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分类浏览

**【所属分类】：** 自然科学--天文学**【标题】：** 水星轨道异常：几种引力理论之比较（修正稿）**【作者】：** 汤克云

牛顿引力定律以极高精度解释了太阳系行星的运动轨道。对水星轨道作100年的观测，仅有微小的43角秒无法用牛顿理论去解释，偏差率只有0.000,008%。除牛顿引力，本文还考察了3种引力理论对水星轨道的解释，包括史瓦西轨道方程、后牛顿近似和推迟引力。我们看到，史瓦西轨道方程中的非线性扰动项恰好能造成43角秒的进动，但略去方程中的线性扰动项是不合理的，更无法解释巨大的岁差和行星摄动。总之，史瓦西轨道方程无法正确解释水星轨道异常。后牛顿近似的合理性有待深入研究；迄今为止，考虑了引力源相对于观测者的速度及加速度的推迟引力可能对水星轨道异常作出了物理图像最清楚、最合理、最完整的解释。

**【关键词】：** 水星轨道异常，牛顿引力，史瓦西轨道方程，后牛顿近似，推迟引力**【联系方式】：** kytang@bao.ac.cn**【发布时间】：** 2014-11-12**【发表状态】：** N未发表**【TITILE】：** Mercury's orbit anomaly: a comparison on several kind of gravitational theories (revised version)**【AUTHORS】：** Keyun Tang

Newton's law of gravity offers an excellent explanation on planet orbits in the solar system. For 100 years, only a tiny part ( 43arc-seconds ) of the observation of Mercury's orbit can't be well explained by Newton's gravitation, the deviation rate is only 0.000,008%. In addition to Newton's law of gravity, this paper also examines explanations on Mercury's orbit by three kind of gravitational theories, including Schwarzschild orbit equation, PPN approximation and retarded gravitation. We have found that the nonlinear perturbation term in the Schwarzschild orbital equation happen to cause the 43 arc-seconds of precession of Mercury's perihelion, but the linear perturbation term in the equation omitted by most textbooks of general relativity can cause 88 arc-seconds of advance of Mercury's rotation, even more unreasonable thing is that the Schwarzschild orbital equation did not to make any explanation on the huge precession due to the gravitational actions on Earth from Sun and Moon, and significant perturbations due to the gravitational forces of Venus, Earth, Mars, Jupiter and Saturn at all; in one word, the anomaly of Mercury's orbit can not be correctly explained by the Schwarzschild orbit equation. The rationality of the PPN approximation solution should be further studied. So far, the retarded gravitational theory, which includes the contribution of relative velocity and acceleration between the gravitational source and observer, may give a most reasonable and complete explanation on the anomaly of Mercury's orbit with a most clear physical picture.

**【ABSTRACT】：** Mercury's orbit anomaly, Newton's law of gravity, Schwarzschild orbit equation, PPN approximation, retarded gravitation**【ADDRESS】：** kytang@bao.ac.cn**【全文文件】：** [水星轨道异常：几种引力理论之比较-20141111修改稿.doc](#)[返回](#)

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