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极光沉降粒子能量与AE、D_{st}指数的相关分析

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摘要 对NOAA的POES系列极轨卫星观测得到的1978年以来近30年的极光沉降粒子半球能量的估算值EPI (Estimated Power Input)数据进行了分析，结果表明，极光沉降粒子有显著的春秋分峰值的年变化特征，并且有冬季半球沉降能量较大的南北半球不对称性.对EPI的时均值Pa与地磁指数AE、D_{st}的相关分析得到，Pa与AE的相关系数为0.76，Pa与D_{st}的相关系数为-0.55.把南北半球的时均值SPa,NPa数据分别与AE，D_{st}指数做相关，发现SPa与AE的相关性稍高于NPa的，SPa和NPa与D_{st}的相关性近似.当时延$\tau=0$时，AE与Pa的相关最好，表明全球极光沉降粒子和极光电集流的变化同步；当D_{st}滞后于Pa，时延$\tau=1\sim2$ h，Pa与D_{st}的相关最好，并且时延τ为6～8 h，Pa与D_{st}的相关都好于无时延的水平.

关键词 极光 沉降粒子 亚暴 EPI 地磁指数 相关分析

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Relationships of the auroral precipitating particle power with AE and D_{st} indices

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Abstract The data of the estimated power input (EPI) of auroral particles from NOAA/POES (Polar orbiting environmental satellite) for some 30 years have been analyzed. The annual variation of EPI shows equinox peaks, and an asymmetric activity with a higher peak in the winter-hemisphere than in the summer-hemisphere. The variation tendencies of the EPI generally coincide with *aa, AE* and D_{st} indices. Studies on the correlations of the hourly average of EPI, *Pa*, with *AE* and D_{st} indices show a correlation coefficient r=0.76 of *Pa* and *AE* and r=-0.55 of *Pa* and D_{st}. The EPIs for north and south polar regions, *NPa* and *SPa*, show a north-south asymmetry with a higher correlation of *SPa* and *AE* (or D_{st}). Time delays of EPI with respect to magnetic indices are examined, the maximum correlation coefficient of *Pa* with *AE* (r=0.78) occurs when the time delay τ=0, suggesting a synchronism of auroral electrojet and auroral precipitating particles, while τ=1~2 hours, the correlation coefficient of *Pa* with D_{st} is maximum (r=0.57), suggesting that the activity of auroral particle precipitation may influence the ring current to some extent.

Key words Auroral; Precipitating particles; Substorm; EPI; Magnetic indices; Correlation

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