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A seabed-mounted diode for unidirectional water-wave propagation LOUIS-ALEXANDRE COUSTON, MOHAMMAD-REZA ALAM, Department of Mechanical Engineering, University of California, Berkeley — The effect of a series of seabed patches of small-amplitude bars with increasing obliquity on a monochromatic oceanic wavetrain is shown to be analogous to the effect of a diode on the current in an electronic circuit. The incoming water wavetrain is deflected at a 90-degree angle in one direction, while barely changing its route in the other. In the reverse direction, i.e. in the direction where wave propagation is blocked, the incoming wavetrain (with bearing angle bi=0 degrees) satisfies a Bragg resonance condition over each one of the seabed patches, ceding its energy to a series of transmitted waves of increasing bearing angle (i.e. $btj > - > bt1 > bi$ with btj the angle of the j-th transmitted wave). The resonances continue over the patches until btj=90 degrees. In the forward direction, i.e. in the direction where wave propagation is allowed, the incident wave satisfies a Bragg condition only with the last patch such that its deflection remains small. The minimum patch lengths leading to full deflection are obtained within potential flow theory using multiple-scale analysis, and the analytical results are validated and extended with High-Order Spectral simulations. Some of the difficulties expected with laboratory experiments are given.

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