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Beach profile evolution under storm sequence forcing in large-scale experiments

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Large-scale experiments on beach profile evolution, performed within the HYDRALAB+ experiments 'RESIST', will be presented providing new insights into the influence of storm sequencing on beach response. Three storm sequences with the same cumulative wave power were generated; each sequence consisted of two high energy (storm) wave conditions each of which was followed by a recovery stage. Beach profile measurements, observations of the wave breaking location and sediment bed samples are used to study the influence of storm sequences on beach profile evolution, including the effect of storm chronology and beach recovery of different energy and duration.

The beach profile is found to evolve towards an equilibrium state that is specific for each wave condition indicating no cumulative effect of storm sequencing on beach erosion in the present experiments. This means that, despite the same cumulative power of each sequence, the final beach configuration of each sequence is different and it depends on the wave condition that was performed at the end of the sequence. Storm sequencing is, however, important for the rate of beach change: As the beach evolves towards equilibrium for each wave condition, the rate of beach change varies for the same wave conditions but different initial beach profiles (different sequencing). This means that the same wave condition can result in either beach erosion or recovery depending on if the beach is in recovered or eroded condition compared to the equilibrium beach configuration for these wave conditions.

This contribution will present one of the first large-scale data sets comprising more than one high energy and subsequent recovery stage in one sequence. We will discuss the influence of the storm chronology, beach equilibrium configuration and recovery conditions on the beach profile evolution.