Integrating Human Risk Perception of Global Climate Change into Dynamic Earth System Models

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This project is a joint activity between The National Socio-Environmental Synthesis Center (SESYNC) and The National Institute for Mathematical and Biological Synthesis (NIMBioS) [6].


Anthropogenic emissions of greenhouse gases (GHGs) over the past two centuries have resulted in rapid climate change. Understanding the potential dynamics of the past two centuries is a critical challenge as GHG emissions continue. We propose to link models of human belief systems concerning risk associated with climate change with models of the ecological and climate systems into a coupled earth system model. In this earth system model, human belief systems and corresponding climate governance will drive anthropogenic GHG emissions that force the climate system, while the magnitude of climate change and related extreme events will influence human perception of associated risk.

The dynamics of the climate system are integrally linked to the dynamics of individual mental models (IMMs) and communal belief systems (CBSs) regarding climate change and its risks. IMMs and CBSs influence policy, climate governance, and ultimately anthropogenic GHG emissions. If individuals do not perceive climate to be changing or unmitigated climate change to pose a risk, then they are unlikely to advocate for potentially costly policies that promote alternative carbon-neutral energy and infrastructure technologies. An individual's beliefs are influenced by beliefs of those in their social
network, so that individuals collectively form a communal belief system. Governmental actions and policy with respect to climate governance are ultimately driven by IMMs and CBSs of constituents and policy makers.

The climate system, in turn, influences individual mental models and communal belief systems. Extreme weather events or nonstationary climate change that is outside of an individual's experience of normality can shift IMMs and CBSs, ultimately influencing policy, climate governance, and GHG emissions. The future trajectory of this complex, coupled system depends on human belief systems, and their resistance to change, with respect to the risk posed by climate change. We request support for an integrative, multidisciplinary team to consider feedbacks between climate, ecological, and human belief systems using a quantitative modeling approach.

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