



平流层CH₄的时空变化特征及其与O₃的关系

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Temporal and spatial features of atmospheric methane and its relation to ozone variation in the stratosphere

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摘要 利用1991年10月到2005年11月的HALO₃E卫星观测资料,对全球70° S~70° N范围内平流层100hPa到1 hPa的大气CH₄混合比进行了时空特征分析.结果表明:①CH₄混合比在平流层是随高度上升而逐渐减小的.平流层中上层CH₄变化存在年循环,而平流层中下层CH₄变化存在半年振荡(SAO₃),且南半球平流层CH₄的季节变化振幅要大于北半球,特别是平流层中上层.平流层各个高度上的CH₄基本呈纬向分布,但是不同高度上分布特征有所差异;②平流层CH₄混合比变化存在3个月,10个月,准25个月和准45个月左右时间尺度的周期,但是3个月的短期变化和10个月的年循环只在1996年之前明显;③不同高度上,CH₄和O₃变化的相关关系是不同的,CH₄对O₃的破坏作用并不是存在于整个平流层,似乎是在有的高度上相关关系明显,有的高度上相关关系不明显.

关键词: CH₄ O₃ 平流层 时空变化特征

Abstract: The methane data observed by HALOE in UARS satellite from October 1991 to November 2005 are used to analyze the temporal and spatial features of stratospheric methane covering 70° S—70° N, 180° W—180° E. The results show that: ① the methane mixing ratio decreases with altitude in the stratosphere. The methane mixing ratio variation contains the annual cycle in the middle and upper stratosphere and the semiannual cycle in the lower stratosphere. And the amplitude of monthly variability in the southern hemisphere is larger than that in the northern hemisphere, especially at the middle upper stratosphere. The methane mixing ratio in low latitudes is larger than that in high latitudes, and is nearly symmetric on either side of the equator, but the distribution features are different at different heights; ② The methane mixing ratio change has 3-month, 10-month, quasi-25-month and quasi-45-month oscillations, while 3-month and 10-month oscillations are obvious before 1996; ③ The relationship between the methane mixing ratio and the ozone mixing ratio is different at different layers. The photochemical destruction effect of the methane to the ozone dose not exist in the whole stratosphere, it seems that the correlation is obvious at some layers, but not obvious at other layers.

Key words: methane ozone stratosphere temporal and spatial features

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