Sources of Uncertainty in Forecasts

Initial Condition Uncertainty

7 Ensemble Members

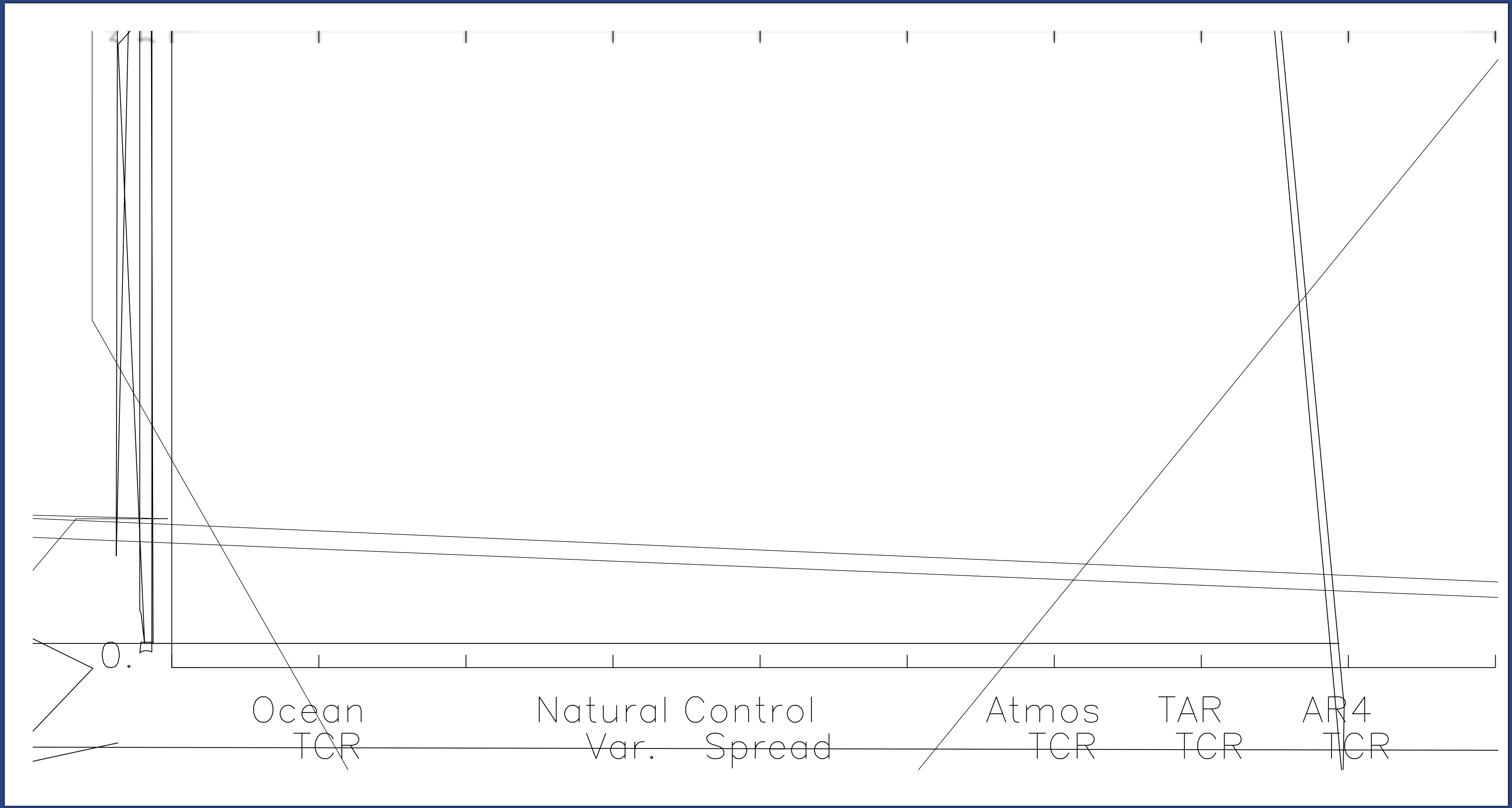
	Isopycnal Diffusivity (m^2s^{-1})	Background Vertical Diffusivity profile ($x10^{-5}$ m^2s^{-1})	Mixed Layer Parameters, fraction, depth (m)	
Standard	1000	1-15	0.7	100
Low ISO	200	1-15	0.7	100
High ISO	2000	1-15	0.7	100
Low VDiff	1000	0.5-4	0.7	100
High VDiff	1000	2-50	0.7	

Global Mean Air Temperature

Not all temperature responses are the same

Transient Climate Response

Difference in 20 yr average g.m. temperature centred on time of doubling of CO_2.



Conceptual Model

$$Q = (! + \text{"})\#T$$

Q is the imposed radiative forcing

#*T* is the global mean temperature change

" is the climate feedback parameter

related to the climate sensitivity

measure of equilibrium warming

! is the ocean heat uptake efficiency.

fraction of warming realised

Hypothetical TCR

Diagnose ! and " for ensemble members

Calculate temperature changes by considering the spread in each property in isolation

Find that changes in " (climate sensitivity) are more important than uncertainty in the rate of ocean heat uptake.

Ocean Heat Uptake

Shaded area is spread from atmospheric model uncertainty

Caveats

It could be that the ensemble does not represent uncertainty:

- *Ranges are too conservative*
- *Wrong parameters chosen*
- *Single perturbations hide non-linearities*

Looking only at the global mean is masking some important regional differences.

Conclusion

The ocean parameter uncertainty has been investigated.

Its effects on the global mean temperature response of transient climate are small.

The spread that does exist seems to come from changes in the equilibrium response not the rate of ocean heat uptake.

Further work is needed to understand why the ocean physics has only a small impact on global mean ocean heat uptake.