

# **Is the physics within the Solar system really understood?**

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Present day gravitational physics experiences a huge success in obtaining better and better experimental results. These results cover the range from cosmology to the search for non-Newtonian forces in the sub-mm range. In some cases the observations do not fit with the present knowledge. Very popular are the issues of dark matter and dark energy which are needed for the explanation of the galactic rotation curves and gravitational lensing, and of the accelerated expansion of our universe. Though these are phenomena on the cosmological scale they may influence the physics within the Solar system. Further observations are the Pioneer anomaly, an anomalous constant acceleration of the Pioneer spacecrafts toward the Sun which until now found no explanation. Another unexplained observation is the flyby anomaly, a velocity increase of satellites during an Earth flyby, which has been observed at many instances. Yet another phenomenon is the secular increase of the astronomical unit by approximately 7 meters per century which has been established last year by taking into account more than 100 years of Solar system data. Finally there is a quadrupole and octopole anomaly of the cosmic microwave background: the quadrupole and octopole part of the cosmic microwave background seems to be correlated with the orientation of the Solar system.

We report on these phenomena, try to establish links and to propose missions to explore these unexplained phenomena.