The Myth of Global Temperature Hiatus

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Introduction

In the latest years, roughly from 2000, global mean temperature increases slower than the global climate model predictions. This is the so called **"Global warming hiatus"**. We investigate whether this phenomenon is real, and if it is unique for the recent time period. More specifically we seek to answer two questions:

1) are the differences statistically significant?, and
2) are they exceptional in a historical perspective?

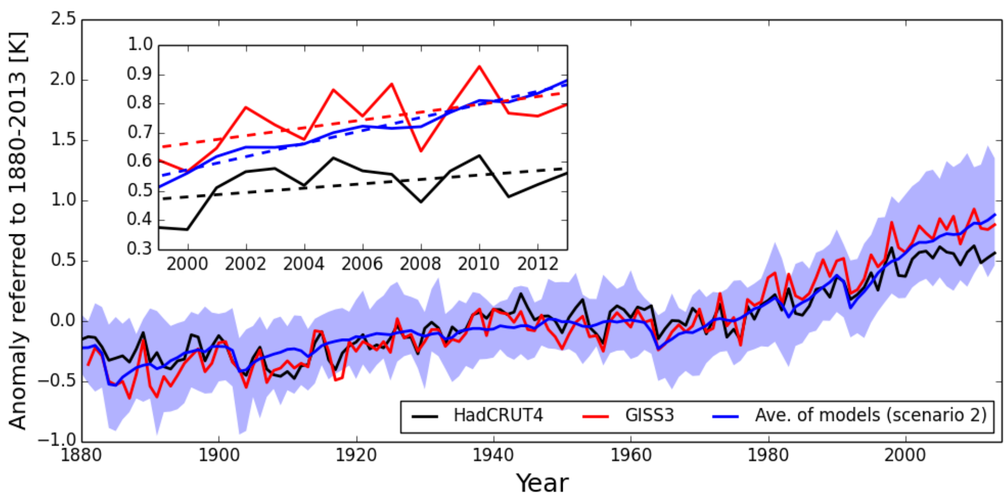


Fig. 1. One example of anomalies taken from the datasets. The shaded area indicates the Min/Max of available models in the scenario 2 experiment.

Tab. 1. The linear regression parameters

	Slope	Intercept	R	p value	stderr
GISS3	0.013	-26.12	0.59	0.019	0.005
HadCRUT4	0.007	-14.47	0.44	0.100	0.004
Ave. of models (2)	0.022	-44.19	0.98	$1.380*10^{-10}$	0.001

Dataset

Global surface temperature

- GISS3 [1]
- HadCRUT4 [2]
- 38 of 45 climate models, RCP2

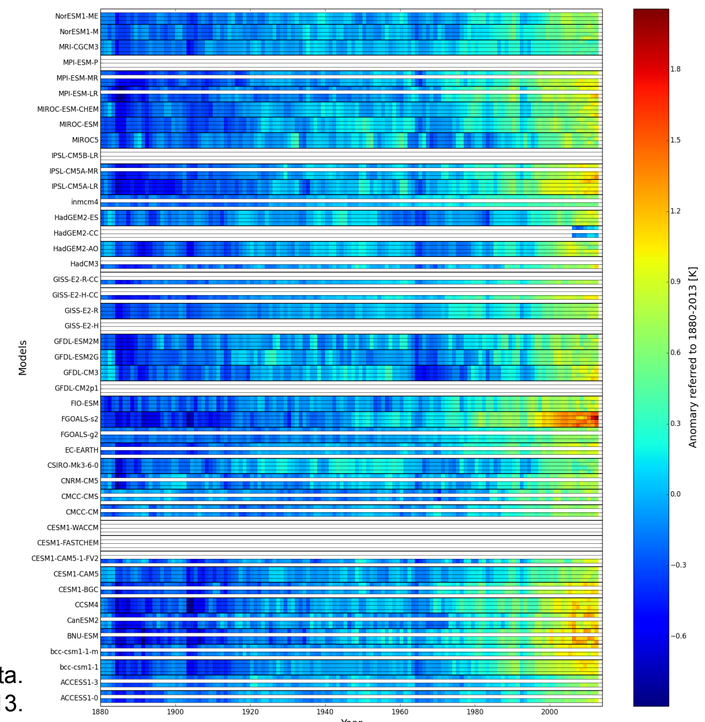


Fig. 2. Anomalies of all modeldata. The reference period is 1880-2013.

Methods

- Comparison of consecutive 15 year periods
- Statistical tests of differences between models and data
- Comparing
  - Mean
  - Variance
  - Linear trend
- AR(1) time series to model autocorrelation

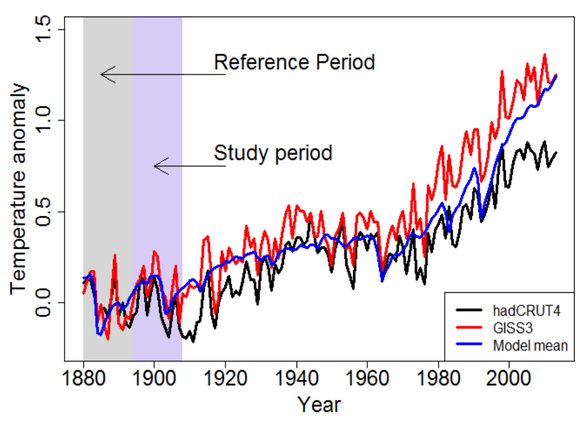
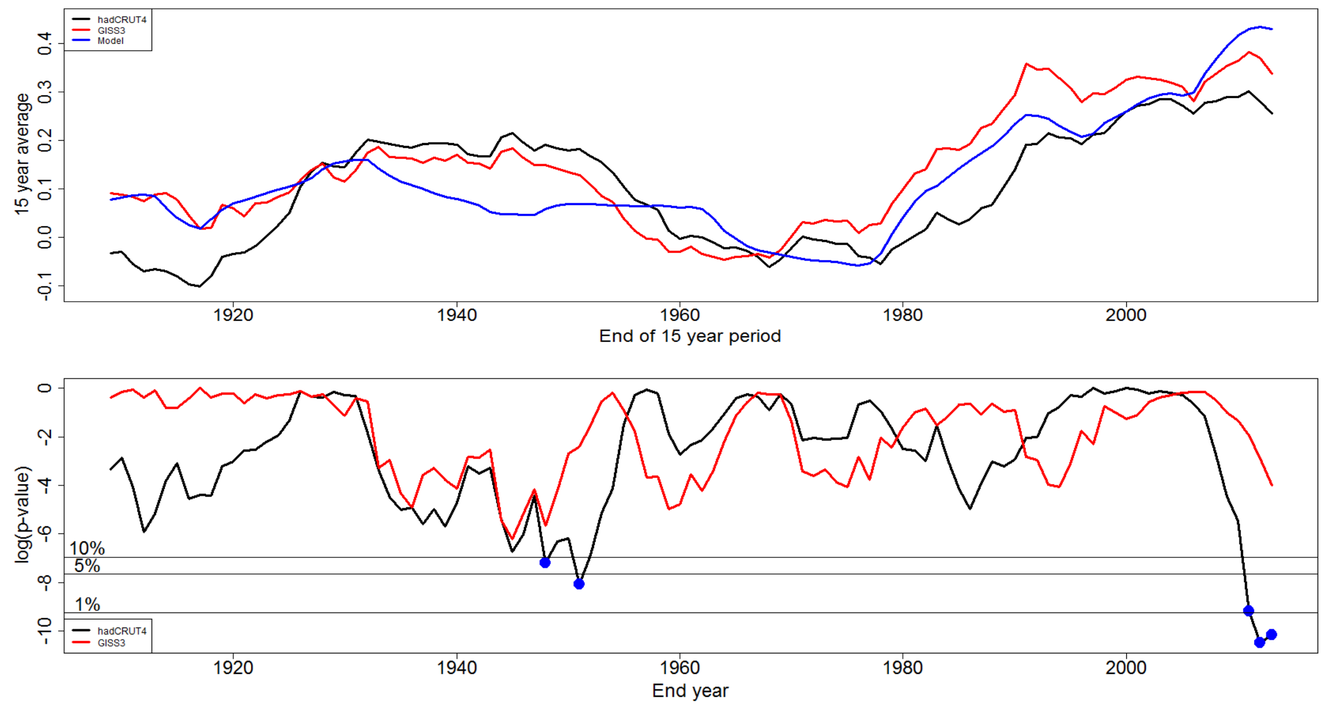


Fig. 3. Temperature anomalies for three data sets. Study and reference periods are shown.

Moving reference period for comparing means. The choice is conservative, neglecting changes accumulated over previous years.

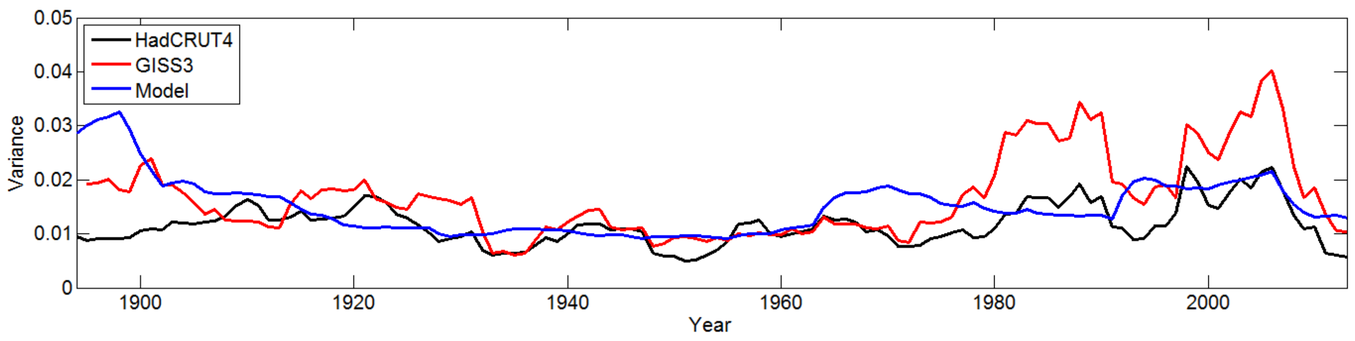
Approach

Means

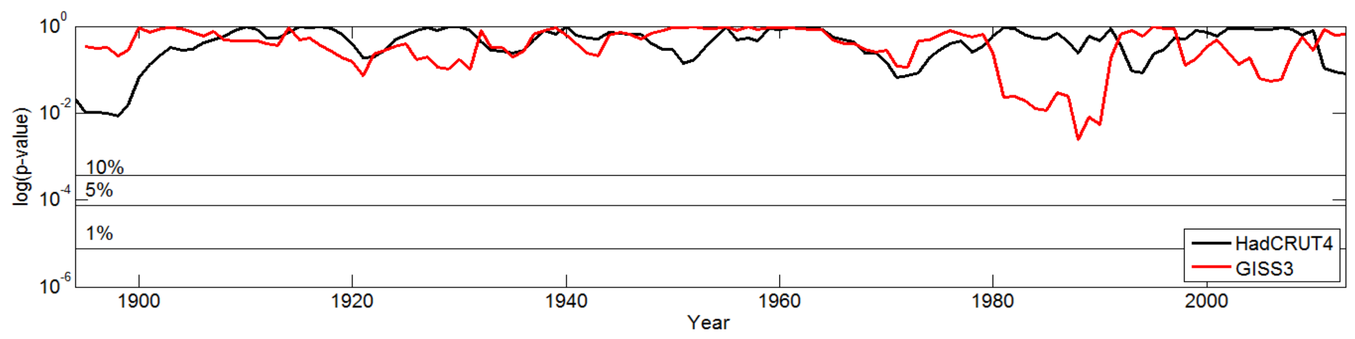


p-values for testing the null hypothesis of no difference in mean values. There are no significant differences in the mean of the model data and GISS3 data. For the hadCRUT4 data significant differences are found after 2000, but also around 1950.

Variances

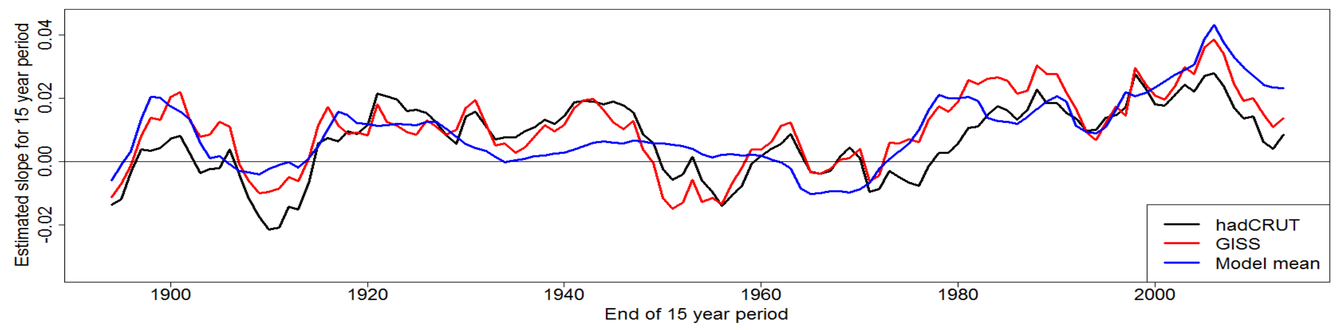


Variances for the models are similar magnitude of HadCRUT4, while they are smaller than GISS after 1980.

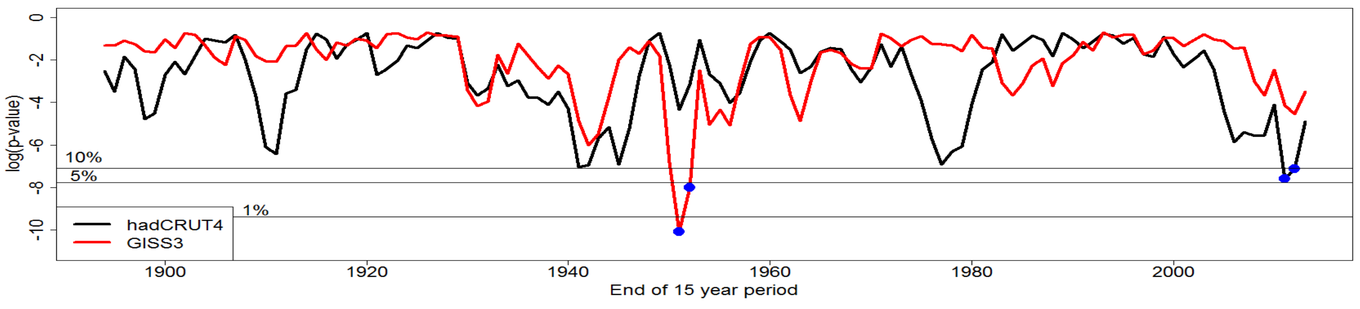


p-values from test of equal variances for models and the two data sets. Neither GISS3 nor HadCRUT4 shows significant differences at the 10% level.

Linear trends



Fitted slope coefficients. There are several periods where the average slope of the models is consistently higher or lower than those of the data series..



p-values for the hypothesis that the average of the model slopes is equal to the slope of the different data sets. Concerning the last few 15 year periods , only hadCRUT4 show some significant differences at a 10% level. Comparable differences are found in the late 1970s and early 1940s.

Conclusions

- Model accordance with data is different for the two data sets
- Results concerning the significance of the recent hiatus are ambiguous
- Only for the hadCRUT4 are the recent discrepancies the most significant

Considering the GISS3 data we find little or no reason to question the model projections for the recent years. Comparing the models to the hadCRUT4 data the models do seem to overestimate the increase in GMT. However, we find comparable discrepancies earlier in time, and find no reason to question that the long term increase in temperatures will continue.

References 1) http://data.giss.nasa.gov/gistemp/ , 2)http://www.cru.uea.ac.uk/cru/data/temperature/