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· 　黄宁

· 　郑晓静

风沙跃移运动发展过程及静电力影响的数值模拟

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摘要　　建立了描述风沙跃移运动发展过程以及风场-沙粒互馈机制的风沙跃移运动数值模型，模型中考虑了风场–沙粒之间的耦合作用以及静电力的影响，同时风场是随时间变化的. 模拟了风沙跃移运动从起始阶段至风沙流达到自平衡状态的整个发展过程所需的时间，起沙率与单宽输沙率随时间变化曲线，以及达到稳定后的单位面积输沙率沿高度分布以及贴地风速廓线的影响. 计算结果表明，当沙粒平均带电量为60μC/kg时，计算所得的单宽输沙率以及输沙率沿高度分布与实验结果吻合得较好.

关键词　　风沙跃移运动,数值模拟,耦合作用,沙粒带电,风速廓线

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The effect of electrostatic force on the evolution of saltaing population of wind-blown grains

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Abstract

A theoretical model is suggested to mathematically describe the evolution and the wind feedback mechanism of the wind-blown grain flow. In this theoretical model, the coupling interaction between the wind flow and saltant grains and the effect of electrostatical force are considered and the wind field is regarded as changing with time. The time for the entire system to reach a steady state, the variation curves of the saltant grain number and the grain transport rate with time, the mass-flux profiles and wind profiles at a steady state are calculated based on this theoretical model. These calculation results are well in agreement with the experimental data with the average charge-mass ratio of 60μC/kg.

Key words　　wind blown sand saltation　numerical simulation　coupling effects　electrification of sand particles　wind profile

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