



17^e Journées d'Etudes des Milieux Poreux

Du 4 au 6 novembre 2025 à Orléans

Domaines variés / *Various topics*

Stockage de l'énergie / *Energy storage*
Géothermie / *Geothermal energy*
Génie civil / *Civil engineering*
Dépollution / *Remediation*
Energies renouvelables / *Renewable energy*
Agroalimentaire / *Food industry*
Santé / *Health*
Matériaux / *Materials...*

Interdisciplinarité / *Interdisciplinarity*

Mathématiques appliquées / *Applied mathematics*
Mécanique des fluides / *Fluid mechanics*
Transferts de chaleur et de masse / *Heat and mass transfer*
Génie des procédés / *Process engineering*
Géosciences / *Geosciences*
Transport réactif / *Reactive transport*
Modélisation numérique / *Numerical modeling*
Microfluidique / *Microfluidics...*

Orateurs invités / *Invited keynote speakers:*

Lydéric Bocquet, Ecole Normale Supérieure, Paris
Laurent Brochard, Laboratoire Navier, Champs-sur-Marne
Carla De Tomas, Imperial College London (Grande-Bretagne)
Jennifer Druhan, University of Illinois Urbana-Champaign (Etats-Unis)
Rainer Helmig, University of Stuttgart (Allemagne)
Sylvie Lorthois, Institut de Mécanique des Fluides de Toulouse



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transverses et
interdisciplinaires

Mardi 4 novembre

salle / room:		plénière		salle atelier 1	salle atelier 2
08:30	Accueil café / Coffee				
08:45	Mots de bienvenue / Welcoming words				
09:00	Keynote 1	Rainer Helmig, University of Stuttgart (Germany), Kimberly-Clark Distinguished Lecturer 2025 of the International Society for Porous Media			
09:45	Pause café / Coffee break				
10:15	Sessions parallèles 1	Imagerie et caractérisation des milieux poreux I	Transport colloïdal et particulaire en milieu poreux	Milieux confinés, nano-échelles et modélisation moléculaire	
11:55	Déjeuner / Lunch				
13:45	Keynote 2	Jennifer Druhan, University of Illinois Urbana-Champaign, Institut de Physique du Globe de Paris			
14:30	Sessions parallèles 2	Ecoulements multiphasiques en milieux poreux I	Mécanique, poromécanique, rupture, endommagement	Mésoporeux	
15:50	Pause café / Coffee break				
16:15	Sessions parallèles 3	Microfluidique	Transfert thermique en milieux poreux	Transferts en milieux fracturés	
17:35					
18:00	Cocktail de bienvenue / Welcome reception - Musée des Beaux-Arts				

Mercredi 5 novembre

salle / room:		plénière	salle atelier 1	salle atelier 2
08:30	Accueil café			
08:45	Keynote 3	Carla de Tomas , King's College London (UK)		
09:30	Sessions parallèles 4	<i>Imagerie et caractérisation des milieux poreux II</i>	<i>Transport réactif I</i>	<i>Méthodes numériques</i>
10:30	Pause café / Coffee break			
11:00	Sessions parallèles 5	<i>Imagerie et caractérisation des milieux poreux III</i>	<i>Milieux poreux biologiques I</i>	<i>Ecoulements multiphasiques en milieux poreux II</i>
12:20	Déjeuner / Lunch			
14:00	Keynote 4	Lydéric Bocquet , Ecole Normale Supérieure (Paris)		
14:45	Sponsors	Présentation des sponsors / Sponsor presentations		
15:15	Sessions parallèles 6	<i>Modèles numériques et couplage pour les milieux poreux</i>	<i>Transport, mélange et dispersion en milieu poreux</i>	<i>Fluides complexes, non-newtoniens, inertiels et turbulents</i>
16:35	Pause café - posters / Coffee break - posters			
17:30	Assemblée générale / FIC general assembly			
19:00	Dîner de gala / Gala dinner			

Jeudi 6 novembre

salle / room:		plénière	salle atelier 1	salle atelier 2
08:30	Accueil café			
08:45	Keynote 5	Sylvie Lorthois , Institut de Mécanique des Fluides de Toulouse		
09:30	Sessions parallèles 7	<i>Imagerie et caractérisation des milieux poreux IV</i>	<i>Couplages multiphysiques en milieux poreux I</i>	<i>Milieux fibreux</i>
10:30	Pause café - posters / Coffee break - posters			
11:30	Sessions parallèles 8	<i>Transport réactif II</i>	<i>Couplages multiphysiques en milieux poreux II</i>	<i>Ecoulements multiphasiques en milieux poreux III</i>
12:30	Déjeuner / Lunch			
14:00	Keynote 6	Laurent Brochard , Laboratoire Navier, Ecole Nationale des Ponts et Chaussées		
14:45	Sessions parallèles 9	<i>Transport réactif III</i>	<i>Milieux poreux biologiques II</i>	<i>Couplages multiphysiques en milieux poreux III</i>
16:05	Pause café / Coffee break			
16:20	Clôture / Closing words			
16:30	FIN / END			
19:00	Conférence grand public au Mobe			

Mardi 4 novembre 2025

Session parallèle 1	<i>Imagerie et caractérisation des milieux poreux I</i> <i>Imaging and characterization of porous media I</i>	
10:15	Imaging solute transport in 3D printed porous media	Lamblin Marc - Géosciences (Rennes France)
10:35	3D visualization of fast two-phase flows in porous media using a laboratory x-ray CT scanner	Oxarango Laurent - Institut des Géosciences de l'Environnement (UGA - IGECS Grenoble, France)
10:55	Morphology probed locally through tortuosimetric analysis	Chaniot Johan - Institut Mines-Télécom (France)
11:15	Exploring water transport and aging mechanisms in bio-based porous materials through NMR relaxometry	Sidi-Boulénouar Rahima — Université Gustave Eiffel (France)
11:35	Fluid transfers through dynamic NMR relaxometry	Maillet Benjamin — Navier Laboratory (Champs-sur-Marne, France)
Session parallèle 1	<i>Transport colloïdal et particulaire en milieu poreux</i> <i>Colloidal and particle transport in porous media</i>	
10:15	Pore-scale modelling of diffusiophoresis for groundwater remediation	Cajot Florian - Institut des Sciences de la Terre d'Orléans (France)
10:35	Stochastic modeling and simulation of particle bridging in constricted channels	Maya Fogouang Laurez - Institut des Sciences de la Terre d'Orléans (France)
10:55	Progressive clogging via dendrite growth in porous media	Okaybi Walid - Institut des Sciences de la Terre d'Orléans (ISTO) (France)
11:15	Flow induced intermittent transport shapes colloid filtration in porous media	De Anna Pietro — Université de Lausanne (Suisse)
11:35	Modeling of the Hydrophobic Treatment of Gas Diffusion Layers to predict PTFE distribution	Arnelli Pierluigi — Laboratoire d'Innovation pour les Technologies des Energies Nouvelles et les nanomatériaux (France)
Session parallèle 1	<i>Milieux confinés, nano-échelles et modélisation moléculaire</i> <i>Confined media, nanoscale and molecular dynamics</i>	
10:15	Fluctuations enhance diffusive transport in nanopores	Marbach Sophie - PHysicochimie des Electrolytes et Nanosystèmes Interfaciaux (France)
10:35	Insights Into Bangham’s Law With Molecular Simulations: Surface Stress vs. Surface Tension in C-S-H	Leng Jingyi - Laboratoire Navier (France)
10:55	Texture-based assessment of gas adsorption selectivity on porous carbons with enhanced separation properties	Schaefer Sébastien - Interfaces, Confinement, Matériaux et Nanostructures (France)
11:15	Thermodynamic and structural insights into water intrusion in ZIF-8 using calorimetry and neutron diffraction	Marescot Thomas — LLB — Matière molle et biophysique (France)

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Session parallèle 2	<i>Écoulements multiphasiques en milieux poreux I</i> <i>Multiphase flows in porous media I</i>	
14:30	Influence of wettability on water relative permeabilities curves in unconsolidated porous media: from water-wet to oil-wet	Hernandez Perez Kevin - Institut Terre Environnement Strasbourg (France)
14:50	Disorder-induced non-linear growth of fingers in immiscible two-phase flow in porous media	Meheust Yves - Géosciences Rennes (France)
15:10	Modeling approaches for drainage instabilities in porous media: phase-field versus dynamic capillary pressure modeling	Omni Siddhartha H. - Institut de Recherche en Génie Civil et Mécanique (GeM) (France)
15:30	Pilot-scale investigation of LNAPL transport under dynamic water table conditions: 3D three-phase flow experiments and simulations	Alamooti Amir - GeoRessources (France)
Session parallèle 2	<i>Mécanique, poromécanique, rupture, endommagement</i> <i>Mechanics, poromechanics, fracture, damage</i>	
14:30	Friction modifies poroelasticity of a yeast clog	Liot Olivier - Institut de mécanique des fluides de Toulouse (France)
14:50	Micro-mechanical study of hydro-mechanical coupling at the interfaces of raw Earth masonry	Georges David - Laboratoire sols, solides, structures - risques [Grenoble] (France)
15:10	Implementing contact-mechanics in faulted porous media using VEM	Chassonnery Pauline - Bureau de Recherches Géologiques et Minières (BRGM) (France)
15:30	Skin factor model for CO2 injection in coalbed reservoir	Le Tien Dung - Laboratoire d'Energétique et de Mécanique Théorique et Appliquée (Vandoeuvre-lès-Nancy, France)
Session parallèle 2	<i>Mésoporeux</i> <i>Mesoporous</i>	
14:30	Use of functionalized mesoporous carbons in production of ¹⁶⁵ Er	Da Silva Isidro - CNRS CEMHTI (Orléans, France)
14:50	NH3-responsive chromism of cyanine dyes adsorbed on surface-modified mesoporous silica	Sohmiya Minoru - Idemitsu Kosan Co.,Ltd. (Japon)
15:10	Quantification of the pore connectivity in mesoporous carbons by analyzing hysteresis scanning curves	Ania Conchi - Conditions Extrêmes et Matériaux : Haute Température et Irradiation (France)

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Session parallèle 3	<i>Microfluidique</i> <i>Microfluidics</i>	
16:15	Measurements of concentration gradients in geological porous media using microfluidics devices and Raman spectroscopy	Sarr Mohamadou - Institut des Sciences de la Terre d'Orléans (France)
16:35	Tuning wettability of microfluidics via in situ plasma treatment	Douat Claire - Groupe de recherches sur l'énergétique des milieux ionisés (France)
16:55	Crystallization of sodium chloride in microfluidic pore systems	Genetelli Jade - Laboratoire d'Analyse et d'Architecture des Systèmes - Equipe MILE (France)
17:15	Pore-scale study of pickering emulsions for chlorinated solvent remediation via compositional ripening	Wang Shuxin - Arts et Metiers Institute of TechnologyA (France)
Session parallèle 3	<i>Transfert thermique en milieux poreux</i> <i>Heat transfer in porous media</i>	
16:15	Selection of convection cells during convective instabilities in heterogeneous porous media: state of the art benchmarking	Quintin Elliot - IFP Energies nouvelles (France)
16:35	Coupled heat and moisture transfer in porous building materials: accounting for the sorption hysteresis	Benmahiddine Ferhat - École Spéciale des Travaux Publics, du Bâtiment et de l'Industrie [Paris] (France)
16:55	Simulation of a porous iron particle melting in a fluid	Robin Jean - Institut Jean Le Rond d'Alembert (France)
17:15	Improved modelling of the conduction-radiation coupling in heterogeneous media by a fully stochastic approach	Roch Mattéo - CEA Le Ripault (France)
Session parallèle 3	<i>Transferts en milieux fracturés</i> <i>Transfers in fractured media</i>	
16:15	The dual porosity approach for modelling seawater intrusion in fractured aquifers	Koohbor Behshad - GeoRessources (France)
16:35	Analysis of heat transport in fracture networks with dead ends	Ringel Lisa Maria - Géosciences Rennes (France)
16:55	Capturing multi-scale fracture effects in CO2 storage modelling under uncertainty	Perez Sarah - Heriot-Watt University (Edinburgh, Royaume-Uni)
17:15	An efficient approach to model fluid flow and heat transfer in fractured rock: application in geothermal energy	Alawieh Nour - GeoRessources (France)

Mercredi 5 novembre 2025

Session parallèle 4	<i>Imagerie et caractérisation des milieux poreux II</i> <i>Imaging and characterization of porous media II</i>	
09:30	Evolution of cohesive contact surface area in biocemented granular media characterized by X-ray microtomography	Naillon Antoine - Univ. Grenoble Alpes, CNRS, Grenoble INP, 3SR, Grenoble, France
09:50	Direct experimental quantification of salt-induced permeability reduction in porous media	Ben Elhadj Hamida Syrine - Université de Pau et des Pays de l'Adour, CNRS, LFCR, DMEX, Pau, France
10:10	Characterization of Porous Metallic Structures Made by Additive Manufacturing for Heat Pipe Applications	Kodio Vincent - LABORATOIRE DE MODÉLISATION ET MATÉRIAUX POUR LA MÉTALLURGIE (France)
Session parallèle 4	<i>Transport réactif I</i> <i>Reactive transport I</i>	
09:30	Multiscale reactive transport modeling of ion transport in charged porous media	Tournassat Christophe - Earth Science Division [LBNL Berkeley] (États-Unis) - Institut des Sciences de la Terre d'Orléans (France)
09:50	Clayrock electrokinetic coupling modelling using Lattice Boltzmann Method	Tinet Anne-Julie - Laboratoire GeoRessources (France)
10:10	Water flow and solute transport in low-cost porous adsorbents: application to olive mill waste water filtration	Lamy Edvina - Université de Technologie de Compiègne (France)
Session parallèle 4	<i>Méthodes numériques</i> <i>Numerical methods</i>	
09:30	Development of a new-well balanced numerical scheme for compressible porous media flows	El Ouafa Simon - Université Paris-Saclay, UVSQ, CNRS, CEA, Maison de la Simulation, Gif-sur-Yvette, France (France)
09:50	Enhancements in large-scale hydraulic flow modeling	Parisot Martin - Inria Université de Bordeaux
10:10	Eliminating contact angle in pore-scale two-phase flow: an OpenFOAM-based approach	Norouzisadeh Mojtaba - Institut des Sciences de la Terre d'Orléans (France)

Mercredi 5 novembre 2025

Session parallèle 5	<i>Imagerie et caractérisation des milieux poreux III</i> <i>Imaging and characterization of porous media III</i>	
11:00	Pore size distribution of Lorrain coal using NMR relaxometry and cryoporometry	Jiang Minchuan - Laboratoire Energies et Mécanique Théorique et Appliquée (France)
11:20	Impact of sedimentary and diagenetic heterogeneities on petrophysical properties (porosity, permeability, P wave velocity) of continental limestones	Jamey Thibaut - Institut des Sciences de la Terre d'Orléans (France)
11:40	Optical thermometry for dynamic imaging of heat transport in analog porous media	Rashed Arwa - Univ. Rennes, CNRS, Géosciences Rennes (France)
12:00	Free and bound water transport during drying of clay material as observed by NMR	Ait Chekh Yousra - Laboratoire Navier (France)
Session parallèle 5	<i>Milieux poreux biologiques I</i> <i>Biological porous media I</i>	
11:00	Spatio-temporal characteristics of a proliferating <i>saccharomyces cerevisiae</i> clog	Ghenni Mathieu - Institut de mécanique des fluides de Toulouse (France)
11:20	Bioclogging and its impact on biodegradation in NAPL-contaminated sites	Eddaoui Noura - Institut des Sciences de la Terre d'Orléans (France)
11:40	Drying dynamics in biological materials revealed by NMR: potatoes as a case study	Zou Yuliang - Laboratoire Navier (France)
12:00	Water transfer in starch-fibers composite	Hbaieb Olfa - Laboratoire Navier (France)
Session parallèle 5	<i>Ecoulements multiphasiques en milieux poreux II</i> <i>Multiphase flows in porous media II</i>	
11:00	Determination of the relative permeability of earthen material during drying using Magnetic Resonance Imaging	Keita Emmanuel - Laboratoire Navier (Champs-sur-Marne France)
11:20	Impact of inertia on the stability of two-phase flow: a pore-doublet approach	Bernard Nathan - Institut des Sciences de la Terre d'Orléans (France)
11:40	Thin film flow: fluid transport via thin liquid film in slow porous media flows	Moura Marcel - PoreLab - University of Oslo (Norvège)
12:00	Enhancements in large-scale subsurface flow modelling	Erdocio Sebastien - IFP Energies nouvelles (France)

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Session parallèle 6	<i>Modèles numériques et couplage pour les milieux poreux</i> <i>Numerical models and couplings for porous media</i>	
15:15	Field scale Thermo-poro-mechanical modelling for CO2 storage	Bourgeois Frederic - Centre scientifique et Technique Jean Feger (France)
15:35	Modeling complex flows in porous media with ComPASS	Smai Farid - BRGM (Orléans France)
15:55	A THMC approach for crack appearance within reactive porous media under hydrochemo-mechanical loads	Seigneur Nicolas - Mines Paris PSL (France)
16:15	Coupled thermo-hydro-mechanical uncertainties for CO2 storage integrity assessment	Pillardou Nicolas - CHLOE - UPPA (France)
Session parallèle 6	<i>Transport, mélange et dispersion en milieu poreux</i> <i>Transport, mixing and dispersion in porous media</i>	
15:15	Dispersion in porous media: A comprehensive numerical comparison of existing methods	Grigorov Emil - Aix Marseille Universite, CNRS, IUSTI, Marseille (France)
15:35	Convective dissolution of CO2 in index-matched porous media: a shadowgraphy study	Imuetinyan Happiness - Laboratoire des Fluides Complexes et leurs Réservoirs (France)
15:55	Incomplet mixing in chaotic flows	Heyman Joris - - Géosciences Rennes (France)
16:15	Intrinsic permeability of heterogeneous porous media	Jiao Wenqiao - University of Lausanne / Institute of Earth Sciences (Suisse)
Session parallèle 6	<i>Fluides complexes, non-newtoniens, inertiels et turbulents</i> <i>Complex, non-Newtonian, inertial and turbulent fluids</i>	
15:15	Numerical simulations of turbulent flows in double porosity media	Roncen Remi - ONERA, Université de Toulouse (France)
15:35	Characterization of Drag and Permeability of Dendritic Grains by Numerical Simulations	Založnik Miha - Institut Jean Lamour (France)
15:55	Poiseuille flow for S-shaped shear-thickening fluids: streamwise banding and viscous sandglasses	Talon Laurent - Fluides, automatique, systèmes thermiques (ORSAY, France)
16:15	Foam coarsening dynamics within non-Newtonian fluids	Zhou Tongke - China University of Petroleum Beijing (Chine)

Jeudi 6 novembre 2025

Session parallèle 7	<i>Imagerie et caractérisation des milieux poreux IV</i> <i>Imaging and characterization of porous media IV</i>	
09:30	19F magnetic resonance imaging-informed of PFAS in porous media	Peyneau Pierre-Emmanuel - Eau et Environnement (France)
09:50	Evaporation of a sodium chloride aqueous solution from a porous medium: dome efflorescence formation	Oumeima Souissi - Laboratoire Matériaux et Durabilité des constructions (France)
10:10	Impact of Saturation Level and Water Redistribution on Carbon Mineralization in Unsaturated Porous Media	Golmohammadi Meysam - Institut des Sciences de la Terre d'Orléans (France)
Session parallèle 7	<i>Couplages multiphysiques en milieux poreux I</i> <i>Multiphysics couplings in porous media I</i>	
09:30	Water retention curve of PEM fuel cell catalyst layer from numerical simulations on 3D digital images	Flaumenbaum Paul - Institut de mécanique des fluides de Toulouse (France)
09:50	Gas transport through porous media induced by a temperature gradient	Graur Irina - IUSTI (Marseille France)
10:10	Theory and lattice Boltzmann modeling of pollutants in solution: effect of the porous medium heterogeneity on adsorption and transport	Ben Amor Nada - Laboratoire Interdisciplinaire de Physique (Saint Martin d'Hères, France)
Session parallèle 7	<i>Milieux fibreux</i> <i>Fibrous media</i>	
09:30	Benchmark exercise on the numerical prediction of permeability of anisotropic fibrous materials	Syerko Elena - Nantes Université, Ecole Centrale Nantes, CNRS, GeM (France)
09:50	Free surface flow around and inside an amphiphilic porous hollow fiber	Beltrame Philippe - Environnement Méditerranéen et Modélisation des Agro-Hydrosystèmes (France)
10:10	Radiative characterization of a fibrous medium by cylinder stack morphological study and Monte Carlo method	Souveton Mahé - Thermique aux Nano échelles et Rayonnement [Institut Pprime] (France)

Jeudi 6 novembre 2025

Session parallèle 8	<i>Transport réactif II</i> <i>Reactive transport II</i>	
11:30	Machine learning for geochemistry and application to thermal reactive transport	Michel Anthony - IFP Energies nouvelles (France)
11:50	Hydro-Mechano-Chemical Coupling for the Simulation of Pore-Scale Integrity in Crystallization Process	Poncet Philippe - Laboratoire de Mathématiques et de leurs Applications [Pau] (France)
12:10	Flow induced intermittent transport shapes colloid filtration in porous media	De Anna Pietro - Université de Lausanne (Suisse)
Session parallèle 8	<i>Couplages multiphysiques en milieux poreux II</i> <i>Multiphysics couplings in porous media II</i>	
11:30	Multi-physics simulation of void evolution in thermoset prepreg UD laminates	Briard Anne-Lise - Institut Clément Ader (France)
11:50	Refined porous ceramic manufacturing using active learning	Gopale Gowda Jnanesh - École des Mines de Saint-Étienne (France)
12:10	A physical approach to the modeling of hygrothermal transfers in bio-based building materials	Daunais Nicolas - Laboratoire Navier (France)
Session parallèle 8	<i>Écoulements multiphasiques en milieux poreux III</i> <i>Multiphase flows in porous media III</i>	
11:30	Modeling and simulation of ocean-groundwater interactions through the beach: a Navier-Stokes and Richards equations coupling	Bonnet Tony - Institut de Mécanique et d'Ingénierie (France)
11:50	Advantages of physics neural networks for modeling seawater intrusion in coastal aquifers	Mansouri Bajgiran Maryam - Institut Terre Environnement Strasbourg (France)
12:10	Impact of water table fluctuations on the redistribution of light hydrocarbons in heterogeneous porous media	Amangaliyeva Lazzat - BRGM (France)



Modification non prise en compte sur le programme imprimé
Update not applied in the printed program

Jeudi 6 novembre 2025

Session parallèle 9	<i>Transport réactif III</i> <i>Reactive transport III</i>	
14:45	Reactive percolation in ultramafic rocks: impacts of permeability and pore structure on hydrogen generation	Obin Thomas - Institut des Sciences de la Terre d'Orléans (France)
15:05	Controls of double-porosity interconnectivity on dissolution of carbonate rocks	Briolet Théo - Laboratoire de géologie de l'ENS (France)
15:25	Experimental investigation of salt precipitation in rock samples for hydrogen storage applications	Kalyoncu Gülce - PProGResS/UGCT, Department of Geology, Ghent University (Belgique)
15:45	Scallop formation due to dissolution-driven convection	Hurtis Radoslav - Department of Applied Mathematics and Statistics, Comenius University, Bratislava, Slovakia
Session parallèle 9	<i>Milieux poreux biologiques II</i> <i>Biological porous media II</i>	
14:45	Porous media modeling of macromolecule diffusivity in the intracellular volume	Chabanon Morgan - Laboratoire d'Énergétique Moléculaire et Macroscopique, Combustion (France)
15:05	Multi-scale characterisation of the porosity in pretreated lignocellulosic biomass	Goc Firat - IFP Energies nouvelles (France)
15:25	Mesofauna activity and soil pore space dynamics: temporal analysis using x-ray microtomography	Cazaurang Simon - Environnement Méditerranéen et Modélisation des Agro-Hydrosystèmes (France)
15:45	Multi-scale modelling of enzymatic hydrolysis of biomass using numerical homogeneization	Berson Emma - Institut de mécanique des fluides de Toulouse (France)
Session parallèle 9	<i>Couplages multiphysiques en milieux poreux III</i> <i>Multiphysics couplings in porous media III</i>	
14:45	Conduction-radiation coupling: Characterisation of the effective thermal properties of geopolymers	Fortunat Adjovi Alexandra - IMT École nationale supérieure des Mines d'Albi-Carmaux (France)
15:05	Moisture behavior in textiles: a dynamic NMR study	Gerony Floriane - Laboratoire Navier (France)
15:25	Averaging random conduit networks, influence of conductivity randomness	Colecchio Iván - IFP Energies nouvelles (France)
15:45	Dynamic Displacement of Wetting Fluids by Non-Wetting Fluids in Geological Fractures: an Analog Experiment	Yves Meheust - Université de Rennes, CNRS, Géosciences Rennes (France)

Posters

Experimental Study of Tidal Oscillatory Flows on a Partially Saturated 1D Porous Column	Alastal khalil - Institut de mécanique des fluides de Toulouse (IMFT) (France)
Gas Adsorption Characterization of Biochar: Surface Area, Pore Distribution, and Sorption Energy	Amoury Bilal - Microtrac Formulation SAS (France)
Experimental Characterization of Foam Flow and Gas Trapping in Porous Media	Baigadilov Adil - Bureau de Recherches Géologiques et Minières (France)
Optimizing Surfactant Foam Formulations for Enhanced (Bio)Remediation of Petroleum-Contaminated Soil	Baimaganbetova Sholpan - BRGM, Orléans (France)
Semi-analytical solution for flow with time-varying viscosity in fractured porous media	Belfort Benjamin - Institut Terre Environnement Strasbourg (France)
Assessment of Groundwater Vulnerability to Leachate Contamination Using Hydrodynamic and Geochemical Indicators in Belloua Mountain, Kabylia, Algeria	Benarab Salah - Faculté de technologie, département de génie des procédés de l'environnement, Université de Boumerdès (Algérie)
Experimental Study of Dissolution Patterns resulting from the competition between Forced and Solutal Convection	Berhanu Michael - Laboratoire Matière et Systèmes Complexes (France)
Linking Mineral Reactions with Induced Polarisation: A Microfluidic Study of FeS Formation and Dissolution	Bil Christiaan - Géosciences Rennes (France)
From Anomalous Transport Of Red Blood Cells To O2 Delivery In Vascular Networks	Blons Hugo - Géosciences Rennes (France)
Synthesis and characterization of nickel oxide nanoparticles by the PECHENIN method for Corrosion Protection and Porous Material Reinforcement Applications	Boughrara Saliha - Laboratory of Food Technology Research (LRTA), University of BOUMERDES (Algérie)
A Novel Machine Learning-based Method for Groundwater Modelling involving Aquifer Rainfall Time Response Analysis and Clustering of Groundwater Wells	Breuillard Hugo - Bureau de Recherches Géologiques et Minières (France)
Probing Particle Dynamics Inside Opaque Porous Media Using X-ray Radiography	Carter Adam - PHysicochimie des Electrolytes et Nanosystèmes Interfaciaux (France)
Elastic Properties of Partially Saturated Tournemire Shale at Seismic Frequencies	Chapman Samuel - Laboratoire de Géologie (France)
Euler-Euler Simulations Of Colloidal Transport And Retention At The Pore Scale	Cheikh Nassim - Institut des Sciences de la Terre d'Orléans (France)
Characterization of the porous network and particle density under compression using XCT of a bio-based porous media	Cekai Tinhinane - cerema (France)
Predicting Seismic Response To Fluid Injection Using Machine Learning	Cuvier Arthur - Bureau de Recherches Géologiques et Minières (France)
Assessment of grid resolution for using Poisson-Nernst-Planck equations in reactive transport modeling.	Dackouo Josaphat - BRGM, ISTO (France)
Studying Diffusiophoresis-Driven Colloid Transport in Porous Media Using Microfluidics	Etienne Pauline - Institut des Sciences de la Terre d'Orléans (France)
Simulation Of Reactive Transport Dynamics In Cerebral Microcirculation	Fialkovsky Dimitri - Institut de mécanique des fluides de Toulouse (France)
Water transfers in starch-fibers composites	Hbaieb Olfa - Laboratoire Navier (France)
Mixing in confined heterogeneous porous media	Sajedi Fateme - Université de Lausanne (Suisse)

Posters

Scalable flow modeling in karstic media through graph simplification	Housni Yousra - IFP Energies nouvelles (France)
Dynamics of Gadolinium Oxide Clogging in Porous Media: Insights from 4D X-ray Microtomography	Iqbal Muqeet - Institut des Sciences de la Terre d'Orléans - UMR7327 (France)
Intrinsic permeability of heterogeneous porous media	Jiao Wenqiao - University of Lausanne / Institute of Earth Sciences (Suisse)
Iterative Coupling Algorithms For Mixed-Dimensionnal Poromechanical Models In Faulted Geological Systems	Jonval Maxime - Inria (France)
Intercooler study using porous media modeling and CFD simulation	Khadidja Boualem - University of Science and Technology of Oran (Algérie)
Streaming Potential Simulation in Variably Saturated Fractured Porous Media	Koohbor Behshad - GeoRessources (France)
Imaging solute transport in 3D printed porous media	Lamblin Marc - Géosciences (Rennes France)
A Versatile Simulator for Multiscale Reactive Transport in Subsurface Environments	Le Trong Emmanuel - Institut des Sciences de la Terre d'Orléans (France)
Direct observation of calcite dissolution with microfluidics and spectral induced polarization. Geochemical and petrophysical modeling	Leroy Philippe – Bureau de Recherches Géologiques et Minières (France)
Multi-Scale Heterogeneities in a Complex Limestone Formation: Imagery and Petrophysical Characterization	Mallet Celine - Institut des Sciences de la Terre d'Orléans (France)
Imaging of solute transport through impermeable inclusions at Darcy scale	Petitjean Clément - Géosciences Rennes (France)
Synthesis and Characterization of Cage-like Mesoporous Silica SBA-16 to Study Cavitation in Confinement	Puibasset Joel - Interfaces, Confinement, Matériaux et Nanostructures (Orléans, France)
Dynamic Displacement of Wetting Fluids by Non-Wetting Fluids in Geological Fractures: an Analog Experiment	Meheust Yves - Géosciences Rennes (France)
Experimental study of the impact of groundwater level fluctuations on the mobilization of petroleum hydrocarbons - geophysical strategy	Wade Alassane - Bureau de recherches géologiques et minières (France)
Flow and phase behavior of nanoconfined aqueous solutions	Boudaoud Abir - Institut Lumière Matière [Villeurbanne] (France)
A Novel Machine Learning-based Method for Groundwater Modelling involving Aquifer Rainfall Time Response Analysis and Clustering of Groundwater Wells	Breuillard Hugo - Bureau de Recherches Géologiques et Minières (France)
Direct observation of calcite dissolution with microfluidics and spectral induced polarization. Geochemical and petrophysical modeling	Leroy Philippe - Bureau de Recherches Géologiques et Minières (France)
Experimental Study of Dissolution Patterns resulting from the competition between Forced and Solutal Convection	Berhanu Michael - Matière et Systèmes Complexes (France)
Smooth Particle Hydrodynamics (SPH) code for fracture and hydrofracture propagation	Dymitrowska Magdalena - Institut de Radioprotection et de Sûreté Nucléaire (France)
Stabilizing Emulsions with Surfactant-Nanomaterial Systems in Carbonated Water Injection for EOR	Khanjani Maral - Nazarbayev University (Kazakhstan)

Conférencier invité

Keynote speaker



Lydéric Bocquet

Lydéric Bocquet is a CNRS researcher and attached Professor at Ecole Normale Supérieure (Paris) working at the Laboratoire de Physique de l'Ecole normale supérieure LPENS. He is a member of the French Academy of Sciences.

His research is at the interface between condensed matter, fluid dynamics, and nano-science. With his research team they combine experiments, theory, and molecular simulations to explore the mechanisms of the dynamics of fluid interfaces from the macroscopic down to molecular level. His team developed unique experiments to study fluid transport using nanofluidics.

His fundamental research has led to the creation of four start-ups, including Sweetech Energy in the field of osmotic energy and Hummink in the field of additive manufacturing on a nanometric scale.

Fluid and ionic flows at the nanoscales, from fundamentals to applications

At the nanometric scale, liquids behave in the most unexpected ways and observations unveil a cabinet of curiosities of singular properties: nearly frictionless flows, emerging quantum effects, or neuromorphic behaviors that makes it possible to dream of ionic computers.

In this talk, I will discuss experimental and theoretical results that we obtained on the transport of water and ions in nanopores, both in 1D nanotubes and 2D channels obtained by van der Waals assembly.

I will in particular focus on osmotic transport at the nanoscales, from the standard van 't Hoff osmotic pressure to some of its unconventional extensions.

Beyond the scientific intrigue, some of the singular nanoscale properties can be scaled up to develop innovations in the water-energy nexus. I will in particular discuss how this led to a revived large-scale perspective for osmotic energy harvesting, as well as large-scale application for separation and desalination under electric drivings.

Conférencier invité

Keynote speaker

Laurent Brochard



Laurent Brochard is a researcher at Navier lab (ENPC, Univ. Gustave Eiffel, CNRS) since 2012, and professor at École nationale des ponts et chaussées (ENPC) since 2023. He received his Ph.D. from Université Paris-Est in 2011. He is also engineer from École Polytechnique (France) and from École nationale des ponts et chaussées (France). His research focuses on multi-scale approaches for the study of the physics and mechanics of materials with emphasis on phenomena that have their origin at the molecular scale: adsorption and poromechanics, fracture mechanics and failure initiation, thermo-mechanical couplings, and confined phase transition. Targeted applications are mostly in geomechanics (CO2 sequestration, nuclear waste and energy storage, earth and bio-sourced construction, cementitious materials, and fault stability).

Poromechanics of microporous media

Microporous media, with pores less than 2 nm large, are known to exhibit complex poromechanical behaviors because the fluid in such small pores is adsorbed and is no more bulk. Well known examples are the deformations of clay or wood induced by humidity. Much progress has been made in the recent years to understand and model the poromechanics under adsorption, and, in this presentation, I will focus more specifically on the contribution of molecular simulation. As a first approach to the problem, we will see how molecular fluctuations observed at very small scale fully characterize the poromechanics, irrespective of the nanostructure of the material. In the particular case of well-defined pore shapes (e.g., slit pores), one can define the concept of porosity, which makes it possible to develop a second approach of poromechanics, more detailed, where one distinguishes the behavior of the fluid from that of the solid. In both cases, molecular simulation is essential to capture the poromechanical effect of the fluid, at a scale hardly accessible to experiments. As illustrations, we consider the case of amorphous cellulose for the first approach and of swelling clay for the second approach.

Fluctuations of physical quantities are ubiquitous in molecular simulations at the atomic scale because of the thermal agitation. It is well known that the magnitude of the fluctuations of thermodynamic state parameters are related to the second order derivatives of the thermodynamic potential minimum at equilibrium (e.g., compressibility, thermal expansion, and heat capacity for a fluid). While fluctuation formulas are well established for simple systems (e.g., pure fluids), in the field of porous media only the isosteric heat of adsorption is commonly estimated from fluctuations, and the formula considered assumes a rigid solid. Here, we revisit the Biot-Coussy theory of thermo-poro-elasticity in a framework adapted to derive fluctuation formulas. All the thermo-poro-mechanical moduli can then be characterized by fluctuations of quantities readily accessible during a molecular simulation, i.e., with no additional computational cost and with no need to define the concepts of porosity or specific surface (ambiguous at the molecular scale). These fluctuation formulas are valid even when the fluid is adsorbed and induces unusual couplings. It is therefore possible to use the formulas to fully characterize the mechanical and thermal effects of adsorption, and conversely to characterize the adsorption response to stress and temperature. The application of these fluctuation formulas is illustrated in the case of amorphous cellulose submitted to moisture, which exhibits many unusual couplings beyond swelling (negative drained thermal expansion, very high drained heat capacity, negative Biot modulus...).



Conférencière invitée

Keynote speaker

Carla De Tomas

Carla de Tomas is a Senior Lecturer in Net Zero in the Department of Physics and a member of the Net Zero Centre, King's College London. She holds a PhD in Physics from the Autonomous University of Barcelona and has built a multidisciplinary research career at the intersection of materials science, energy storage, and computational modelling. Her research interests focus on disordered carbon materials due to their sustainability and tunability to target a wide variety of technological applications, in particular ion batteries, gas storage and air and water purification. Her computational group is dedicated to working closely with experimentalists, using high-throughput atomistic simulations and machine-learning-based tools to guide the rational design of active materials for target applications. Prior to joining King's, she held positions in Imperial College London (Marie Skłodowska-Curie Fellow), the University of Tokyo (JSPS Postdoctoral Fellow) and Curtin University (Research Associate). In addition, she has industrial expertise from her role as Senior Computational Materials Scientist at Happy Electron Ltd., a London-based battery start-up. She currently serves as an Editorial Associate for *Carbon*, the leading journal in carbon science, and is a member of the British and the Australian Carbon Societies.

Advancing Porosity Characterisation with Realistic 3D Models of Nanoporous Carbons

Nanoporous carbon materials play a crucial role in industrial applications like water purification, gas separation, and energy storage. Their unique properties arise from a complex structure with a diverse distribution of pore sizes and geometries. Properly characterising this structure is essential for optimising materials for specific applications.

Current characterisation methods such as NLDFT and QSDFT are based in simplified geometrical models, e.g. slit-pore model, to describe porosity-related properties, in particular gas adsorption isotherms, surface area, and pore size distributions. However, real-world applications demand a deeper understanding of the full 3D porous structure.

We have developed realistic 3D models of nanoporous carbon materials using large-scale atomistic simulations that mimic experimental synthesis processes [1]. These models accurately predict surface area, pore size distribution, and adsorption properties. Leveraging a comprehensive database of 3D structures, we introduced the 3D-VIS characterization method [2], which fits experimental gas adsorption data to identify the most probable pore structures and morphological parameters. This method also generates simulated high-resolution TEM (HR-TEM) images, revealing atomistic-level pore geometry and structure—insights that surpass the capabilities of existing experimental techniques and NLDFT/QSDFT-based characterisation softwares.

The 3D-VIS method is available via a user-friendly online app (<https://3d-vis.streamlit.app/>), where users can upload experimental isotherm data for automated analysis. The app produces pore size distribution plots and visualizes pore structures, including simulated HR-TEM images and molecular model snapshots, delivering a detailed and accessible assessment of material porosity.

References

- [1] C. de Tomas, Structural prediction of graphitisation and porosity in carbide-derived carbons, *Carbon*, 119, 1-9 (2017).
- [2] F. Vallejos-Burgos et al. 3D nanostructure prediction of porous carbons via gas adsorption, *Carbon*, 215, 118431 (2023).

Conférencière invitée

Keynote speaker

Jennifer L. Druhan



Jennifer L. Druhan is Associate Professor at the University of Illinois Urbana-Champaign since 2015 in the Department of Earth Science & Environmental Change. Since 2019 she is also Professeure Associée at Institut de Physique du Globe de Paris.

Her research interests center around the ability to identify the underlying processes contributing to chemical variability during reactive transport through porous media using measurements and modeling of associated stable isotope fractionations. Her recent work has involved integrating stable isotope systems in numerical models of reactive flow and transport to unravel the internal watershed structure and function and emerging stream concentration-discharge relationships.

A reactive transport framework for addition of exogenous solids to eroding porous media

Soils emerge as a balance between the pace of bedrock uplift and erosion, the velocity of meteoric fluid infiltration and drainage, and the rate of chemical weathering reactions. Together, these timescales combine to set the thickness, chemical composition and utility of soils as a foundation for ecosystems and agriculture. Reactive transport models (RTMs) for pedogenesis generally utilize a reference frame in which bedrock supplied from below is converted into erosion of soils at the land surface. However, a variety of pathways lead to differential movement of solid phases in otherwise uplifting porous media. For example, vegetation pushes root structures downward into actively developing soils, exogenous dust inputs infiltrate soil profiles despite erosion and recent carbon sequestration strategies propose to amend agricultural soils with highly weatherable minerals to promote conversion of CO₂ to carbonate alkalinity. These conditions call for the necessity of RTMs capable of treating the differential movement of solids within porous media. Here we modify the open source CrunchTope RTM software to quantitatively interpret the impacts of dust deposition and solubilization in stream water chemistry, regolith weathering rates, and ecosystem nutrient availability. We describe two simulations: (1) a generic model demonstrating a simplified system in which bedrock uplift and soil erosion occur in tandem with solid phase dust deposition at the land surface; (2) a case study based on a small (0.54 km²) upland Mediterranean watershed located on Mont Lozère in the National Park of Les Cévennes, France.

Conférencier invité

Keynote speaker



Rainer Helmig

Prof. Rainer Helmig is the head of the Institute for Modelling Hydraulic and Environmental Systems, Department of Hydromechanics and Modelling of Hydrosystems at the University of Stuttgart, Germany. He is the Kimberly-Clark Distinguished Lecturer 2025 of the International Society for Porous Media.

Rainer Helmig is widely recognized as a pioneer and visionary in developing numerical modelling concepts in the fields of groundwater hydrology, subsurface energy storage, and coupled processes at the interface between porous media and free-flow compartments. Over the course of his illustrious career, Rainer Helmig has consistently produced groundbreaking research that has pushed the boundaries of knowledge in the field of porous-media research. His work has been instrumental in solving real-world problems, his methodologies have been adopted widely and have had a transformative impact on the field. Beyond his research contributions, Rainer Helmig has been a dedicated mentor and educator, nurturing the talents of emerging scientists and engineers in the field.

From the brain to water uptake of roots to fuel cells: - porous media are "almost" everywhere –

Porous media are almost everywhere. The understanding of flow, transport and deformation processes in porous media is important for the optimization of fuel cells, energy storage, the prediction of landslides due to heavy rainfall or the spread of tumors in human tissue. In this lecture, we will give a first a brief overview of the importance of porous media; using selected examples, we will cover the range from environmental to technical and relevant bio-issues. In the second part, we would like to present selected modelling approaches and analyses using two concrete application examples:

- Firstly, for the release multiple sclerosis, we can use knowledge about prose media to help make better predictions. What happens in the porous medium "brain" when the blood-brain barrier no longer functions properly? How can research in the field of porous media positively influence the treatment of multiple sclerosis?
- On the other hand, I would like to discuss with you whether we can improve water management in fuel cells as a drive technology with our knowledge of porous media. What role does the understanding of porous media play in the context of alternative forms of mobility such as fuel cells? Are our "classical models" for water transportation helpful?

This is where simulations help, because they make the invisible processes in the brain and in the fuel cell visible (I hope).

Conférencière invitée

Keynote speaker



Sylvie Lorthois

Sylvie Lorthois is a CNRS Research Director in the Porous and Biological Media group of the Fluid Mechanics Institute of Toulouse. After an engineering degree and a master's degree in fluid mechanics obtained at Sup'aéro, Toulouse, in 1995, she diversified her training in 1996 with a master's degree in vascular biology from the Medical School of Paris Sud University. Her PhD, defended in 1999 at the National Polytechnic Institute of Toulouse, focused on occlusive pathologies of the cerebral macro-circulation. She joined the CNRS in 2001 after a post-doctoral stay at the University of California at Berkeley, where she learned about the fundamental principles of Magnetic Resonance Imaging.

She is now interested in all aspects of brain microcirculation (morphogenesis and architecture, blood flow and transport, regulation and application to functional brain imaging, interaction with cerebro-spinal/interstitial fluid flow, involvement in brain pathologies, ...), which she approaches mainly from a theoretical and numerical modeling perspective. For that purpose, she collaborates on a regular basis with biologists, physiologists and clinicians. In parallel, she also works on the physics of red blood cell flow in networks, which she approaches mainly based on microfluidic.

Modeling blood flow and mass transfers within the brain to highlight the vascular component of Alzheimer's Disease

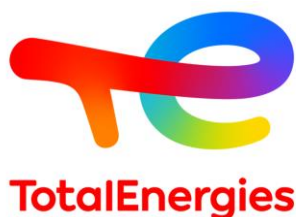
Because the brain lacks any substantial energy reserves, the cerebral microvascular system is essential to a large variety of physiological processes in the brain, such as blood delivery and local blood flow regulation as a function of neuronal activity. It provides a unique window to observe the functioning brain using hemodynamically-based functional imaging techniques. It also plays a major role in disease (stroke, neurodegenerative diseases, ...). However, the functional consequences of vascular damage (including acute occlusions or long-term remodeling in ageing or disease) are poorly understood.

In this context, modeling approaches are increasingly important, and can be inspired by those developed for the study of multiphase or reactive flows in porous media, subsequently enriched to take into account the specific architecture of the microvascular network. This enables to obtain the corresponding scaling-laws for blood flow and mass transport. I will discuss how these scaling-laws are mostly driven by the topology of the microvascular network and highlight how they help understand the vascular component of Alzheimer's Disease.



17^e Journées d'Etudes des Milieux Poreux

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