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Coagulation-Fragmentation Transport and Vanishing Diffusion Limit

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Abstract:

The coagulation–fragmentation kinetics describes the evolution of particles under the influence of convection and diffusion and serves as an important example of an applied infinite-dimensional convection-diffusion dynamic system. The nonlinear collision operator in its domain satisfies the mass conservation law. To prove the existence theorem for both the transport equation and the equation with diffusion we use a version of the maximum principle introduced earlier by the author and establish global in time existence, uniqueness, and stability theorems of classical solutions in an important subclass of bounded kinetic coefficients. As a benefit of the proof, we obtain new asymptotic estimates of the solutions. Besides the conservation law and the maximum principle, the results are based on a new a priori estimate for the "tails" of the series involved in the collision operator. These new estimates allow to prove the vanishing diffusion limit and to evaluate the deviations in terms of the scaling parameter in the diffusion coefficient. At the end we generalize the well-posedness, asymptotic, and vanishing diffusion results towards other infinite-dimensional convection-diffusion systems possessing similar features: conservation law, local Lipshitz property of the collision operator, the maximum principle and tail estimate conditions.

Refreshments will be provided.
For more information contact Darinka Dentcheva or call 201-216-5449.