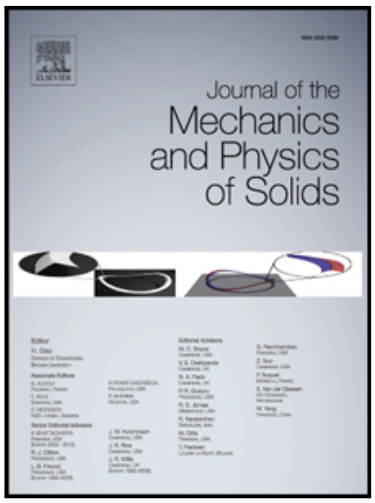

The generalized Tabor parameter for adhesive rough contacts near complete contact

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The generalized Tabor parameter for adhesive rough contacts near complete contact

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Abstract

Recently, the first author has obtained a model for adhesive contact near full contact under the JKR assumptions. The model shows, in the common case of low fractal dimensions, an 'unbounded' adhesion enhancement when larger and larger upper "truncation wavenumber" is considered in the spectrum of roughness, i.e. when we increase "magnification". Here, using a more general Maugis-Dugdale model, we show that a generalized multiscale Tabor parameter can be defined which shows a transition to a non-hysteretic regime, dependent on the root-mean-square (rms) slope of the surface. The contact area returns in the "fractal limit" to the adhesionless one. Two examples of rough surfaces from the literature are considered to show the full dependence on magnification of the adhesive solution. The choice of the truncation of the spectrum remains fundamentally arbitrary.

Keywords: Roughness, Adhesion, hysteresis, Gaussian distribution

1. Introduction

Adhesion between randomly rough elastic bodies is a complicated problem, despite the main conclusion of experiments (Fuller & Tabor, 1975) is that amplitude of roughness is the primary parameter dominating the problem. As we realize that surface roughness is multiscale, many physical quantities seem to depend (according to some models) on short wavelength cutoffs determining slopes, curvatures and even higher order spectral moments, which are quantities not converging if one includes more and more details and scales