Anthropogenic Speed-Up of Oceanic Planetary Waves

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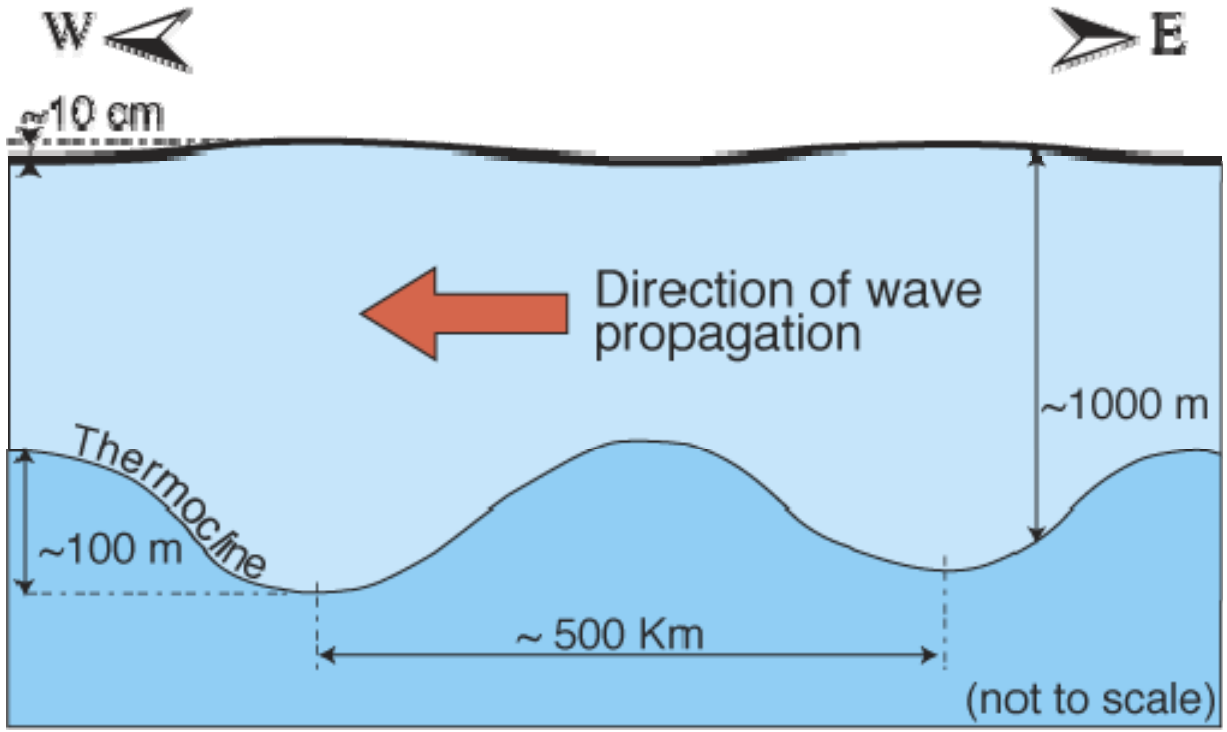
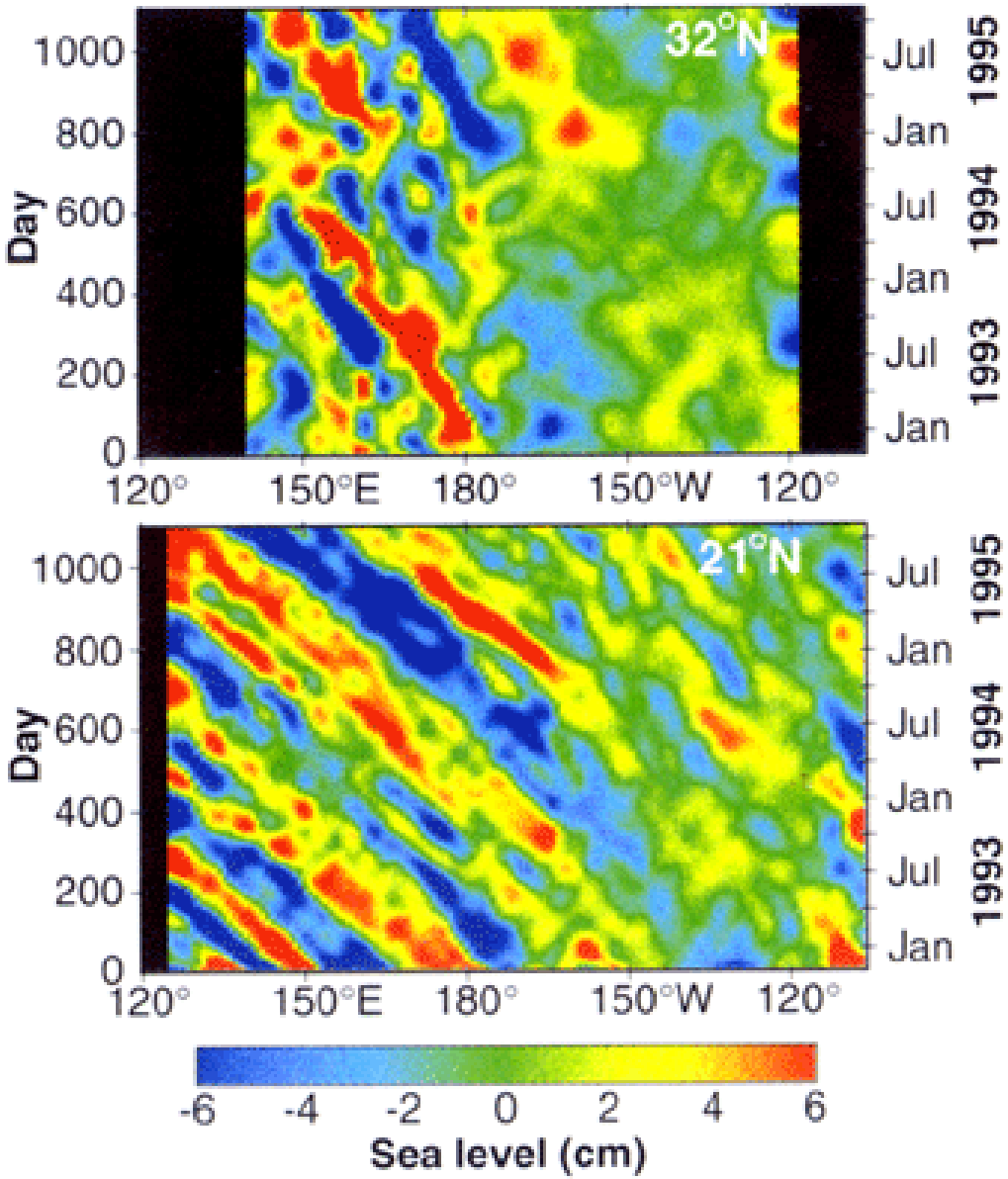
Canada

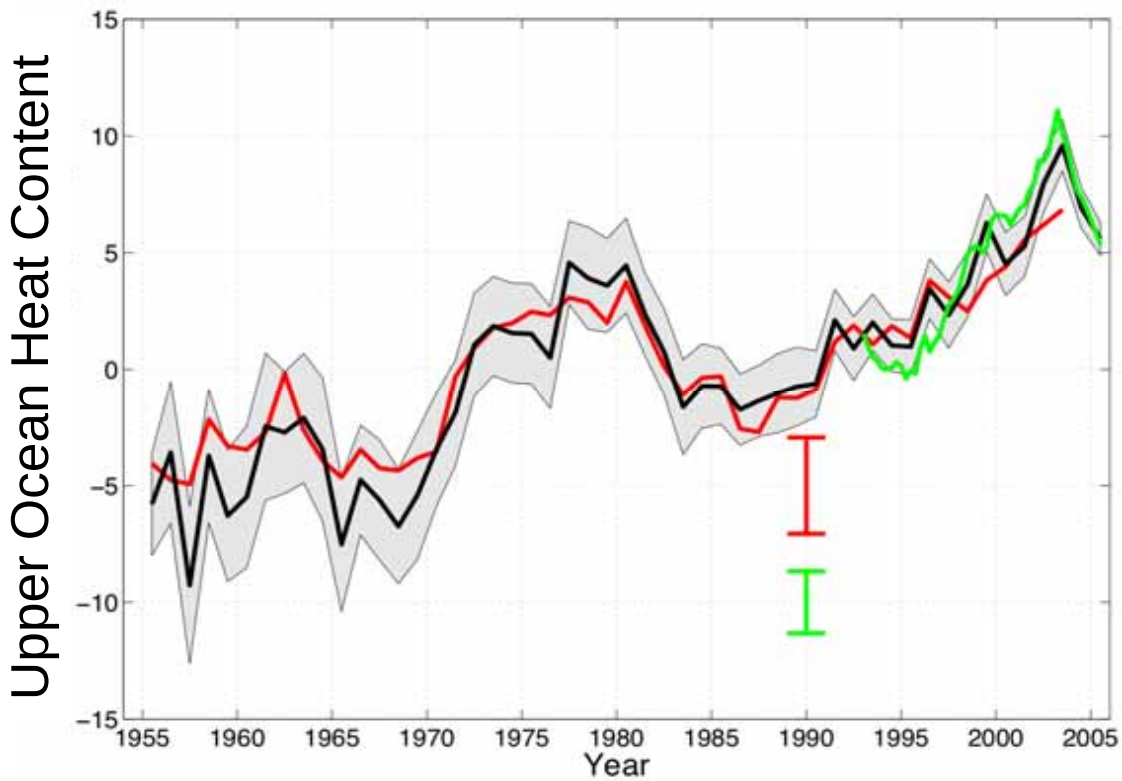


Courtesy of Paolo Cipollini



Chelton and Schlax, 1996

$$C_r = \beta \lambda^2 \quad \text{where} \quad \lambda = H(g\Delta\rho / \rho) / f^2$$



IPCC AR4 Report, 2007

AOGCM Simulations

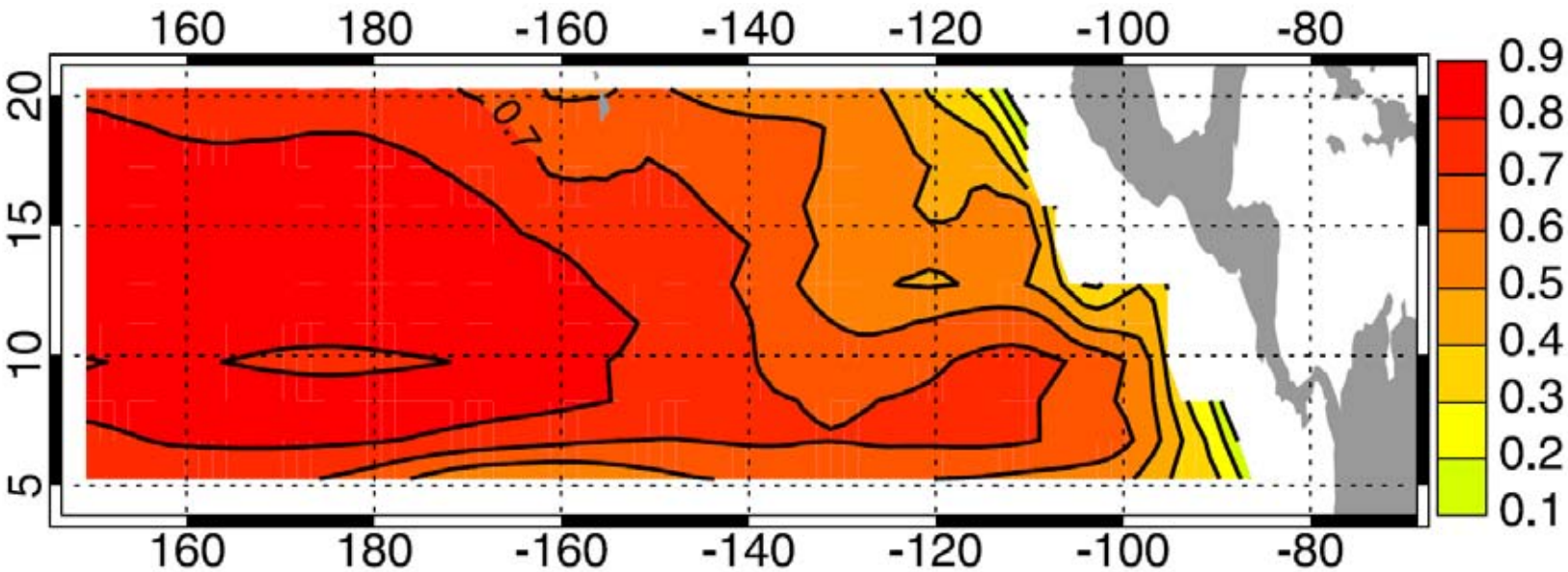
- 1000 year run with fixed external forcing
- Five 20th century runs with observed GHG and aerosol forcing
- Five 21st century runs following the IPCC SRES A2 emissions scenario

For each 20-year period solve:

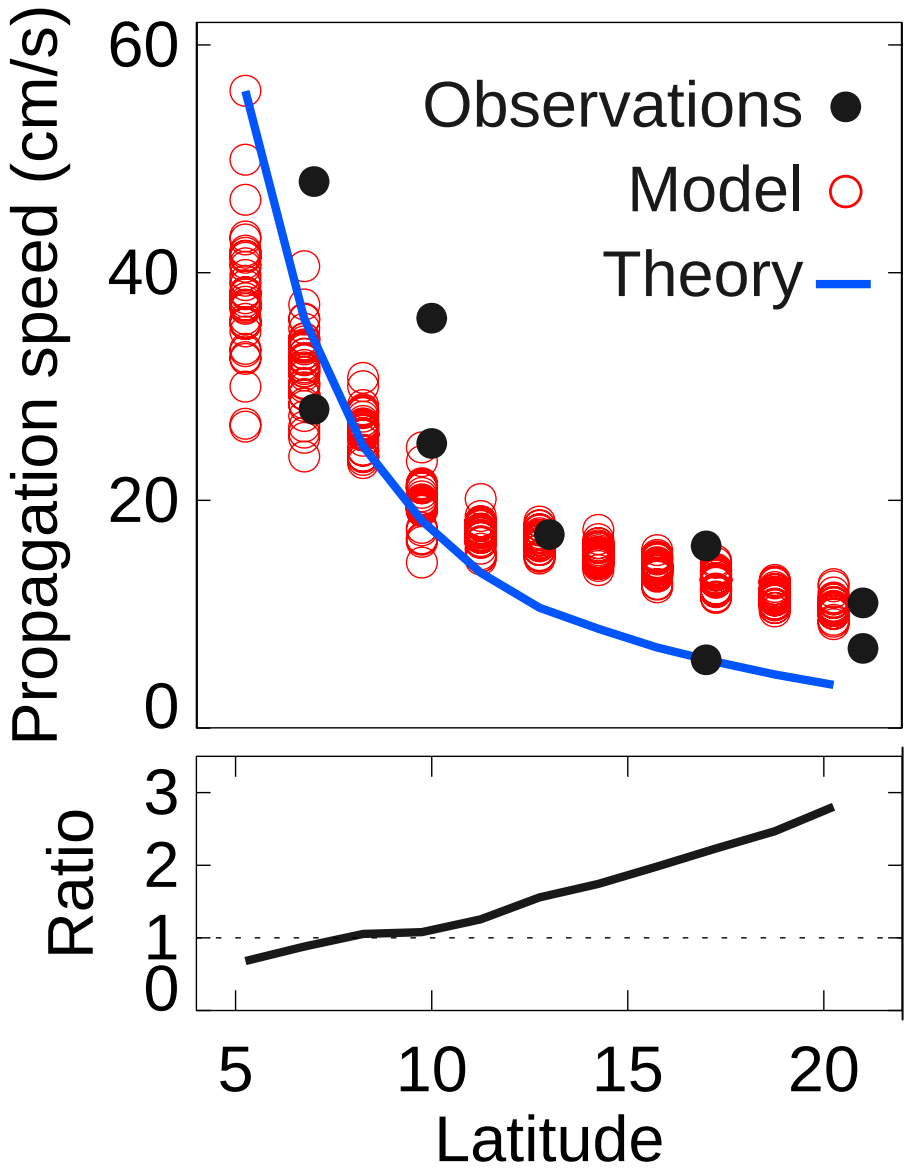
$$\frac{\partial h}{\partial t} - c_r \frac{\partial h}{\partial x} = -W_E - R\,h$$

Capotondi and Alexander, 2001

Correlation between actual and computed *h*

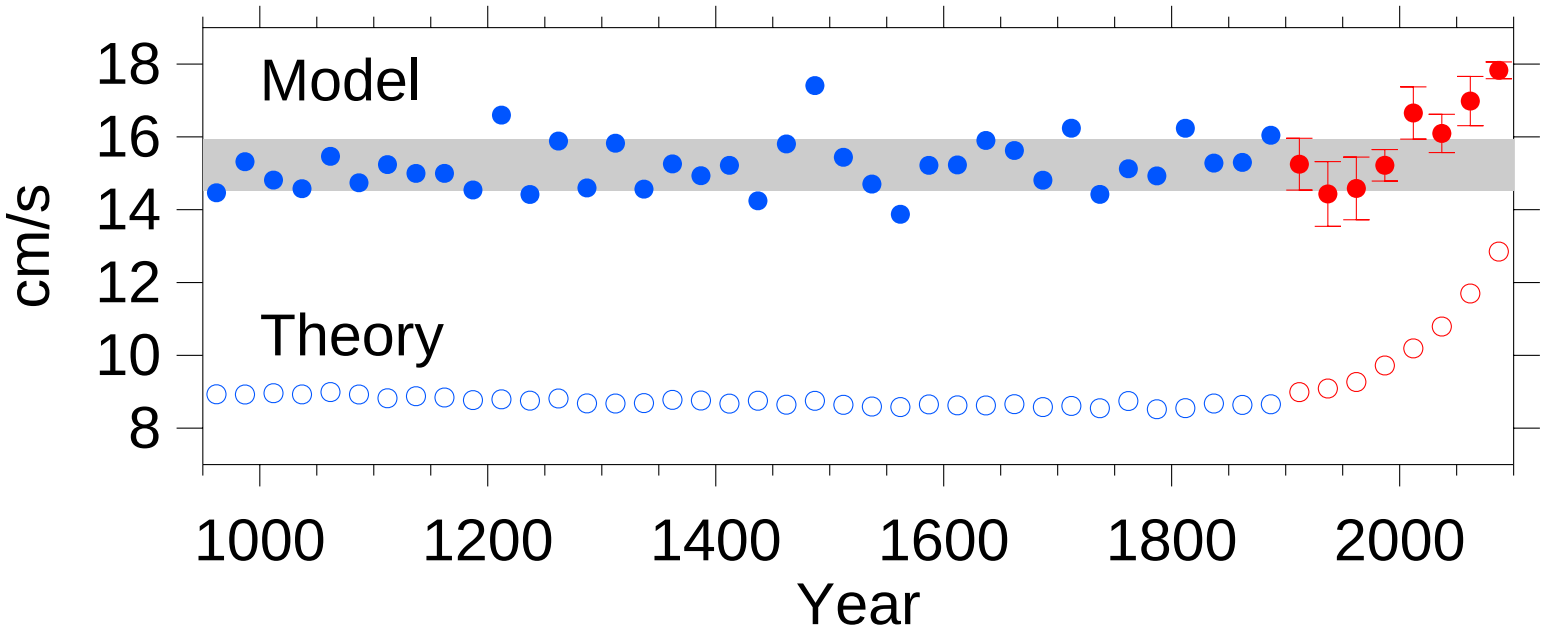


Fyfe and Saenko, 2007



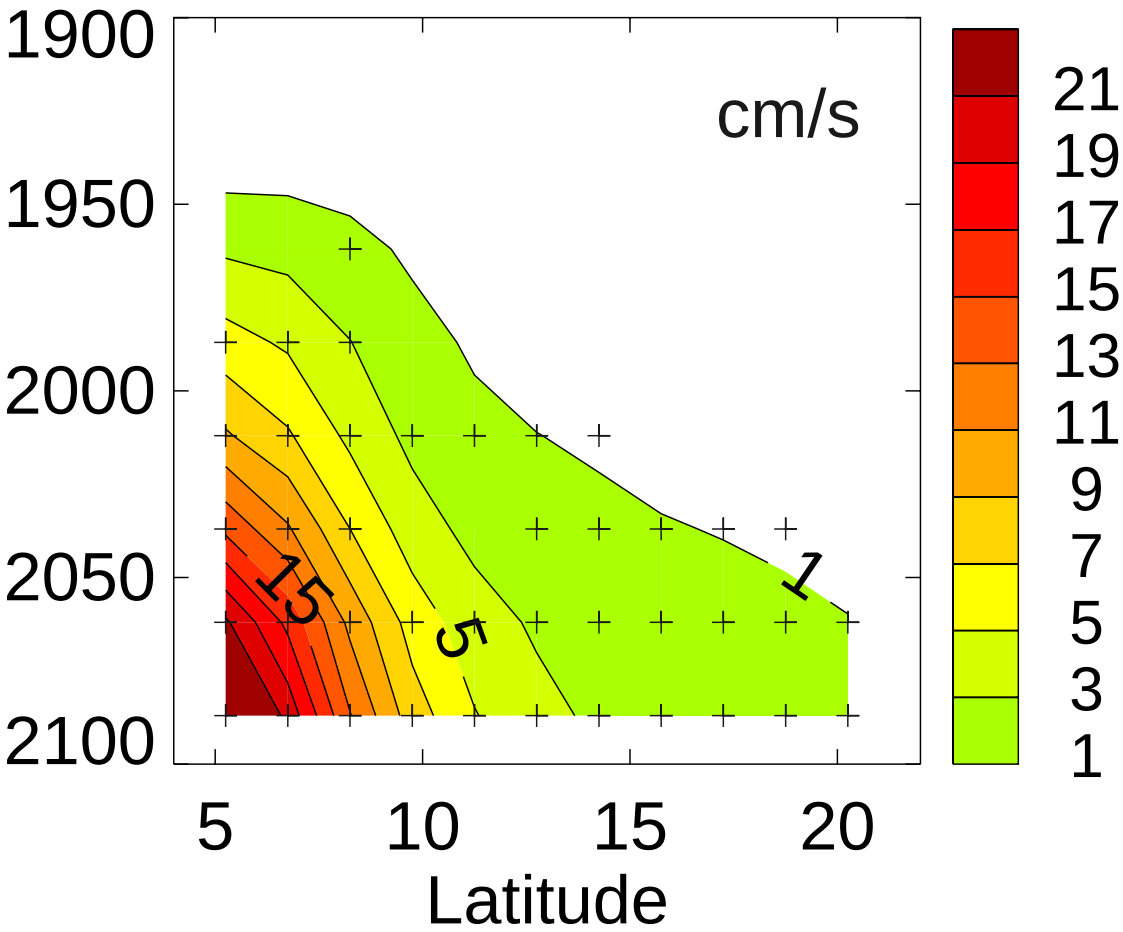
Fyfe and Saenko, 2007

Propagation speed at 14ºN



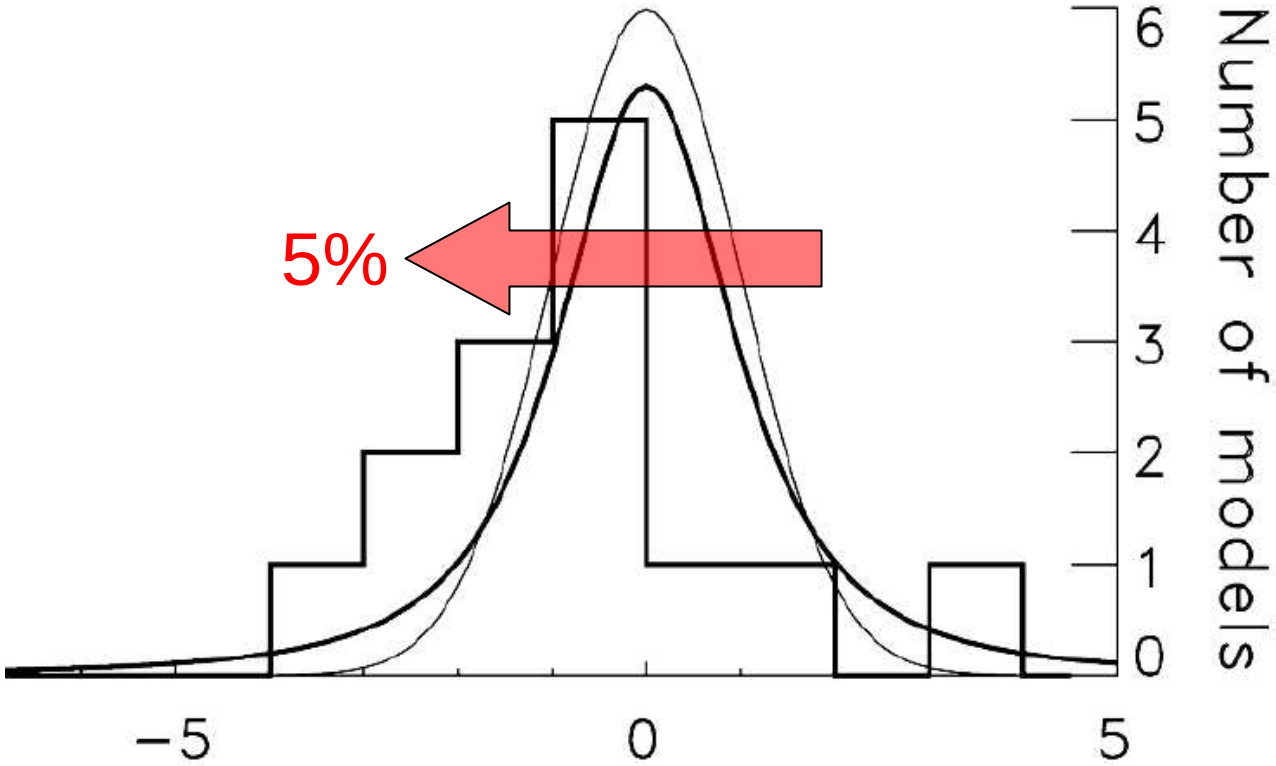
Fyfe and Saenko, 2007

Propagation speed change



Fyfe and Saenko, 2007

Producing more frequent El Niños?



ENSO period change under CO_2 doubling

Merryfield, 2006

Conclusions

- Anthropogenic speed-up of oceanic planetary waves with ocean warming
- Used as possible explanation for more frequent El Niños under CO_2 doubling