Ill-posedness and regularization in dynamic frictional sliding between dissimilar elastic solids

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Recent work has shown the surprising result that the problem of dynamic stability to perturbations from a state of steady frictional sliding at an interface between dissimilar elastic solids is quite often mathematically ill-posed. The ill-posedness is manifest in the unstable growth of perturbations of all wavelengths with growth rate inversely proportional to the wavelength. We have identified two generic, experimentally motivated features of friction that make the stability problem well-posed: (1) a friction law with no instantaneous dependence of frictional strength on normal stress but a fading memory of prior history of normal stress (2) a friction law with positive instantaneous dependence of strength on sliding velocity.