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Flexibility Considerations on the Hydrodynamic Loading on a Vertical Wedge Drop[1] ZHONGSHU REN, Virginia Polytechnic Institute and State University, ZHAOYUAN WANG, University of Iowa, CAROLYN JUDGE, U.S. Naval Academy, FRED STERN, University of Iowa, CHRISTINE IKEDA, Virginia Polytechnic Institute and State University — High-speed craft operating at in waves frequently become airborne and slam into the water surface. This fluid-structure interaction problem is important to understand in order to increase the operating envelope of these craft. The goals of the current work are to investigate both the hydrodynamic loads and the resulting structural response on a planing hull. A V-shaped wedge is dropped vertically into calm water. The hydrodynamic pressure is measured using pressure sensors at discrete points on the hull. Two hulls are studied: one is rigid and one is flexible. Predictions of the hydrodynamic loading are made using Wagners theory, Voruss theory, and simulations in CFDShip Iowa. These predictions assume the structure is completely rigid. These predictions of the pressure coefficient match well with the rigid hull, as expected. The spray root is tracked in the rigid experimental set and compared with the theoretical and computational models. The pressure coefficient measured on the flexible hull shows discrepancies with the predictions due to the fluid-structure interaction. These discrepancies are quantified and interpreted in light of the structural flexibility.

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