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中间层顶变化的SABER/TIMED卫星观测

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Variation of the mesopause observed by SABER/TIMED satellite

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摘要

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摘要 本文利用TIMED卫星搭载的SABER探测仪对全球中间层顶信息进行了研究,包括中间层顶的高度、温度及其季节和纬度变化,并对双中间层顶现象进行了分析。中间层顶的温度约在160~180 K之间变化,高度在85~100 km内变化,温度和高度都是冬季高夏季低,有着较为一致的变化趋势。中间层顶高纬呈现显著年变化,而低纬和赤道呈现弱的半年变化,南北半球的中间层顶信息有着不对称性。高纬地区的双中间层顶现象十分显著,中间层顶一般会从100 km附近迅速降低至85 km附近。根据长时间范围内平均的结果显示,北半球的双中间层顶现象在20° N—30° N的中纬范围开始发生,证实了北半球双中间层顶现象不再仅限于极区和中高纬地区。而南半球则仍是在50° S才显著发生双中间层顶现象。我们统计了中高纬地区夏季所有的单个观测剖面并且与当年冬季的平均背景剖面相比较,数据显示,较低的夏季第二中间层顶高度绝大多数比冬季中间层顶低12~16 km。

关键词 卫星探测, 中间层顶, 双中间层顶, 年变化, 半年变化

Abstract: We have studied the global mesopause including its seasonal and latitudinal variations of temperature and height as well as the double mesopause phenomenon using the data from SABER instrument on TIMED satellite. The results show that the temperature of the mesopause is between 160 and 180 K while the height of the mesopause is between 85 and 100 km. Both temperature and height of the mesopause are higher in winter and lower in summer. It is revealed that the temperature and height of the mesopause change nearly synchronously. An obvious annual oscillation is seen at high latitudes while semi-annual oscillation at low latitudes and the equator. There exists an asymmetry within northern and southern hemisphere mesopause information. The double mesopause is notable at high latitudes that the mesopause descends promptly from about 100 km to 85 km. The phenomenon of the double mesopause occurs widely within the latitudes 20° N and 30° N according to the long-term average. Our results confirm that the double mesopause is not restricted in polar and mid-high latitude areas. The double mesopause generally comes out from 40° S—50° S in the southern hemisphere. We make statistic single temperature profiles in mid-high latitude in summer and compare with averaged winter background temperature profiles. The results show that most second summer lower mesopauses are lower than the winter mesopause by 12~16 km.

Keywords Satellite observation, Mesopause, Double mesopause, Annual variation, Semi-annual variation

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