地球物理学报 » 2012, Vol. 55 » Issue (3) :738-743

引用本文:
薛炳森.高能质子能谱特征在日冕物质抛射影响预报中的应用[J] 地球物理学报, 2012,V55(3): 738-743,DOI: 10.6038/j.issn.0001-5733.2012.03.002

XUE Bing-Sen.The application of spectrum of energetic protons accelerated by CME in the geomagnetic storm forecast.Chinese J.Geophys. (in Chinese),2012,V55(3): 738-743,DOI: 10.6038/j.issn.0001-5733.2012.03.002

高能质子能谱特征在日冕物质抛射影响预报中的应用

薛炳森*

中国气象局国家空间天气监测预警中心 100081

The application of spectrum of energetic protons accelerated by CME in the geomagnetic storm forecast

XUE Bing-Sen*

National Satellite Meteorological Center, China Meteorological Administration, Beijing 100081, China

摘要 参考文献 相关文章

Download: PDF (1076KB) HTML KB Export: BibTeX or EndNote (RIS) Supporting Info

摘要 日冕物质抛射(CME)的规模和对地有效性是地磁暴预报中重点关注的特征.本项研究的目的是通过对行星际高能质子通量和能谱的特征与演化规律的分析,得到CME对粒子的加速能力,评估CME可能对地磁场造成的影响.在工作中,统计分析了ACE/EPAM的1998—2010年的质子数据,对质子能谱进行了拟合,得到了能谱指数,并对能谱指数及其变化特征所对应的CME和地磁暴进行了相关统计.通过研究发现:(1)能谱指数随着太阳活动水平而变化,高年最大,达到-2.6,而且涨落幅度也达到±0.4,而在太阳活动低年则稳定在-3.0左右;(2)CME对粒子的加速对应着能谱指数的升高,幅度达到20%时,CME引起地磁暴的可能性较大;(3)冕洞高速流到达地球时,高能质子通量也会升高,但能谱指数同时会有下降;(4)以2004年全年的能谱指数为例,对能谱指数在地磁暴预报中的应用进行了评估,结论认为,能谱指数的升高是CME引发地磁暴的必要条件,可以作为地磁暴预报的参数使用.

关键词: CME 加速 高能质子 能谱指数 地磁暴

Abstract: The character of CME is crucial in the forecast of geomagnetic storm. In this work, the flux and spectrum of interplanetary energetic proton, together with the particularity of their evolution, were investigated to get the judgment of the acceleration process occurred in CME and evaluate the effect of the CME on geomagnetic field. The proton flux data from ACE/EPAM during 1998 to 2010 was employed and a so-called spectrum index was derived by modeling the data. Through the statistic work on the proton flux, spectrum and relative CME and geomagnetic disturbance, following conclusion was found: (1)The background of spectrum index was -2.6 while its fluctuation reached ?0.4 in the high period of solar activity and it was stable in low period of solar activity with a value of -3.0; (2) The elevating of the spectrum usually corresponds to the acceleration process in CME, and 20% or more increasing in spectrum index means a good probability of geomagnetic storm; (3)There was increasing of energetic proton flux when the shock by high speed stream from coronal hole reached the earth but the spectrum went slightly down; (4)The efficiency of the application of spectrum in geomagnetic storm forecast was evaluated with the relative data in 2004 and the result showed that the CME originated geomagnetic storm always followed the significant increasing in spectrum index, and the proton spectrum index could be an indicator of geomagnetic storm.

Keywords: CME Acceleration Energetic proton Spectrum index Geomagnetic storm

Received 2010-12-06;

Fund:公益性气象行业专项项目"风云卫星空间天气监测数据应用技术研究"(GYHY200906013)资助.

Service
把本文推荐给朋友
加入我的书架
加入引用管理器
Email Alert
RSS
作者相关文章
薛炳森

链接本文:
http://118.145.16.227/geophy/CN/10.6038/j.issn.0001-5733.2012.03.002 或 http://118.145.16.227/geophy/CN/Y2012/V55/I3/738