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Development of the radiation/diffraction code WAMIT

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ABSTRACT

PART 1 -- INTRODUCTION, METHODOLOGY, AND EARLY DEVELOPMENTS

WAMIT is a radiation/diffraction program which has been developed to analyze wave interactions with floating and submerged structures. It is based on the linear and second-order potential theory. The numerical methods are developed from the Boundary Integral Equation Method, also known as the Panel Method. This type of program was motivated by a variety of offshore structures where fully three-dimensional computations were required, starting in the late 1960's. The theory and numerical basis will be reviewed briefly. Restrictive assumptions will be discussed, together with alternative methods of analysis and transformation between the time- and frequency-domains.

Special algorithms and extensions will be described, and applications illustrated. These include the evaluation of free-surface Green functions, iterative solution of the linear system, irregular-frequency removal, zero-thickness elements, multiple bodies, generalized modes, and solution of the second-order potential.

PART 2 -- EXTENSIONS AND ADVANCED APPLICATIONS

Various extensions and advanced applications will be described, including the developments of the higher-order method based on B-spline basis functions, exact geometry definition and CAD integration, and the accelerated pFFT method which reduces the computational cost to O(N log N). Several applications will be used to illustrate these methods including a spar with strakes and moonpools, a drillship with three moonpools, gap resonance between two ships alongside, linear coupling of the external hydrodynamics with internal tanks, applications of the pFFT method to very large floating structures, slowly-varying drift forces on an FPSO in shallow water, and the use of a Navier-Stokes post-processor for estimating viscous effects.