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Evidence of ecological critical slowing-down in temperate soils

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The resilience of ecological systems is crucially important, particularly in the context of climate change. We present experimental evidence of critical slowing-down arising from perturbation of a key function in a complex ecosystem, exemplified by soil. Different behavioural classes in soil respiratory patterns were detected in response to repeated drying:rewetting cycles. We characterised these as adaptive, resilient, fragile or non-resilient. The latter involved increasing erratic behaviour (i.e. increasing variance), and the propagation of such behaviour (i.e. autocorrelation), interpreted as a critical slowing-down of the observed function. Soil microbial phenotype and land-use were predominantly related to variance and autocorrelation respectively. No relationship was found between biodiversity and resilience, but the ability of a community to be compositionally flexible rather than biodiversity *per se* appeared to be key to retaining system function. These data were used to map the extent to which soils are close to crossing into alternative stable states at a national scale.