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Tsunami waves generated by submarine landslides of variable volume

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Tsunami wave generation by submarine landslides of a variable volume in a basin of variable depth is studied within the shallow-water theory. The problem of landslide induced tsunami wave generation and propagation is studied analytically for two convex bottom profiles. In these cases the basic equations can be reduced to the constant-coefficient wave equation with the forcing determined by the landslide motion. For certain conditions on the landslide characteristics (speed and volume per unit cross-section) the wave field can be described explicitly. It is represented by one forced wave propagating with the speed of the landslide and following its offshore direction, and two free waves propagating in opposite directions with the wave celerity. For the case of a near-resonant motion of the landslide along the power bottom profile the dynamics of the waves propagating offshore is studied in detail. Two different scenarios of landslide motion are considered: a) the resonant motion of the landslide of a variable volume; b) the constant-speed motion of the landslide of a constant volume. In both cases amplitude of tsunami waves varies non-monotonically in time. Characteristics of the resonant zone are studied in detail.