Testing Modified Newtonian Dynamics

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Modified Newtonian Dynamics (MOND) is a hypothesis by Mordehai Milgrom as an alternative to the dark matter explanation of the missing mass surrounding spiral galaxies. It states that the acceleration rates at very small accelerations are larger than F=ma would predict. I tested MOND using the astrometry of Ymir, a moon of Saturn. Ymir was selected due to its very small acceleration and relatively short orbital period. The observed positions of Ymir were compared to the Newtonian calculations of where Ymir would be according to Keplerian predictions. Using the LCOGT telescope network, I obtained observations of Ymir on 23 occasions, and was able to get reliable astrometry on 5 occasions. Additionally, extra observations were retrieved from the Pan-STARRS database for additional accuracy. The differences between Newtonian predictions and measurements were consistent with zero, which does not allow for a confirmation of the MOND hypothesis. Additionally, after further investigation has been completed, these measurements will be sufficient to place limits on MOND parameters, assessing its viability as an alternative hypothesis to dark matter.

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