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Abnormal dynamic pressure fields induced by intense surface wave groups

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We consider representative examples of pressure fields under groups of intense surface potential waves in the deep-water situation. Due to nonlinear wave interactions long-scale wave components are produced which may penetrate deep into the water bulk. As a result intense wave groups may produce abnormal impact on submerged constructions and pressure gauges. The asymptotic theories for unidirectional and counter propagating wave groups with similar peak frequencies are developed. Analytic solutions are obtained for groups which have the shape of the nonlinear Schrodinger envelope solitons. As expected, counter propagating groups result in much deeper and stronger dynamic pressure patterns than single travelling groups. The dynamic pressure patterns under single and colliding groups look qualitatively different. The dynamic pressure does not necessarily decay in magnitude with depth. This peculiarity makes time series of the pressure records at different depths complicated. The results are confirmed in the strongly nonlinear simulations of propagating and interacting intense solitary wave groups.