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Title of Talk: Fluid Transport Through Sea Ice

Abstract:
The sea ice that covers the polar regions of the world is a composite material of pure ice with incorporated brine and air inclusions. Fluid transport through sea ice is of fundamental importance in air-sea-ice interactions, in supplying nutrients to sea ice algae, in desalination processes, in sea ice production and decay, and in thermal transport through sea ice. However, until now, little has been understood theoretically about the effective fluid transport properties of sea ice. Current work using continuum percolation theory has yielded striking classification of the critical exponent k characterizing the behavior of fluid permeability of sea ice near its critical temperature. For experiments and processes involving macroscopic transport on geophysical length scales, k takes the universal lattice value of 2.0. While, for mesoscopic transport on smaller scales relevant to local biological processes, non-universal continuum values with $k>2$ can be obtained. Indeed, Arctic field experiments and laboratory centrifuge experiments yield matching results.