

引用本文(Citation):

陈秋杰, 沈云中, 张兴福. 基于重力卫星几何轨道线性化的地球重力场反演方法. 地球物理学报, 2013,56(7): 2238-2244,doi: 10.6038/cjg20130711

CHEN Qiu-Jie, SHEN Yun-Zhong, ZHANG Xing-Fu. Linearization method of recovering Earth's gravity field with respect to gravity satellite's kinematic orbits. Chinese Journal Geophysics, 2013, 56(7): 2238-2244, doi: 10.6038/cjg20130711

基于重力卫星几何轨道线性化的地球重力场反演方法

陈秋杰^{1,2}, 沈云中^{1,2}, 张兴福^{3*}

1. 同济大学测绘与地理信息学院, 上海 200092;
2. 同济大学空间信息与可持续发展应用中心, 上海 200092;
3. 广东工业大学测绘工程系, 广州 510006

Linearization method of recovering Earth's gravity field with respect to gravity satellite's kinematic orbits

CHEN Qiu-Jie^{1,2}, SHEN Yun-Zhong^{1,2}, ZHANG Xing-Fu^{3*}

1. College of Surveying and Geo-informatics, Tongji University, Shanghai 200092, China;
2. Center for Spatial Information Science and Sustainable Development, Tongji University, Shanghai 200092, China;
3. Department of Surveying and Mapping, Guangdong University of Technology, Guangzhou 510006, China

摘要

参考文献

相关文章

Download: [PDF](#) (2101 KB) [HTML](#) (0 KB) Export: [BibTeX](#) or [EndNote](#) (RIS) [Supporting Info](#)

摘要

传统动力学法的观测方程以6个初始轨道参数和先验力模型为初值进行线性化,其线性化误差随积分弧长拉长而增大.本文直接以重力卫星的几何观测轨道为初值进行线性化,其线性化误差与轨道弧长无关,且不需要初始重力场模型和初始轨道参数.导出了基于卫星轨道观测值反演重力场模型的相关公式,利用JPL公布的RL02版本2008年全年的GRACE双星轨道数据和加速度计数据解算了90阶次的地球重力场模型TJGRACE01S,并以EGM2008模型为基准与其他模型进行了比较分析,结果表明:TJGRACE01S模型直到90阶次的大地水准面累积误差为17.6 cm,优于同阶次的EIGEN-CHAMP03S和EIGEN-CHAMP05S模型,前27阶位系数整体精度优于EIGEN-GRACE01S,前15阶位系数整体精度与EIGEN-GRACE02S模型精度大致相当.利用美国8221个GPS水准点数据的分析结果也表明,本文模型也优于同阶次的EIGEN-CHAMP03S和EIGEN-CHAMP05S模型.

关键词 卫星重力, 地球重力场模型, GRACE卫星轨道, 线性化

Abstract:

The observational equation of traditional dynamic method is linearized with respect to the satellite orbit integrated from the 6 initial orbit parameters and the given force model. This paper derives the observation equation linearization with respect to the kinematic orbit determined with GNSS observations; therefore its linearization error is not correlated to orbit arc length, and the initial orbit parameters and initial gravity field model are no longer needed. The correspondent expressions are derived for recovering the Earth's gravity field from kinematic orbit. The earth's gravity field model TJGRACE01S up to 90 degree and order is computed with RL02 orbit data of whole 2008 by using the developed approach. The recovered model is analyzed by comparing with the existent models with respect to EGM2008 model, the results show that the cumulative geoid height error of the model TJGRACE01S is 17.6 cm, which is more accurate than EIGEN-CHAMP03S and EIGEN-CHAMP05S, and TJGRACE01S's coefficient accuracy as a whole is better than EIGEN-GRACE01S in the leading 27 degrees, and is almost the same as EIGEN-GRACE02S in the leading 15 degrees. The analyzed results using 8221 GPS leveling data of the USA demonstrate that the TJGRACE01S is also better than EIGEN-CHAMP03S and EIGEN-CHAMP05S.

Keywords [Satellite gravimetry](#), [Earth's gravity field model](#), [GRACE satellite orbit](#), [Linearization](#)

Received 2013-03-19;

Fund:

Service

[把本文推荐给朋友](#)

[加入我的书架](#)

[加入引用管理器](#)

[Email Alert](#)

[RSS](#)

作者相关文章

[陈秋杰](#)

[沈云中](#)

[张兴福](#)