Novel, speculative highly-scaled carbon removal study on a reduced complexity model, showing a return to preindustrial temperatures by 2100 and updates to achieving net-zero for Anthropocene reversal. Poster B43K2705 presented at AGU23, 11-14 Dec. 2023

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Abstract

Speculations extend the opportunity space of possible future climates by increasing the potential to provide plausible estimated qualities and quantities to further scientific research and aid engineering solutions. This novel work outlines the first steps to achieving an Anthropocene reversal that completes in Zoomers’ lifetimes — by 2100. The novel experimental high-scale carbon removal pathway, which was studied in MAGICC 6.8, required CDR to counterbalance all accumulated anthropogenic emissions since 1750 to return to preindustrial temperature (0.07°C over the 1720-1800 and 0.14°C over the 1850-1900) means by 2100 and complete GHG phaseouts by 2077, excluding Ammonia. The experimental pathway set extreme front loading of emissions reductions to reach net zero, and avoid tipping points, then achieve scaled removal to reach 300 ppm of CO₂ concentration by roughly mid-century. This work’s findings recommend exploring carbon removal of cumulative anthropogenic emissions totaling 600 GtC to 775 GtC on a recent model ensemble with 1.55 to 1.7 times preindustrial CO₂ concentration driven by forcings from emissions and calibrate to reproduce present-day temperatures to provide more detailed projections of temperature, holding below 1.5°C, regional temperatures, below ground CO₂ mineralization, sea-level rise, ENSO, AMOC, and jet-stream turnover, evolve.

Continued fossil-fuel use is unable to yield complete emissions phaseouts or deep removals necessary to match a preindustrial climate. The findings support the utmost urgency to attain a maximally scaled sustainable zero-carbon intensity green growth development. And reinforce the increased global commitment to achieve net zero sooner and to avoid setting off more climate tipping points. The possibility of reaching a preindustrial climate should help inform the debate of maximally scaled sustainable green growth development for the fastest path to net zero, phase out of anthropogenic emissions sources, and scaled carbon removals with zero-carbon intensity to develop a more equal future world.

Figure 1: 300 x 2050 Pathway with ECS = 2, 3.26, and 4.5K
WHAT DOES IT TAKE TO GET TO 0°C BY 2100?

IF IT

Pymagicc = python management toolkit controlling MAGICC and other Reduced Complexity Model

eventually reverse the Anthropocene.

businesses and others to build to net zero, and help play a more positive role to

Notes additional advice to provide more ambitious energy modeling to allow

energy

ground CO

projecting future temps. inc. region differences, holding below 1.5ºC, below

Open for investigation: ESM studies

For the Future

Unable to run CDRMEx code to generate the experiments on MAGICC 7.x.

with present day ambition and clean industrial development.

global ecological damage, and avoid climate tipping points. Yet is implausible

Unable to find higher certainty

at 2100. Seeks guidance from soil/land use/forestry studies for more realistic

Calibration changed Ocean heat exchange, and speeds up

∆

Land use change for SSP 1-1.9 differs from the others.

unsupported by model.

Inferred Ocean outgassing: all FF emissions were removed instead opposed to

2500 years. See

Simulated scaled

1720-1800 mean temperature. Results baseline 0.073ºC warmer than 1850-1900.

emissions (2020) & return reasonable

Heuristically set MAGICC 6.8 to 2015-2020ºC means, 2020 CO

2050 Pathway with ECS… .

Regional temperature splitting of the hemispheres and ocean and land results with

Although highly-speculative, the model predicts an ocean upwelling recovery.

GROWTH DEVELOPMENT

Aerosols, & N

2100. See

ECOSYSTEMS

GROWTH DEVELOPMENT

PARTICIPATION

ECONOMIC SYSTEMS

GROWTH DEVELOPMENT

PARTICIPATION

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IF IT’S NOT PLANNED, IT’S LIKELY TO REMAIN SCFI.