Dynamical imaging of cortical connectivity from MEG signals: methods and application to binocular rivalry

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There is a growing interest in elucidating the role of specific patternso of neural dynamics - such as transient synchronization between distant cell assemblies - in brain functions. Source localization from MEG/EEG surface recordings with its excellent time resolution could contribute to a better understanding of the working brain. However estimating such properties requires using non averaged data in order to reveal non stimulus-locked phenomena. Use of classical distributed models such as distributed method in bad SNR conditions lead to spurious activities which bias the estimated time course of the sources. We propose a robust and original approach to the MEG/EEG distributed inverse problem to better estimate neural dynamics between cortical sources. For this, we use the surrogate formalism1 in order to select the most significant active sources among the sources estimated by a Minimum Norm estimator applied on each trial data. Monte Carlo simulations show that this method allows to reconstruct MEG/EEG data with reduced biases in both source localization and time-series dynamics. We will show application of this method to the estimation of the synchronous neural network involved in conscious perception of a frequency tagged visual stimulus in a binocular rivalry paradigm.