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Retarded gravity and superluminal motions

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***Abstract**: The retarded potential could explain more effects than the metric interpretation of gravitation. Moreover, it allows superluminal motions.*

***Keywords**: gravity, retarded potential, superluminal motion, galaxy, acceleration*

The retarded potential allows superluminal motion [1]. It was suggested that static (electric or gravitational) field can accelerate objects to superluminal motions (even thought the speed of interaction is luminal). The frequency of signal is increasing and observed time span is finite for an infall (and gravitational infall creates a burst of radiation). Superluminal motion disintegrates atoms (bonded by luminal interaction) and thus a closed cycle of elements in the Universe is possible. Also the charged surface of star could produce hot chromosphere by acceleration of particles. The frequency of observed signal is also increasing for binary "black hole" mergers (i.e. mutual infall). But they merge within a finite time of static observer (gravitational-wave detector) and not within infinite time of infall into a "black hole" (to pass its "event horizon" in the metric theory of gravitation).
The retarded gravitational potential has nothing to do with anisotropy of the gravitational constant *G* (as it is metric-interpreted by Clifford Will [2] that uses erroneously external potentials directly as a signal amplitude for accelerometers), as well as the retarded (Liénard–Wiechert) electric potential is not connected with anisotropy of permittivity (its factor of interaction), charge or speed of light. The gradient of gravitational potential of Galaxy is too small to produce effect measurable by laboratory-sized gravimeters. I.e. galactic tides (local spatial difference in galactic accelerations) can not experimentally rule out any theory (e.g. Whitehead's theory of gravitation). The potential of the Galaxy or the Sun is almost static for an observer (instrument) on the Earth. Thus the retardation effect from these potentials is negligible (analogically to the "earth" potential "shift" from a distant external charge). Then the classical gravity measurement of acceleration difference between reference (the Earth) and test masses is almost unchanged (null results also agree with the retarded potential theory and thus the Nordtvedt effect is also not present).
The recent observations suggest that there is a discrepancy between the (metric) theory of gravitation and reality (and it does not correlate with directly unobserved hypothetic "dark matter" and the curved space-time theory is not a good concept). The equation 11 in [3] (that describes multiple observation results) has asymptotes

$$g_{obs} = g_{bar} \qquad \text{for } g_{bar} >> g_{+}$$
$$g_{obs} = \sqrt{g_{bar} g_{+}} \qquad \text{for } g_{bar} << g_{+}$$

and taking into account that this baryonic acceleration is obtained as

$$g_{bar} \approx \frac{GM}{r^2}$$

we will get observed acceleration

$$g_{obs} \propto \frac{\sqrt{M}}{r} \qquad \text{for } g_{bar} << g_{+} \qquad \text{(for "deep-MOND regime")}$$

I.e. for large distances (small accelerations), the "radiative term" $1/r$ dominates (compare it with fields from the Liénard–Wiechert retarded potential) over the classical term $1/r^2$. Also flyby anomalies observed close to the Earth can be explained by a retarded potential [4]. Laboratory measurements of the Newtonian constant of gravitation G work with acceleration errors comparable to this g_+. The G measurement results from several laboratories suggest inconsistency. A different geometric factor for source masses (from the radiative term $1/r$ instead of $1/r^2$) could explain these errors or it could be an effect of nuclear properties [5]. The characteristic acceleration (for given constituents) g_+ is also related to the Hubble time $c/(2\pi g_+)$, i.e. an increase of speed with a time of retardation. The characteristic acceleration is also comparable with gravitational acceleration in atomic nuclei and gravitational-radiation power losses from nucleus have a characteristic time comparable to the Hubble time [6]. Note that the Hubble constant (i.e. characteristic acceleration) could be also considered as local (e.g. in [7]) and not universal.

Although observations, interpretations or measurements could be erroneous, it is shown that the retarded potential can explain several discrepancies of the metric (relativistic) theory of gravitation that is without retardation.

[1] P. Křen: Superluminal motions, 2016, https://gsjournal.net/Science-Journals/Research%20Papers-Cosmology/Download/6701

[2] G. Gibbons and C. Will: On the Multiple Deaths of Whitehead's Theory of Gravity, 2006, https://arxiv.org/pdf/gr-qc/0611006.pdf

[3] F. Lelli *et al.*: One Law To Rule Them All: The Radial Acceleration Relation of Galaxies, 2016, https://arxiv.org/pdf/1610.08981.pdf

[4] J. Hafele: Earth Flyby Anomalies Explained by a Time-Retarded Causal Version of Newtonian Gravitational Theory, 2012, http://zelmanov.ptep-online.com/papers/zj-2012-08.pdf

[5] P. Křen: The momentum and gravity, 2015, https://gsjournal.net/Science-Journals/Research%20Papers-Gravity/Download/5980

[6] P. Křen: Gravitational waves from atoms, 2016, https://gsjournal.net/Science-Journals/Essays-Gravity/Download/6404

[7] G. Rácz *et al.*: Concordance cosmology without dark energy, 2016, https://arxiv.org/pdf/1607.08797.pdf