

New Approaches – Constraining Climate sensitivity (ECS, TCR, TCRE)

Equilibrium Sensitivity (ECS/TCR)

• Interpreting the 20th century record

- Non-constancy of feedbacks and drivers
- Model-data discrepancies in the ocean
 - Warmpool width, ENSO air temperature
 - Southern Ocean Heat uptake
 - Possible links between ΔT and cloud responses

• Quantification of feedbacks and forcings

- Radiative forcing quantification
- Middle and high cloud mechanisms

BGC impact on TCRE

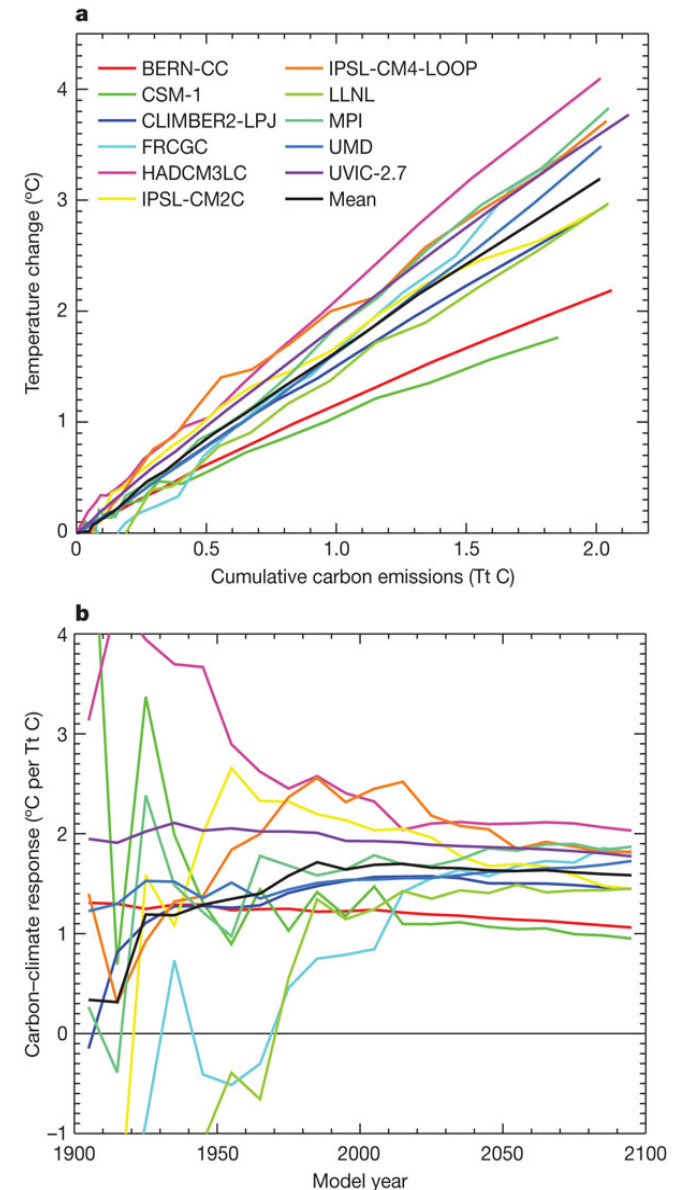
Definition: global mean surface temperature change per 1000 PgC emitted CO₂

$$\text{TCRE} = \Delta T / E = \alpha / (1 + \beta + \alpha * \gamma)$$

- $\alpha = \Delta T / \Delta \text{CO}_2$
- $\beta = \Delta C / \Delta \text{CO}_2$
- $\gamma = \Delta C / \Delta T$

• Understanding limits of TCRE

- 50-50 physical (TCR) and BGC on model spread
- Beta more influential → more focus



Long-term perspective

- Cirrus clouds
- Use of Paleoclimate archives
- Model representations of aerosol-cloud interactions
- Improve models using Emergent Constraint studies