

**The Hong Kong Polytechnic University
Department of Applied Mathematics**

Colloquium

**The non-iterative multi-physics domain decomposition method for
coupled free flow and porous media flow problem**

By

Dr. Xiaoming He

Missouri University of Science and Technology

Abstract

The Stokes-Darcy and Navier-Stokes-Darcy model have attracted significant attention in the past ten years since they arise in many applications involving with coupled free flow and porous media flow such as surface water flows, groundwater flows in karst aquifers, petroleum extraction and industrial filtration. They have higher fidelity than either the Darcy or Navier-Stokes systems on their own, but coupling the two constituent models leads to a very complex system. Based on a short review about the traditional iterative domain decomposition methods for the Stokes-Darcy model, this presentation discusses a series of works for the non-iterative multi-physics domain decomposition method to solve non-stationary Navier-Stokes-Darcy (or Stokes-Darcy) model, including both the algorithm development and analysis. One key idea is to decouple the free and porous media flow through Robin type boundary conditions which arise from the three interface conditions. Another key idea is to use the lagged results from the previous time iteration step to predict the auxiliary functions needed on the interface for the domain decomposition at the current time iteration step. Optimal convergence is proved for the k -step ($1 \leq k \leq 5$) back backward differentiation scheme with finite element spatial discretization. Computational results are presented to illustrate the features of the proposed method.

Date : 28 May, 2020 (Thursday)

Time : 14:00-15:00 (Hong Kong Standard Time GMT +8)

Venue : Online Talk via Zoom (Meeting ID: 99239932829)

Click to join : <https://polyu.zoom.us/j/99239932829>

* The Talk will be given in English.



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