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Bifurcation at the origin of shear band formation in a granular material AXELLE AMON, THAI BINH NGUYEN, JEROME CRASSOUS, SEAN MCNAMARA, Universit Rennes 1 — The spontaneous localization of the deformation in a granular material is a long-standing problem. The incidences of this phenomenon are numerous from soil stability in civil engineering to fault formation in geophysics. Numerous works have been devoted to this problem, which is still nevertheless largely open. We present an experimental study of the shear band formation in a dry granular sample submitted to a biaxial test. We measure the spatial repartition of the deformation in a plane-strain configuration using an interferometric method based on multiple scattering. We quantify objectively the degree of localization in the experimental strain maps and the anisotropy of this field. We show that a bifurcation takes place but without the sudden formation of a slip plane. On the contrary, after the bifurcation, plasticity is still widely distributed in the sample. Still a breaking of symmetry has occurred: the spatial repartition of the deformation is not isotropic anymore but displays a large-scale orientation. After the bifurcation, we observe a progressive concentration of the strain field which evolves as the loading proceed from a wide diffuse band to a narrow stationary one.

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