Strain fluctuations inside a stationary shear band.

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ABSTRACT

We investigate experimentally the strain fluctuations of a shear band inside a granular material. For this, a model granular material, composed of glass beads, is slowly compressed using a biaxial cell until shear bands are formed [3]

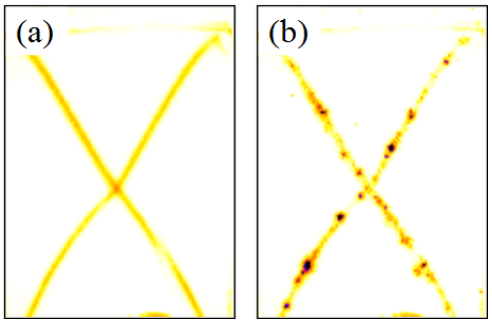

Figure 1: (a) Average and (b) instantaneous deformation of a compressed granular material obtained from correlation of scattered intensity. Two shear bands are present. The color represents the magnitude of the local deformation: white $\varepsilon < 10^{-6}$ - dark $\varepsilon \sim 10^{-4}$

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The local strain is measured using a interferometric technic based on Diffusing Wave Spectroscopy [1]: the light penetrates into the material, and the fluctuations of the scattered fluctuations can be related to the local strain. This semi-quantitative technics is very sensitive and allows to measure strains in the range $10^{-6} - 10^{-4}$. Before failure, the average deformation is homogeneous inside the sample [2]. After failure, the average deformation (fig1.a) shows that well defined shear bands are present into the sample. However, the instantaneous deformation (fig1.b) is very heterogeneous: at a given moment, the deformation is mainly localized into intensely sheared zones.

We will discuss the statistical properties of those fluctuations. In particular, we will show that the correlation functions of those strain fluctuations decay with the macroscopic deformation following a power-law. The analogy between our system and the motion of geological faults will be discussed.

REFERENCES

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