

TITLE

Have gravitational metrologists discovered the ground-based analogue of the Anderson-Campbell-Ekelund-Ellis-Jordan flyby anomaly formula?

ABSTRACT

Measurements of Newton's gravitational constant G have yielded inconsistencies suggesting that variations in measurements of G are correlated with Length Of Day (LOD). In 2007 Anderson et al. published an empirical formula that accurately described the flyby anomaly for 6 flybys of Earth. There might be one or more phenomena that explain the flyby anomaly and the inconsistencies in measurements of G . A better understanding of Milgrom's MOND (Modified Newtonian Dynamics) might be essential for improving measurements of $\Delta G/G$ from $2 * 10^{-4}$ to $5 * 10^{-5}$ — in other words, if metrologists ignore MOND they cannot improve estimates of $\Delta G/G$ by order-of-magnitude from the present measurements, because MOND implies Newtonian-Einsteinian gravitational theory is slightly wrong. String theory with the finite nature hypothesis might explain problems with measurements of G .

MEASUREMENTS OF G

Measurements of Newton's gravitational constant G show inconsistencies.[1]
Measurements of G show inconsistencies that are oscillatory over extended periods of time and are correlated with Length Of Day (LOD).[2]

FLYBY ANOMALY FORMULA

In 2007 Anderson et al. published an empirical formula that accurately described the flyby anomaly for 6 flybys of Earth. [3], [4] However, two Earth flybys (Rosetta spacecraft, 2007 and 2009) contradicted the predictions of the formula.

MODIFIED NEWTONIAN DYNAMICS

If the Pioneer anomaly is explained by a paint problem, this hypothesis should be confirmed by tests of the paint in a vacuum chamber. Fernández-Rañada suggested that there might be an anomalous redshift everywhere in the universe.[4] Kroupa, Pawlowski, and Milgrom have suggested that the empirical successes of MOND (Modified Newtonian Dynamics) require a new paradigm.[6] The simplest way to combine the ideas of Fernández-Rañada and Milgrom might be the Fernández-Rañada-Milgrom effect (replace the $-1/2$ in the standard form of Einstein's field equations by $-1/2 + \text{dark-matter-compensation-constant}$, where this constant is approximately $\sqrt{(60 \pm 10)/4} * 10^{-5}$). Does the Fernández-Rañada-Milgrom effect approximately yield the Anderson-Campbell-Ekelund-Ellis-Jordan formula? Does an easy scaling argument show that the effect is approximately equivalent to MOND when gravitational accelerations are low?

Molecules in the Earth's atmosphere, oceans, and crust undergo random molecular motions based upon frictional forces. On average, the molecules are prevented from orbital decay by friction. Whatever explains the Anderson-Campbell-Ekelund-Ellis-Jordan formula might

also explain the metrological problems of $\Delta G/G$ because of anomalies influencing orbital decay.

WHAT IS THE EXPLANATION FOR MOND?

Fernández-Rañada and Tiemblo-Ramos suggested that atomic time might be blue-shifted with respect to astronomical time, or, equivalently, astronomical time might be redshifted with respect to atomic time.[7] What might explain such a failure of temporal equivalence? I have suggested that: (1) ordinary matter completely obeys the equivalence principle; (2) dark matter has positive mass-energy and zero inertial mass-energy; (3) dark energy has negative mass-energy and zero inertial mass-energy. String theory with the finite nature hypothesis might predict the 64 Particles Hypothesis, the Space Roar Profile Hypothesis, and the Fernández-Rañada-Milgrom effect.

HAS A FALSE ASSUMPTION CONFUSED METROLOGISTS WHO MEASURE G?

Milgrom is the Kepler of contemporary cosmology — this is a fact based upon empirical evidence. By sending out emails, I have discovered that metrologists who measure G disagree with me concerning the preceding fact. What is the meaning of Milgrom's MOND (Modified Newtonian Dynamics)? The answer is unclear, but the empirical evidence supports MOND. Here is my thinking on MOND: Replace the $-1/2$ in the standard form of Einstein's field equations by $-1/2 + D-M-C-C$, where $D-M-C-C$ (dark-matter-compensation-constant) is approximately $\sqrt{(60 \pm 10)/4} * 10^{-5}$ (Fernández-Rañada-Milgrom effect). TRUE LAW FORCE LAW: $((1 - 2 * D-M-C-C)^{-1}) * G * m_1 * m_2 / r^2$ versus FALSE FORCE LAW: $G * m_1 * m_2 / r^2$. By using the false force law instead of the true force law, metrologists are slightly confused. The net confusion in $\Delta G/G$ is approximately $(2 * D-M-C-C) =$ approximately $.00008$ — note that metrologists claim to have narrowed down $\Delta G/G$ to $2 * 10^{-4}$. I conjecture that metrologists who measure G have now almost reached the limit of measuring G under the assumption of the FALSE FORCE LAW.

4-STEP PLAN

Lestone suggested a method for approximating the fine structure constant.[8] Allowing for the quantum uncertainty in the diameter of Lestone's 2-sphere might significantly improve the accuracy of Lestone's approximation. Allowing for the quantum uncertainty in the oblateness of Lestone's 2-sphere might improve the accuracy even more. Lestone's heuristic string theory and the Koide formula might be important for developing string theory with the finite nature hypothesis. Consider the following plan: STEP 1. Find 4 or 5 simple rules that define Wolfram's automaton and generate satisfactory approximations to quantum field theory and general relativity theory. STEP 2. Demonstrate that Wolfram's automaton is an adequate approximate solution to string theory with the finite nature hypothesis. STEP 3. Calculate satisfactory approximations to all of the free parameters of the Standard Model of particle physics. STEP 4. Explain dark matter, dark energy, inflation, the space roar, and the photon underproduction crisis in terms of Wolfram's automaton.

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