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Title:
Theoretical framework for the description of transmembrane receptor cluster coalescence in cells

Abstract:
Moving boundary problems that appear in many fields of science are notoriously difficult to formulate and solve. Due to their complexity, approximation methods play an important role and are widely used to analyze such systems. In this talk, I will present an approximation method for moving boundaries or traps in reaction-diffusion processes that is applied to investigate coalescence of receptor clusters in mast cells. To handle the complexity, which stems from boundary growth due to particle melding, the study is divided into three parts. The first is about stationary trapping problems investigated by the standard defect technique, and the second is about a validity study of an adiabatic approximation for moving boundaries. In the last part, a coalescence theory is developed, which is based on a completely self-consistent approach. Finally, the developed theoretical framework is applied to study the kinetics of immunoglobulin E receptors (FcεRI) cluster coalescence in rat basophilic leukemia cells.