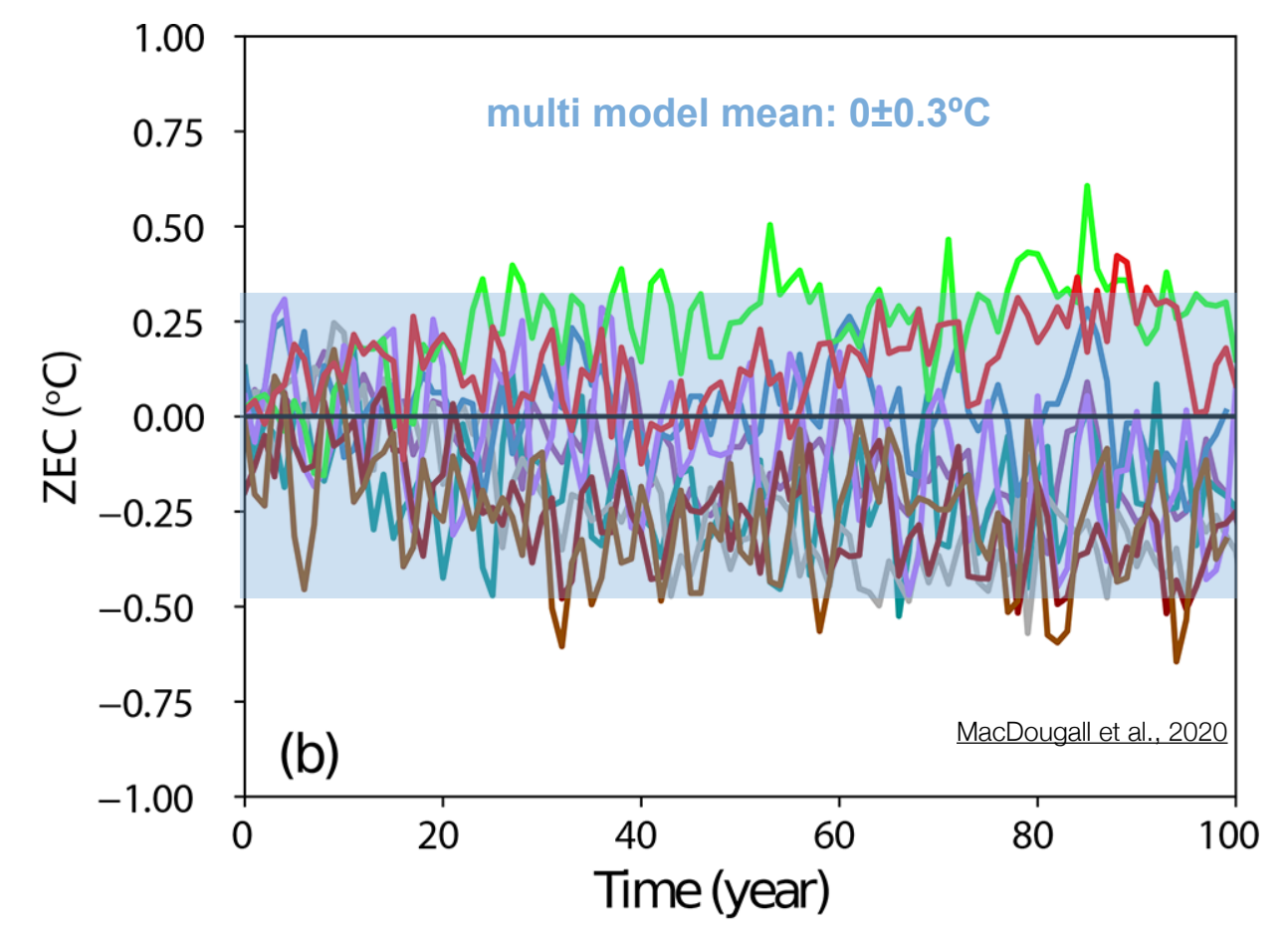


# 1. Background & Motivation

- zero emissions commitment (ZEC) is the unavoidable warming after emissions stop
  - large spread of models for ZEC<sub>50</sub>: 0±0.3°C
  - cancellation of decreasing CO<sub>2</sub> concentration and reduced ocean heat uptake
  - need for:
    - ➔ Earth system simulations with interactive carbon cycle [Sanderson et al. \(2023\)](#)
    - ➔ better understanding of key processes that dominate uncertainty [Palazzo Corner et al. \(2023\)](#), [MacDougall et al. \(2022\)](#)
- ZEC≠0 has significant impact on:
- remaining carbon budget for temperature stabilisation goals
  - sustainable emissions

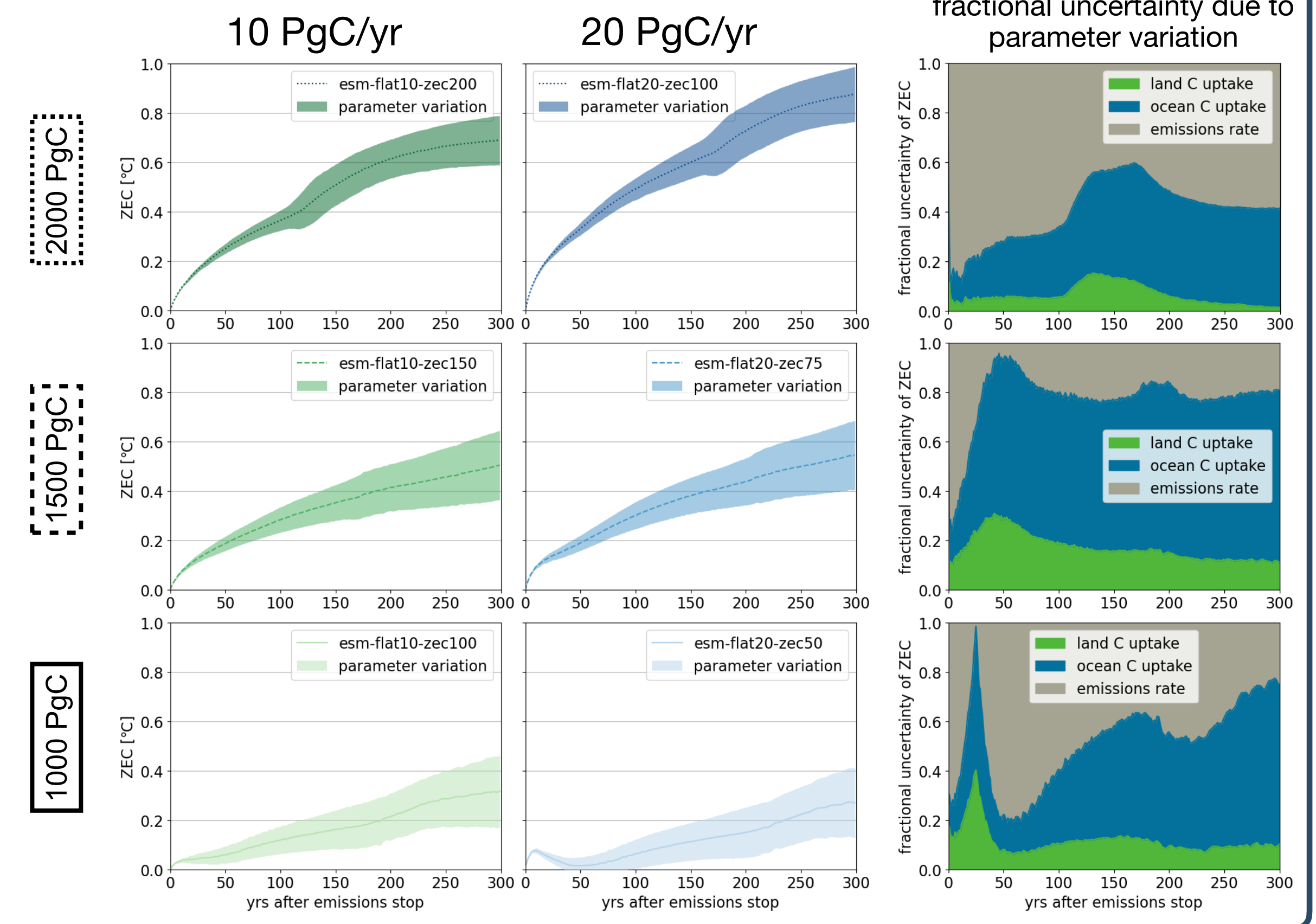


EGU24-16992: Closing in on Zero Emissions Commitment (ZEC) uncertainty

# Emissions rate before cessation can impact ZEC by 0.1°C

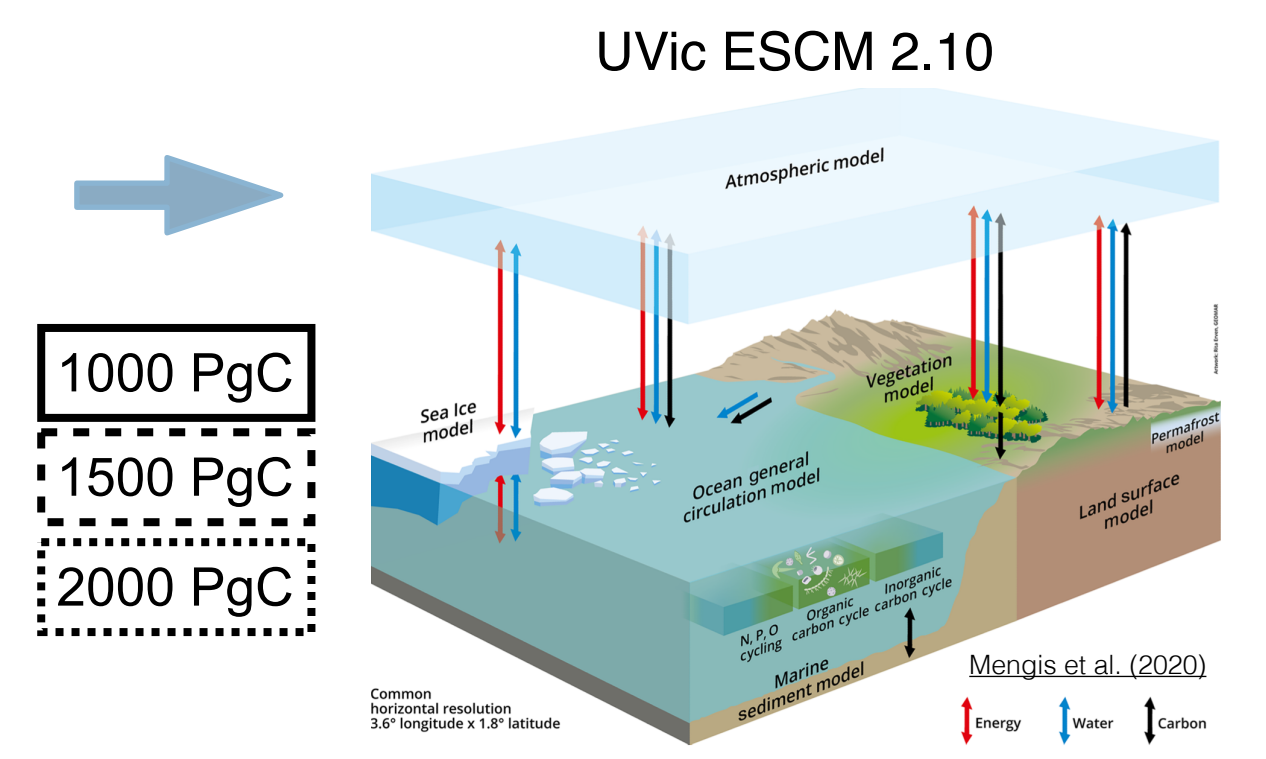
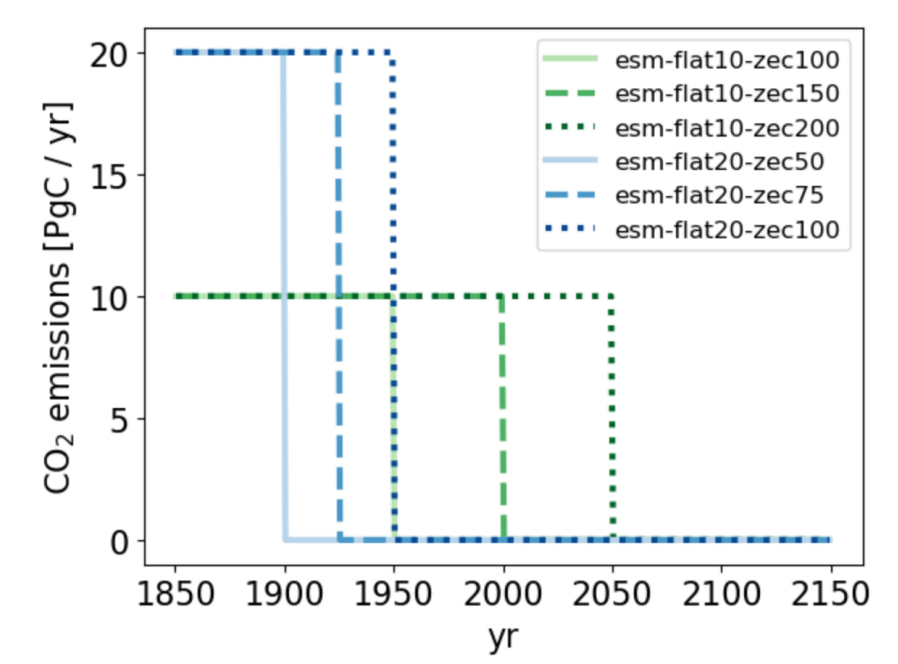
David Hohn, Estela A. Monteiro, Giang Tran, Nadine Mengis

# 3. Results - ΔT after zero emissions



# 2. Method

- CO<sub>2</sub> emissions driven simulations with perturbed parameters
- emissions rate dependence computed for equal cumulative emissions

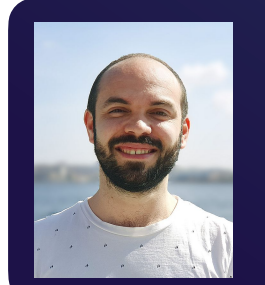


# 2b. Parameter uncertainties

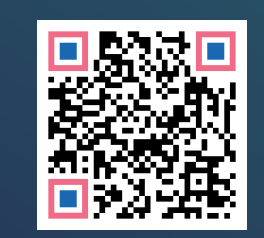
- perturbed parameters grouped by Earth system component/process
- ±10% perturbation of parameters for i) biological ocean carbon uptake, ii) biological land carbon uptake
- relative difference to nominal simulation added in quadrature (assumes independence)

# 4. Outlook

- include parameters affecting:
  - permafrost
  - non-CO<sub>2</sub> greenhouse gases
  - ocean circulation / physical carbon uptake
  - planetary albedo
  - climate sensitivity
- validate parameter range with observations
- correlations between parameters & parameter dependent fractions of total variance



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<https://footprints.carbondioxide-removal.eu>

