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Velocity locking and pulsed invasions of fragmented habitats with seasonal growth KIRILL KOROLEV, CHING-HAO WANG, Boston University — From crystal growth to epidemics, spatial spreading is a common mechanism of change in nature. Typically, spreading results from two processes: growth and dispersal in ecology or chemical reactions and diffusion in physics. These two processes combine to produce a reaction-diffusion wave, an invasion front advancing at a constant velocity. We show that the properties of these waves are remarkably different depending whether space and time are continuous, as they are for a chemical reaction, or discrete, as they are for a pest invading a patchy habitat in seasonal climates. For discrete space and time, we report a new type of expansions with velocities that can lock into specific values and become insensitive to changes in dispersal and growth, i.e. the dependence of the velocity on model parameters exhibits plateaus or pauses. As a result, the evolution and response to perturbations in locked expansions can be markedly different compared to the expectations based on continuous models. The phenomenon of velocity locking requires cooperative growth and does not occur when per capita growth rate decline monotonically with population density. We obtain both numerical and analytical results describing highly non-analytic properties of locked expansions.

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