VALIDATION OF A SIMPLE APPROXIMATE METHOD FOR EVALUATING STEADY SHIP WAVES

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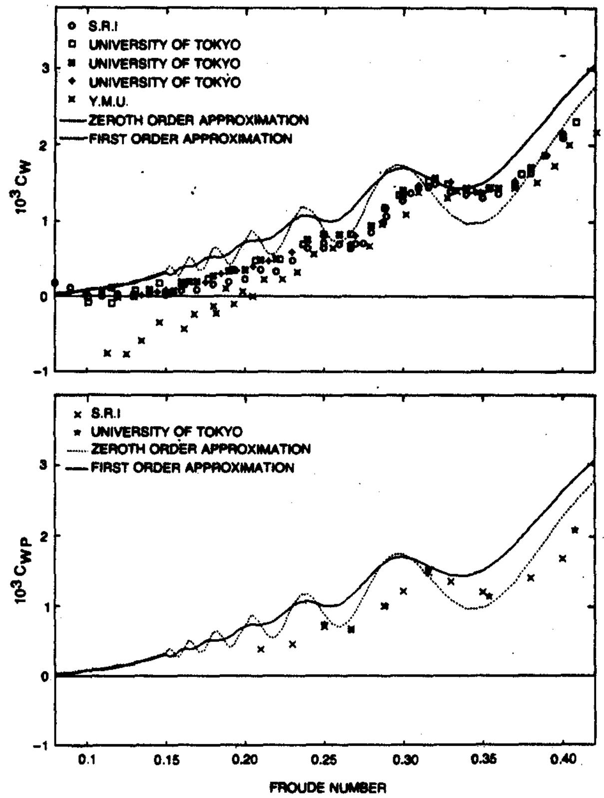
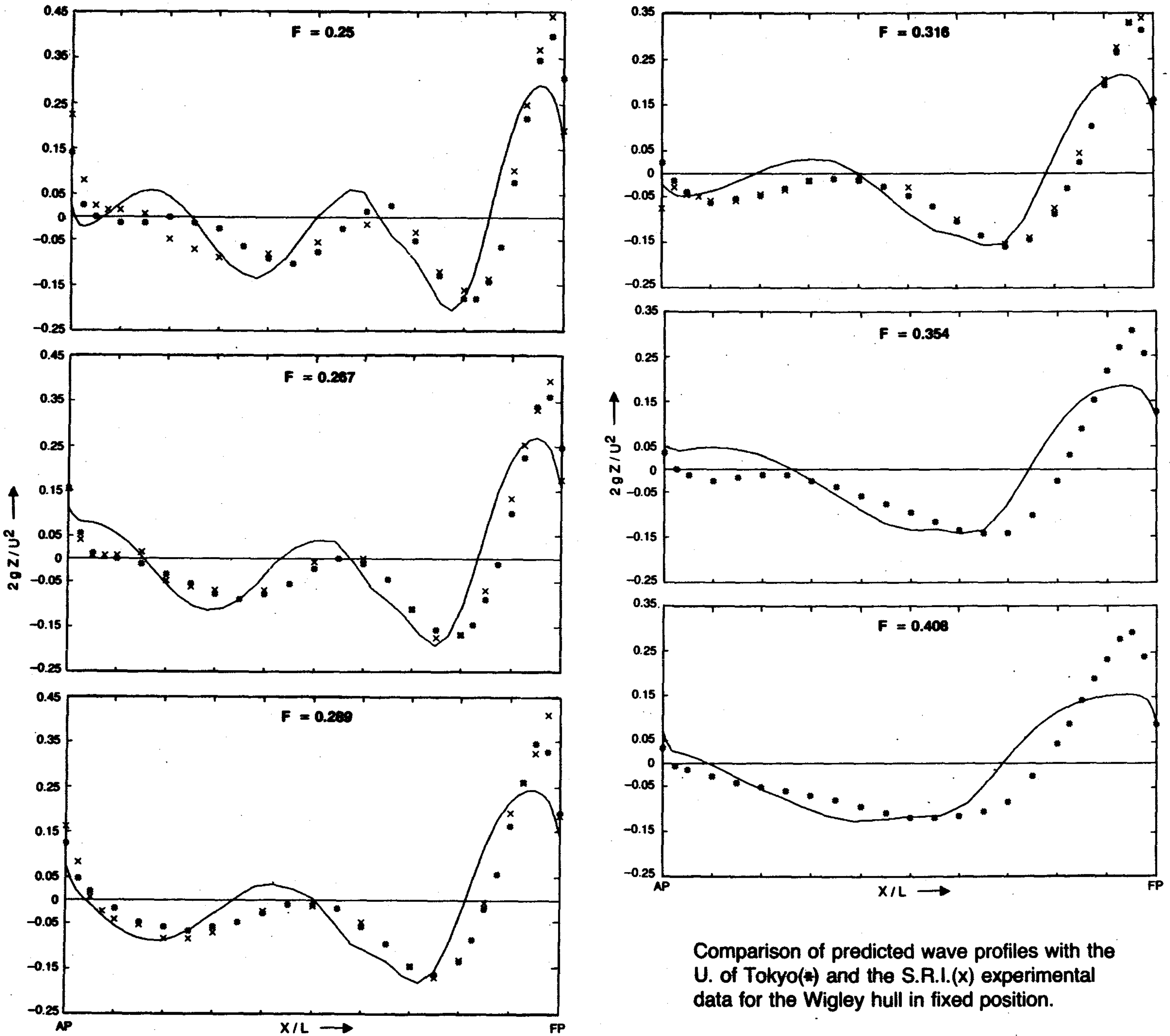
The zeroth- and first-order slender-ship approximations to the Neumann-Kelvin theory given in [1] provide simple approximate methods for predicting steady ship waves. These numerical methods can be implemented on workstations and may thus be used for practical ship-design applications. Extensive recent calculations based on the zeroth-order approximation are reported in [2] and [3]. Numerical predictions based on the first-order approximation are presented in [4,5] and compared with both Neumann-Kelvin predictions and experimental data. Good agreement is shown.

Numerical results obtained recently by the present authors are presented below for the Wigley hull and compared with the experimental data given in [6]. Corresponding results have been obtained for the Series 60 ship form and will be presented at the Workshop. Several recent analytical/numerical developments aimed at improving the efficiency and accuracy of the calculations will also be discussed. These include improved methods for numerically evaluating the nonoscillatory near-field term in the Green function and for integrating this function over a flat triangular panel, and a modified expression for the far-field wave-amplitude function.

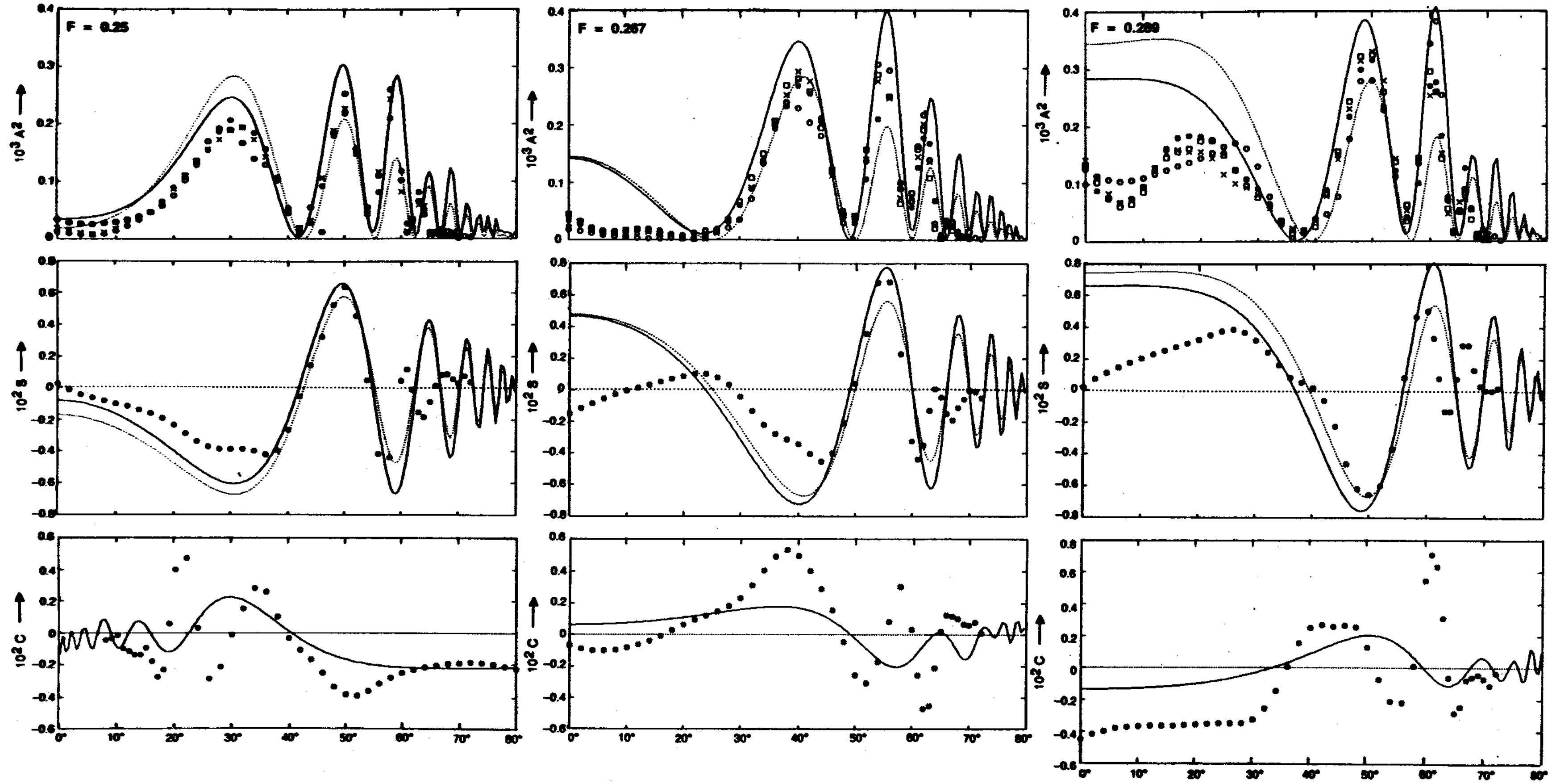


Wave-resistance coefficients C_W & C_{WP} for the Wigley hull held in fixed position.

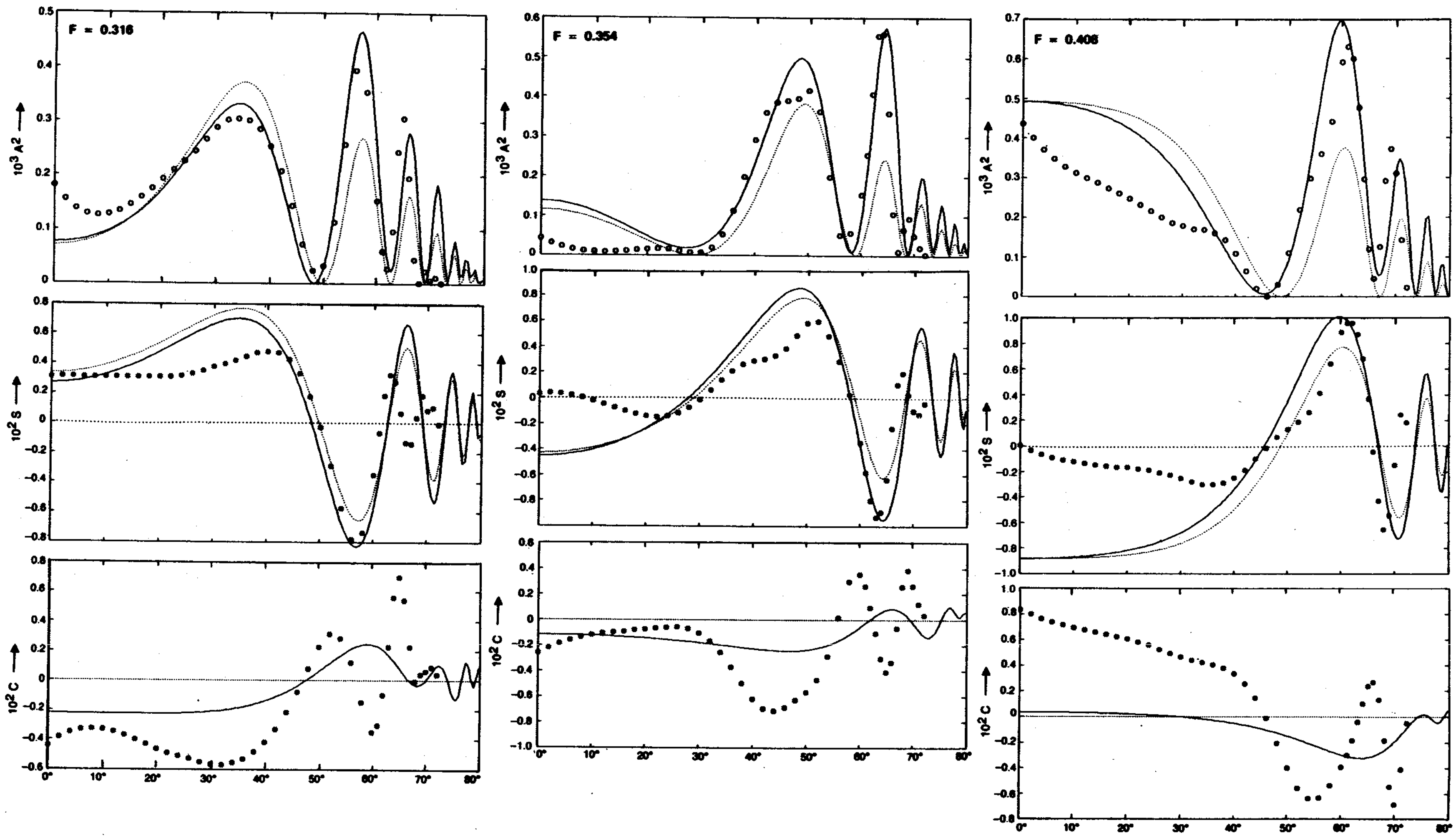
[1] Noblesse, F., 1983, "A Slender-Ship Theory of Wave Resistance," Journal of Ship Research, Vol. 27, pp. 13-33.
[2] Scragg, C., B. Chance, J.C. Talcott and D.C. Wyatt, 1987, "Analysis of Wave Resistance in the Design of the 12-Meter Yacht Stars & Stripes," Marine Technology, Vol. 24, pp. 286-295.
[3] Keramidas, G.A., 1987, "FFSW: A Computer Program for Far-Field Ship Wave Calculations," Naval Research Laboratory Report 6007, 80 pp.
[4] Baar, J.J.M., 1986, "A Three-Dimensional Linear Analysis of Steady Ship Motion in Deep Water," Ph.D Thesis, Brunel University, U.K., 182 pp.
[5] Andrew, R.N., J.J.M. Baar and W.G Price, 1987, "Prediction of Ship Wavemaking Resistance and Other Steady Flow Parameters Using Neumann-Kelvin Theory," The Royal Institution of Naval Architects.
[6] McCarthy, J.H., 1985, "Collected Experimental Resistance Component and Flow Data for Three Surface Ship Model Hulls," David Taylor Research Center, Report DTNSRDC-85/011, 48 pp.



Comparison of predicted wave profiles with the U. of Tokyo(*) and the S.R.I.(x) experimental data for the Wigley hull in fixed position.



Comparison of the zeroth (-----) and first (——) approximations to the far-field wave spectrum functions A^2, S and C with the the U. of Tokyo and the S.R.I. experimental data for the Wigley hull in fixed position at three values of the Froude number.



Comparison of the zeroth (-----) and first (——) approximations to the far-field wave spectrum functions A², S and C with the the U. of Tokyo and the S.R.I. experimental data for the Wigley hull in fixed position at three values of the Froude number.