

WORKSHOP
Nonlinear Instabilities and Localization in Materials,
Geomaterials, Metamaterials and Structures
8-12 April 2019, Arpino, Italy

The research group “Non-linearity and Stability in Continuous media” is part of the International CNRS M&MoCS lab Coss&Vita. A Workshop is organized on April 8-12 2019 in the historical city of Arpino close to Rome to discuss various aspects of instabilities in materials and structures.

The class of phenomena considered during the Workshop are the following:

- strain localization and damage in metallic materials and structures;
- strain localization and damage in geomaterials;
- static and dynamic stability of materials and structures.

Experimental and modeling aspects will be discussed with a view to model parameter identification and derivation of models from materials’ microstructures. Special attention will be dedicated to regularization methods and introduction of internal lengths in the continuum modeling. Large periods of discussion will be reserved for the comparison of the different techniques and theories used in the different scientific domains.

Monday April 8th 2019

16:30 Introductory lecture by Francesco dell'Isola (Memocs Università dell'Aquila and Università di Roma "La Sapienza")

A nonlinear Lagrangian particle model for grains assemblies including grain relative rotations

17:30 Introduction to the Workshop: lecture notes on localization in metals / geomaterials / dynamical instabilities by Francesco D'Annibale, Matthieu Maziere et Ioannis Stefanou.

Tuesday April 9th 2019

Analysis of strain and damage localization phenomena

9:00 Ahmed Benallal (LMT ENS Sacaly, France)

Bifurcation versus perturbation localization approaches and application to metallic alloys

10:00 Matthieu Mazière (Mines ParisTech)

Modelling the Portevin - Le Chatelier effect in metallic alloys: From physical mechanisms up to failure of components

10:45 Break

11:15 Luca Placidi (International Telematic University Uninettuno, Rome)

Damage and plastic evolution of second gradient effective elastic moduli of heterogeneous granular materials

12:00 Samuel Forest (Mines ParisTech)

Strain gradient plasticity modelling of strain localization at large strains

13:00-14:30 Lunch break

14:30 Claire Lestringant (Institute for Mechanical Systems, Department of Mechanical and Process Engineering, ETH Zürich, Switzerland)

Higher-order models for the analysis of localized instabilities in slender solids

15:15 Antoine-Emmanuel Viard (ENSAM, Paris, France)

Lüders instabilities in architected materials

16:00 Martin Horak (Czech Technical University in Prague, Czech Republic)

Hyper-reduction of generalized plasticity: Application to strain localization

16:45 Break

17:15 Vincent Marcadon (ONERA)

Large compaction behaviour of cellular architectures and instability modes

18:00 Pierre Gelineau (ONERA)

Homogenized behaviour of cellular architectures accounting for instabilities

18:30 General Discussion : plastic instabilities, localization and regularization (moderated by M. Mazière)

Wednesday April 10th 2019

Localization phenomena in geomaterials

9:00 Felix Darve (3SR Grenoble, France)

Bifurcations and instabilities in granular media: a DEM contribution

10:00 Ioannis Stefanou (NAVIER Champs-sur-Marne, France)

Going beyond failure in geo-mechanics: From bifurcation theory to strain localization and earthquake control

11:00 Break

11:30 Michele De Angelo (University of L'Aquila, Italy)

Numerical identification of constitutive parameters in reduced-order bi-dimensional models for pantographic structures: application to out-of-plane buckling

12:15 General discussion : Comparison of methods for localization analysis in metallic and geomaterials communities (moderated by I. Stefanou)

13:00-14:30 Lunch break

Statics, Dynamics and Stability of beam-like structures

14:30 Francesco D'Annibale (University of L'Aquila, Italy)
Shear-shear-torsional homogenous beam models for nonlinear periodic beam-like structures

15:15 Angelo Luongo (University of L'Aquila, Italy)
Nonlinear dynamics of tower buildings

16:00 Break

16:30 Giuseppe Piccardo (University of Genoa, Italy)
Static and Dynamic analysis of tower buildings by an equivalent Timoshenko linear beam model

17:15 Manuel Ferretti (University of L'Aquila, Italy)
Flexural torsional buckling of compressed tower buildings

18:00 General discussion: equivalent models for tower buildings analysis

20:00 Social Dinner at the restaurant Il Casale della Regina

Thursday April 11th 2019

Static and Dynamic Properties of Meta-Materials

8:30 Anne-Christine Hladky (Unicersité de Lille)
Tunability and non reciprocity of electrically controlled piezoelectric phononic crystals

9:30 Arthur Lebée
Fitting surfaces with the Miura Ori Tessellation

10:15 Pause

10:45 Inauguration of the new period for the LIA Coss&Vita 2019-2023

Presentations by Olga Allard (CNRS/INSIS) "International Research Program", Anne-Christine Hladky (CNRS/INSIS), F. dell'Isola (role of MEMOCS), S. Forest (First period of the LIA) A. Lebée and G. Rosi (description of the new project)

13:00-14:30 Lunch break

14:30 Giuseppe Rosi (MSME Université Paris-Est)
Waves and generalized continua

15:15 Christelle Combescure (MSME Université Paris-Est)
Insights into the post-bifurcation analysis of highly symmetric structures using group theory

16:00 Break

16:30 Claudio Findeisen (IWM Freiburg Germany)
Stability size effects of unstable mechanical metamaterials, discrete vs. gradient enhanced continuum models

18:00 Daniele Zulli (University of L'Aquila, Italy)
A homogenous beam-like model for multi-layered pipes

18:45 Simona Di Nino (University of L'Aquila, Italy)
A very simple homogenized orthotropic model for in-plane analysis of regular masonry walls

Friday April 12th 2019

Pantographic structures

8:30 Ivan Giorgio (University of L'Aquila, Italy)
Enhanced continuum modeling for pantographic 2D metamaterials in three-dimensional motion

9:15 Emilio Barchiesi (University of L'Aquila, Italy)
Equilibrium path of Hencky-type non-linear pantographic beam model in the three-point bending problem

10:00 Mario Spagnuolo (Université Paris 13 Nord, France)
The role of the pivots in damage in pantographic structures

10:45 General discussion: Modeling and stability of pantographic structures and metamaterials

12:00 Lunch break

12:45 Departure to Rome Fiumicino