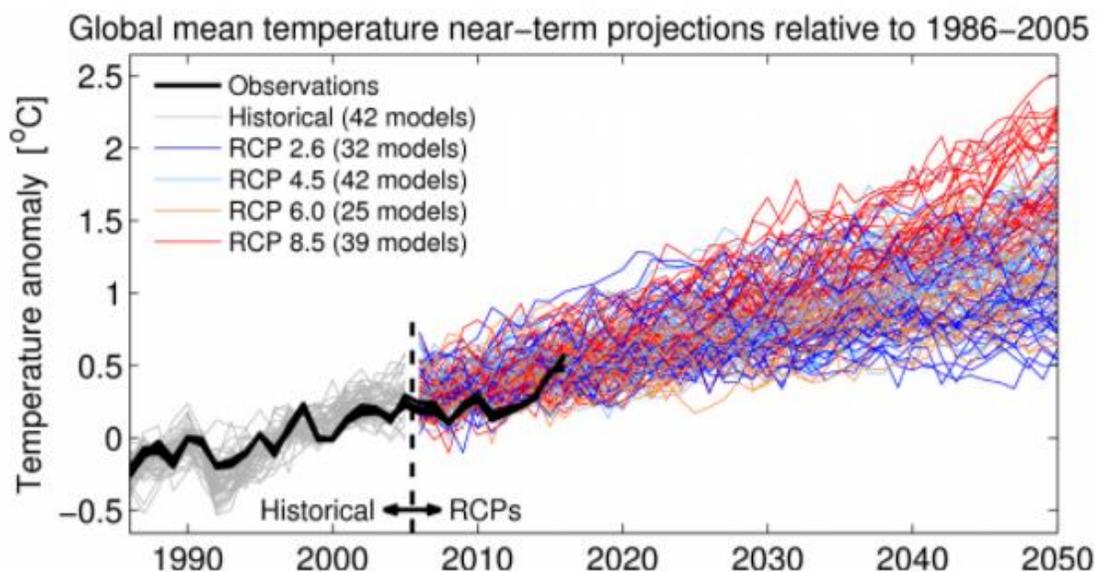


After giving my recent talk at the 6th Lindau Meeting on Economic Sciences and making a reference to the fact that recent climate models run hot relative to evidence, I was urged to look at updated data by others including by a young scholar, [Thomas Schinko](#), at the [International Institute for Applied Systems Analysis](#). I appreciate this push, and it led me to look for updated figures and discussions.

Neither William “Buz” Brock nor I claim to be climate scientists, but we are keenly interested to update information about climate model performance. In terms of the issue at hand, I found a discussion by [Ed Hawkins](#) posted at www.climate-lab-book.ac.uk/comparing-cmip5-observations/. This includes an updated version of Figure 1 in my paper with Buz Brock entitled, “[Wrestling with Uncertainty in Climate Economic Models](#)” and has a nice conjecture for why updated data and model comparisons give a different picture. I reproduce the updated figure here:



Updated version of IPCC AR5 Figure 11.25a, showing observations and the CMIP5 model projections relative to 1986-2005. The black lines represent observational datasets (HadCRUT4.5, Cowtan & Way, NASA GISTEMP, NOAA GlobalTemp, BEST).

At the end of his discussion, Ed Hawkins writes:

There are several possible explanations for why the earlier observations are at the lower end of the CMIP5 range. First, there is internal climate variability, which can cause temperatures to temporarily rise **faster or slower** than expected. Second, the radiative forcings used after 2005 are from the RCPs, rather than as observed. Given that there have been some small volcanic eruptions and a dip in solar activity, this has **likely caused** some of the apparent discrepancy. Third, the real world may have a climate sensitivity towards the **lower end** of the CMIP5 range. Next, the exact position of the observations within the CMIP5 range **depends slightly on the**

reference period chosen. Lastly, this is not an apples-with-apples comparison because it is comparing air temperatures everywhere (simulations) with blended and sparse observations of air temperature and sea temperatures. A combination of some of these factors is likely responsible.

In conversations with other physicists, for instance Bob Rosner at the University of Chicago, I remain convinced that potential model misspecification in climate economic models is an important concern. Understanding how best to use these models while acknowledging this potential and other forms of uncertainty remains an important conceptual challenge.

I am most appreciative for the push to provide a more updated view of the recent model performance. I have replaced Figure 6 in my talk and have removed Figure 7. Interestingly, I first saw Figure 7 in the preliminary [American Physical Society Climate Change Statement Review Workshop Framing Document Climate Change Statement Review Subcommittee](#), December 20, 2013.

Lars Peter Hansen