Title: The inverse droplet coagulation problem

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Abstract

The time evolution of the cluster size distribution of a system of coagulating droplets is determined by the Smoluchowski coagulation equation if the collision kernel capturing the correct micro-physics is known. In this talk, I will discuss the corresponding inverse problem of determining the functional form of the collision kernel from measurements of the cluster size distribution. Such inverse problems potentially offer the possibility of learning about the micro-physics from macroscopic observations in situations in which the detailed micro-physics is unknown or controversial. They are, however, usually formally ill-posed. A-priori assumptions on the collision kernel are therefore necessary if progress is to be made. I will show how this can be done in reasonable generality for the case of a stationary cluster-size distribution in the presence of a source and sink of particles and a homogeneous collision kernel. Prospects for extending the methods to time-dependent problems will be discussed.