海岸和近海工程国家重点实验室
STATE KEY LABORATORY OF COASTAL AND OFFSHORE ENGINEERING

海岸和近海工程国家重点实验室
学术讲堂

题　目： 海床泥沙侵蚀和波浪紊流的ISPH数值模拟及实验研究

报告人： 王 东　博士

时　间： 2020年8月28日 15:30-16:30

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内容简介：

王东，大连海事大学兴海副教授、硕士生导师。获得天津大学水利工程工学博士学位和优秀博士毕业生称号，曾任新加坡国立大学Philip L.-F. Liu教授课题组Research Fellow，并担任Mathematical Problems in Engineering客座编辑。主要从事不可压缩光滑粒子水动力学数值模型、紊流和泥沙动力学、大比尺建筑物周围泥沙冲刷物理模型实验等研究，在波浪、紊流、泥沙数学模型理论和数值模拟技术上有一定的积累。拥有“ISPH泥沙侵蚀软件”软件著作权1项，在Coastal Engineering、Journal of Fluids and Structures等刊物上发表SCI论文10余篇。

摘要：Extreme waves may destroy the coast-protection structures through continuous scour around them. A 3D incompressible Smoothed Particle Hydrodynamics (ISPH) erosion model is proposed to simulate the scouring process around coastal structures. The erosion model is based on the turbidity water particle concept and the sediment motion is initiated when the fluid bottom shear stress exceeds the critical value. To validate the developed model, a laboratory flume experiment was carried out to study the clear water scouring around a vertical cylinder under unidirectional current, in which high-speed video cameras were used for the real-time monitoring of sediment movement. Recently, the Incompressible Smoothed Particle Hydrodynamics (ISPH) method solving the 2D RANS (Reynolds Averaged Navier-Stokes) equations with the k–ε turbulence closure is constructed. The concept of “massless ISPH” utilizing the definition of "particle density" (number of computational particles within unit volume) is stressed. The skills of this numerical model are tested by applying to two laboratory experiments: (1) A non-breaking solitary wave propagating over a bottom-mounted barrier and (2) a solitary wave breaking on a 1 on 50 slope.

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