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First applications of the Rapid Impact Model Emulator

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Climate model emulation has long been applied to IAM emissions scenarios, but is typically limited to first-order climate variables like mean air temperature. Recently, approaches have been developed to reproduce a growing number of climate variables, also with spatial, even gridded, resolution, such as the MESMER (Beusch et al., 2020) and STITCHES (Tebaldi et al., 2022) models.

Here we demonstrate a recently-released post-processing software package, that takes the global mean surface air temperature trajectory, and calculates a range of climate impacts and exposure indicators (25+) in gridded spatial and tabular formats. The Rapid Impact Model Emulator uses a combination of pattern-scaling and time-sampling approaches and can be used on indicators that have been prepared at global warming levels, such as for hydrology and crop yields.

Using a database of such indicators (Werning et al 2023.), including outputs of global climate and hydrological models and a fire weather index, we show how batches of climate indicators can be quickly provided as outputs for new IAM scenarios. Combined with population exposure and vulnerability layers, we present new insights on the climate risk burden of different IPCC scenarios to illustrate how such approaches can bridge the IPCC WGII and WGIII communities, and take us beyond the constraints of RCP pathways.