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A risk assessment framework for interacting tipping elements

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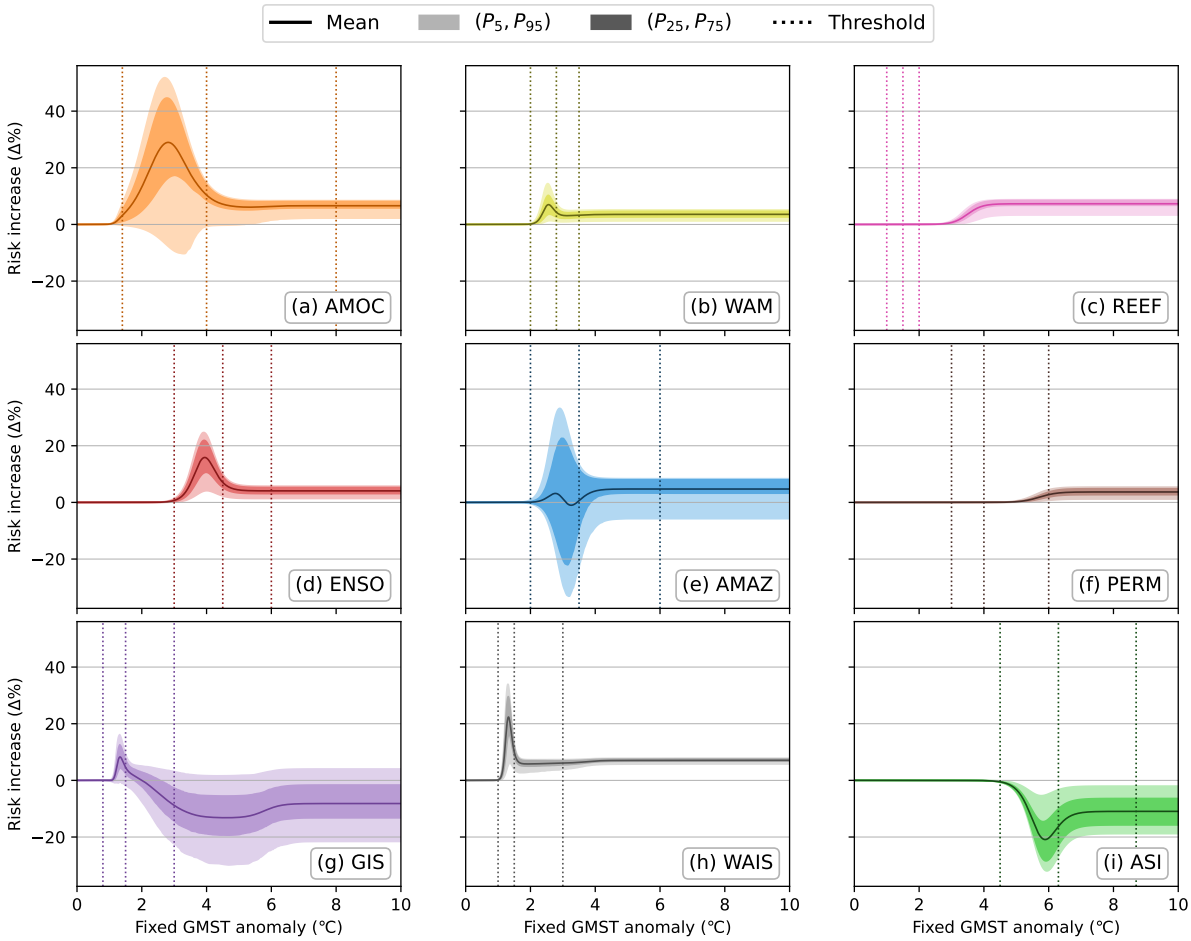

Figure S1. Increase in the equilibrium risk of the 9 climate subsystems, due to their interactions, relative to the interaction-free case, over different fixed levels of global warming. Dashed lines indicate the interaction-free case; bold lines the ensemble mean values; while the coloured bands showing values the 5- to 95-percentile uncertainty range in lighter hue, and the first- to third-quartile uncertainty range in darker hue. The thin dotted lines indicate the tipping threshold of each element (see Table 1).

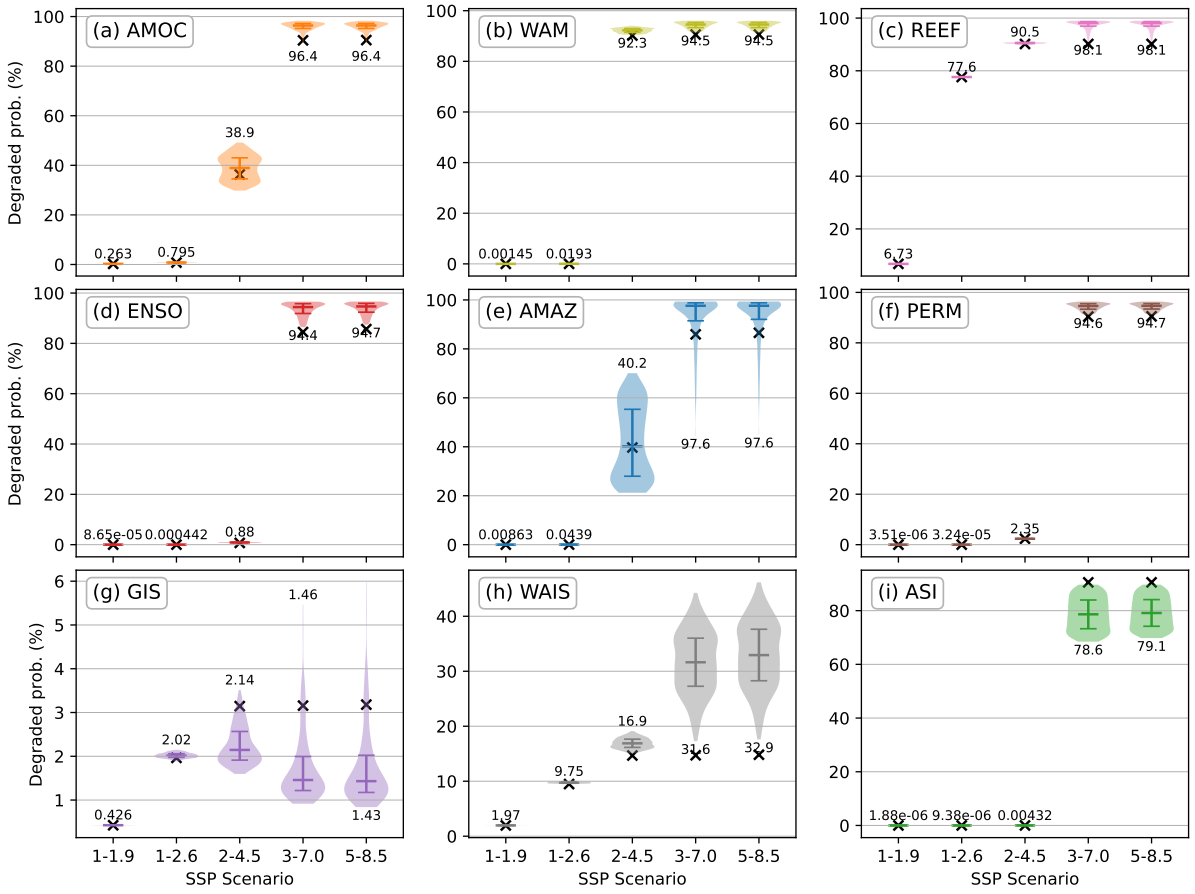

Figure S2. Distribution of risks to be degraded of 9 interacting climate subsystems under different global warming scenarios by the year 2350. In particular, in each panel, each violin plot shows the distribution over the ensemble of plausible interaction matrices, with bars indicating the interquartile range and median, whose value is further indicated. Black crosses meanwhile indicate the interaction-free scenario, also evaluated at 2350.

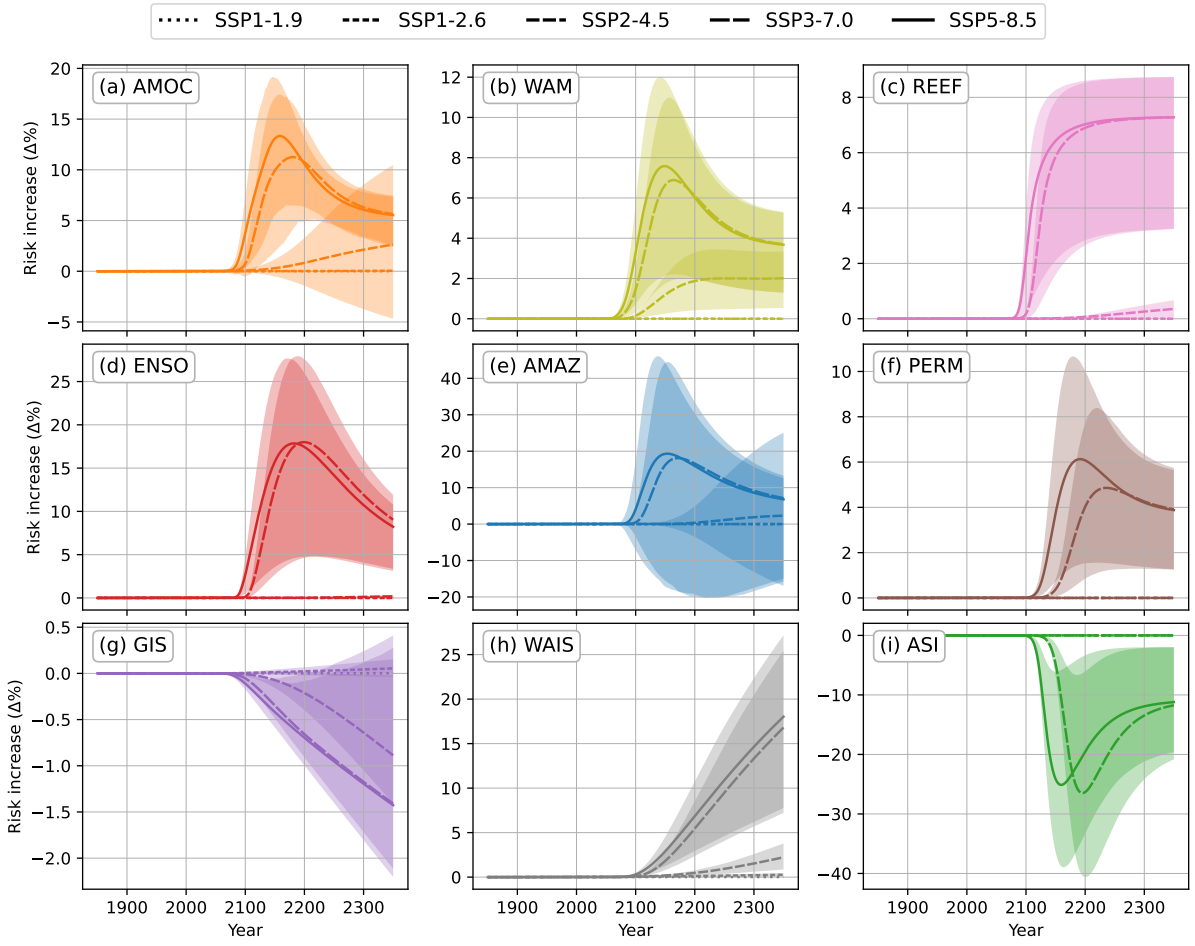

Figure S3. Increase in the probability of the tipping elements and ENSO being degraded, due to their interactions, relative to the interaction-free case, over time under different global warming scenarios. In particular, the bold line represents the historical scenario in the years 1950-2014 while from 2015-2350 the different styles of line represent different extended shared-socioeconomic pathways (SSPs). For graphical clarity, only the 5- to 95-percentile uncertainty range of the ensemble are included.

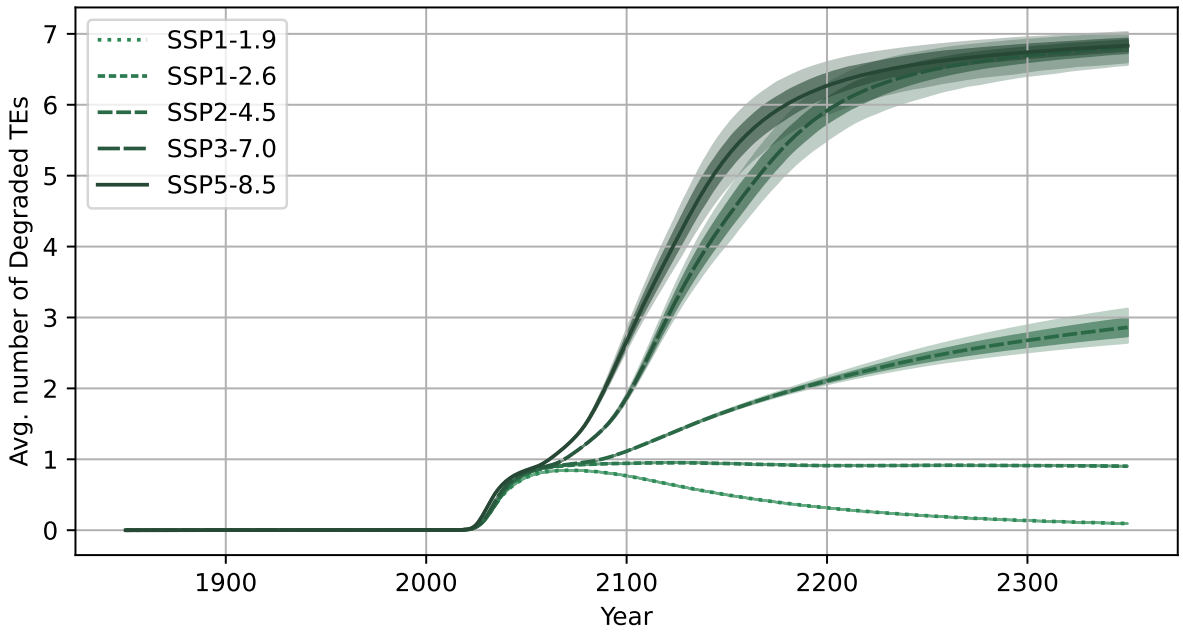

Figure S4. Average number of degraded climate subsystems in the short-term (1950-2350), under different SSP scenarios. Specifically, this is the sum of short term risks over all tipping elements as seen in main text Fig. 3. The dashed line indicates the interaction-free case; bold lines the ensemble mean values; while the coloured bands shows values within the 5- to 95-percentile range in lighter hue, and values within the first to third quartile in darker hue.