

# Complexity, collective behavior and intermittency: from bird flocks to porous media flows

*M. Moura, K.J. Måløy, E.G. Flekkøy and R. Toussaint*

*PoreLab, UiO*

In this talk we will have a brief conversation about complexity, collective behavior and pattern formation mechanisms and show how these topics are connected to the experiments in porous media flows performed by the presenter and many others that preceded him in the group in Oslo. We will show how the use of transparent porous networks can help us understand the transport properties of porous media flows and how the intermittent dynamics of the fluids is reflected on pressure measurements. More specifically, we will consider the analysis of the power spectrum associated with pressure fluctuations during slow drainage experiments. We have observed a  $1/f$  scaling region in the power spectrum which is new for porous media flows and, for specific boundary conditions, we notice the occurrence of a transition from  $1/f$  to  $1/f^2$  scaling. An analytically integrable mathematical framework was employed to explain this behavior.

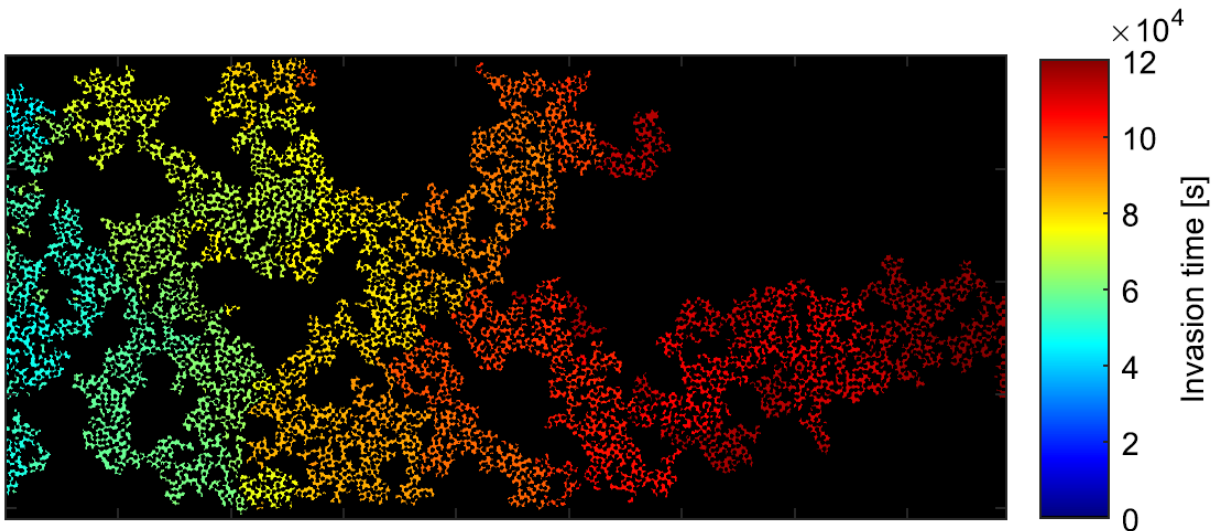


Figure 1: Spatiotemporal map showing the evolution of a slow drainage process in which air displaces a viscous liquid from a porous network. The colormap indicates the time at which a given pore was invaded.

References:

M. Moura, K. J. Måløy, and R. Toussaint, “Critical Behavior in Porous Media Flow,” EPL (Europhysics Letters) **118**, 14004 (2017).