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利用2009年日全食的精细重力观测探寻“引力异常”

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To discriminate the gravity anomaly by the subtle gravity observation of the total solar eclipse in 2009

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摘要

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摘要

日全食期间在是否存在“引力异常”现象是一个关系到引力本质的重大问题,也是一个十分具有现实意义的科学问题.近一个世纪来,许多科学工作者作了大量的观测和实验,研究日全食期间的“引力异常”现象.肯定的、否定的结果并存,更多的是难以确定的结果.在学习、总结和发展的前人工作的基础之上,本文利用7台LaCoste-Romberg重力仪和1台SG-053超导重力仪,对2009年7月22日日全食期间的重力变化进行了精细的观测.研究利用了目前最好的观测环境和观测仪器,无论观测规模还是观测质量在近百年来日全食的重力观测研究中都是首屈一指的.在经过详细的数据处理和图像分析后,可以确定,日全食期间不存在现有观测能力之上的引力异常,以往发现的异常现象受剧烈的气象变化影响可能性极大.另外,在处理重力观测数据时,本文合理的利用了最小二乘多项式拟合法去除理论潮汐值,使计算得以简化,结论更加可靠.

关键词 [LaCoste-Romberg](#), [SG-053](#), [超导重力仪](#), [日全食](#), [重力异常](#), [多项式拟合](#), [固体潮汐](#)

Abstract:

It is a vital problem about the nature of gravity and also a realistic scientific issue whether a gravity anomaly exists during the total solar eclipse. For a century, predecessors did a lot of observations and experiments to research gravity anomalies during the solar eclipses. Nonetheless, a clear result has not been found due to the limitation of the condition and the instruments. On the basis of previous work, this paper studies the gravity data of seven LaCoste-Romberg gravimeters and one SG-053 superconducting gravimeter during the total solar eclipse on July 22, 2009. The study utilized the perfect environment and the delicate instrument. It could to be the best research activity both in the experiment scale and in the observation quality in the past century. Based on the research in this paper, we hold the opinion that the supposed gravity anomaly during the total solar eclipse cannot be detected at present with actual observation conditions and instrument performance. And the previous anomaly was very likely created by the drastic changes in the weather. Moreover, the least square cubic-polynomial fitting method which is used to remove the theoretical earthtide from the observed gravity data makes a more simple calculation and a more reliable conclusion.

Keywords [LaCoste-Romberg](#), [SG-053](#), [Superconducting gravimeter](#), [Total solar eclipse](#), [Gravity anomaly](#), [Polynomial fitting](#), [Earthtide](#)

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