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A fresh look at an old problem: perturbed flow over uneven terrain PAOLO LUCHINI, Università di Salerno - DIIN, FRANCCOIS CHARRU, Institut de Mécanique des Fluides de Toulouse — Flow over an uneven terrain is classically first linearized about a flat bottom and a locally parallel flow, and then Fourier transformed and asymptotically approximated into an interactive representation that couples a boundary layer and an irrotational region through an intermediate inviscid but rotational layer. Or, since this is a one-dimensional OrrSommerfeld problem comparatively easy for any computer, one may decide to forgo the second sweep of approximation and solve the problem numerically. The hidden pitfalls of doing so, and the adopted solutions, are here examined and explained from the viewpoint of boundary-layer symmetries, while also providing a compact and accurate asymptotic approximation for the maximum laminar shear-stress response, whose wavenumber scales with a power of the boundary-layer thickness. In turbulent flow, the maximum shear-stress response occurs instead at a Reynolds-independent wavenumber; the question is still open, also in the light of recent numerical counterexamples, whether a fully developed turbulent regime, similar to the one predicted by a widely adopted eddy-viscosity or mixing-length model, even exists for open flow in the limit of infinite wavelength.

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