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超导重力技术在探讨核幔边界黏性特征中的初步应用

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摘要 旋转椭球型地球的固体地幔与液态地核间相互作用而产生的逆向本征模通常称之为地球自由核章动，自由核章动的品质因子（*Q*值）能有效反映核幔边界层能量耗散特征，与核幔边界的黏滞度密切相关.本文首次利用全球地球动力学计划网络23个台站27组高密度采样的高精度超导重力仪器观测数据，采用迭积技术，确定了自由核章动参数*Q*值，进而计算了核幔边界的黏滞系数.数值结果说明获得的核幔边界动力学黏滞系数达到10^3 Pa·s量级，与加拿大科学家Smylie等利用VLBI观测资料获得的最新结果一致，这说明重力技术是有效应用于研究地球深内部结构的重要手段之一.

关键词 超导重力仪 自由核章动 品质因子 核幔边界黏滞系数

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Preliminary application of superconductive gravity technique on the investigation of viscosity at core-mantle boundary

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Abstract The retrograde rotational eigenmodes are produced due to the interaction between solid mantle and liquid core in a rotating elliptical Earth, it is usually called the free core nutation (FCN). The FCN quality factor (*Q* value), which depends on the viscosity at the core-mantle boundary (CMB), can effectively reflect the characteristics of the energy dissipation at the CMB. The viscosity of the CMB is estimated for the first time based on the FCN quality factor *Q* values determined from stacking 27 high-sampling and high-precision tidal gravity observations at 23 superconducting gravimeters stations in Global Geodynamics Project (GGP) network along the world. The numerical results show that the dynamic viscosity estimated at the CMB can reach at up to the order of 10^3 Pa·s, it is in good agreement with the nearest result obtained using VLBI observations by Canadian scientist Smylie. This result indicates also that the gravity is one of the effective techniques for investigating the deep internal structure of the Earth.

Key words Superconducting gravimeter; Free core nutation; Quality factor; Viscosity of the CMB

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