

Intense soliton-like groups in laboratory experiments and numerical simulations.

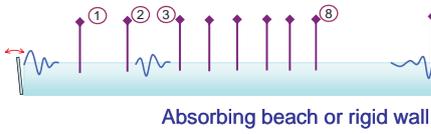
Possible manifestations in the oceanic wave fields

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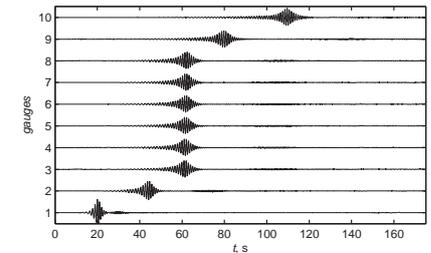
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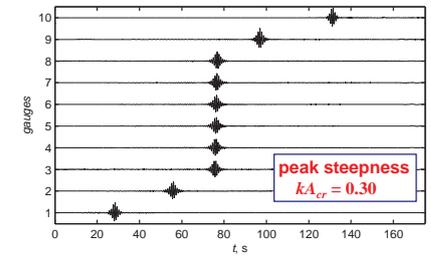
Free propagation of intense envelope solitons in the facility of the Technical Univ. of Berlin



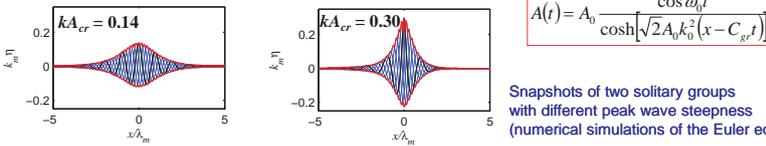
A strongly dispersing group



A stable group - a soliton-like group

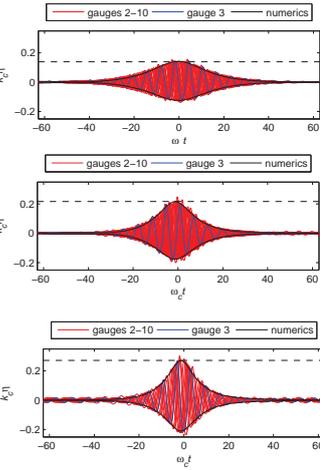


Several methods for the producing the signal for the wave maker were tested. The best efficiency was achieved when the signal was taken from the auxiliary numerical simulation of the Euler equations. However, the analytic solution of the nonlinear Schrodinger equation is sufficient for the generation of the solitary wave groups with the peak steepness $kA_{cr} = 0.30$ as well.

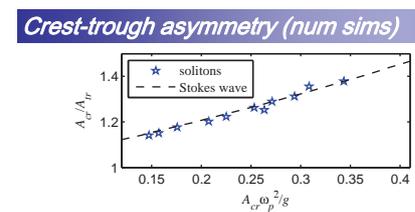


Comparison between the laboratory measurements and numerical simulations

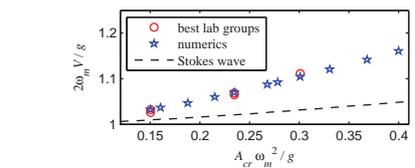
Wave group shapes



Crest-trough asymmetry (num sims)



Wave group velocities



Individual stationary groups of unidirectional waves over deep water are observed in numerical and laboratory simulations

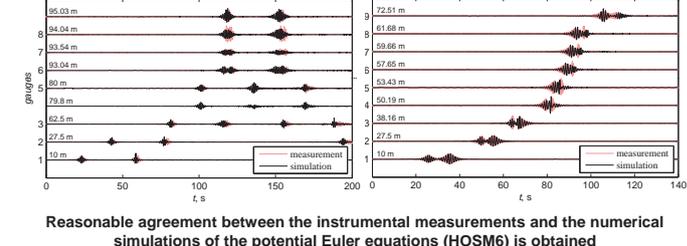
The groups correspond to the envelope solitons of the nonlinear Schödinger equation, when the waves are of small amplitude and there are many individual waves in a group

Very short and intense (but non-breaking) wave groups are observed with peak wave height up to $kH = 0.57$ in HOSM simulations, and $kH = 0.52$ in laboratory runs ($k = \omega^2/g$).

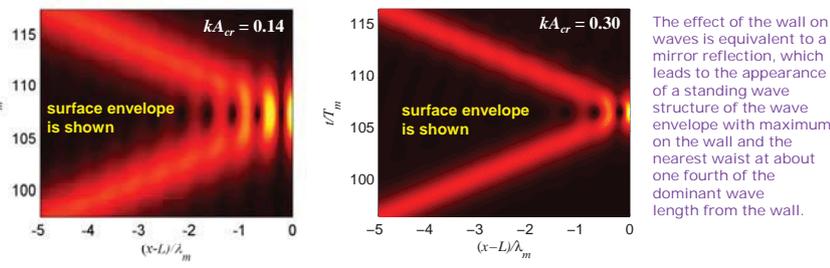
Good agreement between the wave group shapes is observed, when the results of laboratory and numerical simulations are compared

The solitary wave groups possess the same vertical asymmetry as the Stokes waves, but move noticeably faster than corresponding Stokes waves.

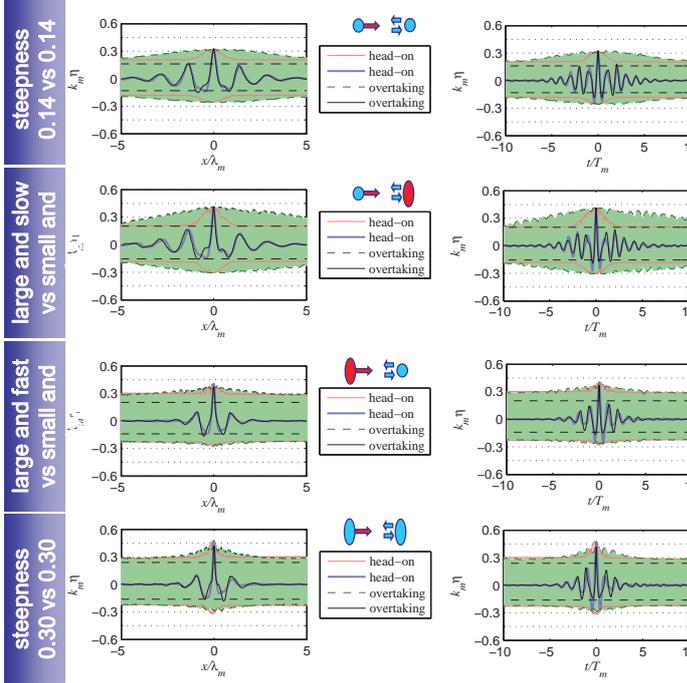
Collisions of the solitary groups: lab vs numerical sims



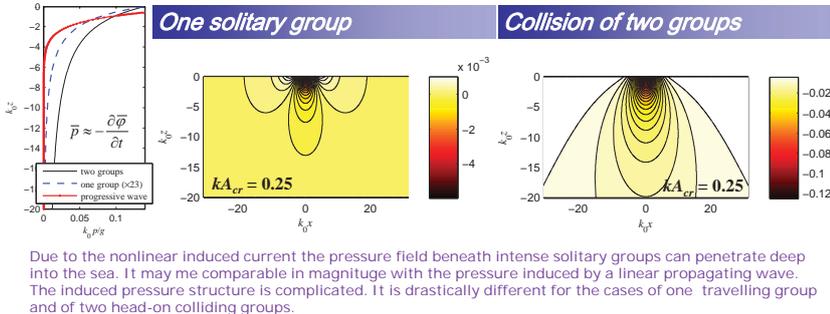
Reflection from the vertical wall (numerical simulations)



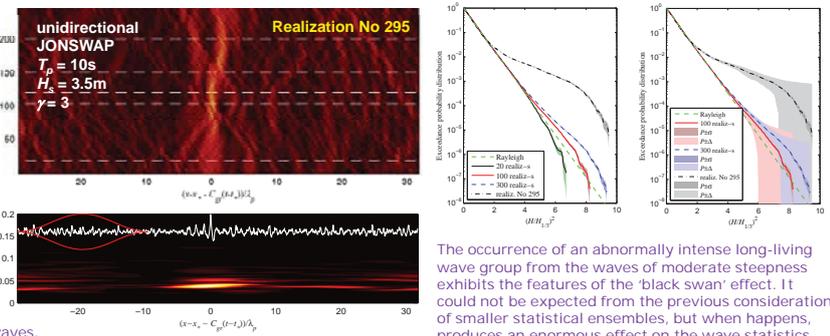
Collision of solitons with different frequencies (num sims)



The dynamic pressure under intense groups (analytic solution)



Step solitary groups in stochastic numerical simulations



Overtaking wave groups may result in pronouncing set-ups of the snapshots of extremely large waves. In head-on collisions the setup is more evident for the snapshots rather than for the time series.