LIMIT THEOREMS FOR SMOLUCHOWSKI DYNAMICS ASSOCIATED WITH CRITICAL CONTINUOUS-STATE BRANCHING PROCESSES

G. Iyer, Carnegie Mellon University, USA, gautam@math.cmu.edu
N. Leger, Carnegie Mellon University, USA, nleger@math.cmu.edu
R. Pego, Carnegie Mellon University, USA, rpego@math.cmu.edu

We will exploit a well known connection (Bertoin, Le Gall ’06) between critical continuous-state branching processes (CSBP) that are absorbed at 0 and the generalized Smoluchowski coagulation equation to prove a variety of limit theorems. We establish a fundamental connection between the existence of a non-degenerate scaling limit and regular variation (at 0) of the branching mechanism. In particular, we show:

- A non-degenerate scaling limit of a critical CSBP (absorbed at 0) exists if and only if the branching mechanism is regularly varying at 0.
- The CDF of the rescaled process conditioned on survival has a nondegenerate limit if and only if the branching mechanism is regularly varying at 0.

When the scaling limits exist, we can further characterise the nondegenerate scaling limits of arbitrary finite-measure solutions in terms of generalized Mittag-Leffler series.