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Unexpected waves

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Rogue waves have received considerable scientific attention in recent years. They are commonly defined as waves with height $H \geq 2.2H_s$, where H_s is the significant wave height (typically estimated from records that are several tens of minutes long). This definition of rogue waves is solely based on the wave height. We suggest that the "unexpectedness" of large waves is also of great concern to mariners and beachcombers, and define "unexpected waves" as waves being twice as large as any of the preceding 30 waves.
Our simulations suggest that, even in a Gaussian sea, unexpected waves might be as common as rogue waves occurring within a longer wave group. The return period of unexpected waves decreases if modifications of the wave shape due to phase locked second harmonics are allowed for. In particular, shallow water effects significantly increase the probability of occurrence of unexpected waves.
We analyze historical Canadian wave buoy records from the Pacific and Atlantic in terms of unexpected waves, and find our simulations to be in agreement with the occurrence rates of unexpected waves obtained from these records. This agreement suggests that extreme waves in the ocean occur largely due to linear superposition