Sediment disturbance due to storm wave action on a steep, mixed sand and gravel beach on the Bay of Fundy, Canada

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Little work has been conducted on mixed sand and gravel (MSG) beaches compared to their single sediment type counterparts, although they are a common occurrence on Canada's shoreline. Our study site, Black Rock Beach, is a planar steep MSG beach with a 1:7 slope. The site is situated on the northern side of the Minas Passage, in the Bay of Fundy. The purpose of this study is to contribute new understanding of MSG beach dynamics. More specifically we aim to examine how waves and currents affect the beach profile and the depth of sediment reworking during storms. Understanding the interaction between sediment and incoming waves at this site is important due to the potential for power generation in the Minas Passage. Because power will be brought to shore via cables buried in the beach, the depth of burial must exceed the maximum depth disturbance.

An array of equally-spaced depth of disturbance rods with free-sliding washers were deployed normal to the shoreline up the beach face. The array records the maximum depth of sediment activation and relative changes in bed elevation. Pressure and temperature data were logged by two submersible dual-channel loggers. Weather data were collected from a weather station 200 m north of the study area. Post-tropical-storm Arthur was the only wavegenerating event to have significant effects on the beach during our study from July 4 to September 5, 2014. The storm, with winds up to 100 $km \cdot h^{-1}$, produced significant wave heights of about 1 m. The maximum DOD was 42.5 cm ± 0.2 cm near the high-water line, values decreasing down the shoreface to about 9.8 cm ± 0.2 cm near the low-water line. An increase in relative beach elevation was recorded, with values of about 18.6 cm ± 0.2 cm closer to high-water and about 1.1 cm ± 0.2 cm closer to low-water. Calmer conditions persisted through the rest of the study, resulting in much lower DOD values, 5 cm or less, and following a similar trend of decreasing values down the shoreface.

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