AOSC 652: Analysis Methods in AOSC

Assignment #10

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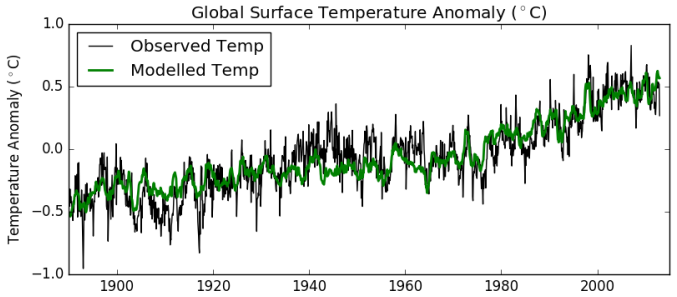

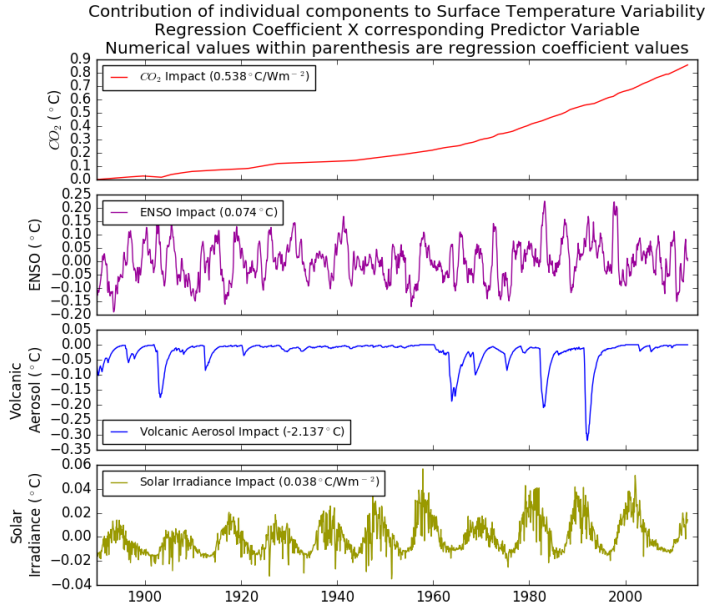

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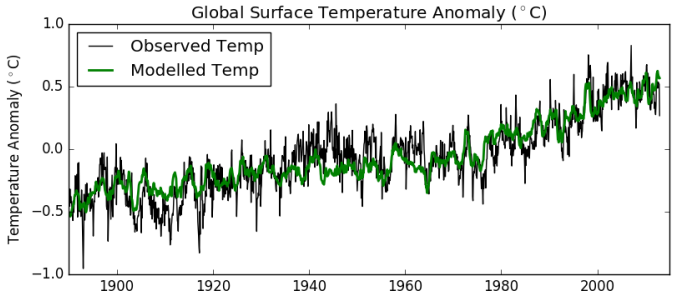

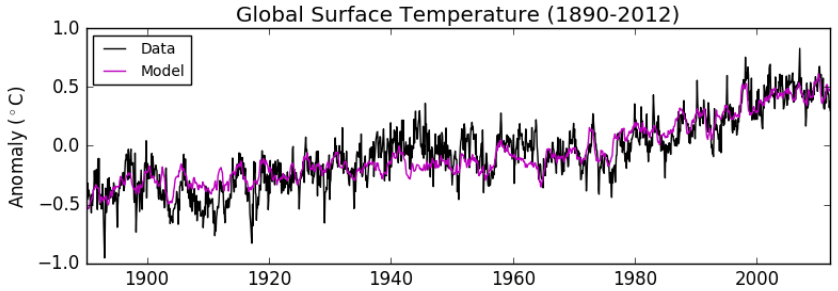

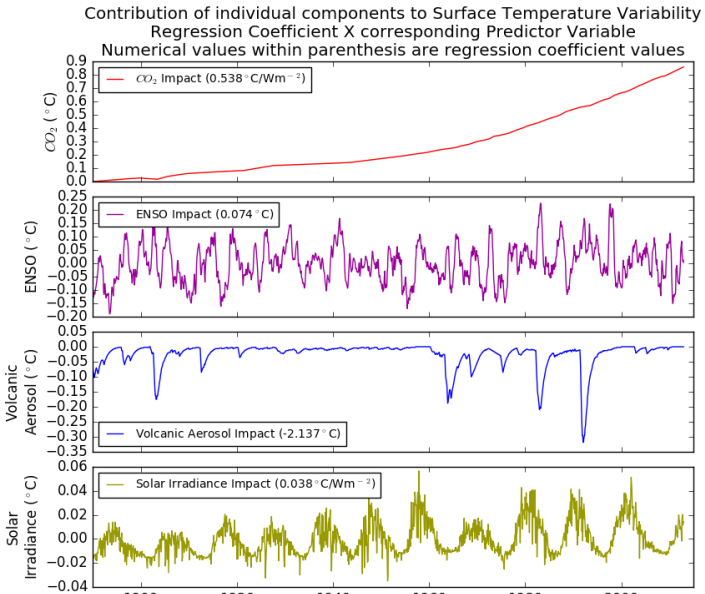

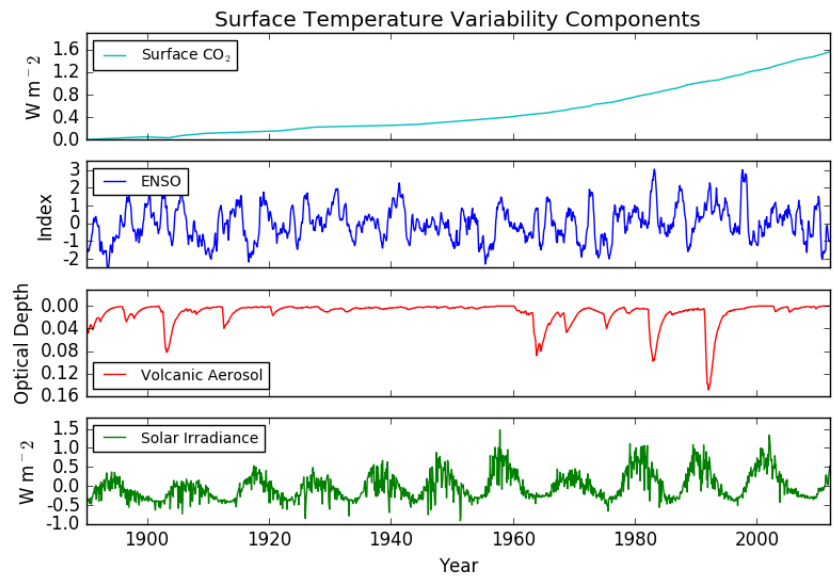

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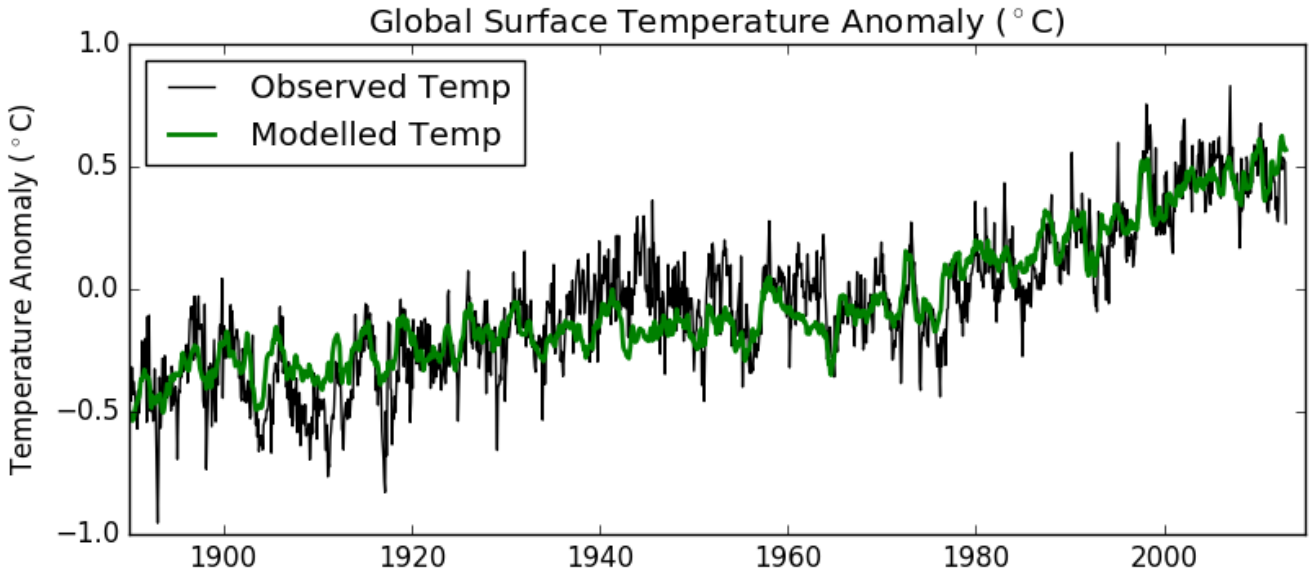

Does the model capture the essence of the data time series ?

AOSC 652: Analysis Methods in AOSC

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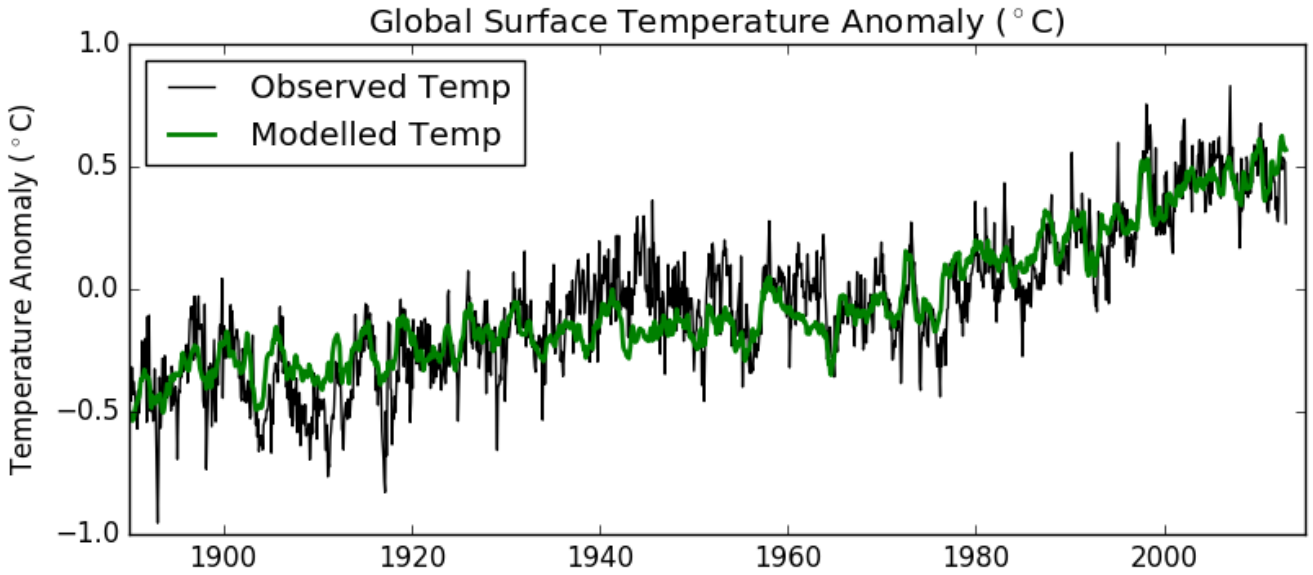

Does the model capture the essence of the data time series ?

Yes! The model & data exhibit a similar, long-term rise and many of the "ups and downs" occur at about the same time.

AOSC 652: Analysis Methods in AOSC

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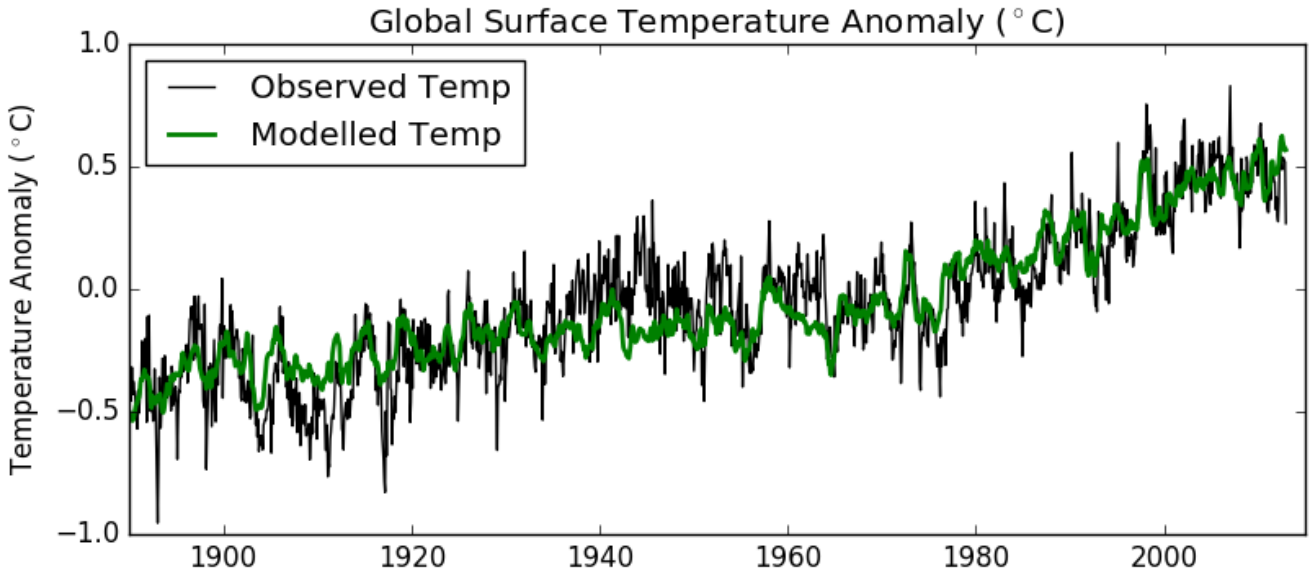

What part of this comparison is most favorable?

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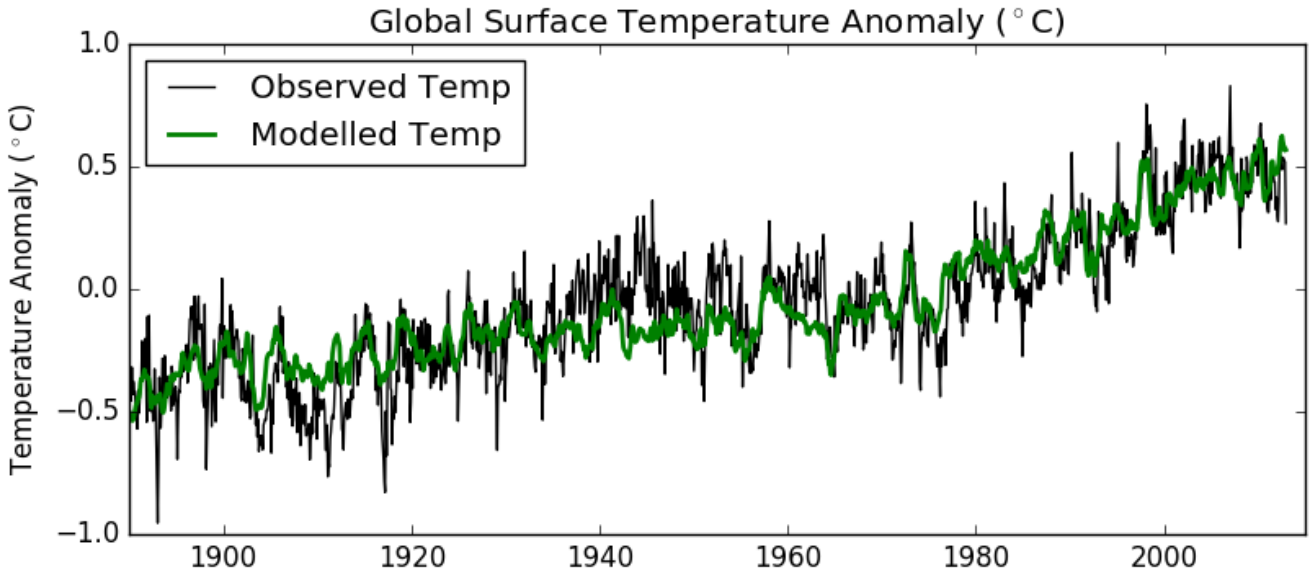

What part of this comparison is most favorable?

The fits at the beginning and the end of the time series

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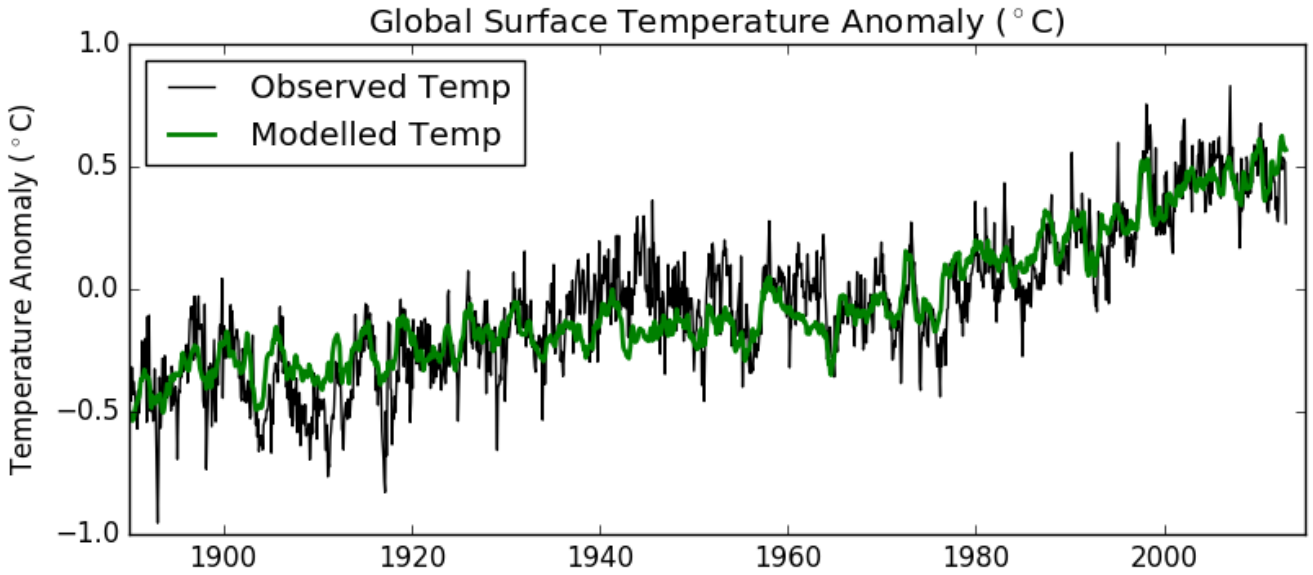

What part of this comparison is least favorable?

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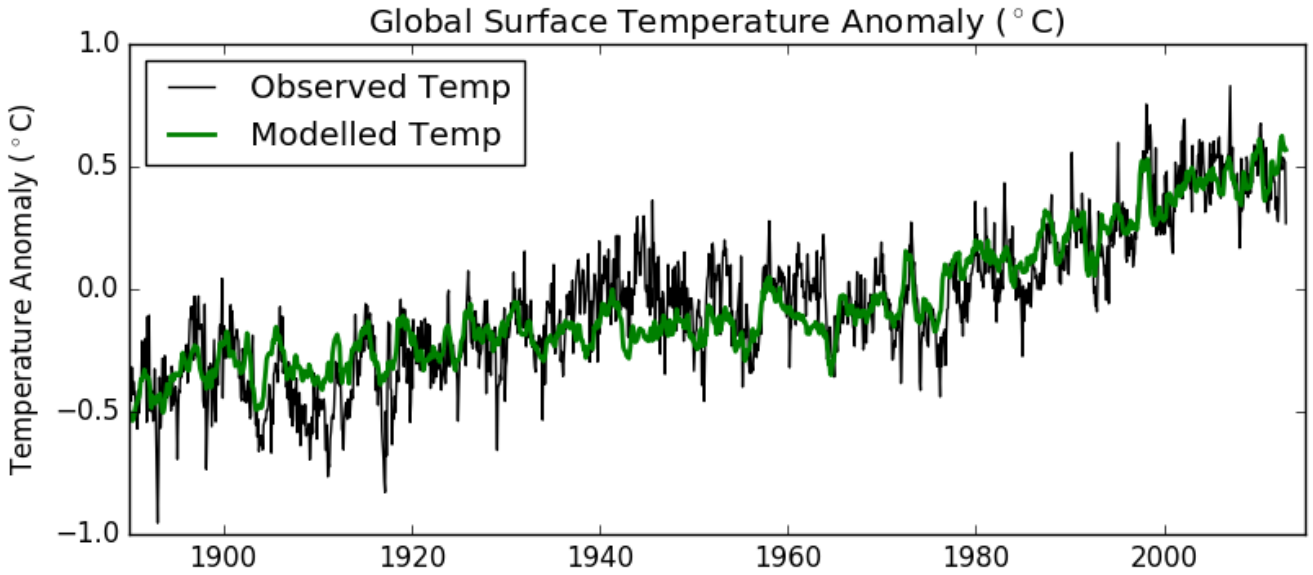

What part of this comparison is least favorable?

Downward deviation of data around 1910 (WWI) and upward deviation of data around 1945 (WWII): perhaps due to *scarcity of observations* as noted by Lean & Rind.

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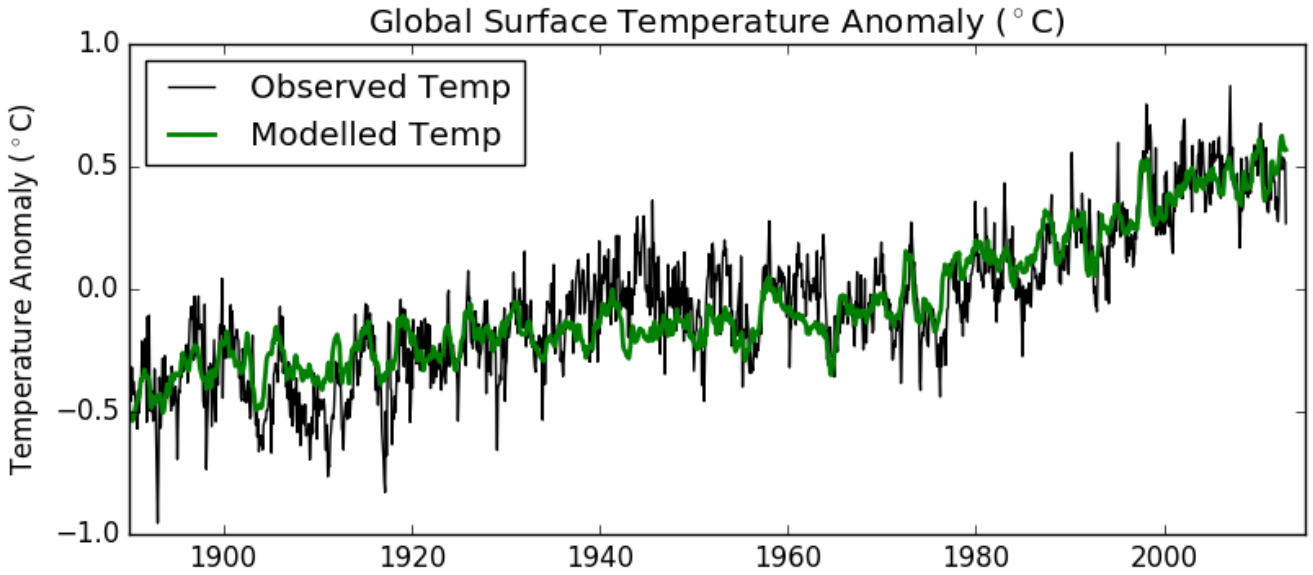

How much of the variance in ΔT is explained by your MLR model?

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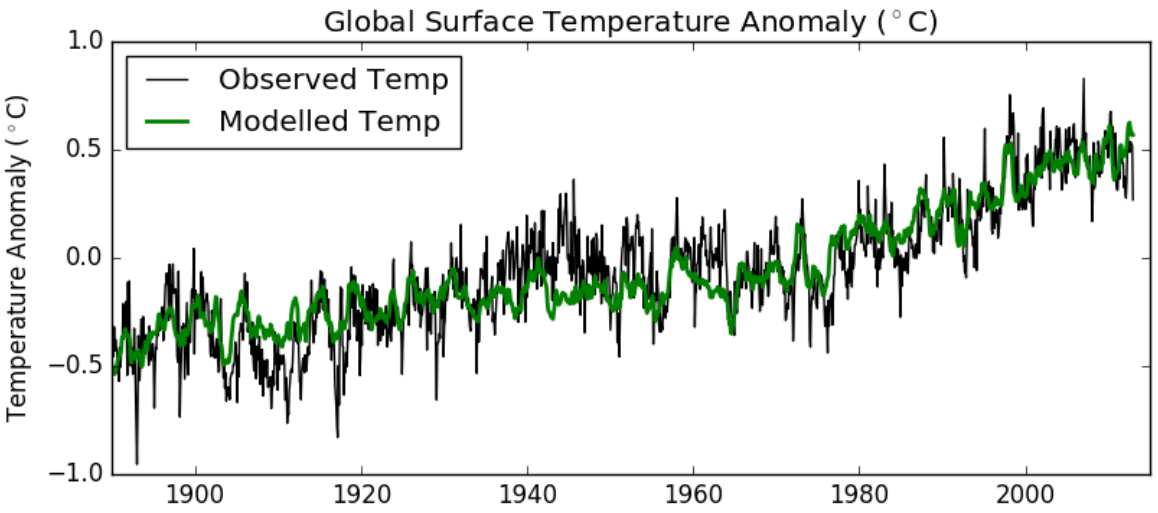

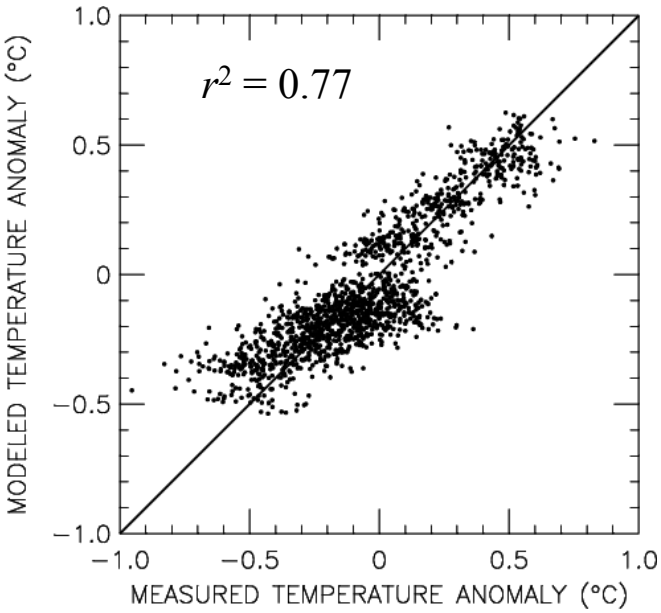

How much of the variance in ΔT is explained by your MLR model?

77% of the variance in ΔT is explained by this simple model.

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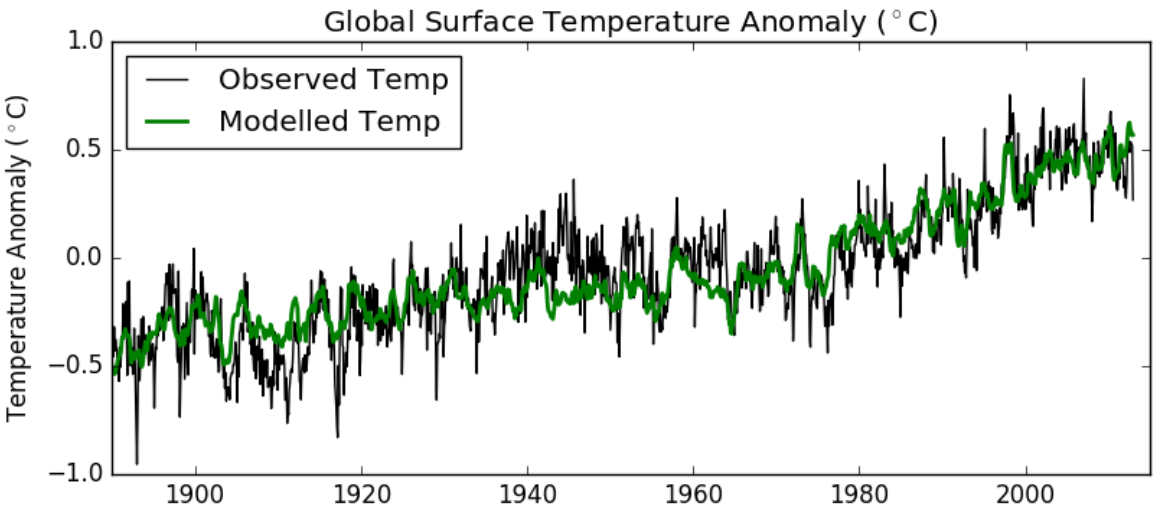

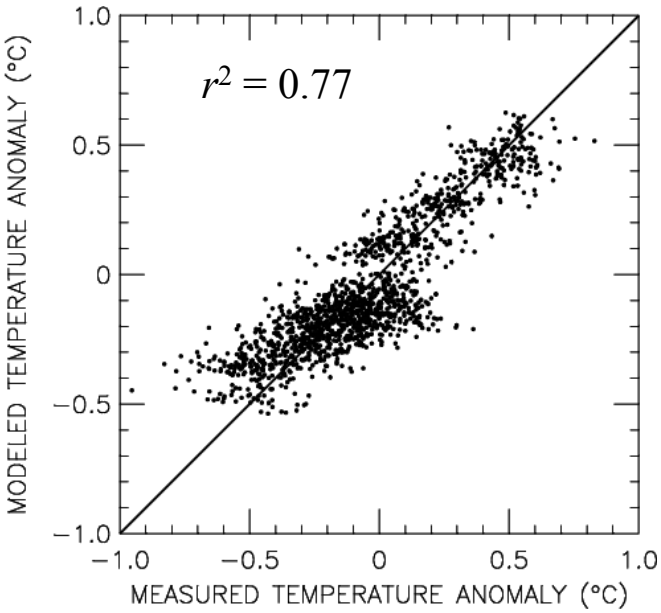

How much of the variance in ΔT is explained by your MLR model?

77% of the variance in ΔT is explained by this simple model.

This is rather remarkable given the simplicity of the calculation & the large investment in climate models, and could also be noted as another favorable aspect of the model.

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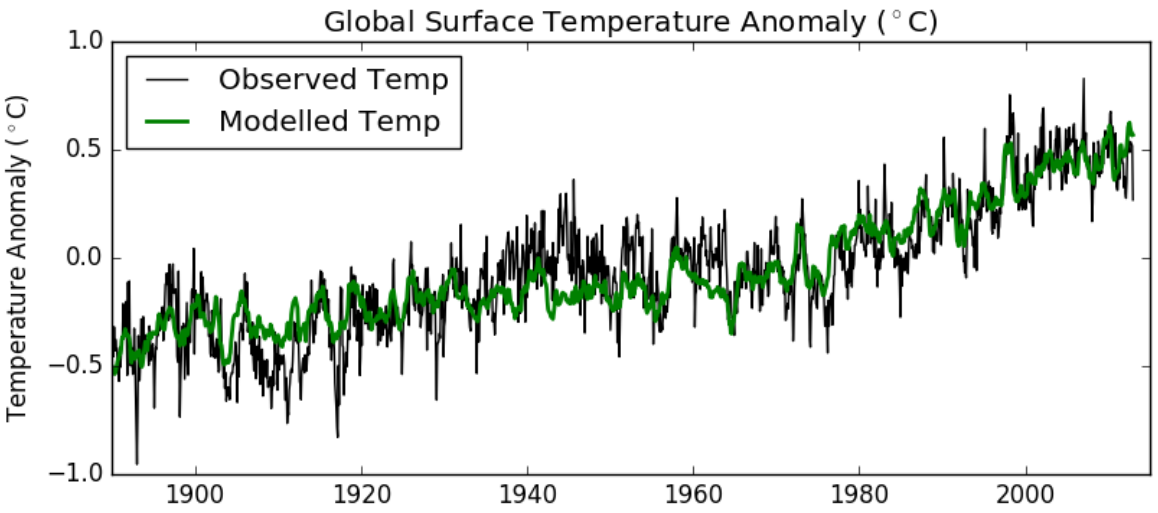

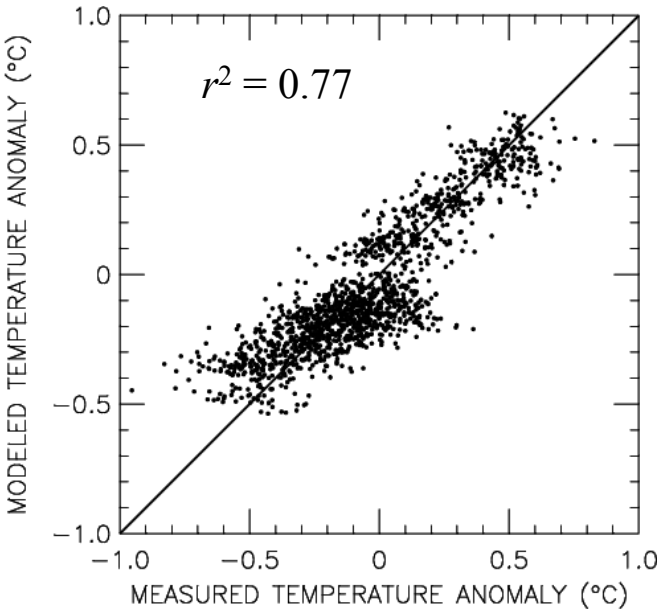

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One student found r^2 for CO_2, ENSO, TSI and Volcanoes and found values of :

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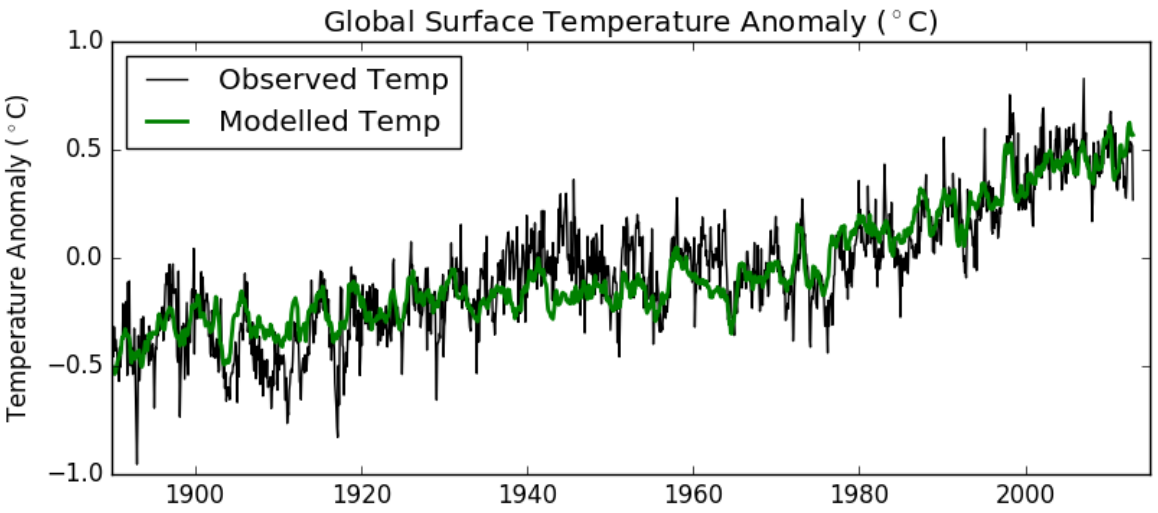

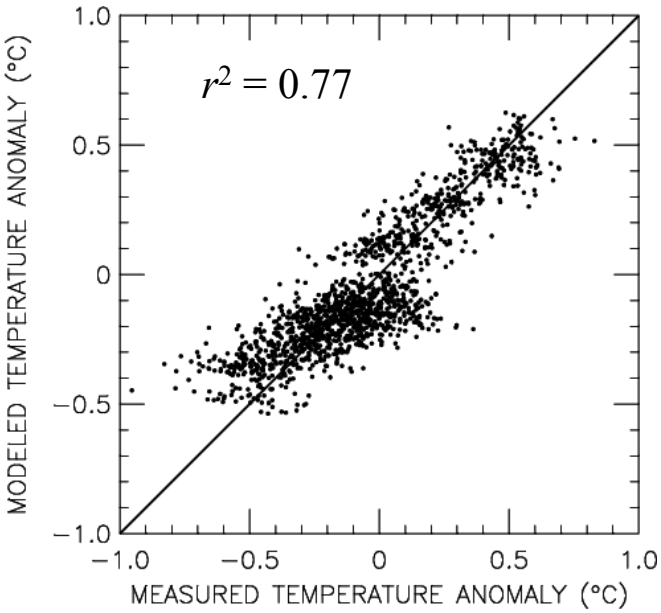

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One student found r^2 for CO_2, ENSO, TSI and Volcanoes and found values of :

0.71 0.096 0.068 0.0041

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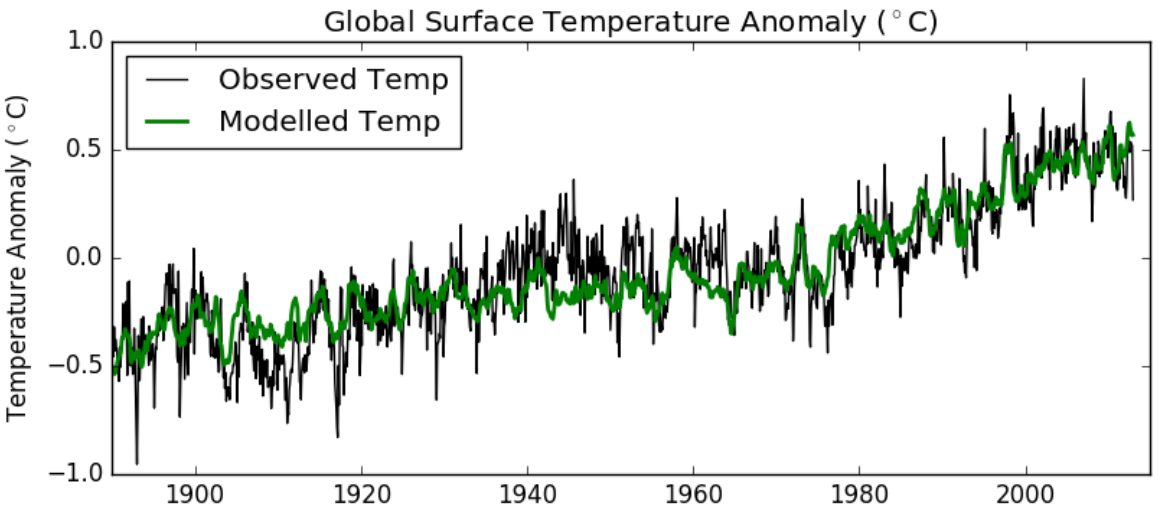

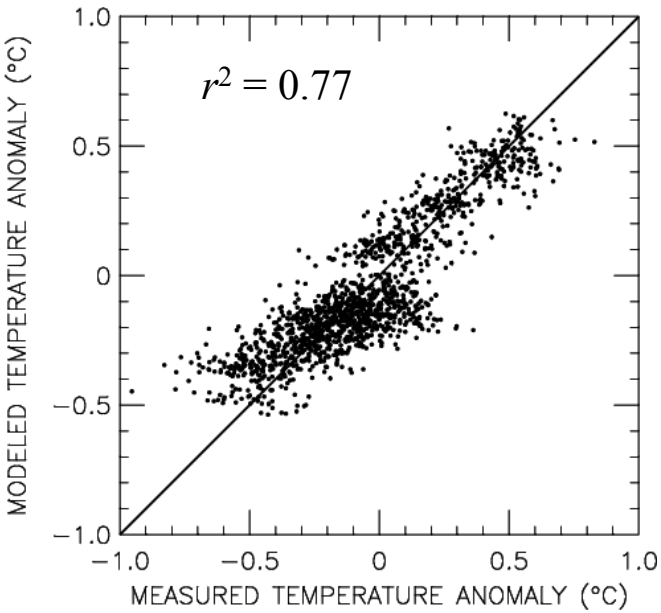

What other quantity might we want to examine ?

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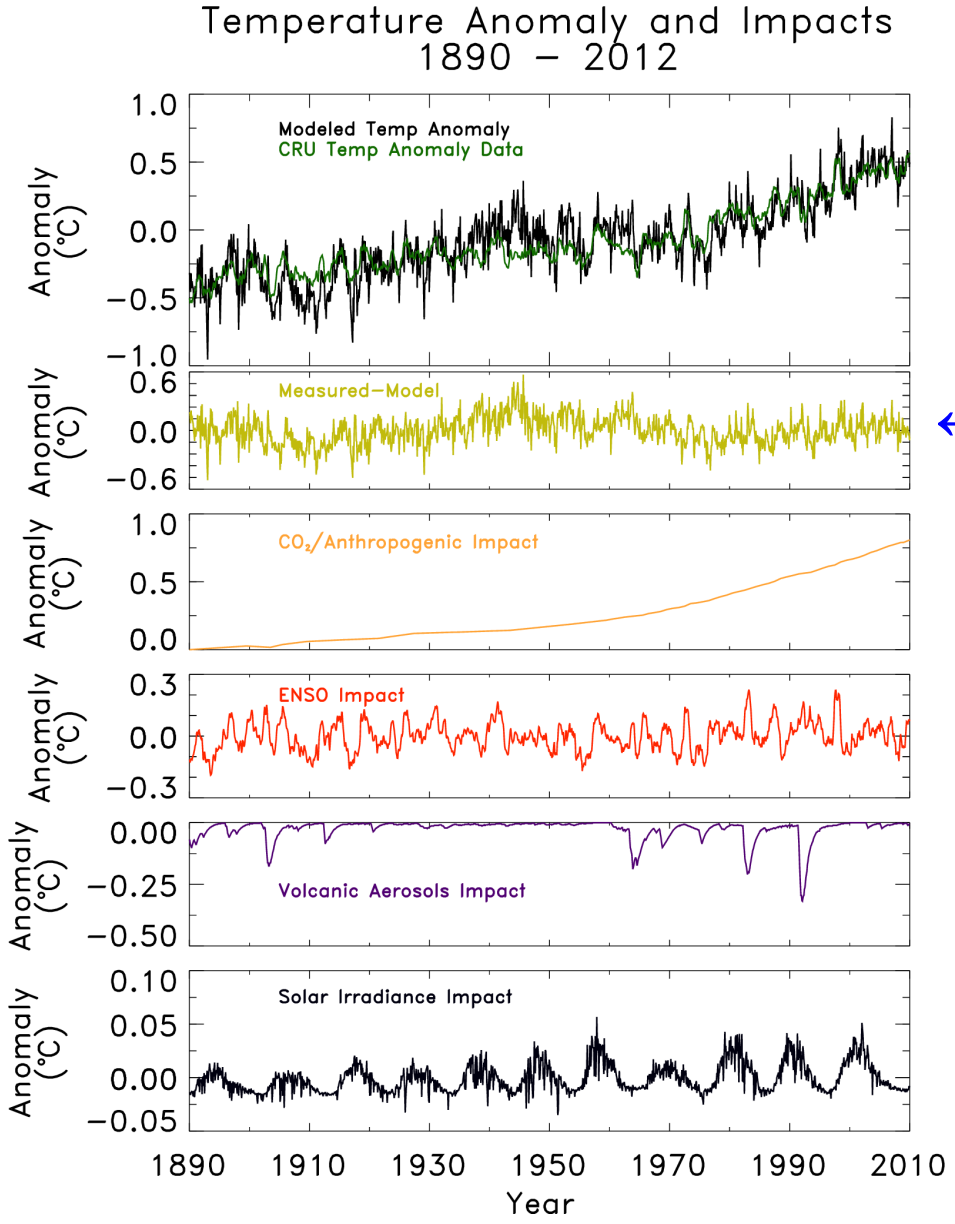
Assignment #10



← **Residual !**

Only one student included a plot of the residual

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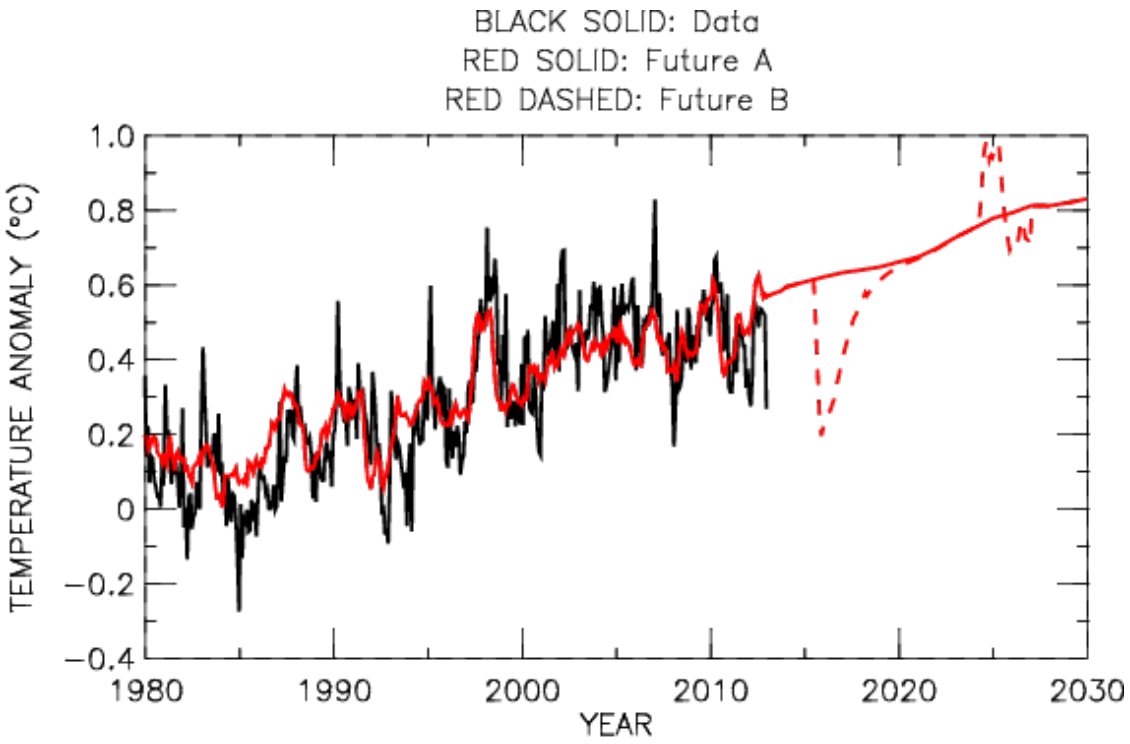
Assignment #10

b) Prepare a plot with x-axis from 1980 to 2030, showing two future scenarios …



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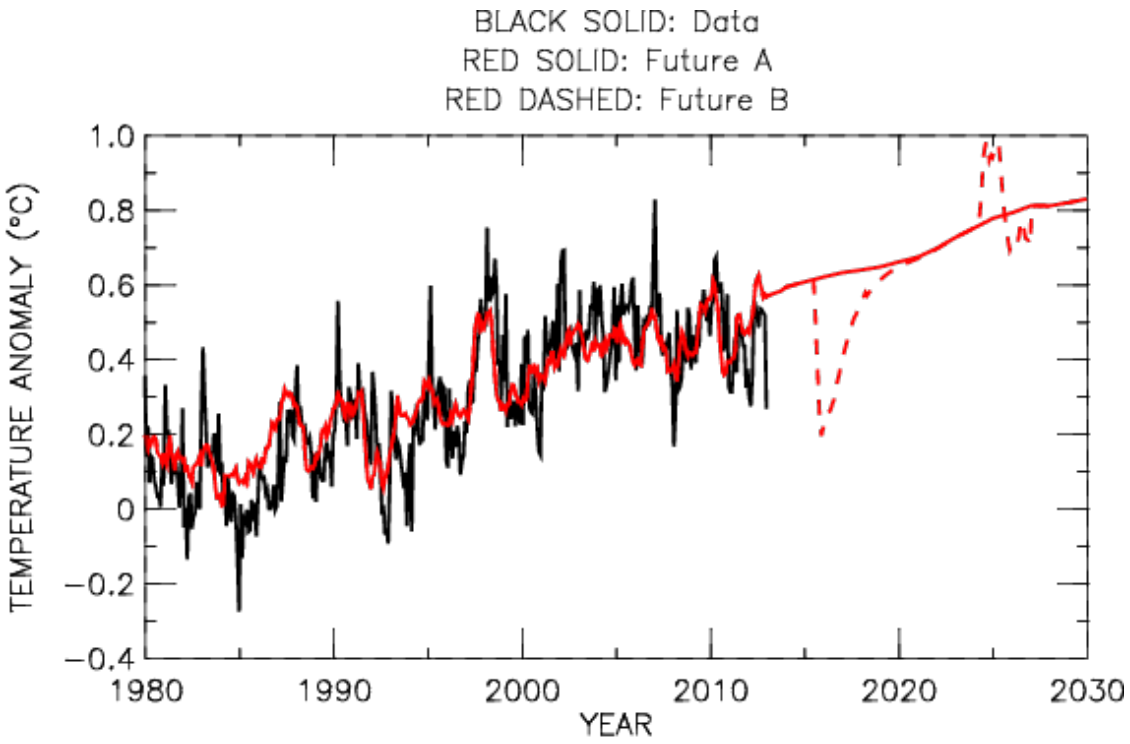

Based on this figure, do we expect warmer conditions in the next several decades ?

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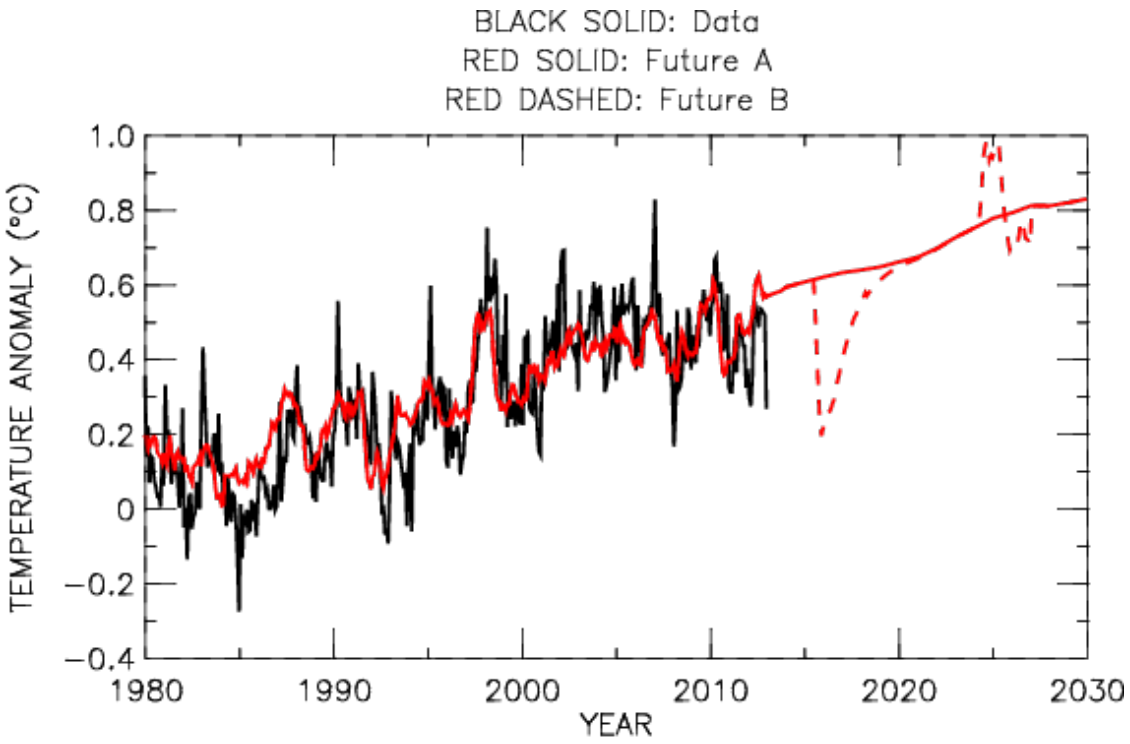


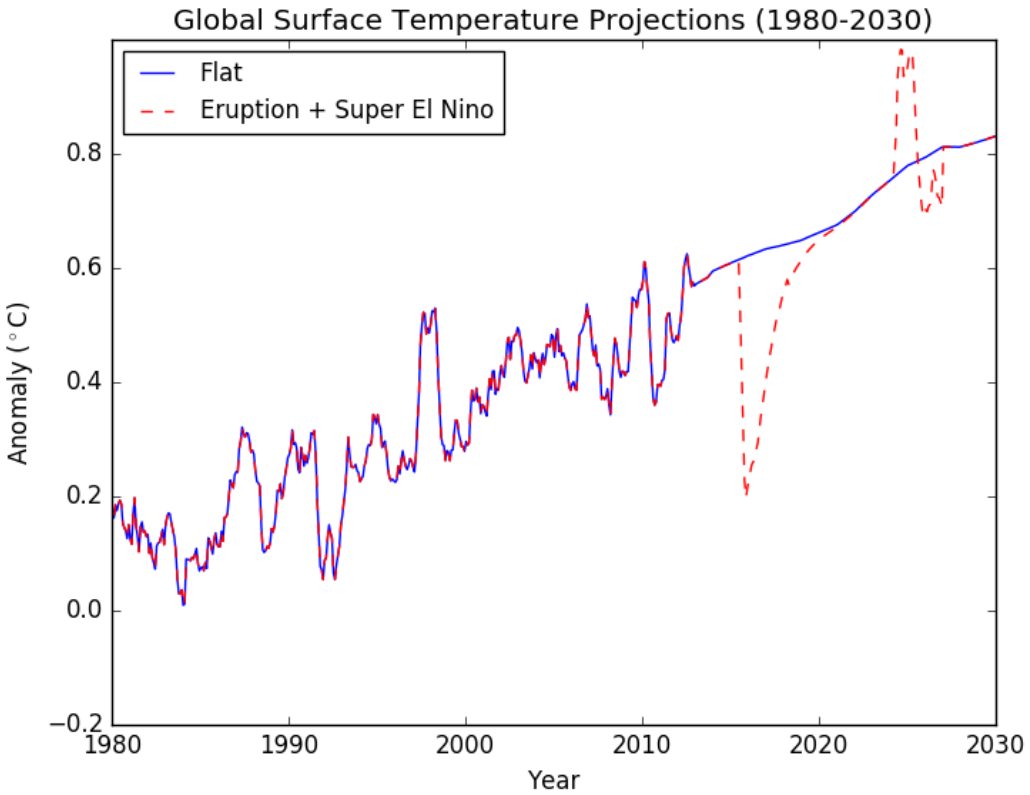
Based on this figure, do we expect warmer conditions in the next several decades ?

Yes, of course !

AOSC 652: Analysis Methods in AOSC

Assignment #10

c) Prepare a plot with x-axis from 1980 to 2030, showing two future scenarios …



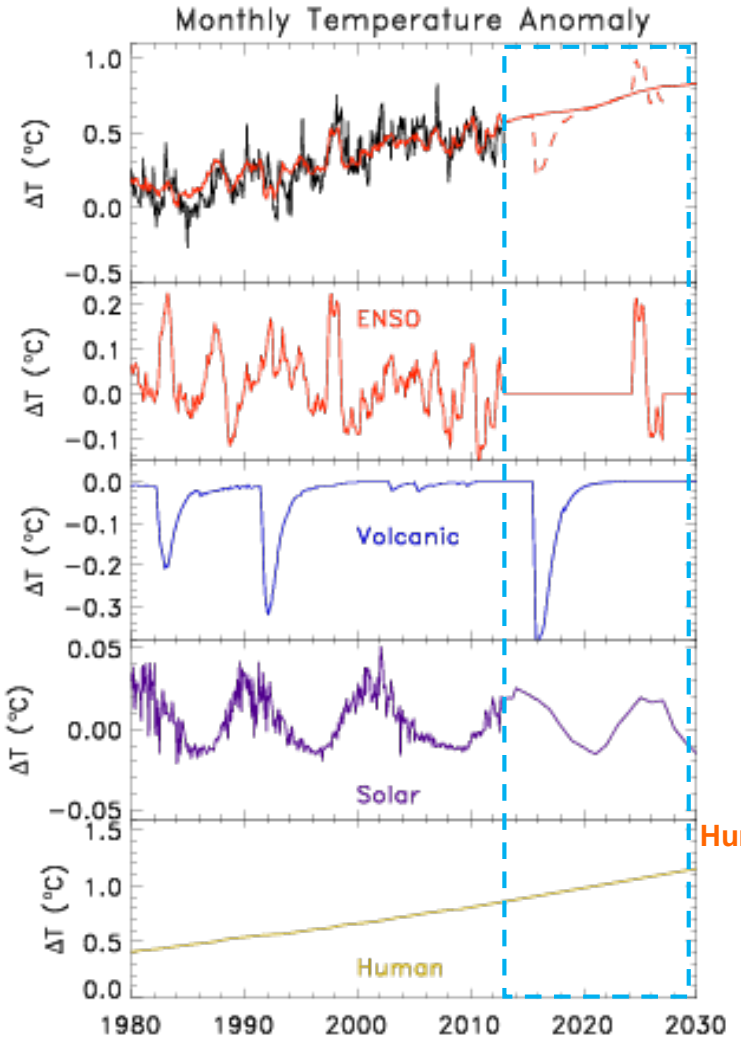
Based on this figure, do we expect warmer conditions in the next several decades ?

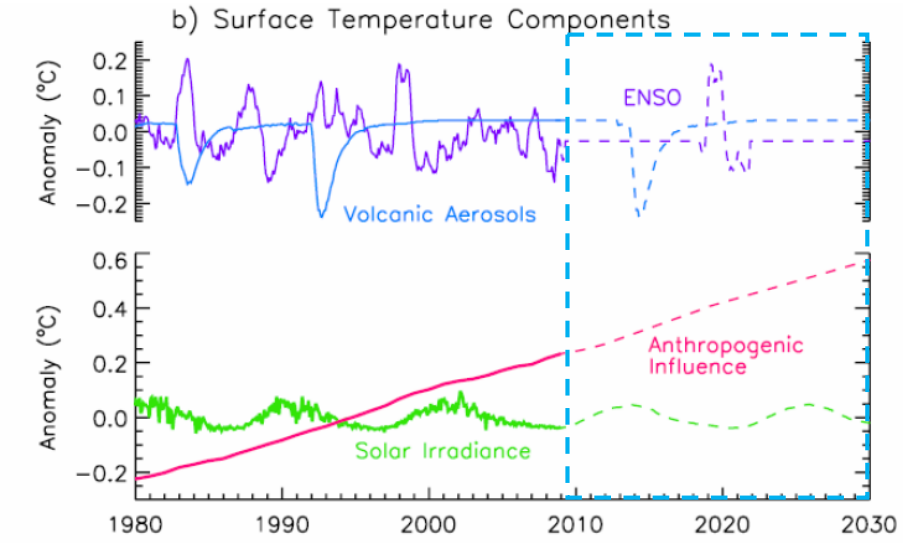
But why ?

AOSC 652: Analysis Methods in AOSC

Assignment #10

Components of regression model, expressed as contributions to ΔT





Lean and Rind 2009
Figure 1b

Human component drives rising temperature

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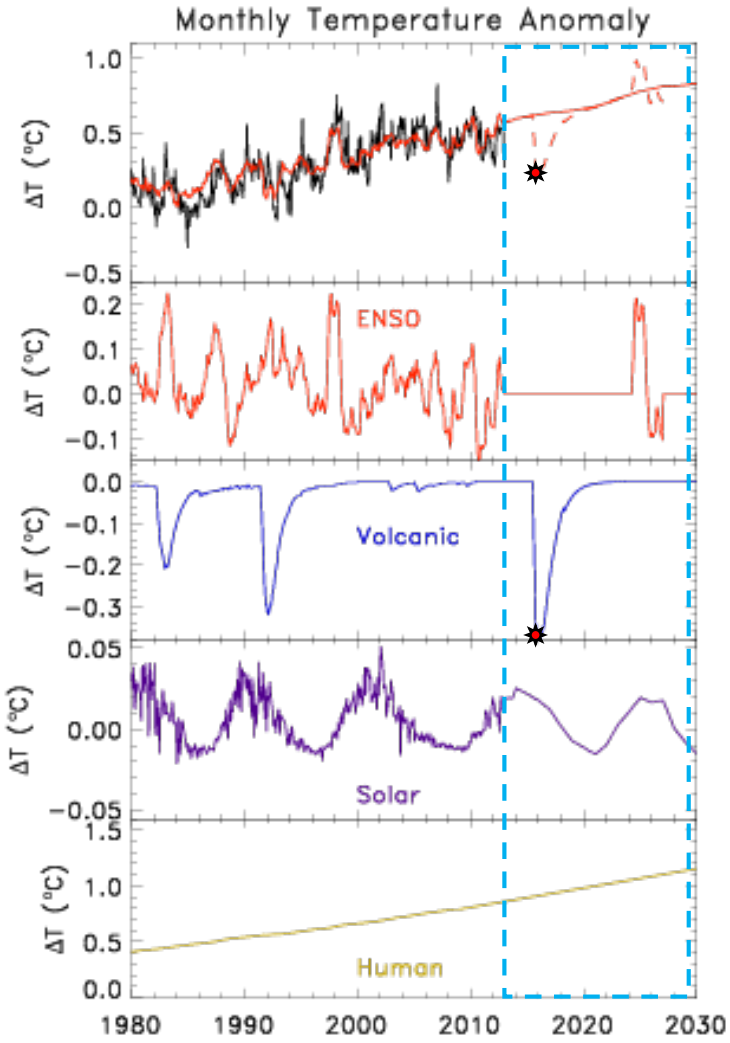
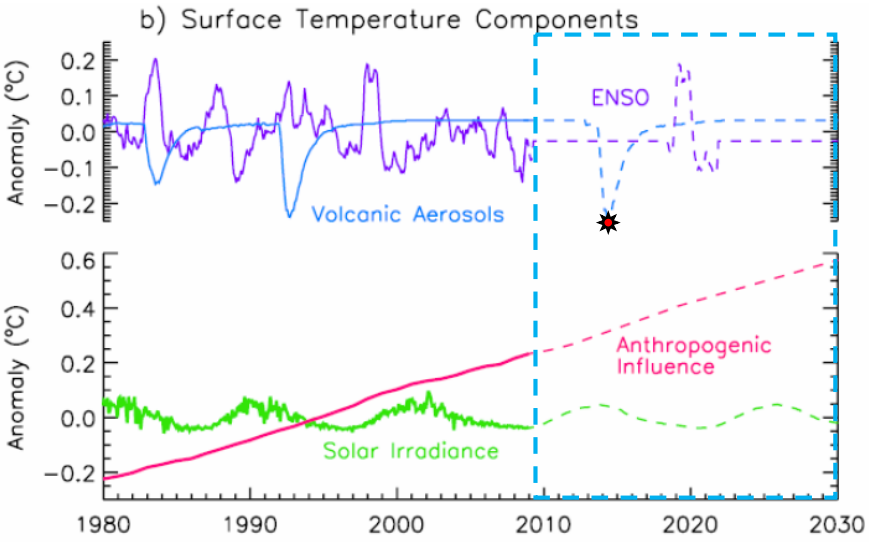
Assignment #10

Future major volcanic eruption could lead to short term *drop* in ΔT



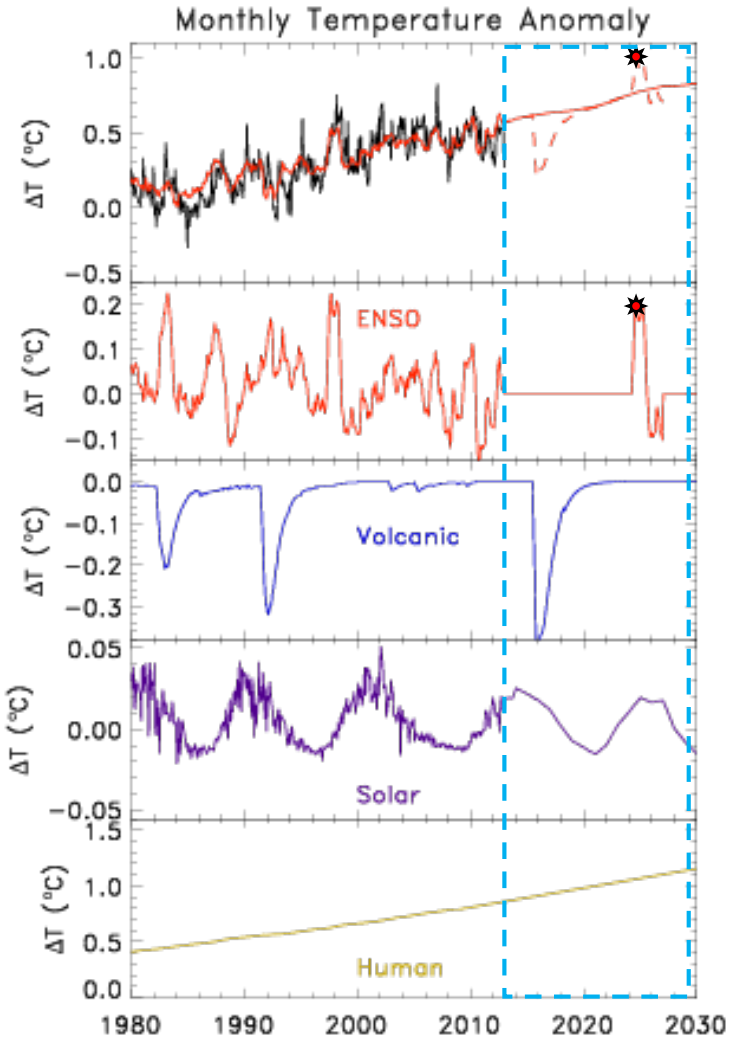


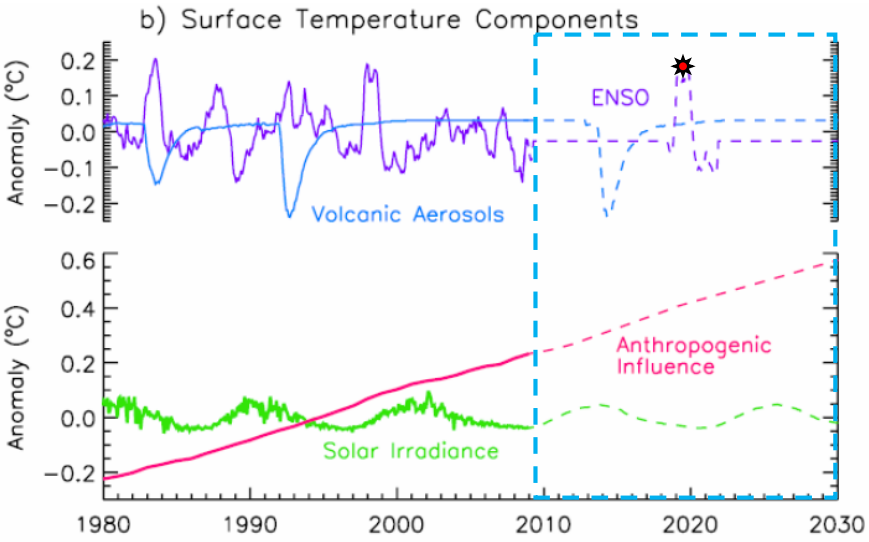
Lean and Rind 2009
Figure 1b

AOSC 652: Analysis Methods in AOSC

Assignment #10

Future major ENSO could lead to short term *rise* in ΔT

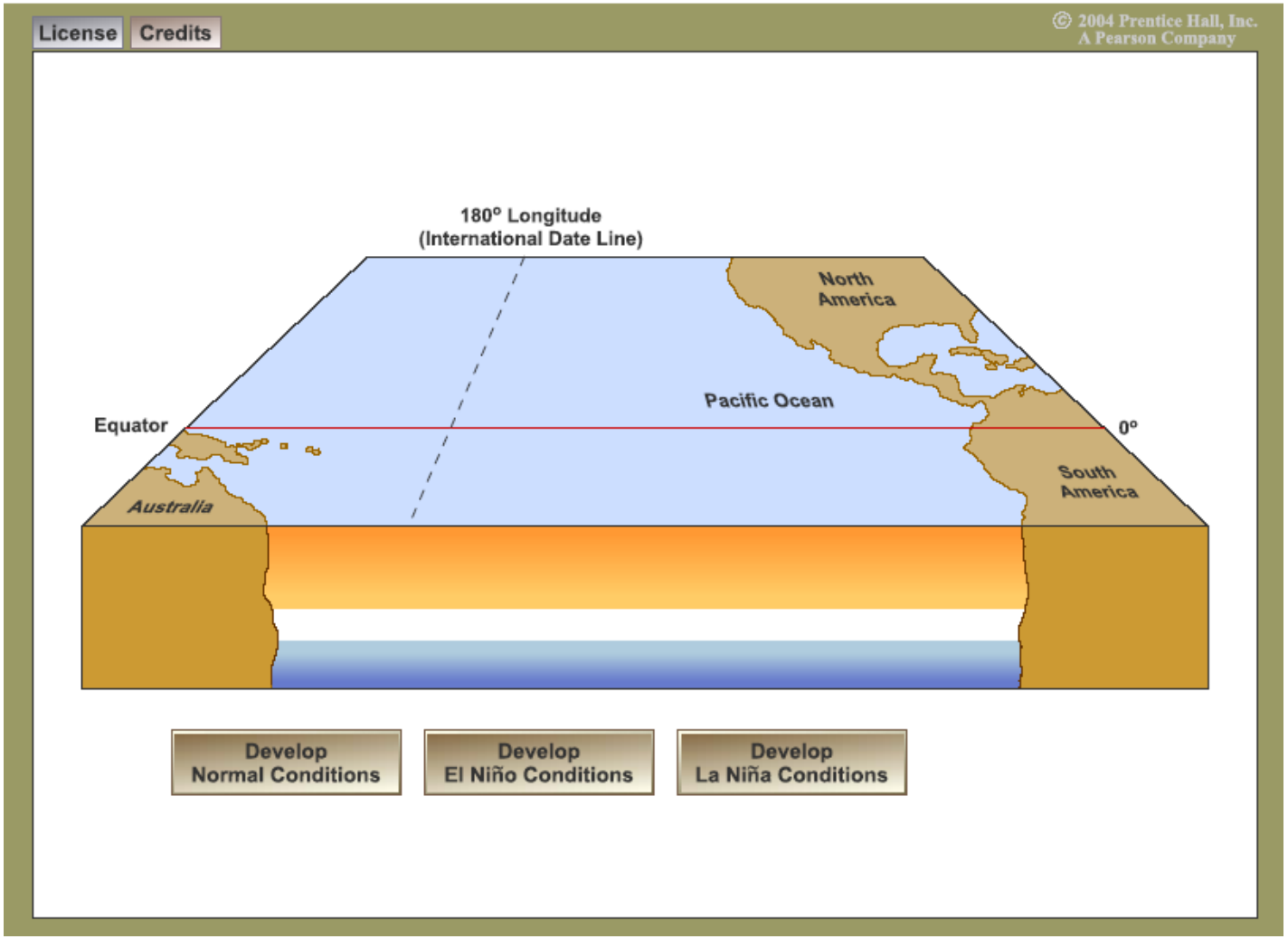




Lean and Rind 2009
Figure 1b

AOSC 652: Analysis Methods in AOSC

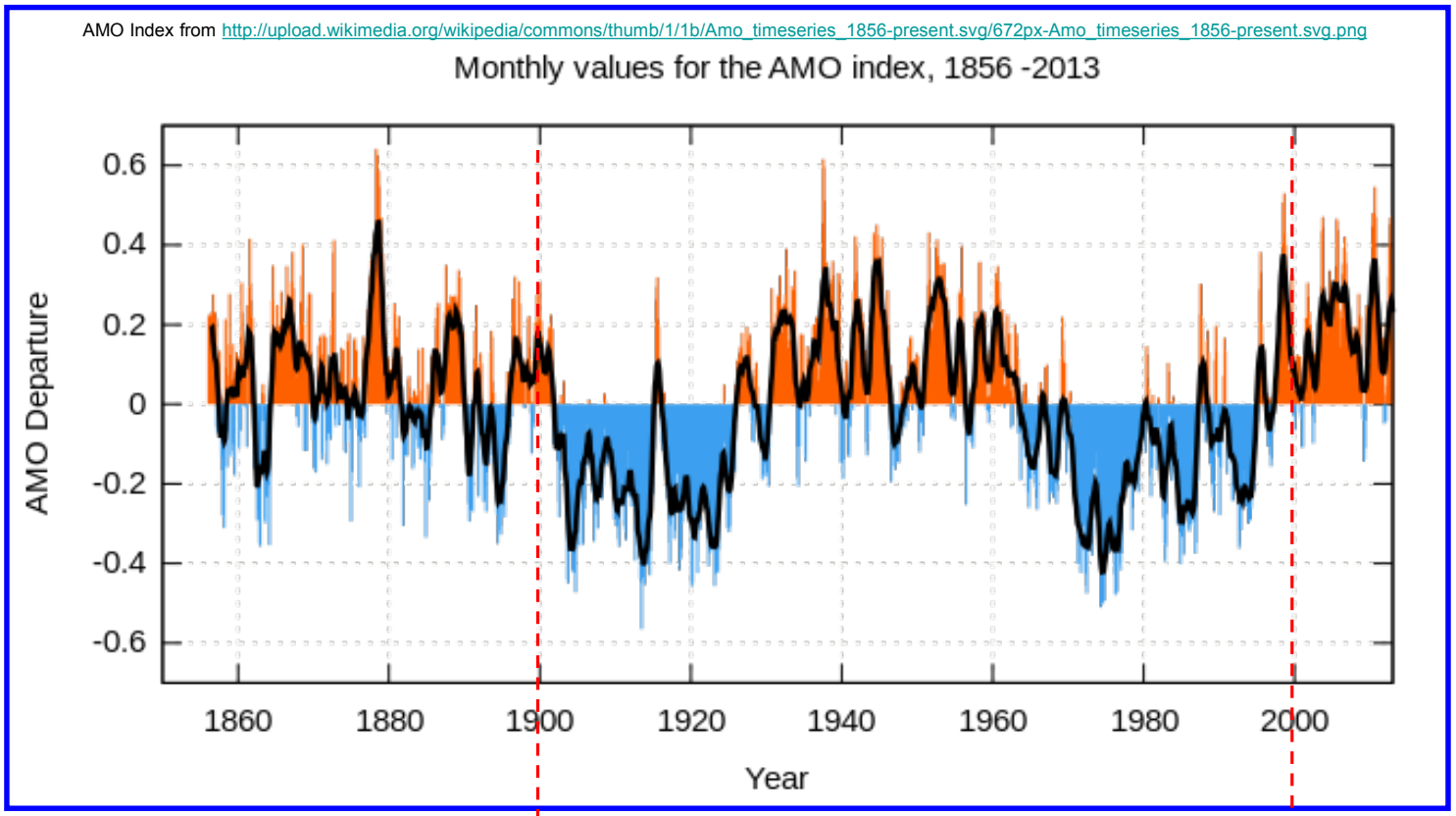
Ocean circulation can affect atmospheric T via storage or release of heat:

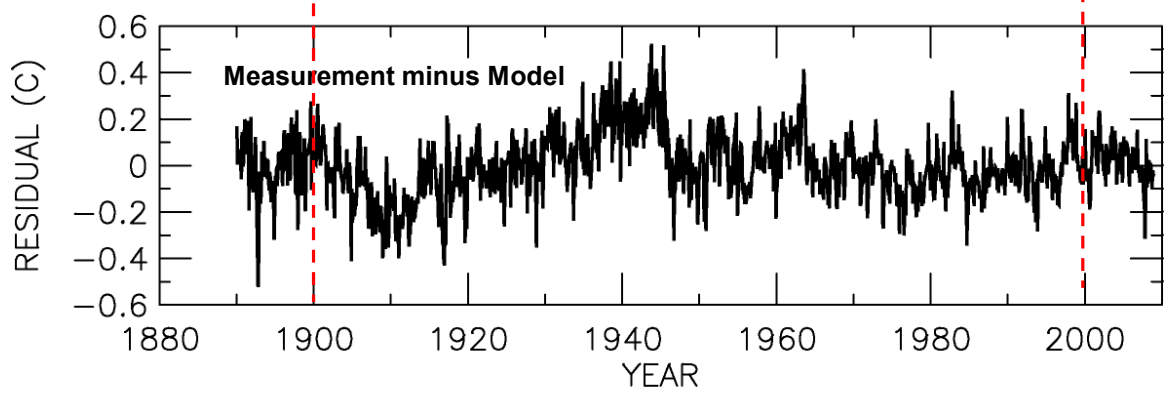


http://esminfo.prenhall.com/science/geoanimations/animations/26_NinoNina.html

AOSC 652: Analysis Methods in AOSC

AMO Index from http://upload.wikimedia.org/wikipedia/commons/thumb/1/1b/Amo_timeseries_1856-present.svg/672px-Amo_timeseries_1856-present.svg.png





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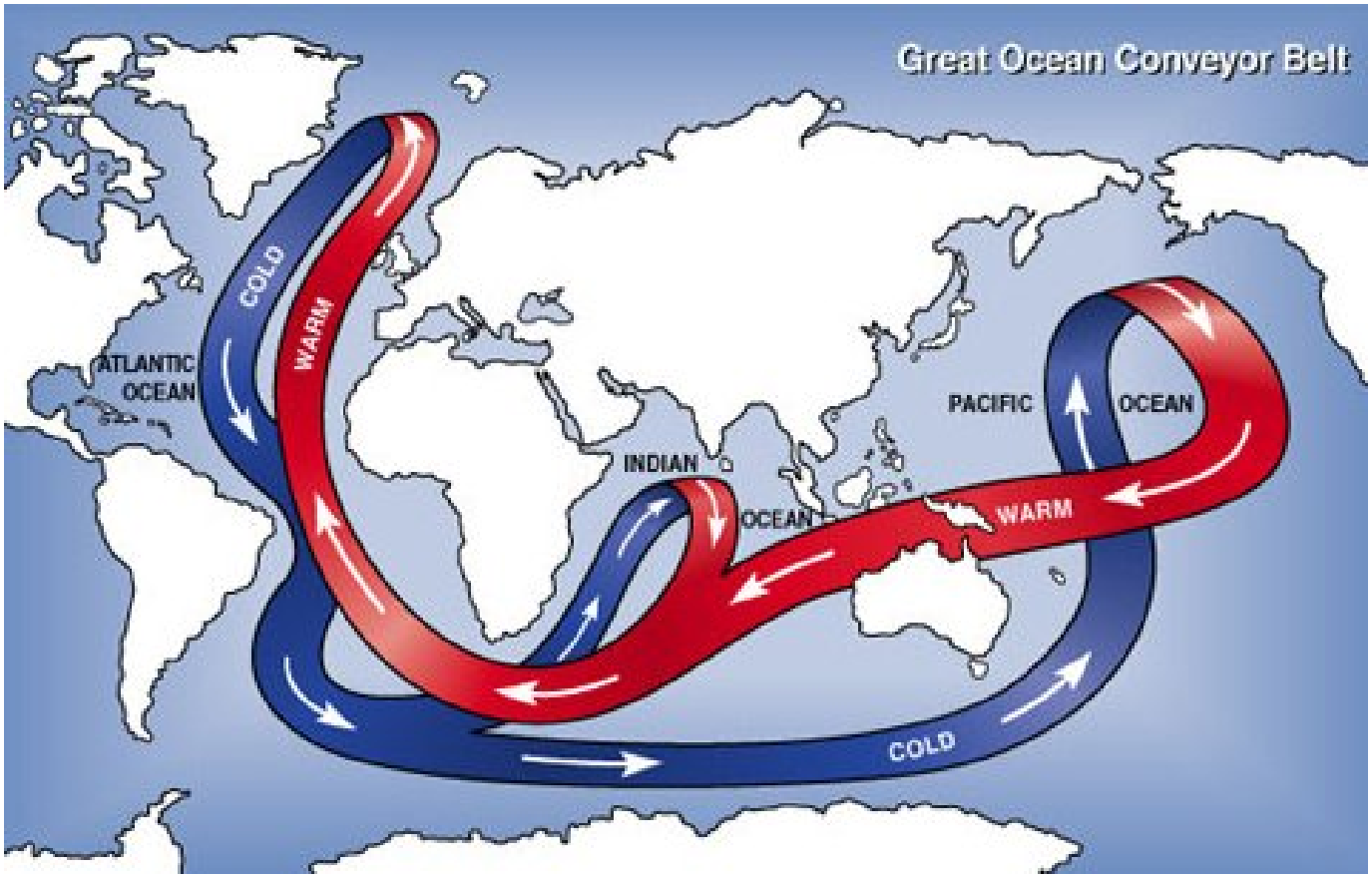

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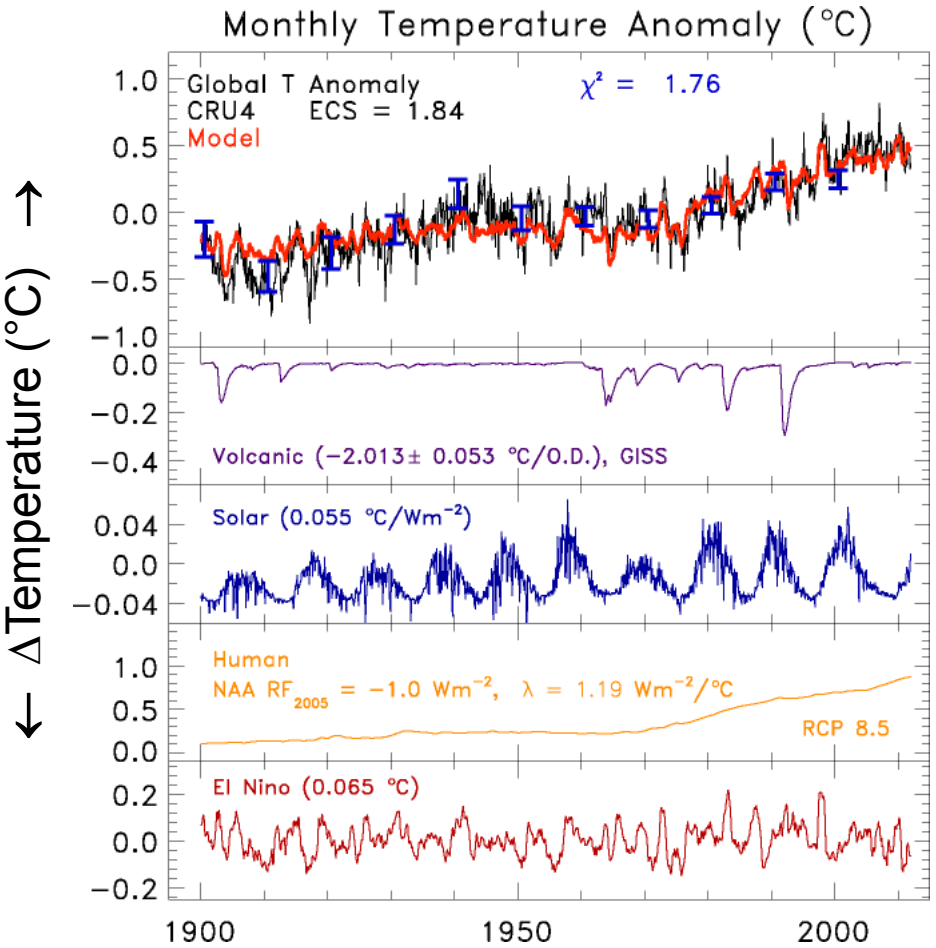

⇦ **Pinatubo Cooling: 0.30 °C**

Canty *et al.*, 2013

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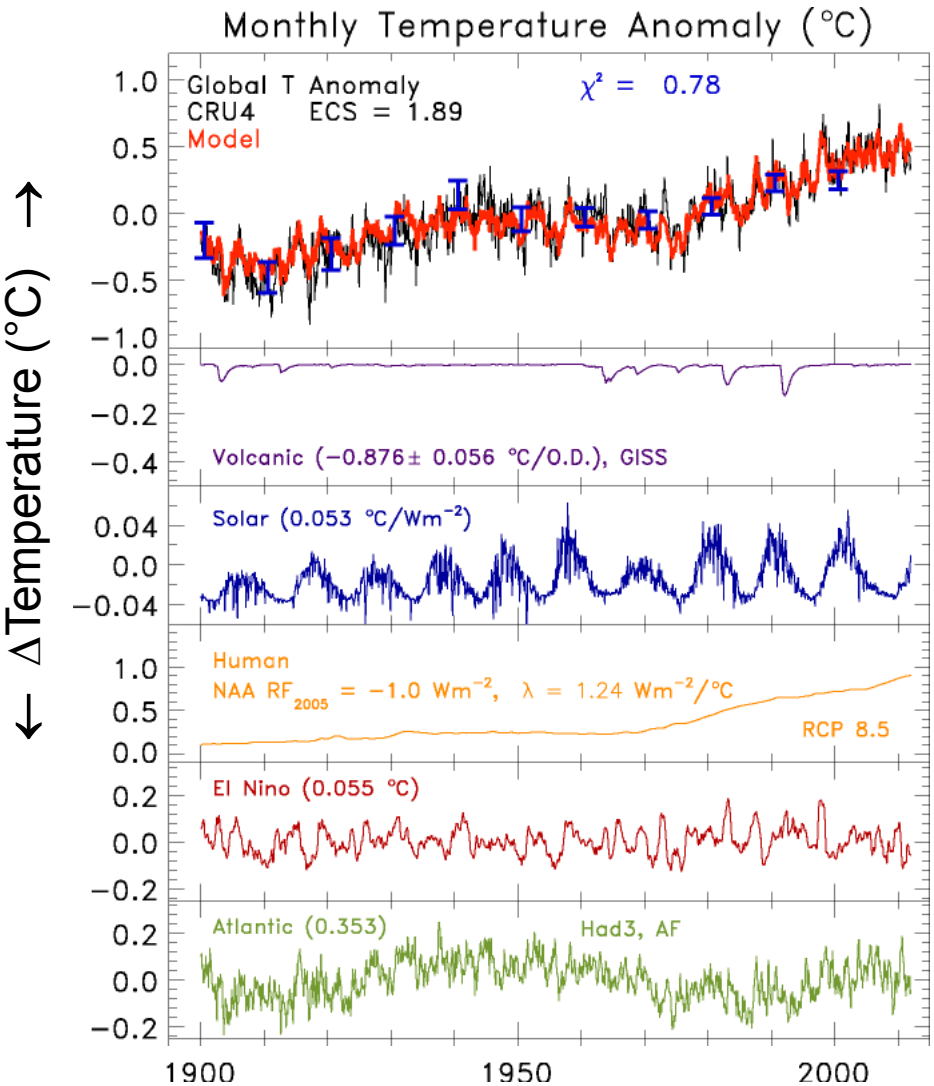
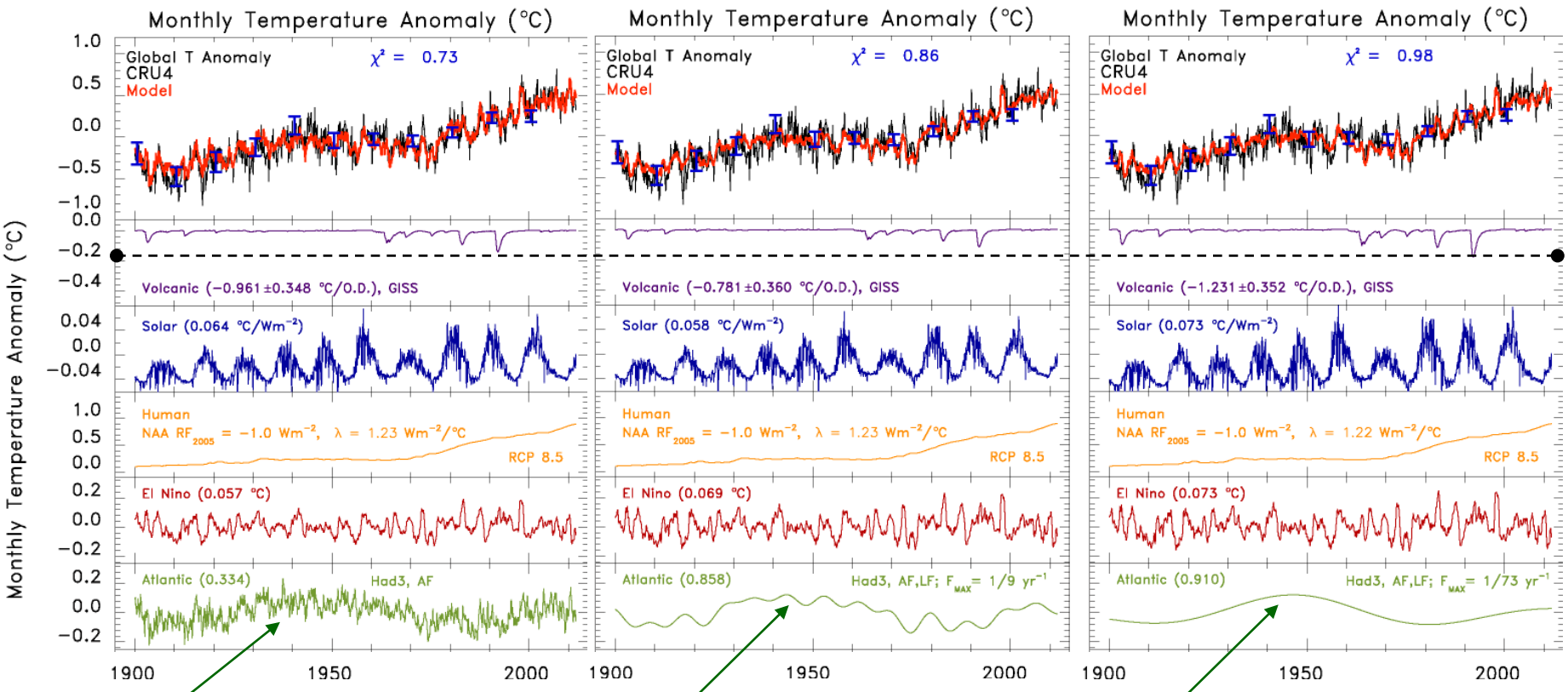


⇦ **Pinatubo Cooling: 0.13 °C**

Canty et al., 2013

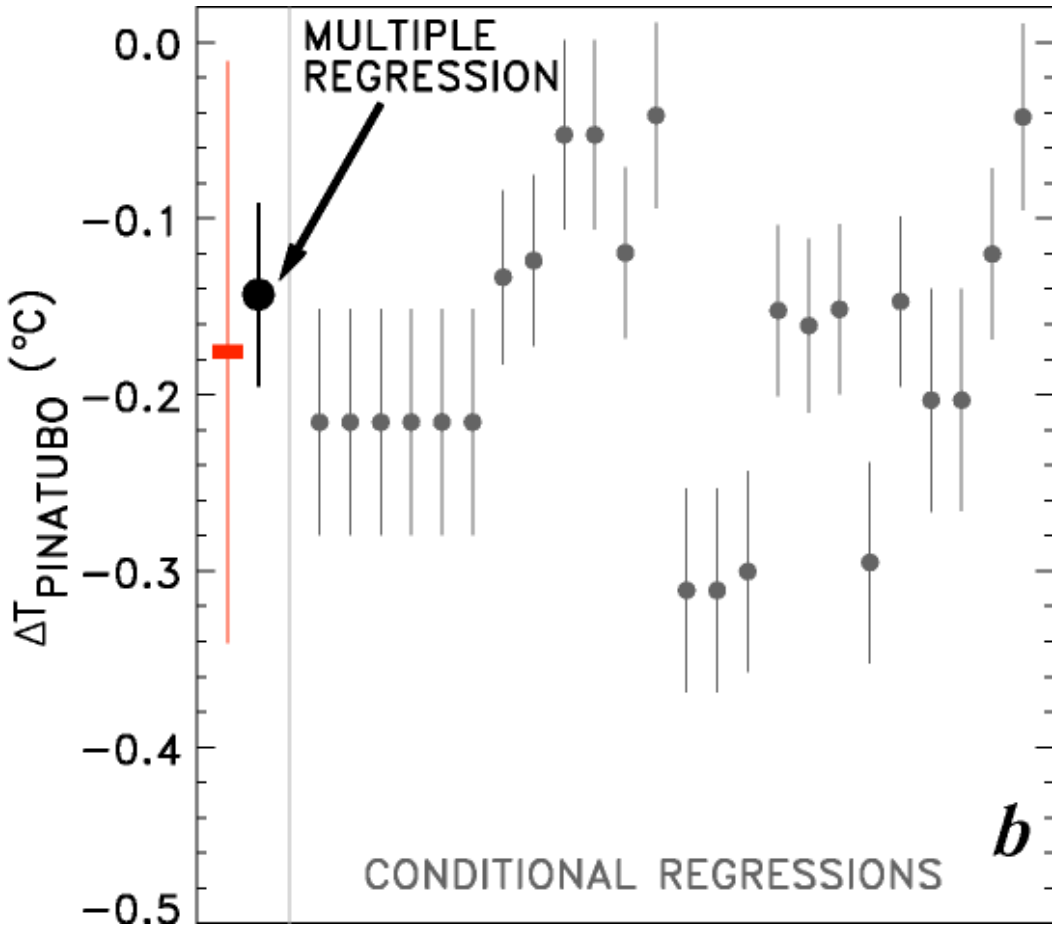
High Amplitude Low Frequency Component of North Atlantic SST Drives Lower Estimate for Volcanic Cooling



Canty *et al.*, 2013

Full AMV **Moderately Filtered AMV** **Heavily Filtered AMV**

AMV Filtering Conducted Using Fourier Analysis



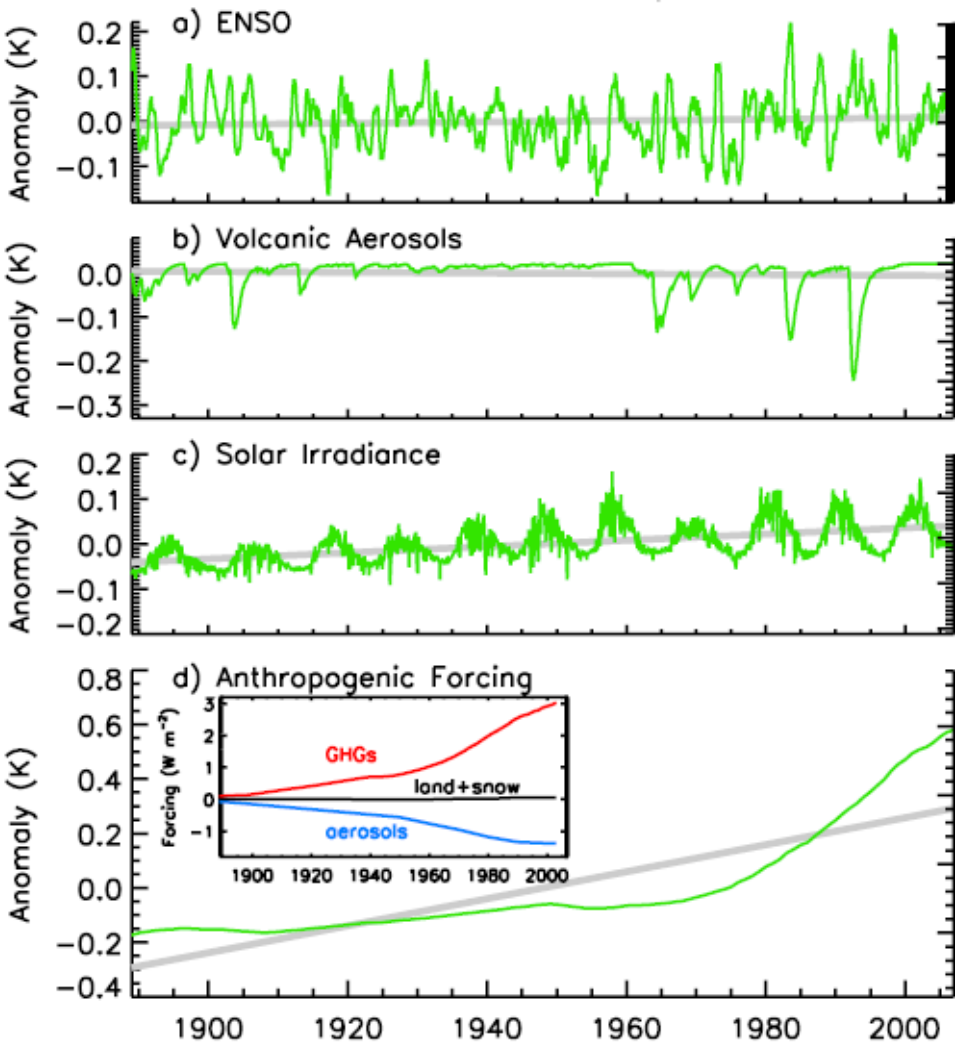
Canty *et al.*, 2013

Co-linearity of regression variables addressed using Conditional Regression

AOSC 652: Analysis Methods in AOSC

Assignment #10

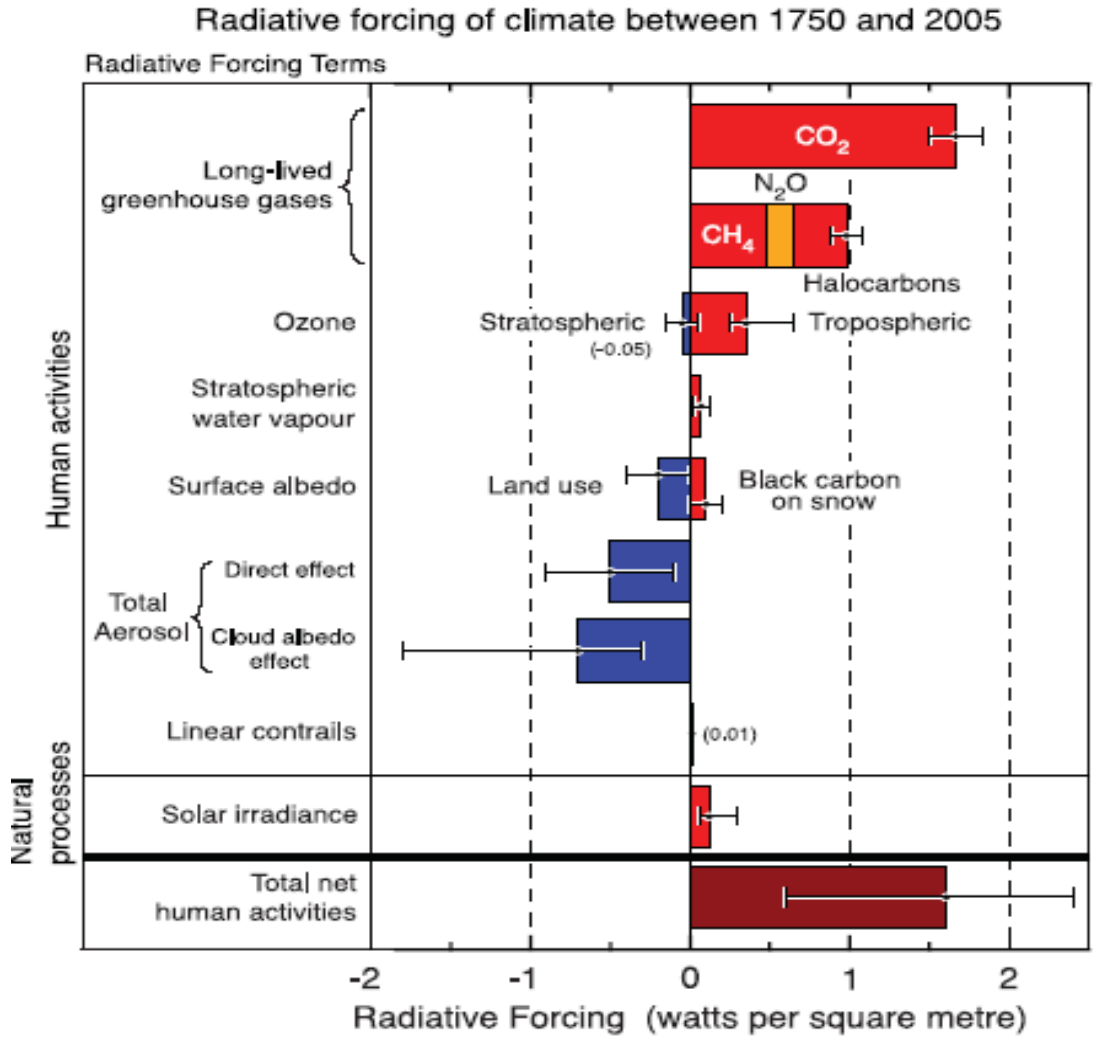
What variable did we handle in a more simple manner than Lean and Rind ?



AOSC 652: Analysis Methods in AOSC

Assignment #10

Based on this figure, does our model provide a reasonable forecast?

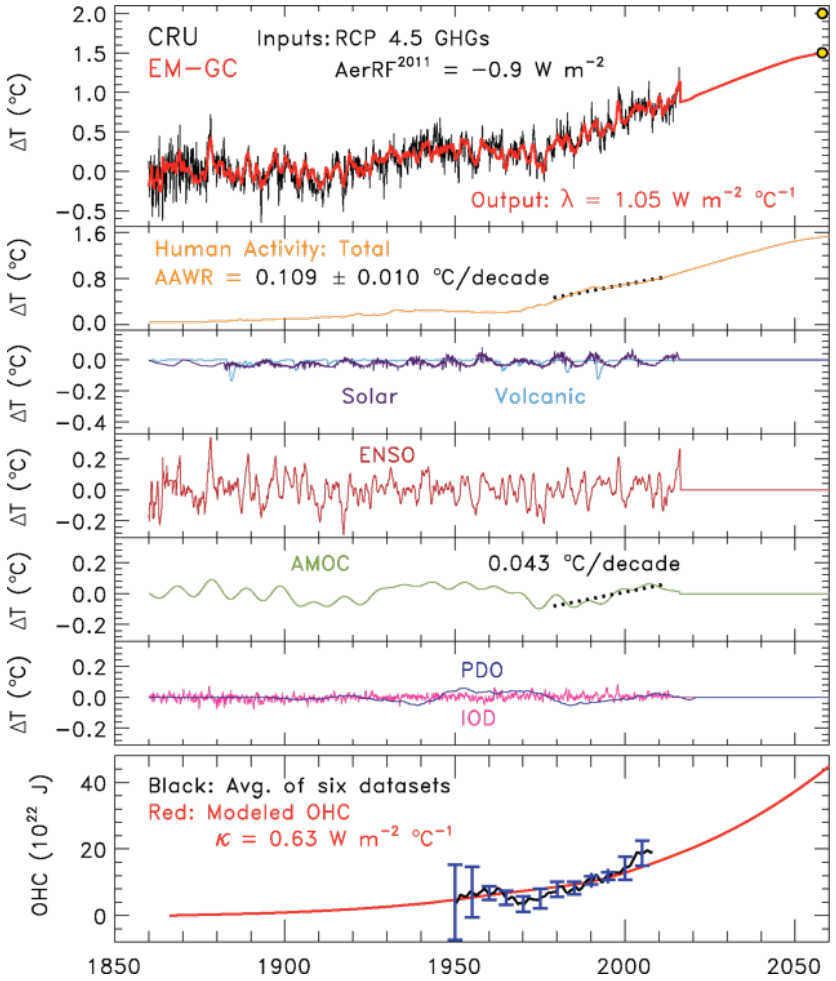


FAQ 2.1, Figure 2. *Summary of the principal components of the radiative forcing of climate change.*

IPCC, 2007

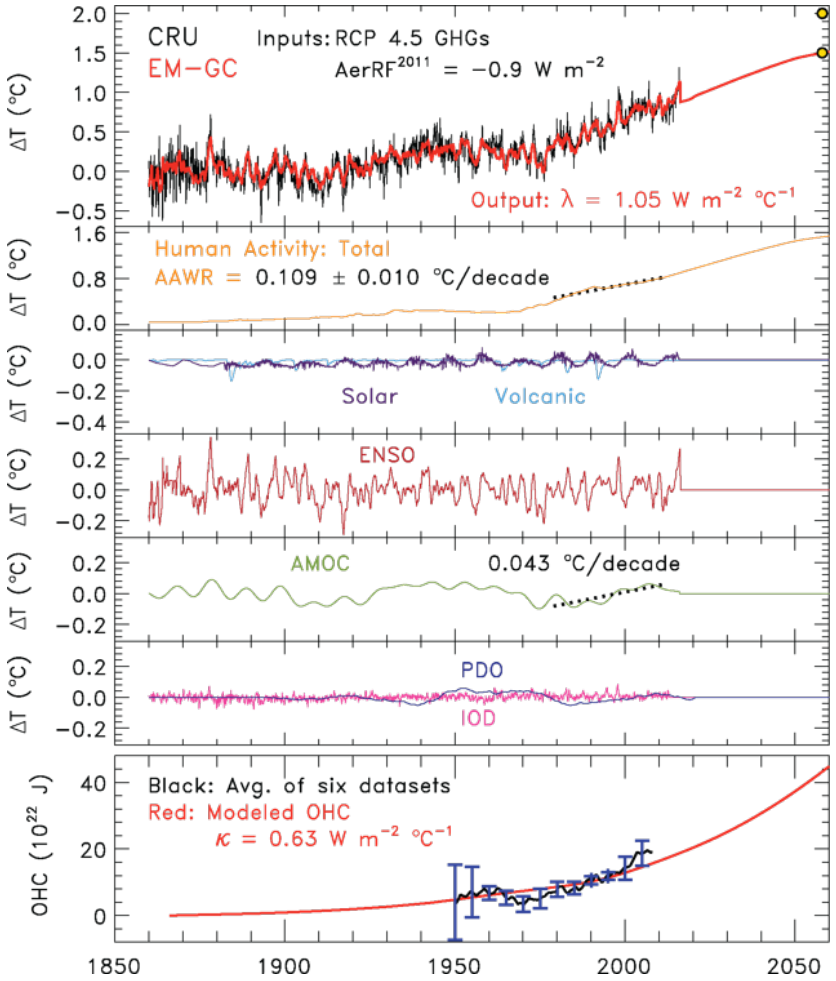
AOSC 652: Analysis Methods in AOSC

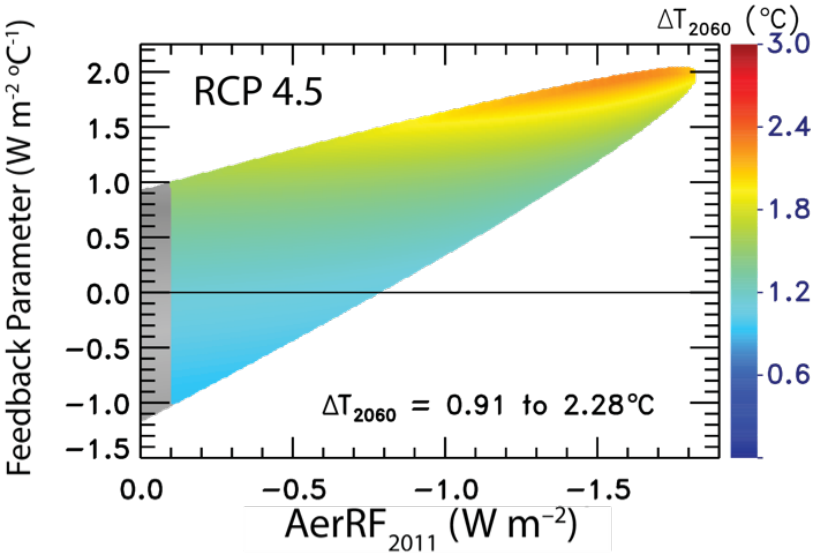
Based on this figure, does our model provide a reasonable forecast?



AOSC 652: Analysis Methods in AOSC

Based on this figure, does our model provide a reasonable forecast?





AOSC 652: Analysis Methods in AOSC

Based on this figure, does our model provide a reasonable forecast?