Characterization of spatio-temporal organization of slow waves during human NREM sleep

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**Sleep is a behavior commonly observed in a large number of animal species. However, neuroscientists still poorly understand the meaning of this loss of consciousness absolutely needed for life. In the present work, we established different methods to characterize the Slow Wave Sleep most recognizable patterns: the Slow Waves (SWs). Since the anatomical structure of white matter tracts that connect various brain regions is not random and thus must constraint the propagation of waves (Hagmann et al., 2008), our basic hypothesis was that large white matter bundles would bias the propagation of SW along specific patterns, which could be identified in homogeneous clusters of waves. To investigate our hypothesis, SWs were detected automatically on the three first periods of SWS using an algorithm based on Massimini et al., 2004. They were then clustered using a two steps procedure involving a hierarchical clustering based on delay maps and a k-means clustering based on the SWs potential in a given time interval around the maximum power of the SW negative peak. To compute the relevance of the final clusters, a mathematical criterion was implemented as well as a visual check. Results of the multisubjects study showed that only bad quality and small clusters could be obtained, suggesting that there is no particular organization of SWs across the night and inforcing the hypothesis that SWs are local phenomena, each one decreasing the homeostatic pressure in only one specific area.**