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Tidal generation of internal waves from a periodic array of steep ridges

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The generation of internal gravity waves by an oscillatory tidal flow over a periodic array of thin vertical walls is calculated analytically. Above the topography a radiation condition is used, effectively implying that the ocean is infinitely deep. The only nondimensional parameter of the problem is the nondimensional wall height $B = 2\pi HN/L\omega$, where H is the wall height, N the buoyancy frequency, L the wall spacing, and ω the tidal frequency. The analytic solution gives the radiated power for arbitrary values of B. If $B > 2\pi$, some of the internal wave characteristics coming from one wall will intersect a neighbouring wall, an effect that is called "shadowing". If $B \ll 1$ there is no interaction between the walls, and the radiated power per wall is the same as for a single thin wall. That means that it is proportional to B^2, in agreement with the linear scaling. Because of resonance, the power diverges logarithmically for $B = (1 + 2n)\pi$. Also, the radiated power is periodic in B with the period 2π, indicating a saturation for large values of B. This is interpreted as a result of shadowing.