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卫星重力捕捉龙滩水库储水量变化

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Detect water storage variation of Longtan Reservoir with GRACE data

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摘要

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摘要 利用近7年的Gravity Recovery and Climate Experiment (GRACE)重力卫星资料,采用改进的滑动窗去相关滤波和扇形滤波技术计算了红水河上游区域的重力变化,结果显示红水河上游区域重力场有明显的上升趋势.利用Global Land Data Assimilation Systems (GLDAS)土壤湿度模型计算了地表水对重力场的影响,结果表明土壤湿度变化对重力场的影响主要表现为季节变化特征,对该地区重力上升趋势的变化并没有明显的贡献.扣除土壤湿度影响之后的剩余重力变化曲线显示,在2006年9月前该地区剩余重力有一约2.17 μGal 的重力抬升.报道资料和水库储水量模拟结果表明,这一重力抬升与我国在建第三大水电站——龙滩水电站水库蓄水有关.这一结果说明GRACE卫星不仅能够反映大尺度的季节变化信息,而且能够为监测大型水库水储量变化提供近实时的空间对地测量资料.

关键词: 卫星重力 重力场变化 红水河上游地区 龙滩水库

Abstract: With the help of nearly seven years' Gravity Recovery and Climate Experiment (GRACE) gravity satellite data, we studied the gravity change of Hongshui river upstream area, which revealed that the gravity has an obvious rise trend. We also calculated the effect of soil moisture on gravity field using the Global Land Data Assimilation Systems (GLDAS) soil moisture model. The result showed that the effect of soil moisture is characterized by seasonal change, and it does not contribute greatly to the gravity rise trend in this area. The residual gravity change shows that there is a 2.17 μGal uplift before and after September 2006. The data and simulation results show that this gravity uplift is related to the water storage reservoirs of the Longtan hydropower station. This result shows that GRACE satellite can not only show the large-scale information of seasonal changes, but also provide the near real-time data for monitoring the variations of the water-level in large reservoirs.

Keywords: Satellite gravity Gravity change Upstream of Hongshui river Longtan reservoir

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