

Tipping elements and climate-economic shocks: Pathways toward integrated assessment

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Article begins on next page

Supporting Information for “Tipping elements and climate-economic shocks: Pathways toward integrated assessment”

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Contents of this file

1. Text S1

Text S1. Supporting methods for Figure 2

The systems shown in Figure 2 are driven by the following equations:

$$y_{eq}(x) = A \left(1 - 1 / \left[1 + \exp \left(- \frac{x - x_0}{\sigma} \right) \right] \right) - \beta x + c \quad (1)$$

$$\dot{x}(y) = F(t) - \gamma(y - y_0) \quad (2)$$

$$\frac{dy}{dt} = \frac{y_{eq} - y}{\tau} \quad (3)$$

where $F(t)$ represents the exogenous forcing as a function of time (Figure 2a), y_{eq} represents the equilibrium response as a function of a state variable x related to forcing (Figure 2b), and y represents the realized response of the system. A scales the non-linear system response, σ scales the width of the sigmoidal equilibrium response, β is the linear response

of the system to the state variable x , τ is the timescale over which the system approaches equilibrium, and γ represents the feedback of y onto x . In Figure 2c-d, $\gamma = 0$. In Figure 2e-f, $\tau \rightarrow 0$ so $y = y_{eq}$.

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