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Detecting ecosystem-relevant crossings of thresholds

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With ongoing climate change, multiple stressors including ocean warming, deoxygenation, ocean acidification and limited nutrient availability are expected to lead to considerable regime shifts within marine ecosystems [1]. However, distinguishing such abrupt shifts from long-term trends in physical and biogeochemical ocean variables may not only be obscured by the natural variability of the system, but also the complexity of the ecosystem itself. Moreover, species-dependent physiological tolerances are likely going to limit the detectability of crossing of thresholds or tipping points of the whole ecosystem. The metabolic index describes temperature-dependent hypoxic tolerances with respect to the oxygen supply [2]. Critical values of the metabolic index indicate the geographical limits of marine species, therefore it is a useful metric to describe the extent of a *potential* habitat. Here, we assess the spatio-temporal detectability of abrupt changes in such a *potential* habitat for selected marine species using an environmental time series changepoint detection routine developed by [3]. We compare the number and timing of these abrupt changes in different Shared Socioeconomic Pathways (SSPs) run with the fully coupled Norwegian Earth System Model version 2 (NorESM2), i.e., analysing the SSP1-26, SSP-5-34-OS, and SSP5-85 scenarios. Preliminary results reveal global, regional and local abrupt changes of lost metabolically viable *potential* habitat in relation to environmental stressors under different evolving climates.

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