

Bifurcations and chaos in a realistic model of the human cortex

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The cortex, located in the outer layer of the brain, is responsible for many high level aspects of cognition. It is a thin layer of many densely connected neurons. As it is located just below the scalp, we can easily measure its electrical activity. This measurement is called the electroencephalograph (EEG). Although EEG measurements have been performed for several decades now, we still have no comprehensive model of the underlying dynamics. In collaboration with David Liley of Swinburne University of Technology, Melbourne, we study a space and time dependent model of EEG activity that reproduces several known physiological features such as the alpha rhythm, 40Hz oscillations and biphasic response to anaesthetic agents. In particular, we show that steady, periodic and chaotic motion all occur in the model, connected by an exotic bifurcation pattern known as Shilnikov's saddle-node.