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Laboratory study of statistical characteristics of nonlinear long wave runup on a beach

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Runup of long irregular waves on a plane beach is studied experimentally in the water flume at the University of Warwick. Statistics of wave runup (displacement and velocity of the moving shoreline and their extreme values) is analyzed for the incident wave field with the narrow band spectrum for different amplitudes of incident waves (different values of the breaking parameter). It is shown experimentally that the distribution of the shoreline velocity does not depend on the breaking parameters and coincides with the distribution of the vertical velocity in the incident wave field as it is predicted in the statistical theory of nonlinear long wave runup. Statistics of runup amplitudes shows the same behavior as that of the incident wave amplitudes. However, the distribution of the wave runup on a beach differs from the statistics of the incident wave elevation. The mean sea level at the coast rises with an increase in the breaking parameter, causing wave set-up on a beach, which agrees with the theoretical predictions. At the same time values of skewness and kurtosis for wave runup are similar to those for the incident wave field and they might be used for the forecast of sea floods at the coast.