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Considerations for Ship Design and Forensics Based Upon Modern Advances in Nonlinear Waves

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My recent activities for Nonlinear Waves Research Corporation have lead to a number of new advances in ocean surface waves that have been applied to the reanalysis and forensics of sunken ships. The methods are based upon progress in the physical understanding of ocean waves and have required a number of breakthroughs requiring applications of algebraic geometry, topology and differential geometry. This work has provided a number of new tools for the forecasting/hindcasting of wind waves (including the prediction of rogue waves), for the deterministic simulation of ocean waves (including both the Type I and Type II instabilities) and for the statistical behavior of ocean waves. These approaches have lead to procedures for the determination of the design wave for ships and for the forensics of sunken ships in past storms. I give examples of how these approaches have been applied.