

PROGRESS IN MULTISCALE MULTIMODEL SIMULATION OF FLUID-STRUCTURE INTERACTION IN MARINE ENGINEERING

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ABSTRACT

In marine engineering, various problems feature with different spatial and temporal scales and are controlled by different factors. For instance, boundary layers are measured by millimeters or centimeters, vortex shedding appear with a scale of meters while ocean waves have a length of hundred meters. Some phenomena, such as wave impact, occur in milliseconds but others, such as internal waves, have a period of minutes. Viscous effects are important when boundary layer and turbulent behaviors are concerned but much less important when studying wave dynamics. Surface tension must be considered for capillary waves with small wave lengths but may be negligible when looking at swell waves with long wave lengths. To simulate physical dynamic problems of different natures with both maximized efficiency and accuracy, the methods based on multi-model and capable to deal with different scales are perhaps of only option.

This presentation will describe the progress in developing the methods for multiscale multimodel simulation of fluid-structure interaction in marine engineering made by the author's team. They include the multimodel method for simulating wave dynamics, the method for modelling wave-structure interaction and these for wave-structure interaction such as vortex induced vibration.