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空间物理学★大气物理学★大地测量学

GRACE卫星精密定轨随机模型精化

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The stochastic model refinement for precise orbit determination of GRACE

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摘要 合理的随机模型是确定高精度卫星轨道的前提条件,目前广泛应用于地面观测数据的随机模型主要有高度角模型和载噪比模型,本文通过对GRACE卫星实测数据的分析表明上述随机模型均不能很好地描述GRACE卫星星载GPS观测值的噪声特点,为此,文中提出了扩展的高度角模型和扩展的载噪比随机模型.利用自主研发的精密定轨软件,分别采用高度角模型、扩展的高度角模型、载噪比模型、扩展的载噪比模型对GRACE卫星进行了轨道确定.数值结果表明:(1)高度角模型的运动学轨道径向精度为3.4 cm,扩展的高度角模型的为3.3 cm;(2)载噪比模型的运动学轨道径向精度为4.9 cm,扩展的载噪比模型的则为3.4 cm,精度提高了1.5 cm.经比较分析,文中提出的扩展的高度角模型和载噪比模型能更好地描述GRACE卫星观测值噪声特点,并能取得更高的卫星定轨精度.

关键词： GRACE 运动学 精密定轨 随机模型 高度角 载噪比

Abstract： Reasonable stochastic model is the prerequisite to determine high-precision satellite orbits, current widely-used stochastic models for the ground-based GPS observations are the elevation-dependent weighting model and the C/N_0 (carrier-to-noise-power-density ratio) derived weighting model. But the analysis of the GPS observables from GRACE indicates that the conventional model couldn't describe the noise characteristics of the space-borne GPS observable properly. Therefore, an extended elevation-dependent model and an extended C/N_0-derived model are put forward. Kinematic orbits of GRACE with elevation-dependent model, extended elevation-dependent model, C/N_0-derived model, extended C/N_0-derived model are computed respectively. The numerical results indicate:(1) The accuracy in radial direction of the kinematic orbits with elevation-dependent model is 3.4 cm, and that with the extended elevation-dependent model is 3.3 cm; (2) The accuracy in radial direction of the kinematic orbits with C/N_0-derived model is 4.9 cm, and that with the extended C/N_0-derived model is 3.4 cm, the accuracy increase is 1.5 cm. The above results show that the two extended model both can describe the GRACE GPS observables more accurately.

Keywords： GRACE Kinematic Precise orbit determination Stochastic model Elevation Carrier-to-noise

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