Self-organized criticality and a constrained thermal system analogue of the onset of chaos

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Abstract –We construct a self-contained statistical-mechanical model for self-organization that emulates the hierarchical properties of the nonlinear dynamics towards the attractors that define the period or band doubling route to or out of chaos. The aforementioned dynamics translates into a sequential partitioning of an otherwise conventional thermal system into isolated compartments that privileges progressively lower entropies, while a new set of configurations emerges due to the multiplicities of the secluded portions. The initial canonical balance between numbers of configurations and Boltzmann-Gibbs (BG) statistical weights is drastically altered and ultimately eliminated by the sequential procedure that mirrors the actions of the attractor. However the emerging set of group configurations implies a different and novel entropy growth process that eventually upsets the original loss and has the capability of marginally locking the system into a self-organized state with characteristics of criticality, therefore reminiscent in spirit to the so-called self-organized criticality.