Geophysical Research Abstracts
Vol. 18, EGU2016-8565, 2016
EGU General Assembly 2016
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Propagation of 3D nonlinear waves over complex bathymetry using a High-Order Spectral method

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Scattering of regular and irregular surface gravity waves propagating over a region of arbitrary three-dimensional varying bathymetry is considered here. The three-dimensional High-Order Spectral method (HOS) with an extension to account for a variable bathymetry is used. The efficiency of the model has been proved to be conserved even with this extension.
The method is first applied to a bathymetry consisting of an elliptical lens, as used in the Vincent and Briggs (1989) experiment. Incident waves passing across the lens are transformed and a strong convergence region is observed after the elliptical mound. The wave amplification depends on the incident wave. Numerical results for regular and irregular waves are analysed and compared with other methods and experimental data demonstrating the efficiency and practical applicability of the present approach.
Then the method is used to model waves propagating over a real bathymetry: the canyons of Scripps/La Jolla in California. The implementation of this complex bathymetry in the model is presented, as well as the first results achieved. They will be compared to the ones obtained with another numerical model.