1119-60-97 **Yevgeniy Kovchegov*** (kovchegy@math.oregonstate.edu) and **Ilya Zaliapin** (zal@unr.edu).
Hierarchical Branching Processes.

We introduce a class of stochastic processes that we call hierarchical branching processes. By construction, the processes satisfy the Tokunaga, and hence Horton, self-similarity constraints. Taking the limit of averaged stochastic dynamics, we obtain the deterministic system of differential equations that describe the temporal dynamics of a Tokunaga branching system. In particular, we study the averaged tree width function to establish a phase transition in the Tokunaga dynamics that separates fading and explosive branching. We then describe a class of critical hierarchical branching processes (that happen at the phase transition boundary) that includes as a special case the celebrated critical Galton-Watson branching process. We illustrate efficiency of the critical hierarchical branching processes in describing diverse observed dendritic structures, and discuss the related critical phenomena from the point of view of respective applications. (Received February 10, 2016)