate further research in different directions. In this review, I would like to provide some suggestions for improvement:

I think that the result for the anomalous perihelion precession rate could be obtained more easily from perturbation theory in Celestial Mechanics. For example, in Eq. (17.8) of the classic textbook by Pollard, Mathematical Introduction to Celestial Mechanics, we have the expression for the rate of change of the argument of the perihelion in terms of the components of the perturbing force. By performing an average over one orbital period one should be able to recover Eq. (30) in the paper.

It would be interesting to perform a more general analysis to calculate the non-inertial frame of the Sun by taking into account all the planets at the same time, i.e., by considering the pull of all the planets in Eq. (15).

I also wonder if the study in this paper could also be carried out in the post-Newtonian regime of General Relativity. If that

would be the case, it would cause a problem for the agreement between GR and observations. I think that some discussion about this issue could be included in the paper.

In the introduction, the author also says that: "Perihelion's precession can be achieved with the same precision of general relativity by extending Newtonian gravity through the inclusion of gravitational and rotational time dilation effects". I think that a section about this extended Newtonian theory would be appreciated by Qeios' readers.