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Boundary Layers Induced by Contact of Rough Bodies

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A micromechanical framework is developed for the analysis of deformation inhomogeneities in the boundary layers that are induced by contact of rough bodies. The aim of such analysis is to develop improved constitutive laws of contact phenomena that would account for the interaction of the deformation inhomogeneities in the contact boundary layer with the macroscopic stress/strain states. The equations of the boundary layer are derived using the method of asymptotic expansions. The averaging operation is then introduced so that the inhomogeneous fields are averaged along the contact surface but the dependence of the averages on the distance from the surface is preserved. Some properties of such averages are provided. As an example a boundary layer associated with ploughing by an array of periodic sine-shaped asperities is analyzed by the finite element method.

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