

Rainey, Rod

The extreme-wave issues in the offshore oil and shipping industries

Extreme crest elevations are extremely important in the design of fixed offshore platforms. These cannot be reliably measured with wave buoys, but are recorded by fixed gauges, from which statistical evidence is accumulating. The latest data and casualties will be reviewed, from the North Sea and the Gulf of Mexico. There is now a consensus that the 2nd order theory used in the older design codes underestimates extreme crest elevations. There is also evidence of violent breaking of the crests. Some possible theoretical explanations will be examined. The water velocities and acceleration are both important, throughout an extreme wave. Relevant computations and laboratory experiments will be presented, which both raise interesting questions on the adequacy of weakly non-linear theory. The wave models used in the design codes will be reviewed, over which there has been controversy for many years. For large ships, the main concern is wave breaking, which can cause impact damage. The latest casualty evidence will be reviewed. Wave breaking is not recorded by wave buoys, so a major problem is predicting its frequency of occurrence from what they can measure, which is the wave spectrum. Methods of making such predictions will be reviewed, including the latest developments.

Abstract of talk given at ICMS Workshop on Rogue Waves December 2005.
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