Title: “Spot Dynamics in a 2D Root Hair Plant Initiation Model.”

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Abstract:
Patch location dynamics of an initiation process in a plant root hair cell at a sub-cellular is thoroughly analyzed. An earlier model proposed by Payne and Grierson captures key features of an interacting small G-protein family so-called Rho of Plants (ROPs). These proteins are in charge of promoting certain protuberances on root hair cells, which are crucial for nutrients uptake from the soil and anchorage, for instance. Auxins are a class of hormones that are known to take part on the morphogenesis of plants. As experimental observations show that a fast auxin flow is heterogeneously distributed along the cell at the ROPs diffusive scale, auxin catalysis is modelled as a spatially dependent coefficient controlling dominant cubic terms. Such a model consists of a generalized two-component Schnakenberg reaction-diffusion system, which is set up in a non-homogeneous domain. Upon considering a more realistic cell geometry, a two-dimensional root hair cell gathers the essential ingredients that allows to rigorously analyze whether shape and form are relevant for patch location dynamics. Numerical bifurcation analysis, as well as time numerical simulations, and the theory of semi-strong interactions are performed in order to shed light on the understanding of dynamical root hair morphogenesis.