

论文

行星际磁场By分量对地球磁层顶场向电流调制

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摘要 采用三维可压缩MHD数值模拟研究了行星际磁场By分量的变化对磁层顶重联区场向电流大小和分布的影响. 行星际磁场通过模拟区 $x=-L_x$ 处左边界条件By来影响重联过程, 从而改变重联区的场向电流. 研究结果表明边界条件By的突然改变, 能使重联区场向电流迅速增加, 甚至达到增大一个量级的水平. By本身的存在(即不为零)也会使场向电流维持在一个较高的水平. 由于行星际磁场By分量不为零, 而形成模拟区磁场By不对称分布, 这种不对称分布是场向电流不对称分布产生的主要原因. 这些结果是与Orsted卫星最新观测结果和地面观测结果相符合的, 它表明行星际磁场By分量对地球空间场向电流有较大的调制作用.

关键词 [行星际磁场的By分量](#) [地球磁层顶场向电流](#) [磁场重联](#)

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DOI:

INFLUENCE OF INTERPLANETARY MAGNETIC FIELD B_y ON THE FIELD ALIGNED CURRENT IN THE MAGNETOPAUSE

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Abstract Recent satellite observations and ground based observations show that the interplanetary conditions have a strong influence on the field aligned current (FAC) of the earth. This paper studies the influence of interplanetary magnetic field B_y component on the FAC in the reconnection region of magnetopause by means of 3D MHD simulation. B_y influences the reconnection process and the associated FAC of the simulation region by dayside boundary magnetic field B_y at $x=-L_x$. Results show a rapid increase of B_y can increase FAC remarkably, sometimes about one order larger. Larger B_y can also maintain FAC at a high level. In addition, asymmetric distribution of B_y in the reconnection region caused by B_y gives rise to the asymmetry of FAC. These results are in good agreement with satellite observations. Because FACs at the inner side of the reconnection layer flow into the polar ionosphere along magnetic field lines, the results are very important to better understanding of coupling of Solar wind magnetosphere ionosphere.

Key words [Interplanetary \$B_y\$](#) ; [Field aligned current](#); [Magnetic reconnection](#).

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