Marine heatwaves in stabilized climate

ISALINE BOSSERT[1], YERAY SANTANA-FALCÓN[1], ROLAND SÉFÉRIAN[1]

[1] *CNRM, Université de Toulouse, Météo-France, CNRS, Toulouse, France*

Marine heatwaves - periods of anomalously warm sea surface temperature - have detrimental effects on marine ecosystems. Their magnitude, frequency, and extent are predicted to increase with global warming, altering environmental conditions in all ocean basins. Most of the current knowledge on these extremes is established using transient states of the Earth system either from observations or from models. However, this method potentially underestimates the response of the ocean to a given level of warming. Here, we analyze the response of marine heatwaves to stabilized climate. For this reason, we explore novel types of future idealized scenarios stabilizing warming at various global temperature targets using (i) the Adaptive Emission Reduction Approach (AERA) with the CNRM Earth System Model (CNRM-ESM2-1) or (ii) a constant ramp-up of 0.2°C per decade until net zero emissions are applied. This idealized simulation set-up allows to investigate the impacts of marine heatwaves on marine ecosystems within a warming space instead of mixing the response of various models at different times. Running these stabilized simulations allows us to sample events hidden in the far tails of the climate distributions, counteracting the relatively long return period of such extremes. Moreover we could gain insight in the vertical structure of heatwaves and their extent, preparing further work on seafloor species response to temperature extremes. Thus, it offers an unprecedented opportunity to investigate statistics of high-impact and low-probability events in the ocean.