**ΕΡΓΑΣΤΗΡΙΟ ΑΝΤΟΧΗΣ ΥΛΙΚΩΝ, ΤΟΜΕΑΣ ΜΗΧΑΝΙΚΗΣ, ΣΕΜΦΕ & ΕΡΓΑΣΤΗΡΙΟ ΘΕΜΕΛΙΩΣΕΩΝ, ΤΟΜΕΑΣ ΓΕΩΤΕΧΝΙΚΗΣ., ΣΠΜ, Ε.Μ.Π.**

# WHAT ACTUALLY HAPPENS WHEN GRANULAR MATERIALS DEFORM UNDER SHEAR: A LOOK WITHIN

**15 ΜΑΡΤΙΟΥ, 3.30 ΜΜ**

**ΑΙΘΟΥΣΑ ΕΚΔΗΛΩΣΕΩΝ ΣΧΟΛΗΣ ΠΟΛΙΤΙΚΩΝ ΜΗΧΑΝΙΚΩΝ Ε.Μ.Π.**


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**ABSTRACT**

Strain localization presents major challenges for continuum models of geo-materials. For these models to be successful, the microstructure of the material (grain scale for sands) should be explicitly taken into account. This in turn requires experimental characterization of shear banding at the grain scale. X-ray micro tomography is used to provide complete 3D images within sand samples while they deform under triaxial compression. Images from x-rays are then analysed either in a continuum sense (using 3D Digital Image Correlation) or looking at the individual particle kinematics (Particle Tracking), where the kinematics (displacement + rotation) of each individual grain in the sample are measured. These advanced techniques offer a clear inside view at what actually happens when a granular material deforms and eventually fails by transition from homogeneous to localized deformation.


**About the speaker**

Cino Viggiani was born in Napoli (Italy), where he obtained a B.S. in Civil Engineering (1988), his Ph.D. in Geotechnical Engineering at the University of Roma "La Sapienza" (1994), and his H.D.R. (*Habilitation*) in Mechanics at Université Joseph Fourier, Grenoble, France (2004), where he is full Professor since 2004. In 2012 he was advanced to the rank of *Professeur de Classe Exceptionnelle* by the French National Council of Universities (CNU). He served in the capacity of Vice-President for Research in Physics and Engineering, and he is Editor of the International Journal *Acta Geotechnica* (Springer) since 2006. He is the author of about 100 scientific papers and delivered numerous keynotes and invited lectures worldwide. His research involves experimental investigations as well as theoretical and numerical modeling of the behavior of geomaterials, including localized failure and hydro-mechanical coupling. Applications are principally in geoenvironmental, petroleum, and civil engineering. On the experimental side, he has been using quite a range of soils and rock testing apparatus, including plane strain compression devices for soils and rocks equipped with ultrasonic tomography / acoustic emission systems, and a generalized shear apparatus with principal stress rotation. Methods such as Digital Image Correlation and x-ray tomography, have been developed applied to detect the onset of localized deformation.