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利用VLBI和超导重力资料研究自由核章动周期时变特征

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Temporal variation of the period of free core nutation derived from VLBI and superconducting gravity data

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摘要

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摘要 本文根据自由核章动在章动观测和时变重力观测中引起的与其频率相近的受迫章动项或固体潮波的共振特性, 选取6个不同机构解算的VLBI天极偏差序列和全球超导重力仪网络提供的7个台站高精度时变重力观测资料, 根据加权最小二乘方法拟合地球自由核章动参数, 研究其本征周期的时间变化特征. VLBI资料获得的本征周期变化幅度在1天之内, 存在十年尺度的时间变化特征, 迭积多台站同时段重力资料获得的自由核章动本征周期时变特征与VLBI获得的结果相比变化幅度较大, 但趋势大致符合. 在此基础上, 通过自由核章动的理论模型探讨了影响其本征周期的几个主要因素, 结果表明FCN周期变化与电磁耦合存在相关性, 核幔边界磁感应强度径向分量变化导致的电磁耦合的变化可能是造成FCN周期时变性的原因.

关键词 自由核章动, 本征周期, VLBI, 超导重力仪, 核幔边界

Abstract: This study is based on the observation that the resonance enhancement in the gravity tides and nutations is caused by Free Core Nutation (FCN). FCN parameters are determined by the least square method using 6 VLBI observation series from International VLBI service and superconducting gravity observations at 7 Europe stations. The FCN periods obtained from VLBI observations are very stable with a variation less than 1 sidereal day and show a decadal variation. The results obtained by stacking SG observations have relatively larger variations. Influence factors on the FCN period are analyzed according to its theoretical models. The results show that there exists possible correlation between the variable FCN period and magnetic coupling, and the change of magnetic field at the core-mantle boundary is likely the cause for temporal variation of the period of FCN.

Keywords Free core nutation, Period, VLBI, Superconducting gravimeter, Core-mantle boundary

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