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主磁场梯度的空间分布和长期变化特征

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Characteristics of the spatial distribution and the secular variation of the main geomagnetic field gradients

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摘要

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摘要 根据GUFM1和IGRF11模型,计算1590—2010年主磁场总强度 F 、水平分量 H 和磁倾角 I 三个要素的水平梯度和垂直梯度,分析了它们的空间分布和长期变化特点.结果表明: F 和 H 的垂直梯度与其磁场的空间分布类似,水平方向的梯度以及磁倾角 I 在3个方向的梯度都与其磁场分布有明显差异. H 的3个方向的梯度分布清楚地指示出南磁极的位置.梯度的长期变化表明,北半球磁场梯度漂移缓慢,南半球磁场梯度变化较快.磁倾角的垂直梯度显示,中太平洋负异常周围的正异常在围绕该负异常旋转.近赤道的梯度异常带在 60° W附近的转折是由印度洋异常向非洲方向移动所致.

关键词 主磁场, 水平梯度, 垂直梯度, 空间分布, 长期变化

Abstract: Based on the GUFM1 and IGRF11 models, we have calculated the horizontal and vertical gradients of three geomagnetic components during 1590—2010, such as the geomagnetic intensity F , the horizontal component H and the declination I . We also analyzed their spatial distribution and the secular variation. The results indicate that the spatial distributions of the vertical gradient of intensity F and horizontal component H are similar to that of their main field, however, the horizontal gradient and the gradients of declination I in three directions are very different from their field distributions. The vertical gradients of H in three directions clearly show the position of the South magnetic pole. The secular variations of the gradient indicate that the anomaly foci of the gradient are drifting more slowly in the northern hemisphere, but faster in the southern hemisphere. And the gradient variations are more drastic in the northern hemisphere than that in the southern hemisphere. The vertical gradient of the declination I is a negative anomaly in the middle Pacific, and the positive anomaly in the neighboring region tends to rotate about this negative one. The turn of the gradient anomaly belt near the equator of 60° W is caused by the movement of the Indian anomaly to the African direction.

Keywords Main geomagnetic field, Horizontal gradient, Vertical gradient, Spatial distribution, Secular variation

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