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Vegetation Patterns in Semi-Arid Regions.

The appearance of striped vegetation patterns along topographical gradients has been well documented in a variety of semi-arid regions. The development of these patterns has been accounted for in past literature by using a system of nonlinear PDEs that model plant and water interactions. In these models, the striped patterns originate as bifurcations of the homogeneously vegetated state as the amount of precipitation decreases or as plant mortality increases. Such models, however, might admit solutions which physically correspond to continuous heating or cooling in the region. In lieu of this, we propose a new modeling strategy using a global energy functional which penalizes the system for deviating from energy balance. This functional is studied by numerical minimization over a discretized region. Furthermore, application of a naive gradient descent on this functional generates a structure similar to the traditional dynamical PDE models. (Received September 25, 2017)