基础类成果

泥沙运动随机理论研究

【创新性】

提出了泥沙三种运动形式滚动、跳跃、悬浮的统一概化模式；建立了滚动、跳跃、悬浮的力学方程；阐明了床面泥沙交换的统计规律；从理论上揭示并证实了输沙能力的多值性；起动流速及起动规律研究取得突破性进展；突破了多年来泥沙运动在床面的边界条件无法从理论上严格表述的难题，给出了理论上的定量表达公式；建立了非均匀沙不平衡输沙数学模型，在国内外 100 多个工程或水库中应用；首次从理论上建立了推移质不平衡输沙方程，证实了推移质不平衡输沙几乎是绝对的，但恢复很快；首次揭示并从理论上证实了交换粗化的存在；推移质扩散取得突破性进展。

【影响力】

美国流体力学百科全书，设专章（第六卷第十八章）介绍泥沙运动统计理论；在国际上引起了强烈反响，先后有包括国际水利学会前主席肯尼迪、林泰造在内的美国、日本、英国、澳大利亚、新西兰、波兰等国 30 余位专家来信来函，表示钦佩和祝贺；近年，美国和欧洲的一些学者采用韩其为院士的非均匀沙不平衡输沙公式或思路改进泥沙数学模型。建立了完整的泥沙运动随机理论体系，成为泥沙学科的理论基石之一，稳居国际领先地位；获得 1993 年度国家自然科学三等奖。

主要完成人：韩其为、何明民
受奖单位：泥沙所

RESEARCH OF THE STOCHASTIC THEORY OF SEDIMENT TRANSPORT

【 Innovation 】

It proposed the generalized modes for three forms of sediment transport, namely roll, jump and suspension; established roll, jump and suspension mechanics equations; clarified the statistical law of bed surface sediment exchanges; theoretically revealed and proved the multi-value feature of sediment transport capacity; made great breakthroughs in the research of incipient velocity and laws of incipient motion; addressed an issue that sediment transport cannot be strictly expressed under the boundary conditions of the bed surface in theory over the years, and put forward an quantitative expression formula theoretically; built a mathematical model for non-equilibrium transport of non-uniform sediment, which has been applied in more than 100 projects or reservoirs at home and abroad; initially established a non-equilibrium bed-load sediment transport formula in theory, demonstrating that the non-equilibrium bed-load sediment transport is almost absolute but recovers very soon; initially revealed and theoretically verified the existence of exchange coarsening; made great breakthroughs in bed-load spreading.

【 Influence 】

The U.S. fluid mechanics encyclopedia set up a special chapter (Chapter 18 of Volume 6) to introduce the statistical theory of sediment transport; it has aroused strong reactions in the world, and nearly 30 experts from the U.S., Japan, Britain, Australia, New Zealand and Poland, including Kennedy and Lin Taizao, former Chairpersons of the International Association for Hydro-Environment Engineering and Research (IAHR), successively sent letters to express their admirations and congratulations; in recent years, some American and European scholars have adopted Academician Han Qiwei's formula or thinking for non-equilibrium transport of non-uniform sediment to improve mathematical models for sediment; established a complete stochastic theory system for sediment transport, making it part of the theoretical foundation of the sediment discipline and retain its leading position in the world; won the third prize of the National Natural Science Awards in 1993.

Main Contributor : Han Qiwei, He Mingmin
Award-winning Unit : Department of Sediment Research