

EGU22-5197

<https://doi.org/10.5194/egusphere-egu22-5197>

EGU General Assembly 2022

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## Investigating the 'Hothouse narrative' with dynamical systems

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The 'hothouse narrative' states that tipping cascades could lead humanity to a binary choice between a 'governed Earth' and a 'hothouse' with no midway alternative. To investigate this scenario, we construct a toy model of interacting tipping elements and ask the following questions: Given a continuous family of emission scenarios, are there discontinuities in the family of responses, as suggested by the 'hothouse narrative'? How realistic is this given knowledge provided by climate simulations and paleo-climate evidence? The relatively low complexity of our model allows us to easily run it for several thousand years and a large range of emissions scenarios, helping us highlight the fundamental role of the different time scales involved in answering our questions. On the one hand, we find that the near-linear relationship predicted by GCMs between global temperature and GHG emissions for the next century can break up at millennial time scales due to cascades involving slower tipping elements such as the ice sheets. This translates as a discontinuity in the family of responses of our model. On the other hand, we find that different emissions scenarios respecting the same carbon budget could potentially lead to different tipping cascades and thus qualitatively different outcomes.