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GRACE和地面重力测量监测到的中国大陆长期重力变化

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Long-term gravity changes in Chinese mainland from GRACE and terrestrial gravity measurements

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摘要

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摘要 自2002年以来, GRACE卫星探测计划可提供高精度的时变地球重力场, 用以探测地球系统的物质分布. 自1998年中国大陆重力监测网建立以来, 利用FG5绝对重力仪和LCR-G型相对重力仪每2年对该网进行重复测量获取重力场时变信息. 基于此, 本文利用GRACE和地面重力测量获得了中国大陆重力场的长期年变率, 利用位错理论根据USGS发布的断层模型计算了2008年汶川 $M_s 8.0$ 级地震的同震重力变化并进行了300 km高斯滤波. GRACE卫星重力和地面重力结果均表明华北地区地下水流失严重, 在绝对重力基准站上, GRACE卫星重力与绝对重力变化率较为一致, 汶川区域的地面重力变化结果可视为大地震前兆信息.

关键词 GRACE卫星, 地面重力测量, 重力变化, 地震, 位错

Abstract: Since 2002, the GRACE satellite mission has been providing precise survey data of the Earth's time-variable gravity field, and has greatly improved the understanding of mass distribution on and near the surface of the earth. A gravity network in Chinese mainland is established to determine gravity variations using LCR-G relative gravimeter and FG5 absolute gravimeter about every 2 years since 1998. Based on these observations, the secular trend of gravity changes in Chinese mainland is obtained and analyzed, and co-seismic gravity changes caused by the 2008 Wenchuan $M_s 8.0$ earthquake are computed using the dislocation model of USGS and treated with 300 km Gaussian filter. Both GRACE and terrestrial observation results show that in the north part of China, the features have strongest resemblance, indicating the presence of large-scale changes in ground water storage, at the absolute gravity datum stations, the features of the gravity variations observed by GRACE and the absolute gravity measurements agree reasonably well, the terrestrial gravity changes around Wenchuan area could be viewed as a precursor of the great earthquake.

Keywords GRACE satellites, Terrestrial gravity measurements, Gravity change, Earthquake, Dislocation

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