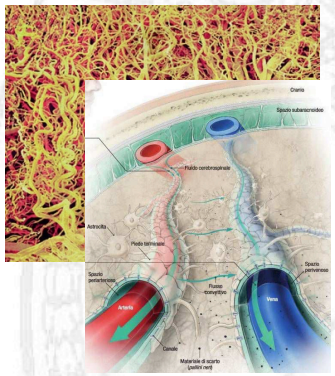
Università degli Studi di Pavia
Computational Mechanics & Advanced Materials Group - DICAr

3D@UniPV
Virtual Modeling and Additive Manufacturing for Advanced Materials

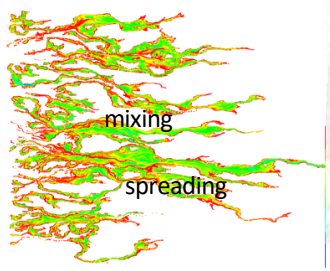
SEMINAR

Transport processes across scales in heterogeneous environments

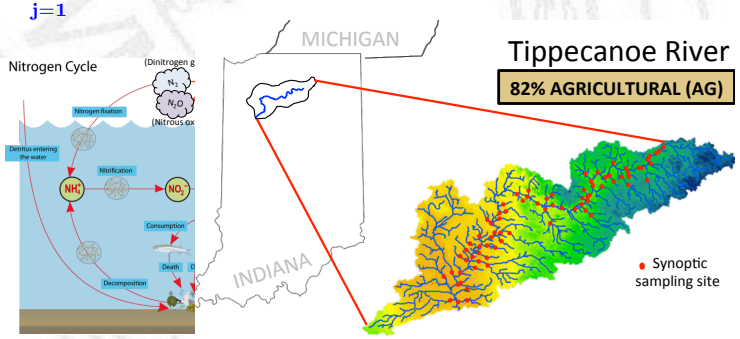
Porous media are ubiquitous in nature and occur at scales ranging from a few microns, such as in capillary vessels, to hundred and even thousands of kilometers when dealing with regional aquifers or oils reservoirs. Despite transport processes are similar at small scales, upscaling them to the scale of interest in applications is hampered by the large uncertainty affecting the spatial variability of hydraulic properties. In this seminar I will discuss a wide class of transport processes having water as currier and occurring in porous media and in complex networks. I will start by considering transport of solutes reacting upon mixing in porous media at scales smaller than the Darcy's scale and transport of macromolecules across capillary walls in biological systems. Then I will consider groundwater transport at the local scale in heterogeneous aquifers and transport along river systems, including hyporheic exchange occurring at the interface between surface and subsurface waters. A larger view showing how heterogeneity influences catchment and global scale processes, such as transport of contaminants (including emerging ones) and emissions of greenhouse gasses at the global scale closes my presentation.



$$\frac{d}{dr}\left[r\, l_p(\sigma-1)\frac{\Pi}{RT}\frac{dp}{dr}\right]+\frac{d}{dr}\left[r(l_p\sigma-l_d)\frac{\Pi}{RT}\frac{d\Pi}{dr}\right]$$



$$\Omega(\mathbf{x})=\nabla\times\mathbf{V}=\nabla\times\sum_{j=1}^{N}\mathbf{v}(\mathbf{x}-\tilde{\mathbf{x}}_j;\boldsymbol{\theta}_j)$$



Prof. Alberto Bellin
Department of Civil, Environmental and Mechanical Engineering
University of Trento

February 18th, 11:30am (sharp)
DICAr MS1 Meeting Room
Via Ferrata, 3 – Pavia