



Einladung zur öffentlichen Defensio von

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Thema der Dissertation

Hybrid asymptotics and numerics of traveling water waves

Abstract: Based on well-established analytical approaches, we study numerical methods to compute traveling water waves, which for example model Tsunami waves on the open sea. This category of waves, also known as steady periodic waves, are only affected by gravity and can be considered in a two dimensional framework. We are interested in their key properties like wave height and for which parameter sets such waves can be formed. Of particular interest are vorticity, which measures the local rotation of the fluid velocity, and the existence and position of stagnation points, which are points where the horizontal fluid velocity is equal to the wave speed of propagation. Our numerical outcomes are in agreement with the existing analytical results and in some cases, they lead to speculation of further analytical properties of waves.

We present a numerical continuation approach, where we compute families of solutions starting from linear approximations of small amplitude waves. Numerical examples illustrate the performance of the algorithm for flows of constant vorticity, where we compare the results with known literature. We extend this approach from existing findings to compute new qualitative and quantitative results considering the characteristics of the water waves both for constant and variable vorticity.

Further, we consider a constructive algorithm based on asymptotic expansions for waves without stagnation points. We present a numerical implementation of this algorithm, which was previously only considered analytically, that verifies the analytical results and, indeed, computes large amplitude waves. Finally, we introduce a modification of the existing analytical procedure, which allows the computation of waves with variable vorticity.

Prüfungssenat

Univ.-Prof. Mag. Dr. Andreas Cap
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Zeit:

05. Mai 2022, 09:00 Uhr

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Ort:

Topic: Thesis defense D. Amann

Time: May 5, 2022 09:00 AM Vienna

Join Zoom Meeting

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