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Gap junctions and synchronization clusters in the Thalamic Reticular Nuclei

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Gap junctions and synchronization clusters in the Thalamic Reticular Nuclei

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The Thalamic Reticular Nuclei (TRN) mediate processes like attentional modulation, sensory gating and transitions from wakefulness to sleep. The GABAergic inter neurons in the TRN are known to exhibit widespread synchronized activity patterns. One known contribution to shaping synchronization and clustering patterns in the TRN is coming from the presence of gap junctions. These are organized in specific connectivity architectures, that have been identified empirically through dye and electrical coupling studies.

We present a computational model that implements both chemical synapses and gap junctions in realistic connectivity schemes, and we use it to investigate their differential role in TRN networks. In particular, we explore the potential effects of the size, strength and distribution of gap junctional clusters on synchronization patterns, and how these effects are modulated by other factors, such as the level of background inhibition.