**OC.098.Multimodal or coupled networks: just a matter of taste?**
7 June 10:00-12:00 (Parallel 4), Session: Complex Networks

Populations of phase oscillators can display a variety of synchronization patterns. This depends on the coupling between oscillators and on intrinsic properties like the oscillators' natural frequency. If several populations with unimodal frequency distribution are coupled to one another, the resulting dynamics may resemble that of a single population with multimodally distributed frequencies; see, e.g., [3-5] for related conjectures. Using an Ott-Antonsen ansatz in the all-to-all coupled Kuramoto model [1], we have proven that in the case of two symmetric networks both the subpopulation approach and the bimodal approach are equivalent and lead to the same properties as regards stability, dynamics, and bifurcations [2].

This equivalence strongly suggests a generalization to more complicated set-ups. On the one hand, our findings for two populations seem to be robust when refraining from perfect symmetry assumptions, see, e.g., [5]. On the other hand, the step to more than two populations appears to be not trivial at all. Even in the case of three populations, the network dynamics cease from being analyzed by means of the Ott-Antonsen ansatz.

In our talk, we will address these three points step by step. First, we discuss the dynamics of two coupled symmetric populations of Kuramoto phase oscillators. It turns out that, compared to the bimodal network as has been studied by Martens and co-workers [3], an additional bifurcation parameter enters the system. However, we show that this parameter does not lead to new dynamical behavior, but both descriptions prove to be topologically equivalent. Second, we add asymmtry in the frequency distributions. A starting point here is the work by Pazó and Montbrió [5], which then will be compared against our results. Last, we give an outlook for investigating more than two populations, and discuss chances and problems when comparing the coupled subpopulation approach vis-à-vis the multimodal approach.

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