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Stability boundaries for the Rayliegh-Taylor instability in elastic-plastic solid slabs

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The linear theory of the incompressible Rayleigh-Taylor instability in elastic-plastic solid slabs is developed on the basis of the simplest constitutive model consisting in a linear elastic (Hookean) initial stage followed by a rigid-plastic phase. The slab is under the action of a constant acceleration and it overlays a very thick ideal fluid. The boundaries of stability and plastic flow are obtained by assuming that the instability is dominated by the average growth of the perturbation amplitude and neglecting the effects of the higher oscillation frequencies during the stable elastic phase. The theory yields complete analytical expressions for such boundaries for arbitrary Atwood numbers and thickness of the solid slabs.

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