EGU21-357
https://doi.org/10.5194/egusphere-egu21-357
EGU General Assembly 2021


# Critical transitions in Earth system dynamics

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It has been argued that several components of the Earth system may destabilise in response to gradually changing forcing such as rising atmospheric greenhouse gas concentrations and temperatures. Key examples of potentially unstable parts of the Earth system include the polar ice sheets and sea ice cover, the Atlantic Meridional Overturning Circulation, as well as tropical rainforests and monsoon systems. There are reasons to believe that the leading dynamical modes of these subsystems may essentially mimic bifurcations in low-order random dynamical systems. The stability loss on the way to critical transitions associated with such bifurcations typically leaves characteristic imprints in the statistics of time series encoding the dynamics of the system in question, which can hence serve as a proxy to assess the stability of the system. Here, we present recent advances in detecting stability loss along these lines and investigate proxy reconstructions and observations of several of the Earth system components that have been proposed to be at risk of destabilisation. We discuss the control parameters relevant for the different Earth system components and report on the posterior distributions of the critical thresholds, beyond which stability would be lost.