MAX PLANCK INSTITUTE
FOR HUMAN COGNITIVE AND BRAIN SCIENCES

Monday, June 14, 2021, 15:00 hrs
Zoom Meeting

Institute Colloquium

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High angular resolution susceptibility and diffusion imaging in post mortem chimpanzee brain: Current status, acquisitions & applications

Susceptibility-weighted imaging is gaining momentum in brain MRI due to the linkage of multiple brain pathologies to local alterations of iron and myelin. Multiple methods have been proposed for susceptibility quantification, most prominently quantitative susceptibility mapping (QSM). Typically, QSM models do not consider the anisotropic character of susceptibility in white-matter (WM) regions, which results from the specific arrangement of myelin lipids surrounding the WM fiber bundles. This may lead to potential inaccuracies on the derived QSM maps. In susceptibility tensor imaging (STI), susceptibility is depicted as a second rank symmetric tensor, in a similar way as orientation-dependent diffusivity in diffusion tensor imaging (DTI). However, STI suffers from acquisition and processing issues, primarily due to the need for physical re-orientation of the sample inside the main magnetic field. Hence, while orientation-dependent QSM datasets achieving a high spatial resolution they are typically rather limited in terms of angular resolution. In our study, we try to tackle the acquisition issues, obtaining high angular susceptibility datasets in fixed brain tissue, along with corresponding high angular-resolution diffusion-weighted imaging. These datasets are further processed to compare the susceptibility and diffusion tensors and their eigen-analysis results, to assess the susceptibility maps derived by STI in comparison to those derived by QSM in different orientations, and finally, as an approach to use DTI information to inform QSM on orientation-dependence in local susceptibility estimation. Furthermore, the high angular data open the way for studies of the susceptibility orientation distributions beyond tensorial analysis limitations.