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河流与海洋

河床表面分形特征及其分形维数计算方法

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摘要 将分形原理、地理信息（GIS）技术与河床演变理论相结合, 以河道水下地形图为基础，首先通过编程自动提取高程数据，利用GIS软件建立河床表面数字高程模型，然后以此来计算河床表面的分形维数，并对投影覆盖法进行了改进. 最后对比了各河段不同时期的床面分维数，初步探讨了其物理意义. 研究表明, 该方法用来计算复杂表面的分维数高效准确，为计算河床表面分形维数提供了一个新的途径. 同时河床表面分维数具有时空变异性，能定量反映床面的冲淤起伏程度，与河床演变中的河势和河型都有内在关系. 这在河床演变及河流动力学具有一定的应用价值.

关键词 河床表面；分形；GIS；河床演变

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Study on fractal properties of a river bed and the calculation method of its fractal dimension

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Abstract

In this paper, in case of fractal properties of river bed and the calculation method of fractal dimension, the fractal principle, technology of Geography Information System (GIS) and theory of river bed evolution were combined. Firstly, the attitude data was automatic extracted from the underwater geographical map by the programming, and the GIS software was used to build the river bed surface DEM. Then the Projection Covering Method was improved to calculate fractal dimension of the bed surface with the DEM. At last, the physics conception was discussed by the comparison among the fractal dimensions of each reach in different periods. This research show that this calculated method is effective and accurate, and supplies a new way to calculate fractal dimension of bed surface. Meanwhile, the bed surface fractal dimension varies with the time and space. It can be used to describe the undulating degree of bed scouring and sedimentation quantitatively, and the fractal dimension is correlation with river regime and pattern. This method and conclusion are valuable to river evolution and river mechanics.

Key words river bed surface fractal GIS river evolution

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