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# 太阳和地磁活动对磁赤道地区低热层NO密度的影响研究

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# Lower thermospheric Nitric Oxide density over geomagnetic equator response to solar and geomagnetic activities

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摘要

利用SNOE卫星1998年3月11日至2000年9月30日共计935天观测的NO密度和太阳软X射线数据,分析了低热层NO的时空分布特征及其对太阳和地磁活动的响应,得出了以下结论:NO密度从96.67 km开始增加,大约在105～110 km高度达到最大,随后开始减小;同一高度处一般夏季期间最大,冬季次之,春秋分季最小;密度峰值大小变化范围约为$(0.5～1.5)\times10^8$ mol/cm$^3$,峰值高度基本分布在107 km和113 km高度处,且不随太阳活动变化,平均值约为107 km;NO密度与太阳软X射线及地磁*Ap*指数的相关系数在不同高度存在0、1和2天的最佳延迟时间,而同太阳软X射线的统计关系在不同高度和季节存在"线性"、"放大"和"饱和"现象;从统计和事件分析结果来看,太阳活动对磁赤道地区低热层NO密度的气候尺度变化的影响远大于地磁活动,但地磁活动对NO短期变化贡献非常明显.

关键词 太阳软X射线, 地磁*Ap*指数, 磁赤道地区, NO密度

Abstract:

The paper analyzes the relationships between solar soft X-ray irradiances, geomagnetic activity and the lower thermospheric Nitric Oxide density measured by SNOE (Student Nitric Oxide Explorer) satellite during 11 March 1998 and 30 September 2000, and the paper has got some conclusions: the NO density has altitude variation, increasing from 96.67 km, maximum at 105～110 km, and decreased in the topside. Usually, NO density in summer is larger than winter, and minimum in the equinox. The peak density is about $(0.5～1.5)\times10^8$ mol/cm$^3$, and the peak height is mainly 107 km or 113 km which are not varied with solar activity, about 107 km meanly. It has found that the correlation between the solar soft X-ray or geomagnetic *Ap* indices and the NO data in different altitude was better, usually when the space weather data is used from the previous one or two day. The relationship between solar soft X-ray and NO data present "linear", "saturation", "amplification". As a result, the solar soft X-ray is the main cause of the variation in the geomagnetic equator lower thermospheric NO densities for longer intendancy and middle time scales, but weaker in short-time scale for geomagnetic activity.

Keywords Solar soft X-ray, Geomagnetic *Ap* index, Geomagnetic equator region, NO density

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