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Linear and Nonlinear Effects in Freak Wave Formation JESSICA GRABER, Xavier University — Freak (or rogue) waves are waves of great height that appear out of nowhere from otherwise ordinary, if rough, seas. The steepness of these waves can cause an enormous amount of damage to ships and oil platforms. The number of these waves physically occurring appears to be larger than predicted by the Gaussian statistics often used to model sea states. Understanding the cause of freak waves will help us to predict dangerous conditions, and engineer structures better able to withstand such waves. A number of mechanisms have been studied as the source of freak waves, including linear focusing, refraction of waves through a current field, and nonlinear effects. The Benjamin-Feir instability is a promising candidate with "breather" solutions of the nonlinear Schrodinger equation. Two of these breather solutions are the Ma soliton solution with large waves appear periodically in space at a given time, and the Akhmediev soliton solution, which is a wave forming periodically in time at a specific position. The relationship between linear and nonlinear effects has not been well-studied. Comparing the time scales on which the linear and nonlinear effects act gives us an idea of the regime in which various input parameters cause one effect or the other to be negligible, and when they act together to create a heightened response.

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