Abstract: Shear bands are narrow zones of intense shear observed during plastic deformations of metals at high strain rates. Because they often precede rupture, their study attracted attention as a mechanism of material failure. Here, we aim to reveal the onset of localization into shear bands using a simple model developed from viscoplasticity. We exploit the properties of scale invariance of the model to construct a family of self-similar focusing solutions that capture the nonlinear mechanism of shear band formation. The key step is to de-singularize a reduced system of singular ordinary differential equations and reduce the problem into the construction of a heteroclinic orbit for an autonomous system of three first-order equations. The geometric singular perturbation theory is applied to this problem to achieve an invariant surface. The flow on the invariant surface is analyzed via the Poincaré-Bendixson theorem to construct a heteroclinic orbit.

Alle Interessenten sind herzlich eingeladen!

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