



Breathers in the Ocean

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The motion of nonlinear water waves in deep water including the dynamics of extreme waves can be studied through weakly nonlinear evolution equations, such as the nonlinear Schrödinger equation (NLS) or modified nonlinear Schrödinger equation. An accurate numerical investigation can be achieved using the higher-order spectral method (HOSM). In fact, a number of experimental studies related to nonlinear extreme waves validated the proposed theoretical and numerical approach with very high accuracy. We present a numerical study based on the HOSM in the investigation of one-dimensional propagation of extreme events in JONSWAP seas, having their origin from exact and tailored breather solutions of the NLS. The results are validated with laboratory experiments. Furthermore, we will discuss the significance and limitations of the approach with respect to applications to realistic ocean configurations.