



Met Office
Hadley Centre

Isolating the signal of ocean global warming

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Collaborators

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- Simon Tett



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Contents

This presentation covers the following areas

- Introduction
- Data & methods
- Time series
- Spatial maps
- Conclusions

Data

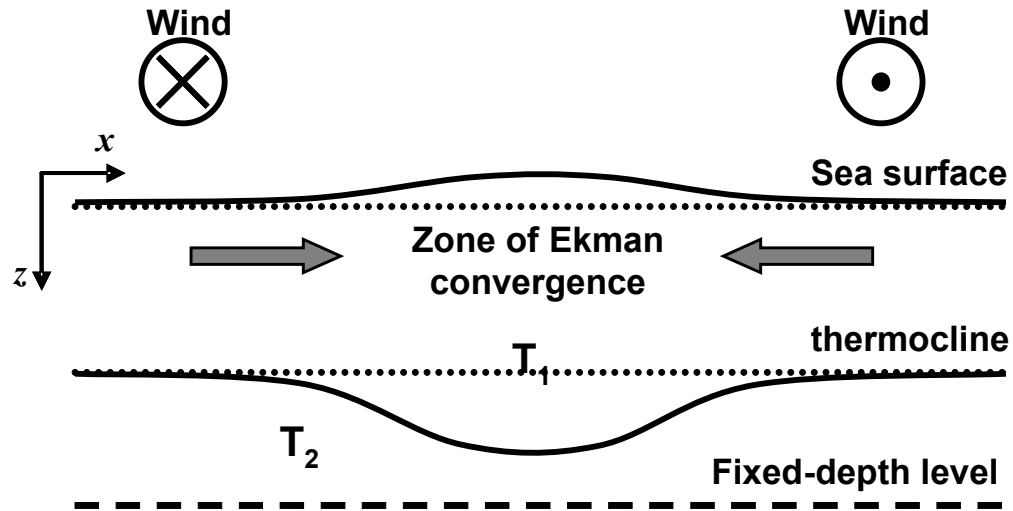
- Temperature profiles from ENACT/ENSEMBLES
- Version 2 (1956-2004) and version 3 (1950-2006)
- Based on WOD01/WOD05 with updates from Argo GDACs and GTSSP (1990 onwards)
- Available from:

<http://www.metoffice.gov.uk/hadobs/en3>

Method

- Create $2^{\circ} \times 2^{\circ}$ gridded fields for each month:
 1. Mean temperature $> 14^{\circ}\text{C}$
 2. Mean depth of 14°C
 3. Mean temperature $> 220\text{m}$
- Create monthly climatology for 1956-2004
- Compute the volume-weighted mean anomaly for each month for each ocean basin.
- No in-filling. Assumption that missing grid boxes = mean value of observed grid boxes.

Why isotherms?

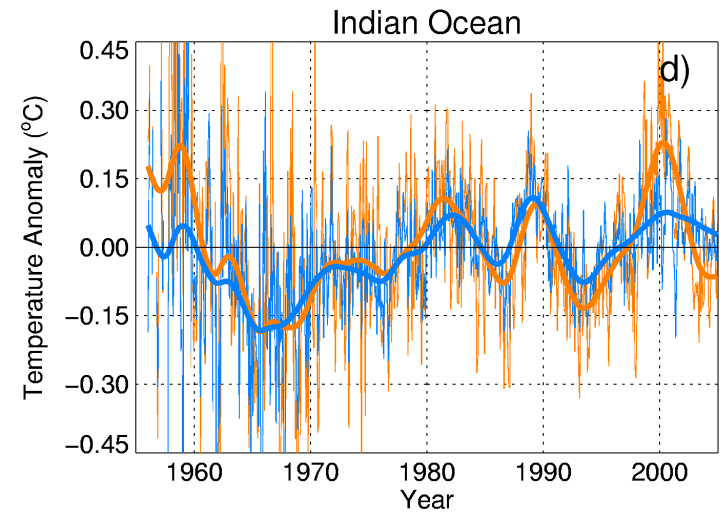
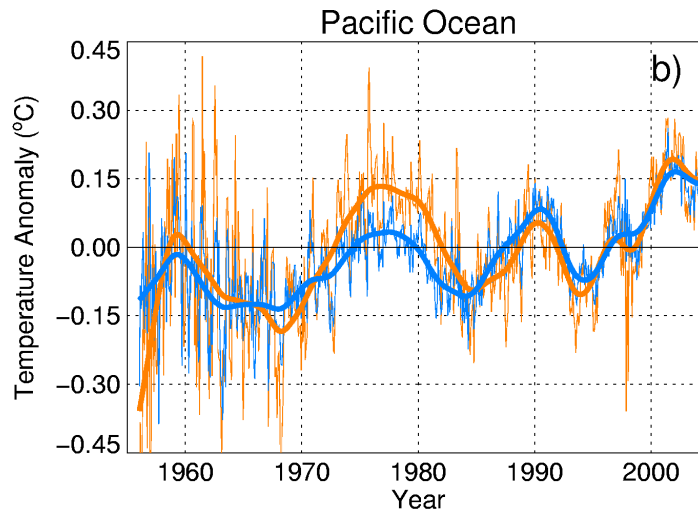
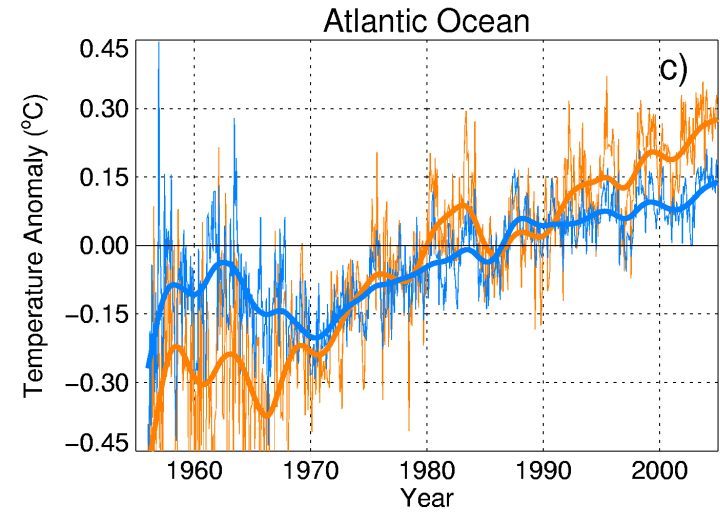
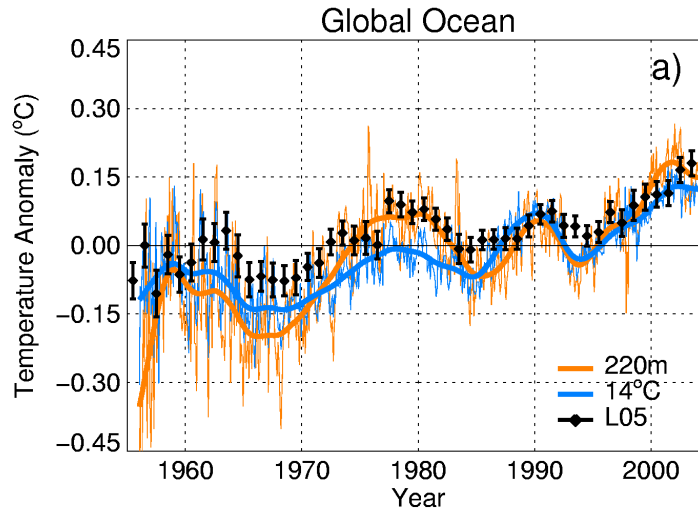


Short time-scales: waves, eddies

Long time-scales: mean winds, ocean advection

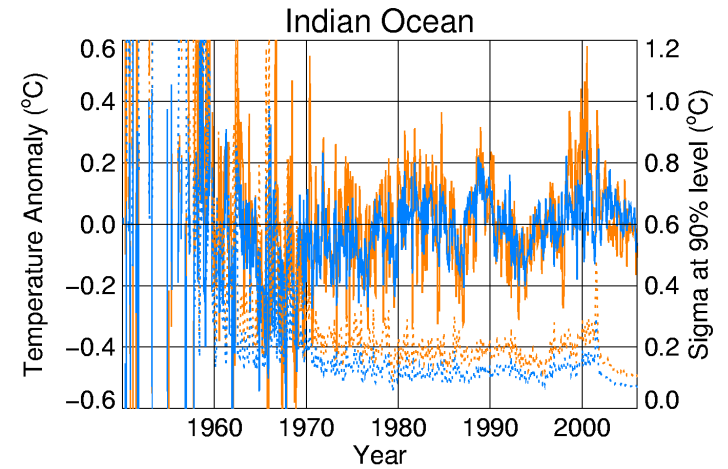
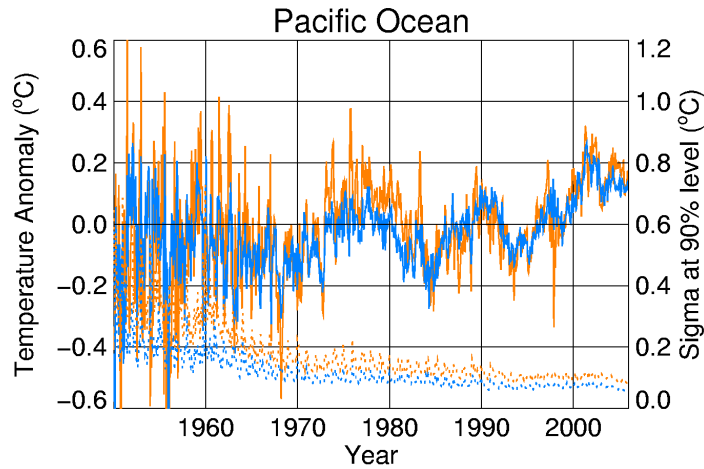
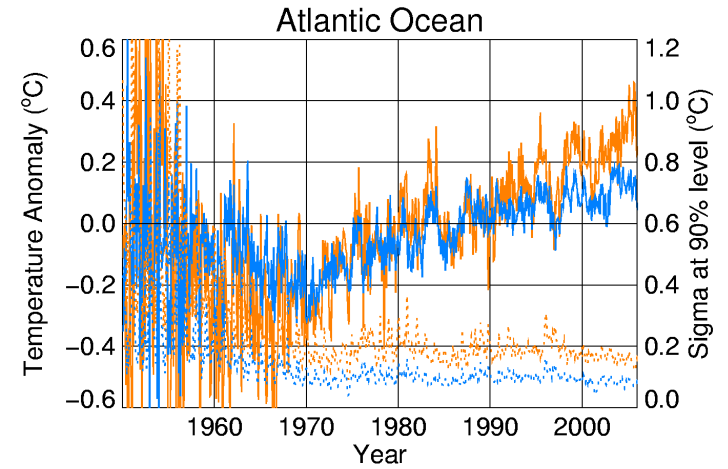
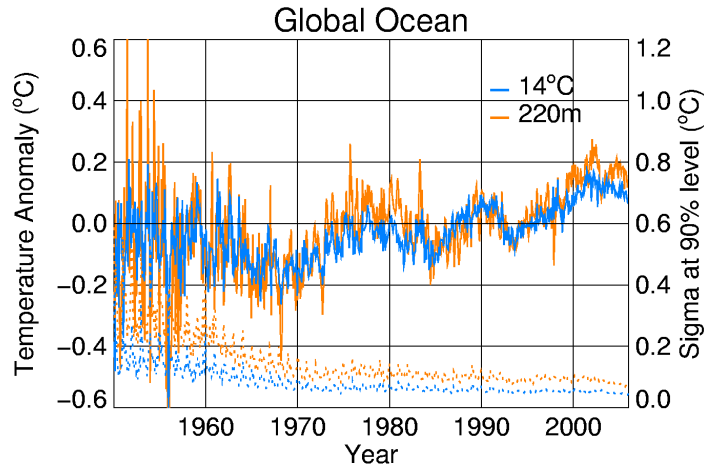
Walin [1982], Stevenson and Niiler [1983], Toole et al. [2004]

Time series



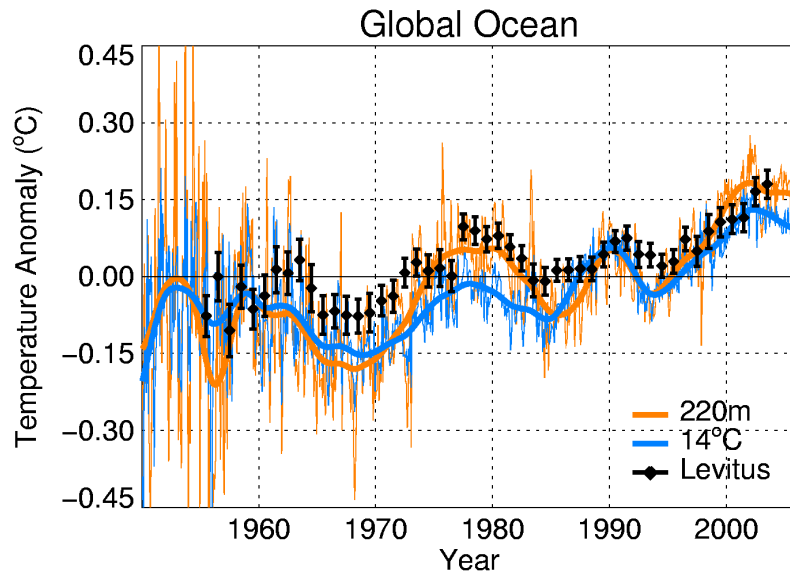
Palmer et al. [2007]

Sampling errors

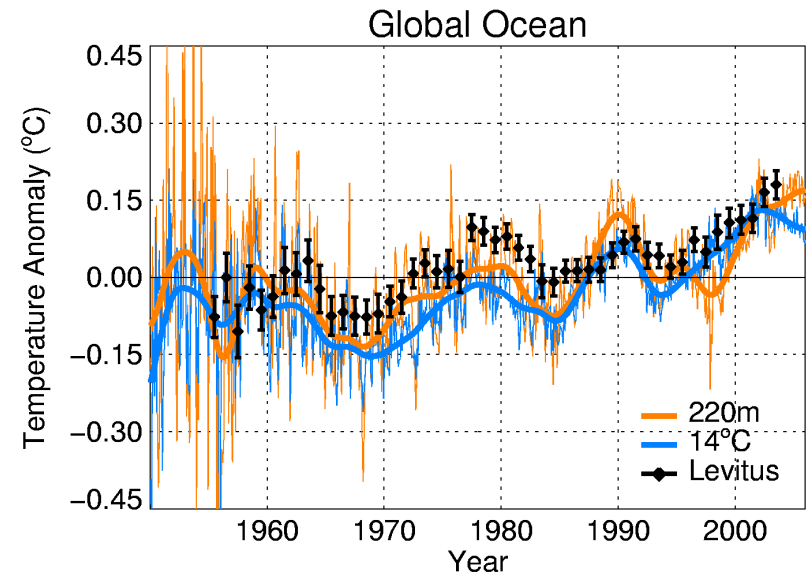


See Palmer and Brohan Poster

XBT corrections



No XBT corrections

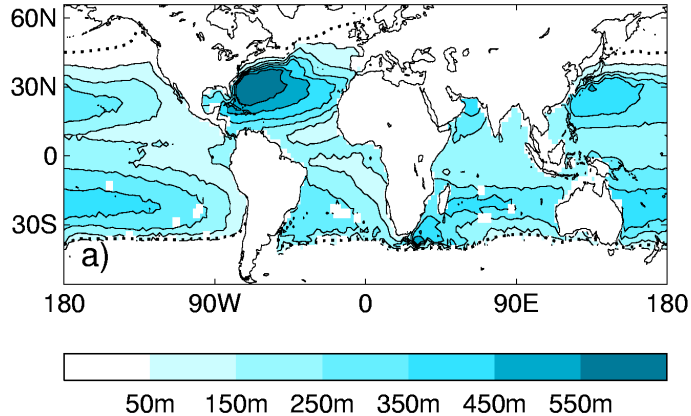


XBT corrections*

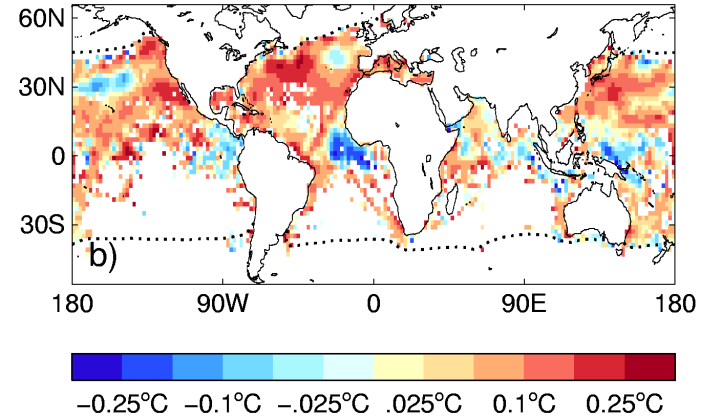
*Following Wijffels et al. [2008]

Spatial maps

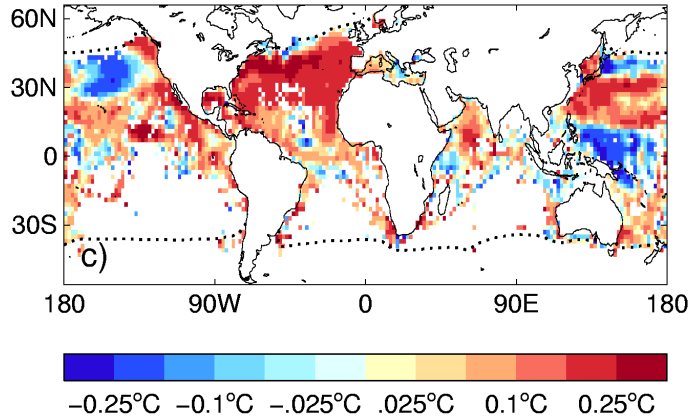
Mean depth of 14°C



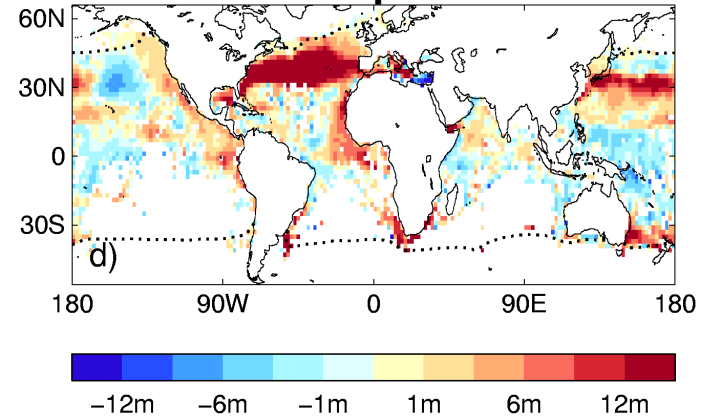
Trend in T > 14°C



Trend in T > 220m



Trend in depth of 14°C



Palmer et al. [2007]

Conclusions

For isotherm analyses:

- Reduction in high-freq and multi-annual variability
- More consistent warming trends among basins
- More uniform pattern of global warming
- Removal of fall-rate XBT bias
- More information to suggest possible mechanisms



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Questions and answers