Homogenization theory for neural field models

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In the last decades great advances have been made in mapping neural circuitry of the brain. This has been facilitated by novel experimental techniques for studies both at the single - cell and systems levels. It still remains, though, to combine all the pieces in the puzzle to a coherent picture of brain function. While single nerve cells are fairly well understood, the signal - processing properties of the nerve - cell networks in cortex are still obscure. The growth of experimental data has led to a revival of so - called rate equation models for cell networks in nervous tissue (neural networks). In these models, the probability for firing action potentials, the key information carriers in the brain, is the main dynamical variable. These models assume the form of (coupled) integral and integro - differential equations, and they describe non - linear interactions between different neuron populations. See Bressloff [1] and the references therein. Recent studies of such models take into account that the cortical tissue has a microstructure. The impact of this microstructure is studied by means of homogenization theory [2, 3, 4].

The present talk is devoted to the continuum limit of the rate equation models (neural field models) with periodic microstructure. We will discuss topics like existence and stability of stationary localized solutions of such models.

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