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东亚地区人为硫酸盐气溶胶辐射气候效应不同模拟方法的对比

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The comparison of different simulation methods for the climate responses of the radiative forcing of anthropogenic sulfate aerosol over east Asia

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摘要 利用区域气候模式RegCM2与大气化学模式连接的模拟系统,研究了中国地区人为排放生成的硫酸盐气溶胶分布及其辐射气候效应,并与全球模式的结果进行了比较,同时对比了硫酸盐气溶胶辐射气候效应的在线、离线模拟方法所得结果差异的细致情况.通过以上工作表明:区域气候和大气化学耦合模式系统能在比大气环流模式更精细的尺度上获得硫酸盐分布规律和辐射气候效应;并且区域气候模式与大气化学模式的在线与离线连接方法得到的硫酸盐柱含量、有反馈和无反馈大气顶直接辐射强迫和地表温度响应在较小区域平均的尺度上存在较显著的差异,并且在全区域平均尺度上也不能被忽略;通过对气候响应的进一步分析发现:模拟结果显示了从硫酸盐含量到辐射强迫和地表温度响应逐渐加大的不确定性.

关键词: 硫酸盐气溶胶 直接辐射强迫 气候响应 在线模拟 离线模拟

Abstract: On the basis of the simulation system coupling the region climate model RegCM2 with the atmospheric chemistry model,the distribution of anthropogenic sulfate aerosol over China area and its radiative climate responses have been studied and compared with the results of the holospheric model.The details methods for the climate responses of the radiative forcing of sulfate aerosol have been compared.The results show:① The coupling simulation system obtains more accurate results of the distribution law of sulfate and radiative responses than the atmospheric circulation model.② It has been clarified that there is difference in most region between results of the on-line and off-line methods both in sulfate burden and in radiative forcing having feedback or not at top of atmosphere(TOA) and in surface temperature response.The difference on regional average results is more obvious than that of large scale average results which is clear and cannot be neglected.③ By the further analysis to the climate responses,the simulation results show the gradually increasing uncertainties from sulfate contents to radiative forcing and surface temperature response.

Key words: sulfate aerosol direct radiative forcing climate responses on-line simulation off-line simulation

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