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基于配置法的局部重力场延拓模型构建与应用分析

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Continuation model construction and application analysis of local gravity field based on least square collocation

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摘要 在大地坐标系下利用Forsberg局部扰动位协方差模型（即DPM模型）导出了实用的局部重力异常协方差模型（即GAC模型）和局部扰动重力协方差模型（即GDC模型），两种模型形式完全一致.针对GAC模型，提出了两种模型参数的拟合方法,即按照泊松积分向上延拓获得的不同高度数据进行拟合以及按照测量区域的平面实测数据进行拟合，通过某地区的实测数据检验得出两种参数拟合方法得到的参数值相差不大，这种差别在向上和向下延拓过程中的影响可以忽略.依据本文的算例，GAC模型作为配置法的协方差模型用于延拓时，其向上延拓的精度在1.8×10^{-5} m·s^{-2}左右，向下延拓的精度在5×10^{-5} m·s^{-2}左右，完全满足局部重力场在中等山区的延拓要求.通过对不同高度下GAC模型用于延拓效果的对比，可以得出基于GAC模型的延拓精度随着高度的增加而衰减，在满足测量精度要求下其最大向下延拓高度约为7 km.总体而言，本文推导的GAC模型能够很好地利用地形数据，较好地满足了航空重力测量在局部重力场的延拓要求.

关键词 配置法， 局部重力场， 向上延拓， 向下延拓， 协方差模型

Abstract: Under the geodetic coordinate, the covariance model of gravity anomaly(GAC) and gravity disturbance(GDC) is respectively derived from the covariance model of disturbing potential (DPM) which is established by Forsberg, the results show that both model have the same expression formula. Two methods for parameter estimation of GAC model are described in detail. According to the actual airborne and land surveying, the accuracy of upward continuation based on the GAC model is about 1.8×10^{-5} m·s^{-2}, and the accuracy of downward continuation is about 5×10^{-5} m·s^{-2}.Based on the continuation result of different height, the model′ s application range is determined as about 7 kilometers. It can be generally concluded that the DPM model and GAC model can fulfill the continuation requirements of airborne surveying.

Keywords Least square collocation, Local gravity field, Upward continuation, Downward continuation, Covariance model