

Pattern formation in an exact neural field model with gap junctions

Áine Byrne, James Ross, Rachel Nicks, Stephen Coombes

Over the last decade, the Ott-Antonsen ansatz has become commonplace in mathematical neuroscience. Applying the ansatz to a network of spatially distributed theta-neurons we derive an exact neural field model with both synaptic and gap junction coupling. As the model is derived from a population of interacting spiking neurons, realistic gap junctions can be included at the cellular level. We investigate the role of gap junction coupling in pattern formation on an idealised planar cortex, paying particular attention to its effect on population synchrony. We report an array of different spatial patterns, such as periodic waves, spiral waves and dynamic bump states.