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The dynamics of neuronal redundancy in decision making BRYAN DANIELS, Arizona State University, JESSICA FLACK, DAVID KRAKAUER, Santa Fe Institute — We propose two temporal phases of collective computation in a visual motion direction discrimination task by analyzing recordings from 169 neural channels in the prefrontal cortex of macaque monkeys. Phase I is a distributed phase in which uncertainty is substantially reduced by pooling information from many cells. Phase II is a redundant phase in which numerous single cells contain all the information present at the population level in Phase I. A dynamic distributed model connects low redundancy to a slow timescale of information aggregation, and provides a common explanation for both behaviors that differs only in the degree of recurrent excitation. We attribute the slow timescale of information accumulation to critical slowing down near the transition to a memory-carrying collective state. We suggest that this dynamic of slow distributed accumulation followed by fast collective propagation is a generic feature of robust collective computing systems related to consensus formation.

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