

Standard model forcing for period 40 ka to preindustrial:

- Orbital parameters
- Greenhouse gas radiative forcing
- Land ice albedo
- Coral reef regrowth
- North Atlantic freshwater input

& changes in seven mechanisms (parameters p_i):

- Southern Ocean wind stress
- Southern Ocean air-sea gas transfer rate
- Export rain ratio
- Organic matter remineralization
- Coral reef regrowth
- Organic weathering flux
- Land carbon stock

50 Bern3D
factorial runs



Sensitivity to
each
mechanism i
for each target T :

$$S_i^T = \frac{\partial T}{\partial p_i}$$

60 Bern3D multi-
parameter runs



Emulator of
Bern3D results
for target T :

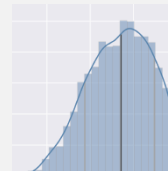
$$\Delta T = a^T + b^T \cdot \left(\sum_{i=1}^7 \Delta p_i \cdot S_i^T \right)$$

500 000 multiparameter runs with
emulator and uniform prior distribution



Constrain with proxy targets T

$\delta^{13}\text{C}_{\text{DIC}}$ $\delta^{13}\text{C}_{\text{atm}}$ CO_2 CO_3^{2-}



Observation-constrained
change in land carbon
(Δland)