Bias Adjustments to Historical Sea Surface Temperature

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- Characteristics of uncorrected SST data
- Atmospheric model experiments
- Global, regional and seasonal tests
- Changes in I-COADS data from test SST data
- Conclusions

CLIMAR II CONFERENCE, BRUSSELS, NOV 2003

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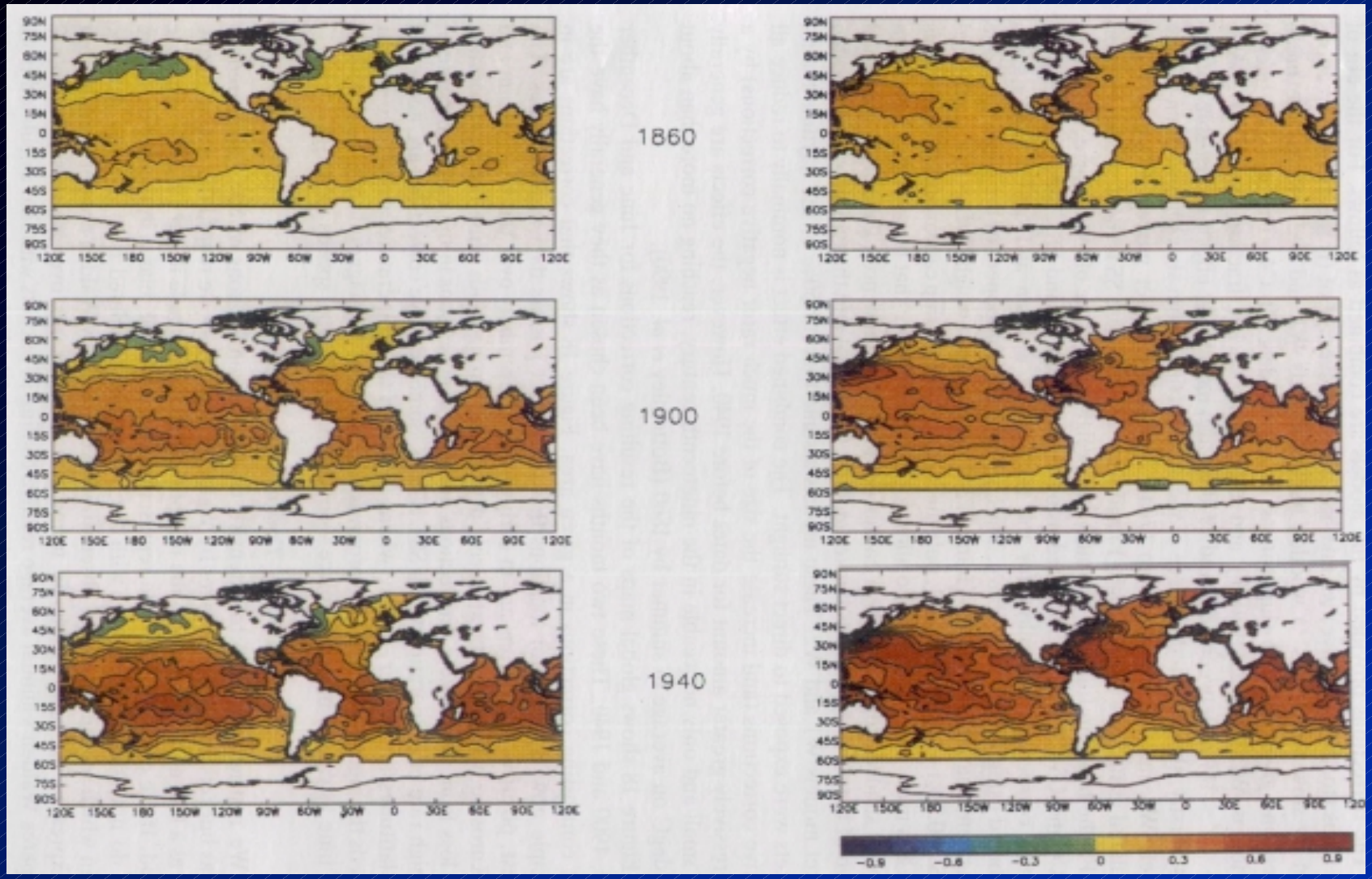
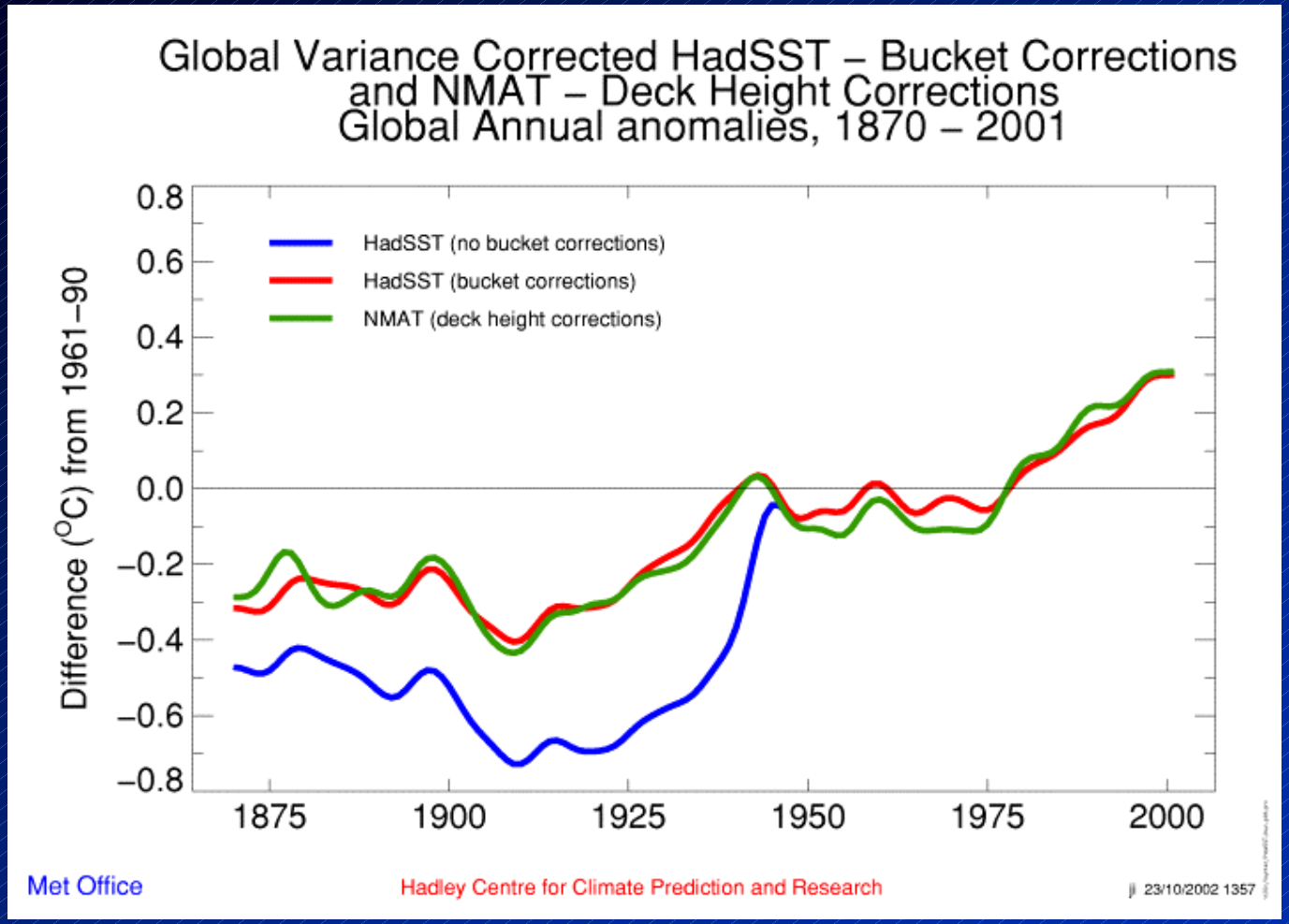


SST bias corrections ^{o}(C), June (left) & December (right)

1860, 1900 and 1940. From *Folland and Parker, Q.J. Roy. Met. Soc. 1995*

Effect of bias corrections on historical SST



Picture from pre I-COADS data sets

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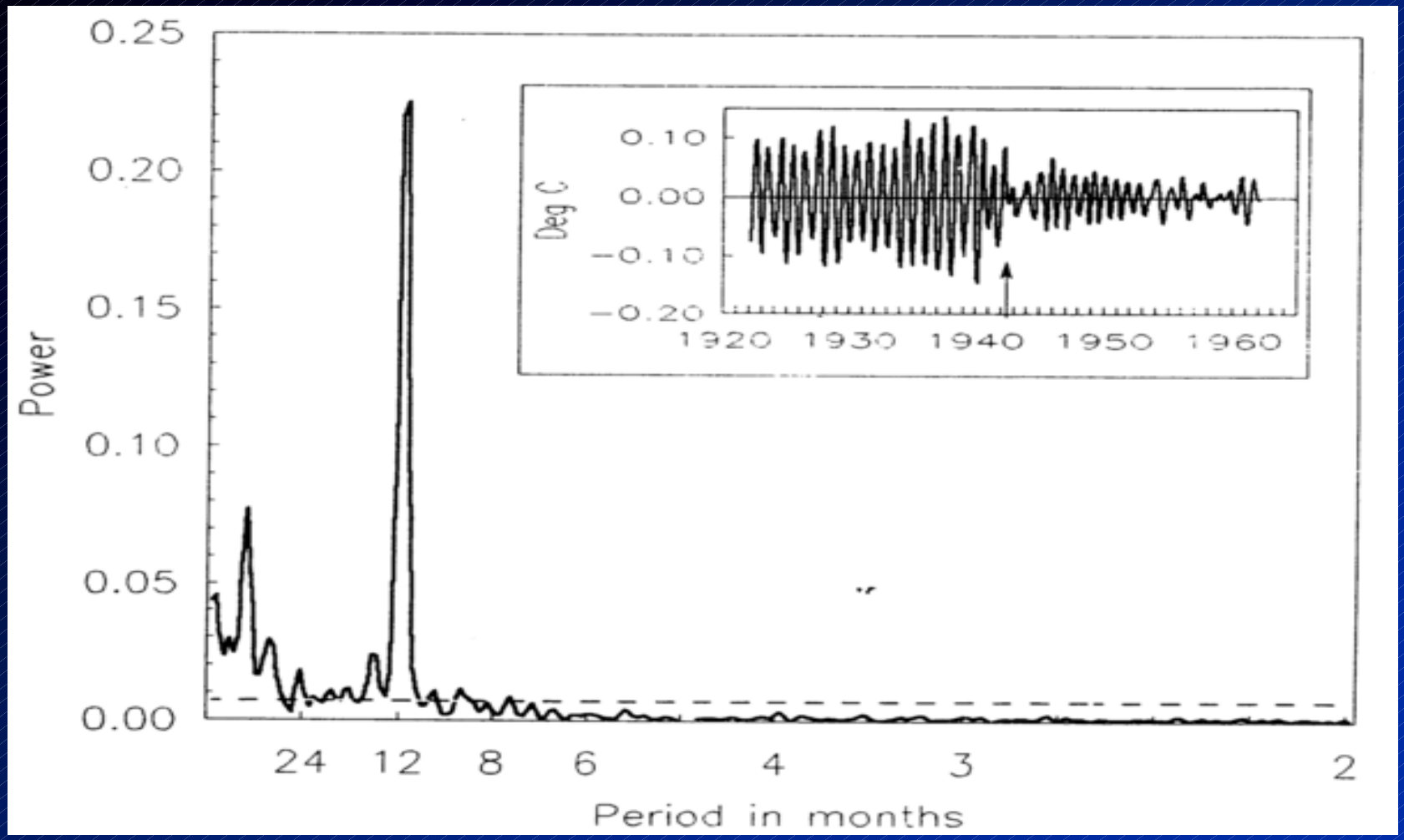


Power spectrum of *uncorrected* SST anomalies from 1951-80, for Northern hemisphere north of 20ºN in 1901-40. Insert is band-pass filtered annual cycles of SST anomalies for 1922-61.

From Folland and Parker, Q.J. 1995

Cross cutting issue-
Use of an atmospheric climate model to test a data set

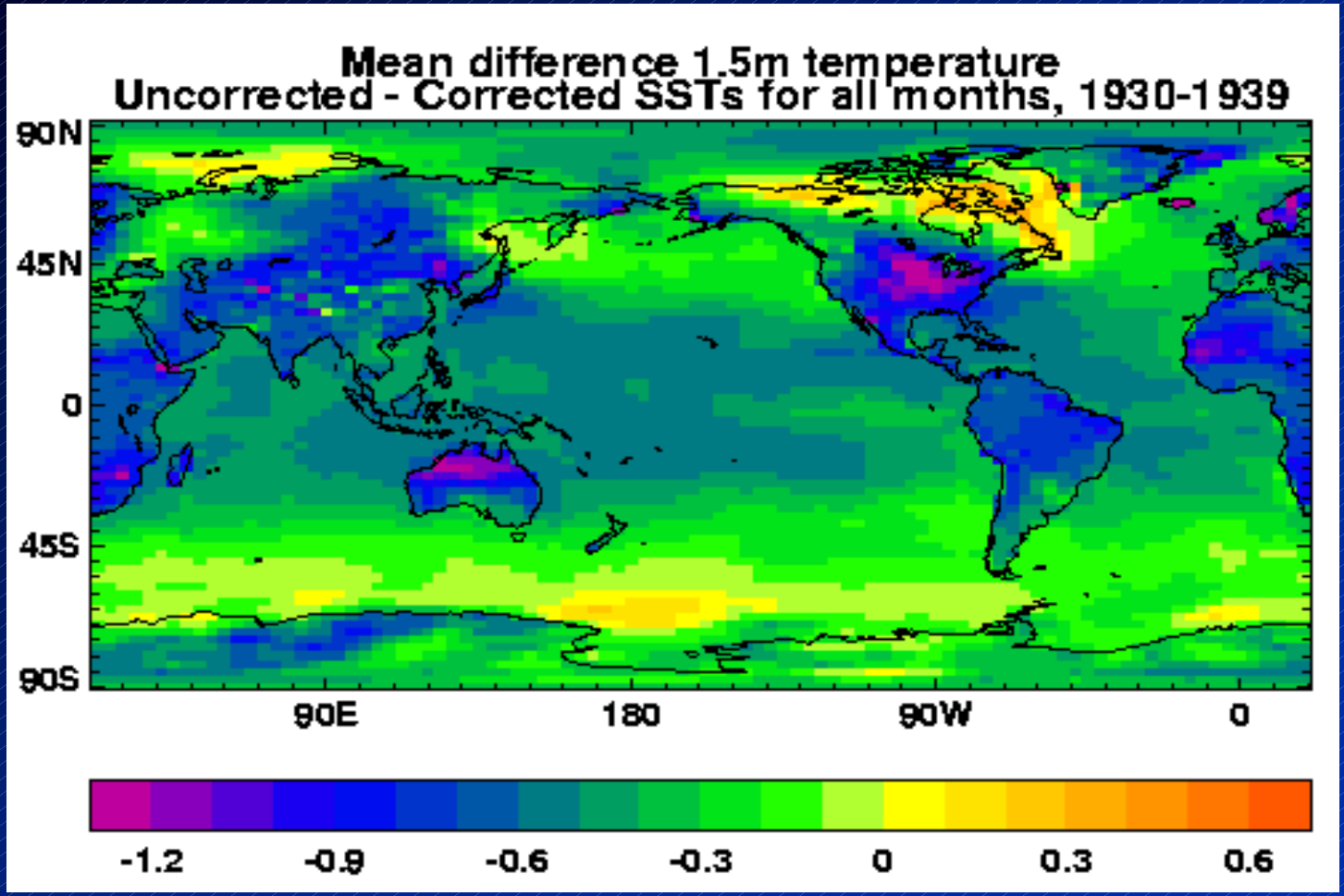
- Models are usually tested against data sets to evaluate them.

- Here we test the influence of both bias corrected and uncorrected SSTs against a model simulation of land surface air temperature and its comparison with observations to evaluate the two SST sets.

Model Experiments

- HadAM3 2.5º lat. x3.75º long. atmospheric model
- Forced with GISST3.1 SST and sea ice extent data set
- Six experiments run in ensemble mode with SST bias corrections (1871 to end 1941)
- Four experiments run with *no* bias corrections to 1998
- Compare modelled land surface air temperature with (Jones) observations over 11 large regions

Difference in HadAM3 1.5m temperature in decade of largest SST corrections



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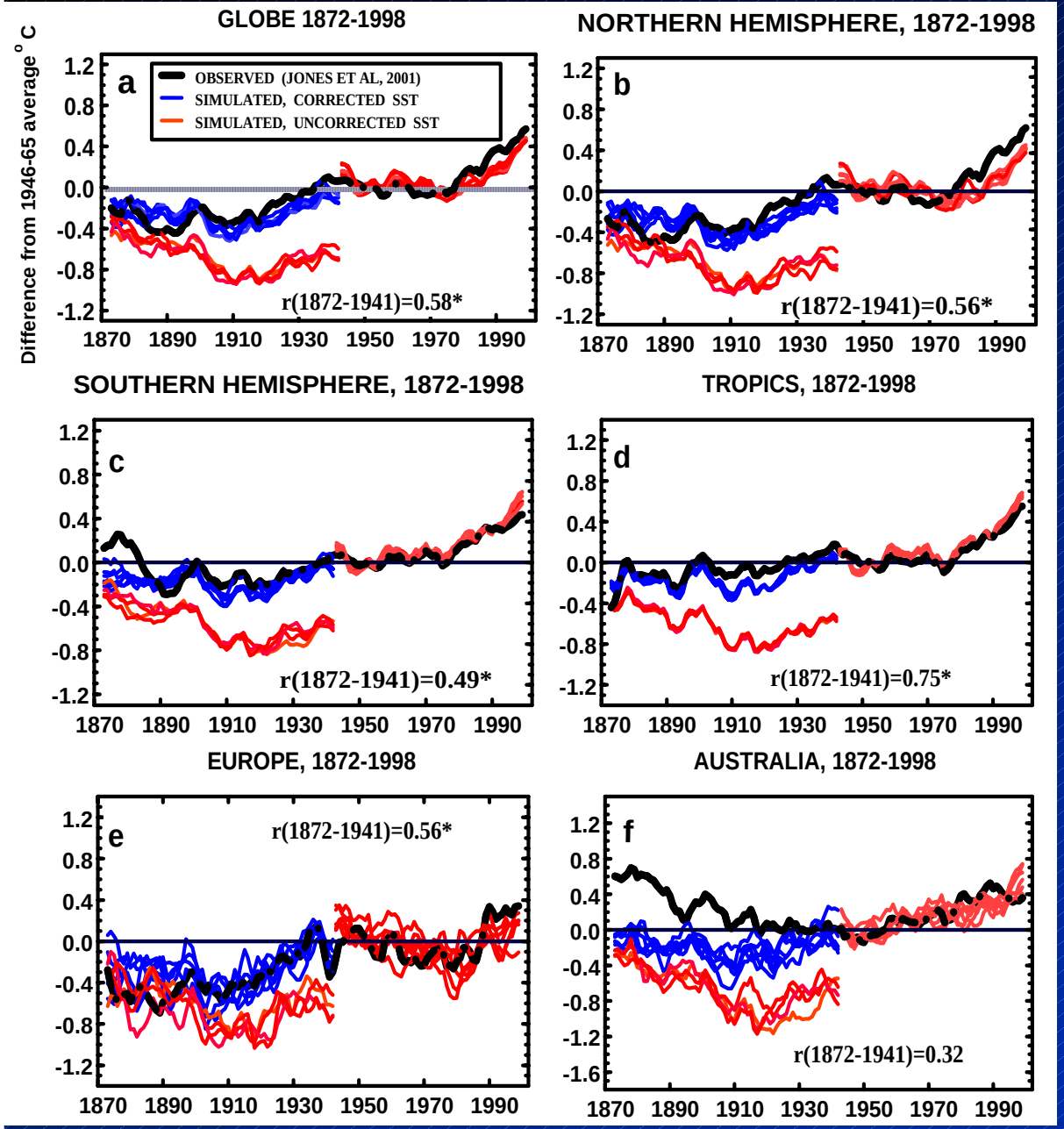

Simulated *annual* land surface air temperature anomalies using HadAM3 atmospheric model.

Ensemble of 6 runs.

Red: forced with uncorrected SST

Blue: forced with corrected SST

Black: observed

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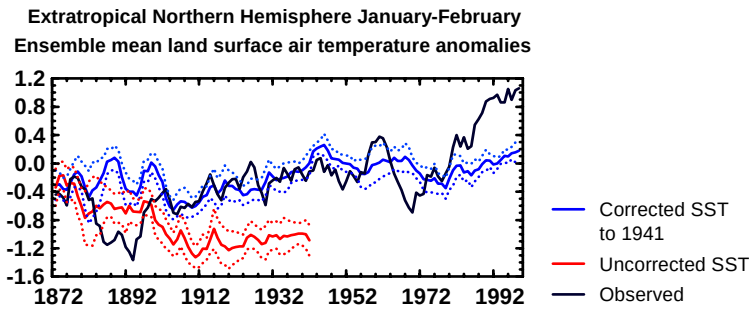

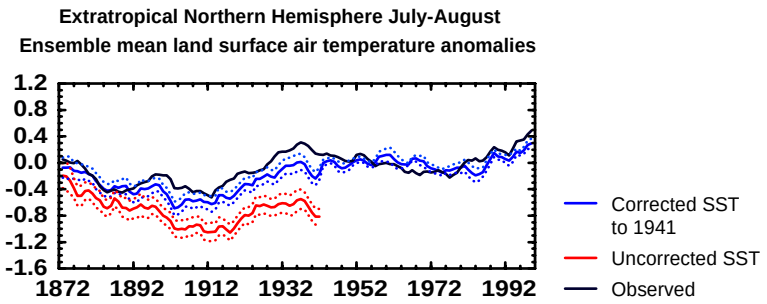

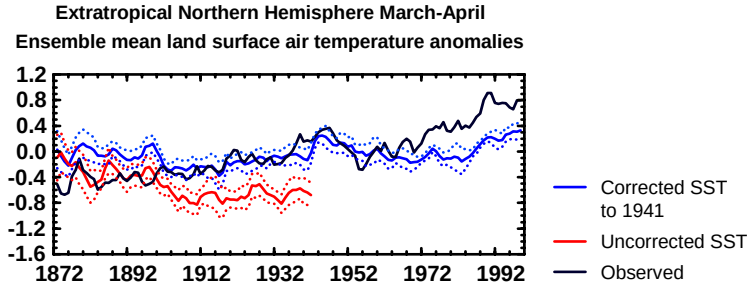

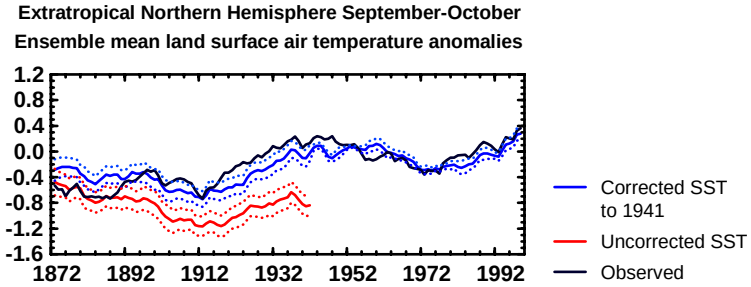

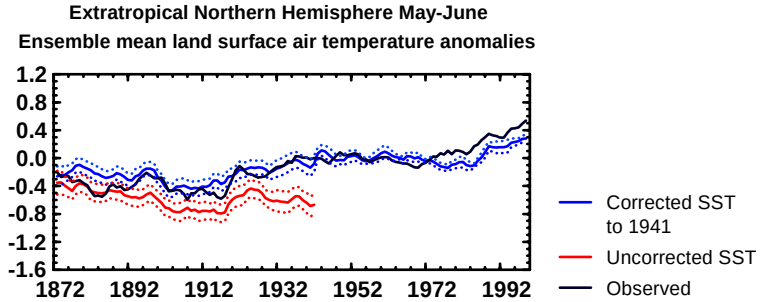

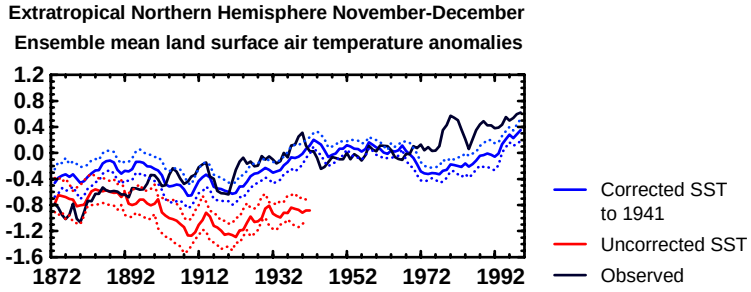

Model test of SST bias corrections for extratropical Northern Hemisphere *through seasonal* cycle - ensemble means & uncertainties

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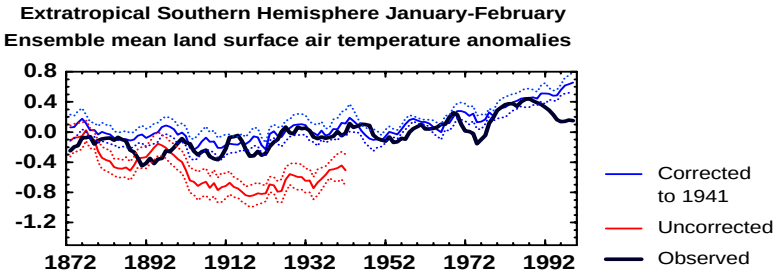

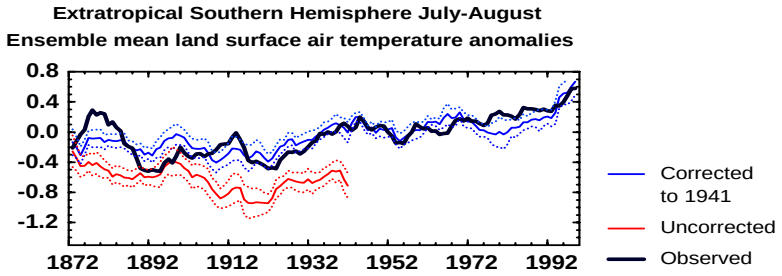

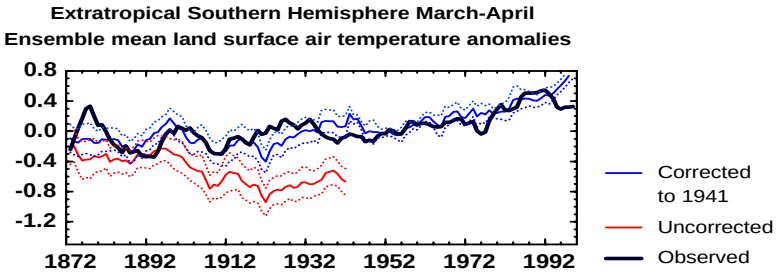

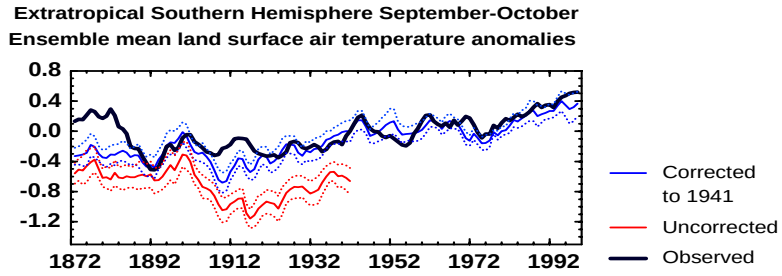

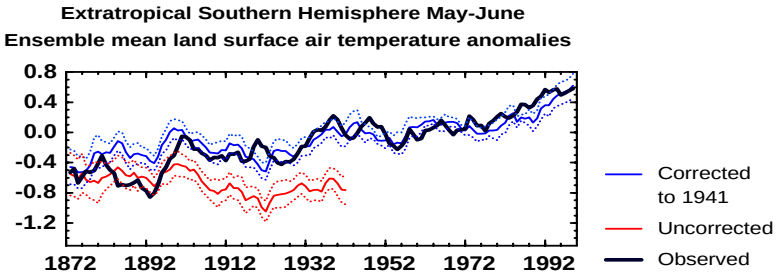

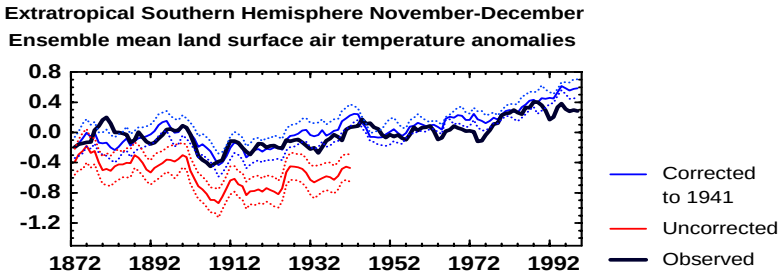

Model test of SST bias corrections for Extratropical Southern Hemisphere *through seasonal* cycle - ensemble means & uncertainties

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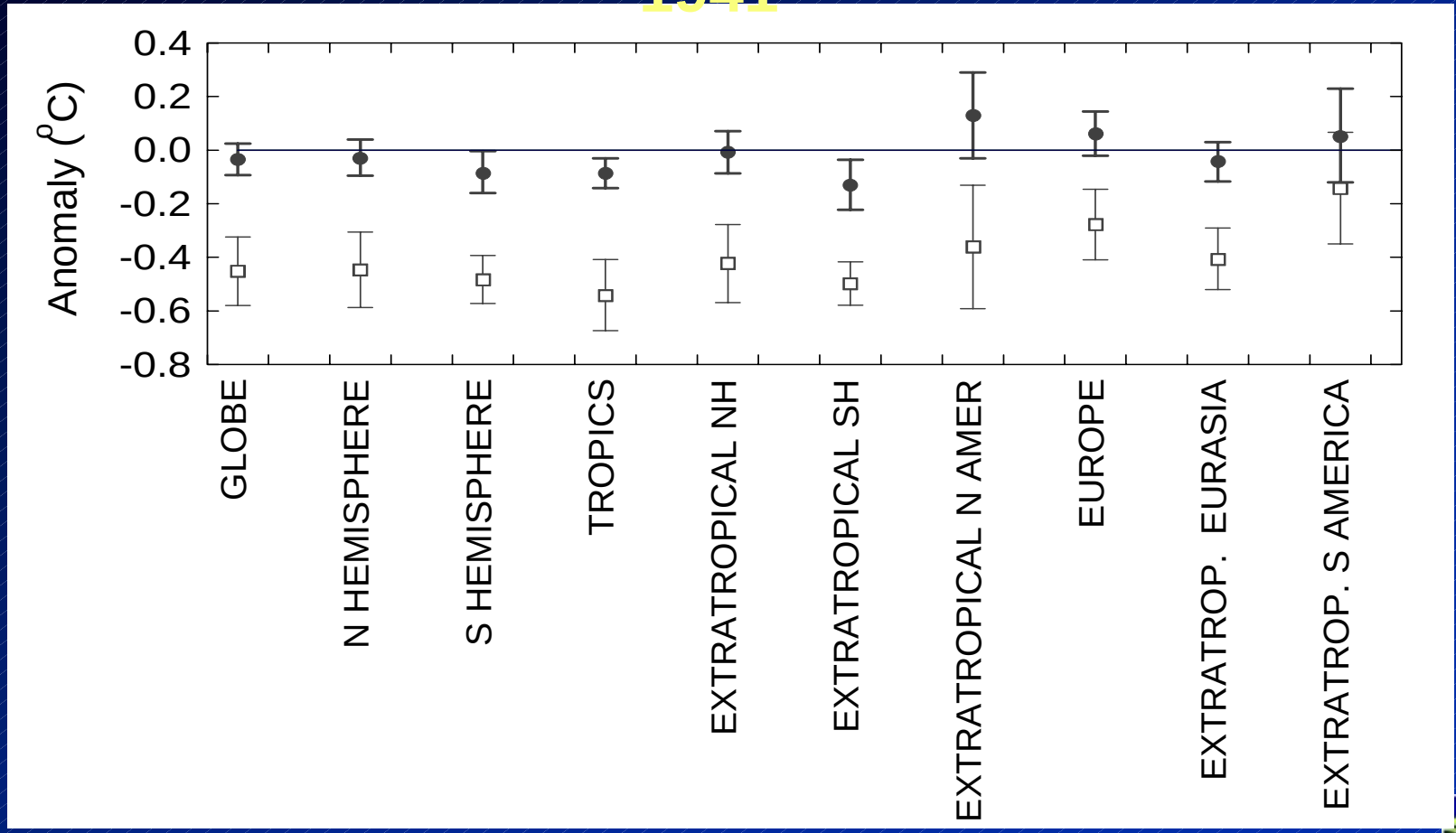
Differences between annual simulated land air temperature & observations using corrected (solid circles) and uncorrected SST (open circles), 1872-1941



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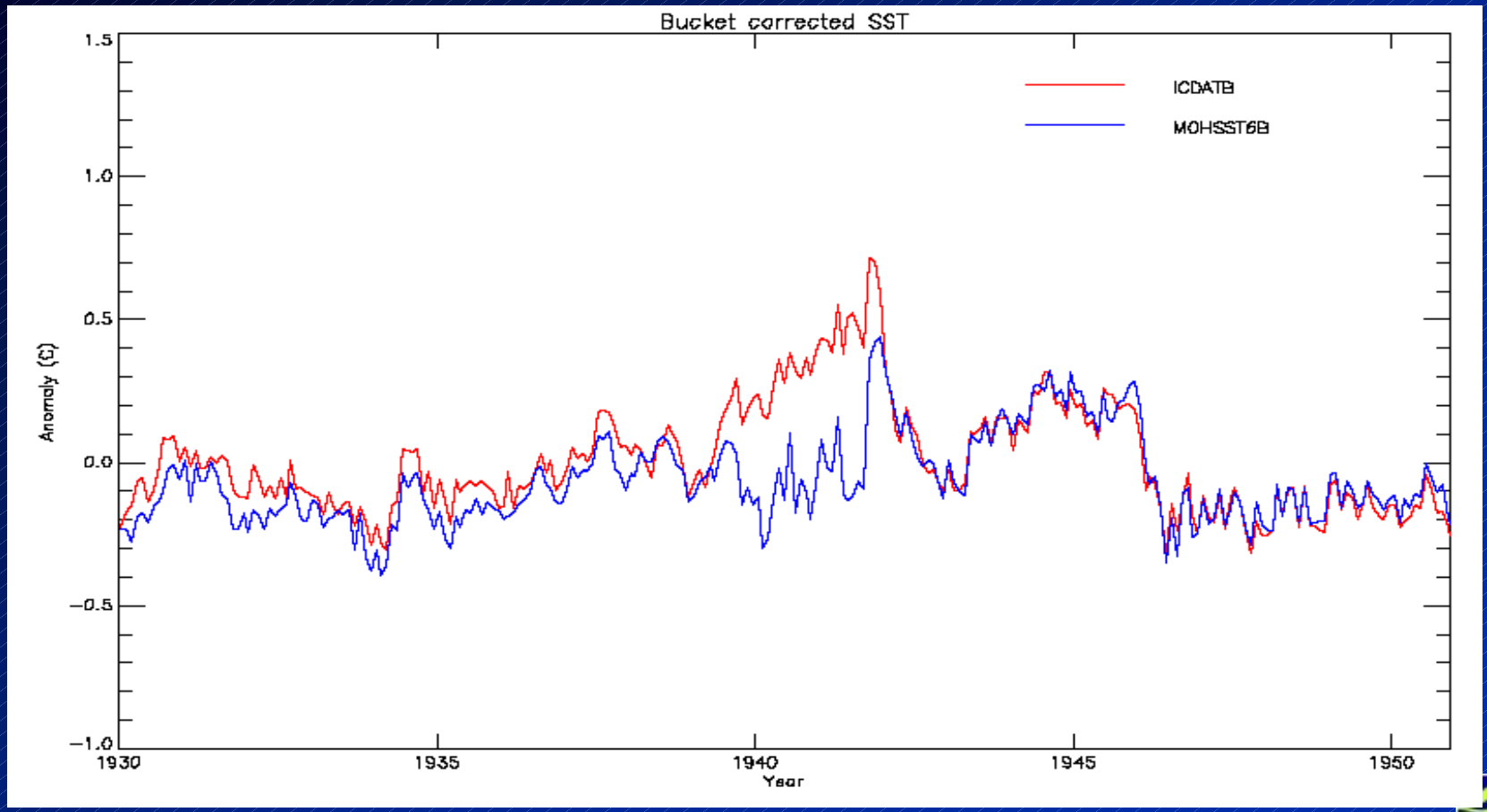
I-COADS compared to MOHSST6 SST data with *same* 5º x5º bucket corrections



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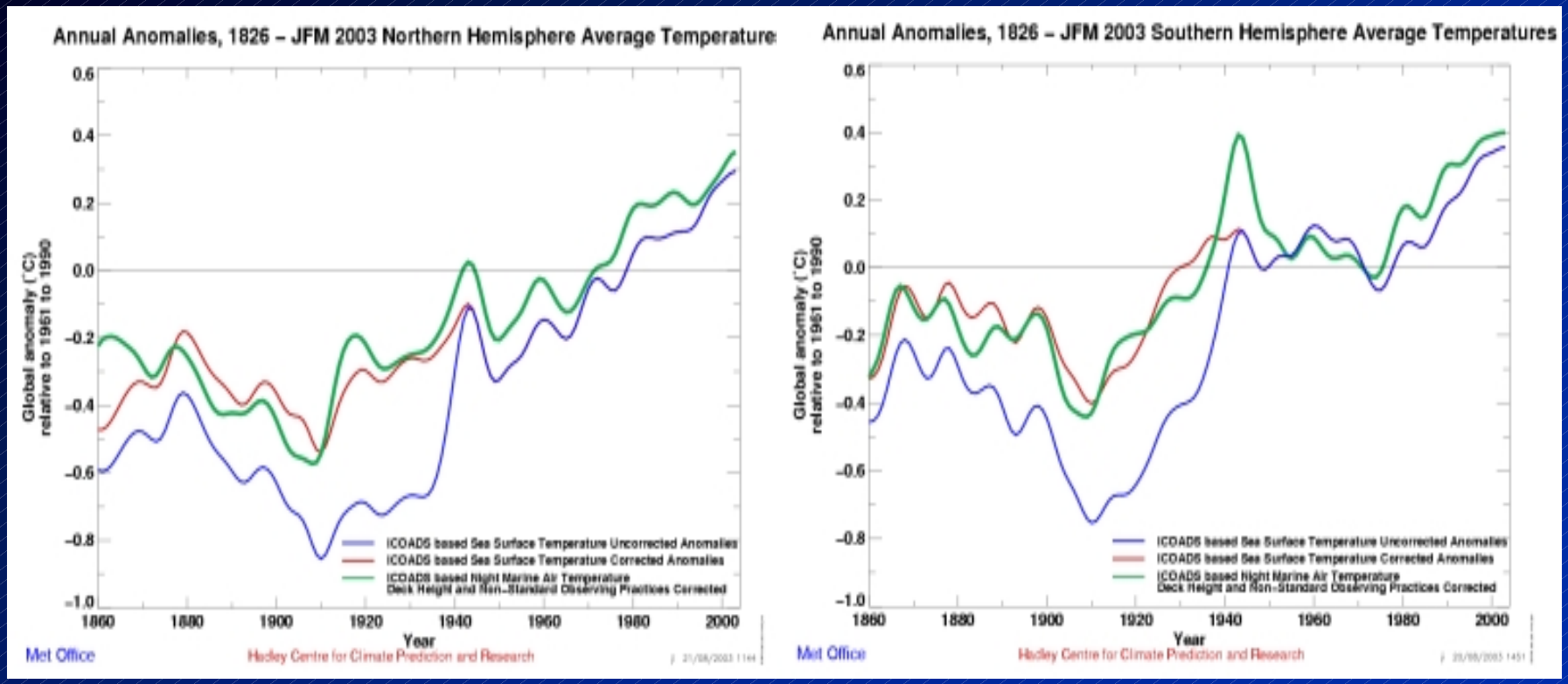
Northern and Southern Hemisphere corrected (red) and uncorrected (blue) SST - I-COADS DATA



New I-COADS night marine air temperature shown for reference (green)

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Conclusions

- Climate model forced with corrected & uncorrected SST supports general accuracy of SST corrections.
- Annual cycle of corrections broadly acceptable in extratropical Northern & Southern Hemispheres.
- SST and land temperatures globally seem to be *thermodynamically consistent*
- Improved Jones and Moberg (2003) land surface air temperatures will help tests of new I-COADS corrections.
- Different corrections needed for 1939-41 in I-COADS.