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Spontaneous formation of permanent shear bands in a mesoscopic model of flowing disordered matter[1] KIRSTEN MARTENS, LYDÉRIC BOCQUET, LPMCN, Université Lyon 1, JEAN-LOUIS BARRAT, LIPhy, Université Joseph Fourier, Grenoble — In this presentation we propose a coherent scenario of the formation of permanent shear bands in the flow of yield stress materials. Within a minimalistic mesoscopic model we investigate the spatial organisation of plasticity. The most important parameter is the typical time needed to regain the original structure after a local rearrangement. In agreement with a recent mean field study [Coussot *et al., Eur. Phys. J. E*, 2010, **33**, 183] we observe a spontaneous formation of permanent shear bands, when this restructuring time is large compared to the typical stress release time in a rearrangement. This heterogeneous flow behaviour is different in nature from the transient dynamical heterogeneities that one observes in the small shear rate limit in flow without shear-banding [Martens *et al., Phys. Rev. Lett.*, 2011, **106**, 156001]. We analyse the dependence of the shear bands on system size, shear rate and restructuring time. Further we rationalise the scenario within a mean field version of the model, that explains the instability of the homogeneous flow below a critical shear rate. Our study therefore strongly supports the idea that the characteristic time scales involved in the local dynamics are at the physical origin of permanent shear bands.

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