Karlstad Applied Analysis Seminar (2023)

Douglas Svensson Seth

NTNU:Norwegian University of Science and Technology, Norway.

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Three-dimensional steady water waves with vorticity

Abstract

The water wave problem concerns solving a free boundary problem. Specifically, the equations of motion for a uid in a two- or three-dimensional domain where the shape of the upper boundary is unknown. The problem becomes steady through the assumption that the waves travel with uniform and constant speed. The rst rigorous existence results for the two-dimensional problem are due to Nekrasov and Levi-Civita in the 1920s. On the other hand, the rst corresponding rigorous existence result in three dimensions took until 1981 and is due to Reeder and Shinbrot.

In this talk we will begin with a brief overview of the water wave problem. Then present two more recent existence results for the three-dimensional water wave problem where the vorticity (curl of the velocity) is nonzero. This talk is based on joint work with Erik Wahlen (Lund University), Evgeniy Lokharu (Lund University) and Kristo er Varholm (NTNU).