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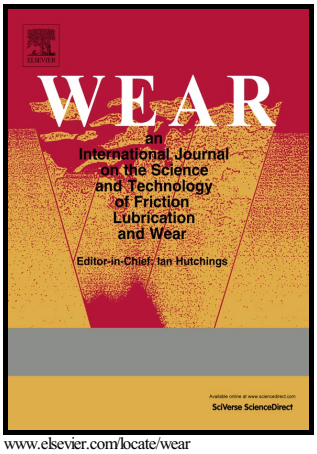

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Numerical Prediction of Cavitation Erosion on a Ship Propeller in Model- and Full-Scale

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Abstract

The cavitating flow around a ship propeller was simulated with an implicit RANS based flow solver using the Volume of Fluid (VoF) method to model the interface between the two phases. The sliding interface method was applied to simulate the rotation of the propeller, comprising a rotor and a stator region. Erosion was predicted with a numerical model based on the microjet hypothesis, using the information from the flow solution. Simulations of a propeller under non-cavitating and cavitating conditions were compared to experimental measurements, thereby demonstrating the ability of the presented numerical method to qualitatively predict cavitation erosion for a ship propeller.

Keywords: propeller; cavitation; erosion; multiphase flow; computational fluid dynamics; erosion prediction

1. Introduction

Depending on temperature, pressure, and quality, liquid water may evaporate. We speak of boiling when heated water at constant temperature evaporates. The process of evaporation and condensation due to pressure changes in the flow under isothermal conditions is called cavitation. Cavitation occurs when a combination of low local static pressure and high flow velocities leads to

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