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Stanislav M Mintchev*, mintchev@cooper.edu, and **Benjamin Ambrosio**. *Periodically kicked feedforward chains of simple excitable FitzHugh-Nagumo neurons.*

We present results on regular depolarization cascades in periodically-kicked feedforward chains of excitable two-dimensional FitzHugh-Nagumo systems. The study documents a parameter exploration by way of changes to the forcing period, upon which the dynamics undergoes a transition from simple depolarization to more complex behavior, including the emergence of mixed mode oscillations. Both rigorous studies and careful numerical observations are presented. In particular, we provide rigorous proofs for existence and stability of periodic traveling waves of depolarization, as well as the existence and propagation of a simple mixed mode oscillation that features depolarization and refraction in alternating fashion. Detailed numerical investigation reveals a mechanism for the emergence of complex mixed mode oscillations featuring a potentially high number of large amplitude voltage spikes interspersed by an occasional small amplitude reset that fails to cross threshold. Further careful numerical investigation provides insights into the propagation of this complex phenomenology in the downstream, where we see an effective filtration property of the of the network; the latter amounts to a successive reduction in the complexity of mixed mode oscillations down the chain. (Received July 27, 2018)