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**Treatment of Interface Conditions for Coupled  
Stokes-Darcy Flow in Least Squares Finite Element  
Methods**

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In this talk we will present a least squares based finite element method for the coupled Stokes-Darcy flow. These problems typically arise in investigating the interaction between surface and groundwater flow. Both subproblems are well understood and there are several approaches in setting up an elliptic least squares functional. We choose a velocity-stress for Stokes flow and a flux-pressure formulation for Darcy flow where all process variables involved in interface conditions are directly available. Nonetheless formulating the coupled problem using appropriate boundary conditions on the interface is essential to guarantee well-posedness and the property of the least squares functional as an error estimator. Still, while ensuring the well-posedness of the problem, the practicability of the method has to be considered.

Numerical experiments using Raviart-Thomas (for each stress component and the flux) and standard conforming piecewise polynomials (for the velocities and the hydraulic potential) will be presented. Using the least squares functional as local error estimator an adaptive refinement strategy will be investigated.