Seminar

Speaker: Hormoz Jahandari

Subject: *Forward modelling of gravity data on unstructured grids using an adaptive mimetic finite-difference method*

When: October 31, 2019

Where: ED-4010

Time: 2:00-3:00 pm

Abstract: *While the mimetic finite-difference method shares many traits with the finite-element and finite-volume methods, it has the advantage that it naturally accommodates grids with arbitrary polyhedral elements. For the forward gravity problem, we use cell-based and vertex-based mimetic finite-difference schemes to solve the corresponding diffusion problem, in mixed form, and Poisson's problem, respectively. The cell-based scheme is solved for the gravitational potential and attraction at the centroids and the facets of the elements, respectively, and the vertex-based scheme is solved for the potential at the vertices of the elements. Using synthetic models, these mimetic finite-difference schemes are compared with cell-based and vertex-based finite-volume schemes and a vertex-based finite-element scheme, in terms of the accuracy of the potential, and the equivalence of the vertex-based mimetic finite-difference and finite-element schemes, on tetrahedral grids, is demonstrated. We then show the advantage of the mimetic finite-difference method, in accommodating arbitrary elements, by implementing an automatic adaptive mesh refinement using the cell-based mimetic finite-difference scheme and realistic models. The mesh adaptation is applied by an iterative h-refinement where goal-oriented error estimates are used to mark the elements for refinement. The marked elements are then decomposed into eight smaller tetrahedra, creating an octree mesh. Since arbitrary polyhedra are naturally permitted in the mimetic finite-difference method, no modification of the scheme or averaging is required to deal with the hanging nodes and any extra refinement is avoided. This characteristic allows preserving the quality of the initial grid and simplifying the refinement procedure.*

There will also be snacks provided