COMPUTATIONAL MODELLING OF MULTI-UNCERTAINTY AND MULTI-SCALE PROBLEMS

Porto | 12-14 September | 2017

Comus17

ECCOMAS THEMATIC CONERENCE

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Comus₁₇

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The development of **multi-uncertainty and multi-scale models** has received significant attention over the last decade. New mathematical formulations and numerical solution strategies allied to the increase in computational power/cost ratio have fostered a dramatic growth in this **rapidly expanding field**. Research activity in this area has been devoted to the development and combination of different analytic tools (homogenization, asymptotic analysis) and computational methods (parallel computing, stochastic analysis, code coupling) for application in fields as diverse as metal processing, composite materials, oil & gas development, fuel cell technology and biomedical tissue engineering etc. Such developments have played a central role in the understanding of the interaction among multi-physics and multi-uncertainty phenomena taking place at multiple scales in space and time. Nevertheless, new challenges remain emerging mainly driven by advanced industrial applications, and these outstanding challenges continue to drive the most forefront research in computational mechanics and computational engineering.

It is also true that in many scientific and engineering problems, the challenges associated with **multi-scale and multi-uncertainty** often arise together and even coupled, and therefore a synthesized solution approach is required. In the most general format, the proposed Colloquium timely targets the **latest advances in the modelling of multi-uncertainty in multi-scale problems**.

The main aims of the **Comus 17** are:

(a) To present the state-of-the-art in this field by showing the most recent developments by leading experts, and

(b) To provide a forum for discussion of current research trends and future challenges in computational multi-uncertainty and multi-scale modelling.

[September 12 Tuesday]

08:30 to 09:00 :::::::::::::::	*Registration*
09:00 to 09:10 :::::::::::::::	*Welcome Remarks*
09:10 to 10:10 :::::::::::::::	**Plenary Session || Prof. Lallit Anand (MIT):** *A Cahn-Hilliard-type theory for species diffusion coupled with large elastic-plastic deformations. Application to Li-ion electrode materials* [AUDITORIUM]
10:15 to 10:35 :::::::::::::::	[95] **Geert Buckinx** (KU Leuven): *A Macro-Scale Topology Optimization Method for Flow through Arrays of Solid Structures* [@B032] [98] **Thomas Kuhn (**IAG University of Stuttgart**):** *Uncertainty Quantification with discontinuous Galerkin discretization for Aeroacoustic applications* [@Room B031]
10:35 to 10:55 :::::::::::::::	Coffee Break
11:00 to 11:20 :::::::::::::::	[58] **Vladimir Tcheverda** (Institute of Petroleum Geology and Geophysics) *Model order reduction in nonlinear elastic full waveform inversion by decomposing the model space* [@Room B032] [69] **Rajiv Shivpuri** (The Ohio State University): *Multiscale Modeling of Uncertainties Associated with Material Defects and their Evolution during Deformation Processing* [@B031]
11:20 to 11:40 :::::::::::::::	[134] **Jan Havelka** (Faculty of Civil Engineering, Czech Technical University) *Application of non-intrusive inverse problem in civil engineering* [@Room B032] [93] **Pedro Prates** (University of Coimbra): *On the influence of mechanical properties variability in the robustness of sheet metal forming processes* [@B031]
11:40 to 12:00:::::::::::::::	[72] **Xueyou Li** (The Hong Kong University of Science and Technology): *Modelling of multi-layer geologic profile considering intra- and inter-layer variabilities* [@Room B032] [120] **Anna Nikishova** (University of Amsterdam): *Semi-intrusive Uncertainty Quantification method for Multiscale models* [@B031]

12:00 to 12:20 ::::::::::::::::	(92) **René Milk** (Applied Mathematics Münster): *A Massively Parallel Localized Reduced Basis Multi-Scale Solver with EXA-DUNE and pyMOR* **[@B032]**
	(85) **Xianfeng Luo** (Hubei Polytechnic University): *Calculation of Small failure probability in slopes with spatial variation of soil properties* **[@B031]**
12:20 to 12:40 ::::::::::::::::	(124) **Jouni Freund** (Aalto University): *Statistical homogenization of a fibre network* **[@B032]**
	(115) **Nuno Silvestre (IST - University of Lisbon)** *Postbuckling of graphene sheets* **[@B031]**
12:40 to 14:00 ::::::::::::::::	**Lunch**
14:00 to 15:00 ::::::::::::::::	**Plenary Session || Prof. Roger Ghanem University of Southern California [@AUDITORIUM]**
15:05 to 15:25 ::::::::::::::::	(137) **Anna Kučerová** (Faculty of Civil Engineering, Czech Technical University in Prague): *Heuristic technique for design of robust experiments based on global sensitivity* **[@B032]**
	(73) **Haojie Wang** (The Hong Kong University of Science and Technology) *Updating Landslide Susceptibility Using Bayesian Networks* **[@B031]**
15:25 to 15:45 ::::::::::::::::	(4) **Jia-Lin Tsai** (National Chiao Tung University): *Characterizing Young's modulus of graphene/epoxy nanocomposites using multiscale simulation* **[@B032]**
	(127) **Thiago Doca** (University of Brasília): *Analysis of plasticity and wear on a sphere-to-flat frictional contact* **[@B031]**
15:45 to 16:05 ::::::::::::::::	(142) **Jakub Krajniak** (KU Leuven): *Reverse mapping method for complex polymer systems* **[@B032]**
	(77) **Fabio Malgioglio** (Siemens Industry Software): *Effect of local fiber volume fraction variability and misalignment of fibers on stiffness and failure of ud carbon fiber composite ply* **[@B031]**
16:05 to 16:25 ::::::::::::::::	(89) **Maenghyo Cho** (Seoul National University):*Two-step computational homogenization of polymer nanocomposites considering particle agglomeration* **[@B032]**
	(131) **Liang Yang** (Imperial College London): *An immersed variational multiscale solver for large-scale fluid-structure interaction problems in haemodynamics* **[@B031]**

16:25 to 16:45 :::::::::::::::::	**Coffee Break**
16:50 to 17:10 :::::::::::::::::	[141] **Fan Gang** (The Hong Kong University of Science and Technology) *Time-frequency solution of seismic stability of rock slopes* **[@B032]** [106] **Diego Camargo-Trillos** (Universidad Pontificia Bolivariana): *Non-local hydrodynamic mesoscale model in slit nanopores* **[@B031]**
17:15 :::::::::::::::::::::::: 17:30 :::::::::::::::::::::::::	**Departure from FEUP** **Welcome Session: Visit to Port Wine Cellars followed by Port Wine Tasting**

[September 13 Wednesday]

08:30 to 09:30 :::::::::::::::::	**Plenary Session || Prof. Chris Pearce (University of Glasgow):** **Numerical multi-scale analysis for fracture in heterogeneous materials** **[@AUDITORIUM]**
09:35 to 09:55 :::::::::::::::::	[62] **Jan Podrouzek** (University BOKU, Vienna): *Characterisation of spatial variability in lattice models* **[@Room B032]** [104] **Eugenia Romeo** (University "Mediterranea" of Reggio Calabria): *Interval finite element analysis of composite laminates with spatially varying uncertainties using abaqus* **[@B031]**
09:55 to 10:15:::::::::::::::::	[5] **Robert Zemčík** (University of West Bohemia): *Degree of irregularity of microstructure in unidirectional composites and its influence on anisotropy of elastic properties* **[@B032]** [118] **Ismail Caylak** (Paderborn University) *Comparison between stochastic and possibilistic evaluation of rubber materials* **[@B031]**
10:15 to 10:35:::::::::::::::::	[7] **Dmytro Pivovarov** (Chair of Applied Mechanics, Friedrich-Alexander University Erlangen-Nürnberg) *Reduced order fuzzy-stochastic fem based homogenization framework for heterogeneous materials with polymorphic uncertainties in the microstructure* **[@B032]** [117] **Konstantin Kogan** (Bar-Ilan University*): Supply chain equilibrium under two types of uncertainty: customers demand and suppliers leadtime* **(@B031]**

10:35 to 10:50 :::::::::::::::	**Coffee-Break**
10:50 to 11: 50 :::::::::::::::	**Plenary Session || Prof. Stefanie Reese (RWTH Aachen University): Multiscale modeling using finite elements, fast Fourier transforms and proper orthogonal decomposition in production and medical technology** **[@AUDIORIUM]**
11:55 to 12:15::::::::::::::::	[133] **Anna Nasedkina** (Southern Federal University): *Finite element modeling of nanostructured piezoelectric composites and uses in ultrasound applications: example of transducer with plano-concave face* **[@B032]** [105] **Jan Chleboun** (Czech Technical University in Prague) *Fuzzy set membership function defined by a material model response and used in uncertainty quantification* **[@B031]**
12:15 to 12:35 :::::::::::::::	[8] **Fuyuan Gong** (The University of Tokyo): *Multi-scale computational modeling for concrete damage caused by mixed pore pressures from coupled alkali silica reaction and freeze/thaw cycles* **[@B032]** [110] **Mohamed El-Beltagy** (Cairo University): A Practical Comparison Between The Spectral Wiener Chaos Expansions In Solving the Stochastic Differential Equations (SDEs) **[@B031]**
12:35 to 14:00 :::::::::::::::	**Lunch**
14:00 to 15:00 :::::::::::::::	**Plenary Session || Prof. Daniel Straub (Technical University of Munich): Sequential methods for rare event estimation and Bayesian learning** **[@AUDITORIUM]**
15:05 to 15:25 :::::::::::::::	[75] **Ernesto Rodriguez Pila** (Institut de Mécanique – Bordeax) *Multi-scale design methodology for composite structures based on uncertainty propagation* **[@B032]** [116] **Moindze Soilahoudine** (Laboratoire MSSMat, CentraleSupélec, CNRS*):Fully scalable implementation of a volume coupling scheme for the modeling of random polycrystalline materials* **[@B031]**
15:25 to 15:45 :::::::::::::::	[97] **Sergey Shevtsov** (SSC RAS): *The model-based multiobjective optimization of cure process control for a large cfrp polymeric composite panel* **[@B032]**

15:45 to 16:05 :::::::::::::::::	(84) **Shaoqing Wang** (Institute of Metal Research,CAS): *High-entropy alloys: MaxEnt modelling and elasticity calculation* **[@B031]**
	(74) **Niclas Strömberg** (Örebro University): *Sorm-based rbdo with rbfn and kriging* **[@B032]**
	(103) **Dirk Vandepitte** (KU Leuven): *Numerical quantification of spatial variability in tow reinforcement geometry of carbon composite materials* **[@B031]**
16:05 to 16:25 :::::::::::::::::	(57) **Giovanni Falsone** (Dipartimento di Ingegneria): *A probability transformation method (PTM) for the dynamic stochastic response of structures with non-Gaussian excitations* **[@B032]**
	(66) **Lucas Mattos** (Federal University of Rio de Janeiro): *Finite element calculation of the effective thermal conductivity of two-dimensional three-scale heterogeneous media* **[@B031]**
16:25 to 16:45:::::::::::::::::	(114) **Heung Soo Kim** (Dongguk University): *Uncertainty Analytics in a Computational Model* **[@B032]**
	(122) **Fábio Conde** (IDMEC): *Analysis and optimization of hybrid polymer composites in uniaxial traction: analitycal and computational study* **[@B031]**
16:45 to 17:05 :::::::::::::::::	**Coffee-Break**
17:10 to 17:25 :::::::::::::::::	(90) **Juan Luis Osa** (University of the Basque Country UPV/EHU): *Future of the discrete element method in the modelling of the grinding wheel* **[@B032]**
	(79) **Aleksandar Donev** (Courant Institute, New York University): *Fluctuating Hydrodynamics of Complex Fluid Mixtures* **[@B031]**
17:25 to 17:45 :::::::::::::::::	(63) **Olympia Panagouli** (University of Thessaly): *A multiscale model for thermal contact conductance of rough surfaces under low applied pressure* **[@B032]**
	(112) **Decheng Feng** (Southeast University): *Multi-Scale Stochastic Damage Model and Its Application to Shearwall Structure* **[@B031]**
17:45 to 18:05 :::::::::::::::::	(121) **Haitao Wang** (Tsinghua University): *Numerical study on the uncertainty of failure probability calculation for nuclear graphite components* **[@B032]**
	(143) **Bernardo Ferreira** (Faculdade de Engenharia da Universidade do Porto): *On the Predictive Ability of a Continuum Damage Model through an Homogenization-Based Multi-scale Model* **[@B031]**

18:15 :::::::::::::::::::::::::::	*Departure from FEUP and Bus Mini-Tour and Conference Dinner*

[September 14 Thursday]

09:30 to 10:30 ::::::::::::::::	**Plenary Session || Prof. Pierre Adler (University Pierre and Marie Curie): Tmulti scale analysis of porous media** [@AUDITORIUM]
10:35 to 10:55 ::::::::::::::::	[132] **Sergio Turteltaub** (Delft University of Technology*): Multiscale mixed-mode failure criterion and traction-separation relation for composite materials* **[@B032]**
	[148] **Shaoqing Cui** (Swansea University): *Statistical reconstruction of heterogeneous materials* **[@B031]**
10:55 to 11:15 ::::::::::::::::	**Coffee Break**
11:20 to 12:20 ::::::::::::::::	**Plenary Session || Prof. Shi Jin (University of Wisconsin-Madison):** *A stochastic Asymptotic-Preserving scheme for a kinetic-fluid model for disperse two-phase flows with uncertainty* [@B032]
12:20 to 12:40 ::::::::::::::::	[81] **Madhavan Swaminathan** (Georgia Institute of Technology): *Black Box Optimization of 3D Integrated Systems* **[@B032]**
	[146] **Philippe Bussetta** (INEGI): *Damage of heterogeneous composite material: from the fibres to structural level* **[@B031]**
12:40 to 14:00 ::::::::::::::::	[91] **Omar Knio** (King Abdullah University of Science and Technology): *Global sensitivity analysis of reaction kinetics using rate rules* **[@B032]**
	[9] **Peng Hu** (Zhejiang University) *An efficient shallow water hydro-sediment-morphydynamic model for alluvial rivers* **[@B031]**
14:00 to 14:20 ::::::::::::::::	**Lunch**
14:20 to 14:40:::::::::::::::::	[107] **Eduin Lopez** (Universidad Nacional de Colombia): A *model for mass transport in porous media based on hybrid probabilistic/deterministic approach* **[@B032]**
	[64] **Galina Reshetova** (Institute of Computational Mathematics and Mathematical Geophysics): *Finite difference simulation of waves' propagation in multiscale media* **[@B031]**

14:40 to 15:00 :::::::::::::::	[128] **Amelie Fau** (IBNM): *Numerical strategies for a mechanical model based on mixed aleatory and epistemic uncertainties* **[@B032]** [136] **Juarez Azevedo** (Universidade Federal do Recôncavo da Bahia): *Reaction-diffusion-chemotaxis model on uncertainty parameters* **[@B031]**
15:00 to 15:20:::::::::::::::	[149] **Jin Wang** (Swansea University) *Polynomial normal transformation function and its application in structural reliability analysis* **[@B032]** [129] **Eliška Janouchová** (Faculty of Civil Engineering, Czech Technical University in Prague): *Probabilistic methods for quantification of uncertainties in properties of heterogeneous materials* **[@B031]**
15:20 to 15:40 :::::::::::::::	[130] **Henri Dolfen** (Ghent University) *Uncertainty Quantification of an Unmanned Aerial Vehicle* **[@B032]** [6] **Jicai Zeng** (Wuhan University): *Multi-scale Modelling of the Unsaturated-saturated Flow in a Shallow Aquifer System* **[@B031]**
15:40 to 16:00 :::::::::::::::	[139] **Mohamed Sassi** (Masdar Institute of Science and Technology): *Digital Rock Physics: Segmentation Comparison for a Carbonate Rock* **[@B032]** [144] **Miguel Carvalho** (Faculty of Engineering of the University of Porto) *Multi-scale Constitutive Modelling of Multiphase Alloys* **[@B031]**
16: 00 to 16:20 :::::::::::::::	[80] **Md. Shahabul Alam** (University of Saskatchewan): *Characterizing Temporal and Spatial Variability in Soil-Vegetation-Atmosphere-Transfer (SVAT) Modelling of Reclamation Covers in Northern Alberta, Canada* **[@B032]** [108] **Claudio Maruccio (University of Salento)** *Multi-scale and multi-uncertainty modeling of energy harvesters under environmental vibrations* **[@B031]**
16:20 to 16:40:::::::::::::::	**Coffee Break**
16: 40 to 17:00 :::::::::::::::	[82] **Abigail Hunter** (Los Alamos National Laboratory): *Plasticity and Fracture in Quasi-Brittle Metals* **[@B032]** [76] **Bryan Moore** (Los Alamos National Laboratory): *Predictive Modeling For Brittle Metal Fracture Growth* **[@B031]**
17:00 to 17:20 :::::::::::::::	[71] **Gowri Srinivasan** (Los Alamos National Lab): *Advancing predictive capability in brittle materials through graphical representations of microstructure* **[@B032]** [126] **Nesrine Hmida** (National School of Engineers of Tunis) *Thermo-mechanical modeling of compressor ROOTS: multi-physical problems* **[@B031]**

	(147) **Muhannad Aldosary** (Swansea University): *Efficient surrogate models for reliability analysis of systems with fuzzy random variables* **[@B032]**

Around CAMPUS

Inegi Restaurant (2nd floor)

Cafeteria: Besides meals (meat, fish or vegetarian main course), the cafeteria provides a snack service with several options including soup, salads, sandwiches, fruit, etc.

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B Building – Rooms B032 and B031

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It offers a range of hot or cold snacks; American sandwiches; ham, tuna and chicken sandwiches; hamburgers, etc.

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