

## **SELF-ORGANIZED CRITICALITY AS AN INVERSE CASCADE**

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Models that are said to exhibit self-organized criticality (sandpile, slider block, forest fire) can be explained in terms of an inverse cascade of clusters. Small clusters of “particles” coalesce to form larger clusters. Clusters grow primarily by bridging the “gap” between existing clusters. Particles are lost in avalanches that eliminate clusters of all sizes, but significant numbers of particles are lost only from the largest clusters in the largest avalanches. These large avalanches terminate the cascade. We determine cluster-order statistics in the same manner that stream-order statistics are determined. Single particle clusters are first order and they coalesce to form second-order clusters, second-order clusters coalesce to form third-order clusters, and so forth. We find that the clustering in the forest-fire model satisfies the same Horton-Strahler number-order and length-order statistics and the same Tokanaga side-branching statistics that are satisfied by river networks and diffusion limited aggregation clusters.