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## 沙漠绿洲地区夏季地表能量收支的数值模拟

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Numerical simulation of summer land surface energy budget in desert and oasis regions

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摘要

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摘要 本文在MSPAS(Modified Soil-Plant-Atmosphere Scheme)的基础上, 引入了一个有效的晴天大气辐射传输方案, 建立了一个能在物理上真实地模拟陆气相互作用及其反馈机制的二维模式MLAIM (Modified Land Atmosphere Interaction Model). 本文利用HEIFE实验的观测资料对MLAIM的模拟结果进行了检验, 对其中不合理的部分进行了分析, 指出了在干旱半干旱区陆面过程参数修正的必要性, 对干旱半干旱区土壤水分传输以及大气近地面层湍流输送的参数化方案进行了改进. 改进后的模式能够较好地模拟夏季连续晴天条件下沙漠的地表能量收支, 因此, 本文利用MLAIM研究了绿洲对其周围沙漠地表能量收支的影响, 并对地表能量收支各分量之间的相互作用进行了分析. 结果表明, 绿洲向其下风向沙漠的水汽输送是导致其上下风向沙漠间地表能量收支差异的最重要的因子.

关键词 沙漠, 绿洲, 夏季, 地表能量收支, 陆气相互作用, 数值模拟

Abstract: In this paper, by extending MSPAS to include an efficient cloudless day atmospheric radiation transfer parameterization scheme, we have developed a two-dimensional model MLAIM, which allows physically realistic simulation of land atmosphere interactions as well as the feedback mechanisms. Using HEIFE experiment's observational data to validate the simulation results of MLAIM, we have discussed the unreasonable part in the simulation, and the necessity of the parameter calibration for the land surface model has been pointed out, and have modified parameterization schemes of soil water transfer in arid and semi-arid areas as well as atmospheric surface layer turbulence transfer. The modified model simulates well the summer land surface energy budget in desert under continuous cloudless conditions, and therefore, we have used MLAIM to study the impact of oasis on the land surface energy budget of its surrounding desert. We also have discussed the interactions among every component of land surface energy budget. Results indicate that the most important factor which induces the differences in land surface energy budget between oasis's windward desert and leeward desert is the water vapor transport from oasis to its leeward desert.

Keywords Desert, Oasis, Summer, Land surface energy budget, Land atmosphere interactions, Numerical simulation

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