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Tsunami Asymptotics

MICHAEL BERRY, Physics Department, Bristol University, UK

Optical analogies, and some singularity theory, give new information about tsunamis. For most of their propagation, tsunamis are linear dispersive waves whose speed is limited by the depth of the ocean and which can be regarded as diffraction-decorated caustics in spacetime. For constant depth, uniform asymptotics gives a very accurate compact description of the tsunami profile generated by an arbitrary initial disturbance. Variations in depth act as lenses and can focus tsunamis onto cusped caustics, and this "singularity on a singularity" constitutes an unusual diffraction problem, whose solution indicates that focusing can amplify the tsunami energy by an order of magnitude.