

论文

平流层臭氧对人类活动排放氯化物及氮氧化物的非线性响应

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摘要 利用本文所建立的平流层下部臭氧异相光化学系统, 研究硫酸气溶胶表面积浓度以及氯化物和氮氧化物的排放强度对系统状态的影响.光化系统由19种分别来自氧族、氢族、氮族、氯族和碳族的化学成分组成.研究结果指出, 仅就气溶胶而言, 它不是一个重要的决定光化系统行为的因子.然而, 当它与奇氯ClO<sub>x</sub>或奇氮NO<sub>x</sub>的外源共同影响系统时, 通过复杂的非线性光化学过程, 它将使系统的行为发生重大变化.可以看到, 在某些确定的参数范围内, 系统存在多平衡态解, 并构成一个“折叠”突变流型.

关键词 [平流层](#) [大气臭氧](#) [气溶胶](#) [非均相化学](#) [多平衡态](#)

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**On the nonlinear response of lower stratospheric ozone to NO<sub>x</sub> and ClO<sub>x</sub> perturbations**

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**Abstract** The impact of H<sub>2</sub>O, H<sub>2</sub>SO<sub>4</sub> aerosol, ClO<sub>x</sub> and NO<sub>x</sub> perturbations on stratospheric ozone is researched by using the heterogeneous chemical system, which consists of 19 species belonging to 5 chemical families. The results show that, just in terms of aerosol, it is not an important factor to decide the nonlinear behaviors of the heterogeneous system under the current conditions. However, if the heterogeneous system is controlled jointly by aerosol and a source of reactive chlorine (ClO<sub>x</sub>) or a source of reactive nitrogen (NO<sub>x</sub>), the heterogeneous chemistry may produce significant influence on nonlinear behaviors of the system through chlorine chemistry and nitrogen chemistry. And in some parameters range, it can be presented as the existence of multi equilibrium solutions which could produce a folding transition.

**Key words** [Lower stratosphere](#); [Atmosphere ozone](#); [Aerosol](#); [Heterogeneous chemistry](#); [Multi equilibrium](#)

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