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基于实测重力异常和地形数据确定重力梯度的研究

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Based on measured gravity anomaly and terrain data to determine the gravity gradients

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摘要

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摘要

本文利用澳大利亚北领地West Arnhem Land 地区实测重力异常数据并联合DEM(9")和SRTM3(3")地形高程数据,使用移去-恢复技术和Stokes积分方法计算了该地区两条剖面的重力梯度及其功率谱密度,使用FFT方法解算了整个地区的重力梯度值,结果证明了联合重力异常数据和高分辨率地形高程数据能有效地提高重力梯度的解算精度;功率谱密度的计算结果与国外成熟的重力梯度功率谱密度模型相吻合,表明高于0.3 Hz频率范围的功率谱密度可看做噪声,为重力梯度数据处理中噪声的辨别和剔除提供了借鉴,另外对重力梯度辅助导航基准图的构建以及重力梯度测量系统的标定提供了有益的探索.

关键词 重力梯度, 移去-恢复法, SRTM3, Stokes积分, 功率谱密度

Abstract:

Based on gravity anomaly data and terrain elevation data (DEM(9") and SRTM3(3")), this paper calculates the gravity gradients and its power spectral density of two profiles in West Arnhem Land of Australia's northern territory. We implement Remove-Recovery and Stokes integral method to obtain the outcomes. We also implement FFT methods to calculate the gravity gradients covering the entire area. The results show that combination of gravity anomaly data with high spatial resolution terrain elevation data can effectively improve the accuracy of gravity gradients. Calculated power spectral density matches well with the power spectral density model, it shows that power spectral density greater than 0.3 Hz can be regarded as noise. The results provide a reference for data processing in identifying and eliminating the noise in gradients. In addition, it provides beneficial exploration for reference map of gravity gradient assisted navigation and for gravity gradient measurement system calibration.

Keywords Gravity gradients, Remove-Recovery, SRTM3, Stokes integral, PSD

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