

From: Phil Jones <p.jones@uea.ac.uk>
 To: Ben Santer <santer1@llnl.gov>
 Subject: Re: [Fwd: More PCM-ERA40 comparisons]
 Date: Tue Mar 2 09:06:41 2004

Ben,

Thanks for the plots and keeping me up to date. The ERA-40/CRU comparisons are quite interesting. I'm hopeful Adrian will write up a summary for publication in addition to an ECMWF report.

This sort of thing is important wrt IPCC and also papers such as Kalnay and Cai.

I'm also working with Russ Vose and others at NCDC to get a comparison of CRU/GHCN and NASA datasets in GRL. NCDC have used their first difference technique with CRU data. Differences are very, very small due to data and the technique doesn't matter much either. All seems to boil down to how the global average is defined. Calculated as one domain as NCDC (and until recently the HC as well) want to do it, it is biased to the NH. If you do it the CRU way ($G=0.5(NH+SH)$) then it looks much more like an OA version of HadCRUT2v that the HC have just produced. Been saying this for years as has Tom, so no surprises. Finally got the HC to realise it, now just need to convince NCDC.

NCDC will also have a new 5 by 5 deg gridded dataset of Tx and Tn soon, right up to the present. Need to compare this with ERA-40.

Cheers

Phil

At 18:46 01/03/2004 -0800, you wrote:

Dear Phil,

Here are the PCM/ERA-40 2m temperature comparisons that I mentioned in my email to Adrian....

Cheers,

Ben

--

 PCMDI HAS MOVED TO A NEW BUILDING. NOTE CHANGE OF MAIL CODE!

Benjamin D. Santer

Program for Climate Model Diagnosis and Intercomparison

Lawrence Livermore National Laboratory

P.O. Box 808, Mail Stop L-103

Livermore, CA 94550, U.S.A.

Tel: (925) 422-7638

FAX: (925) 422-7675

email: santer1@llnl.gov

-----Return-Path:
 <santer1@llnl.gov>

Received: from smtp-3.llnl.gov ([128.115.41.83] verified)

by popcorn.llnl.gov (CommuniGate Pro SMTP 4.0.6)

with ESMTP id 34392268 for santer1@popgun.llnl.gov; Thu, 26 Feb 2004 18:00:27 -0800

Received: from pierce.llnl.gov (localhost [127.0.0.1])

by smtp-3.llnl.gov (8.12.3p2-20030917/8.12.3/LLNL evision: 1.13 \$) with ESMTP id i1R200E6003673

for <santer1@popgun.llnl.gov>; Thu, 26 Feb 2004 18:00:24 -0800 (PST)

Received: from smtp-3.llnl.gov (smtp-3.llnl.gov [128.115.41.83])

by pierce.llnl.gov (8.12.3p2-20030917/8.12.3/LLNL evision: 1.5 \$) with ESMTP id i1R20Nk0028603

for <santer1@llnl.gov>; Thu, 26 Feb 2004 18:00:23 -0800 (PST)

Received: from popcorn.llnl.gov (localhost [127.0.0.1])

by smtp-3.llnl.gov (8.12.3p2-20030917/8.12.3/LLNL evision: 1.13 \$) with ESMTP id i1R208Af003594;

Thu, 26 Feb 2004 18:00:09 -0800 (PST)

Received: from [128.115.57.176] (account santer1 HELO llnl.gov)

by popcorn.llnl.gov (CommuniGate Pro SMTP 4.0.6)

with ESMTP id 34392176; Thu, 26 Feb 2004 18:00:08 -0800

Sender: bsanter@smtp-3.llnl.gov

Message-ID: <403EA554.20D01DFD@llnl.gov>

Date: Thu, 26 Feb 2004 18:03:00 -0800

From: Ben Santer <santer1@llnl.gov>

Organization: LLNL

X-Mailer: Mozilla 4.79 [en] (X11; U; Linux 2.4.18-14 i686)

X-Accept-Language: en

MIME-Version: 1.0

To: Adrian.Simmons@ecmwf.int, wmw@ucar.edu, meehl@ucar.edu, wigley@ucar.edu, ammann@ucar.edu

Subject: More PCM-ERA40 comparisons

References: <403B1219.4060905@ecmwf.int>

Content-Type: multipart/mixed;

boundary="-----7A520C5A8CA7CE01BA097390"

X-Mozilla-Status2: 00000000

Dear Adrian,

Thanks very much for sending me your comparison of surface air temperature changes in CRU and ERA-40. I've been looking at a related issue - the correspondence between 2m temperature changes in ERA-40 and PCM.

Here's the background to this work. Increasingly, there is some interest in the problem of identifying anthropogenic climate change at regional scales. I have to give a brief talk on this subject tomorrow. In preparing for this talk, I decided that it would be useful to show how signal and noise change as a function of spatial scale. I looked at the behavior of 2m temperature in the four individual realizations of the PCM "ALL forcings" experiment (the same experiment that we analysed in our joint Nature paper). For each realization, I computed spatial averages over the globe, the Northern Hemisphere, and the western United States (30-50N, 126W-114W). These spatial averages were then expressed as anomalies relative to climatological monthly means over 1979-1999. The orange shading in the three panels of the figure entitled "tas_tseries3.ps" is a measure of the between-realization variability in PCM. The envelope is simply the range (during any given month) between the maximum and minimum values of the four realizations. This range was then low-pass filtered. The solid red is the low-pass filtered ensemble mean.

To facilitate comparison with PCM data, I've defined 2m temperature anomalies in ERA-40 in the same way (i.e., relative to climatological monthly means over 1979-1999), and have used the same low-pass filter. One can then ask whether the 2m temperature changes in ERA-40 are consistent with those in PCM - in other words, are they encompassed by PCM's envelope of possible climate responses to combined anthropogenic and natural forcing?

They are. Surprisingly, this consistency occurs not only at the global-mean level, but also for the NH and western U.S. For the global-mean and the NH, the ERA-40 2m temperature changes are outside PCM's envelope of 2m temperature changes during the first 5-10 years of the reanalysis. After the late 1960s, however, the ERA-40 2m temperature changes are entirely consistent with those in PCM. Over the western U.S., 2m temperature changes in PCM and ERA-40 are consistent throughout the reanalysis period.

Such qualitative consistency, while interesting, is no substitute for formal, pattern-based fingerprint detection studies at global, hemispheric, and regional scales. For example, an overestimate of the regional-scale variability of 2m temperature by PCM could explain why PCM's 2m temperature changes over the western U.S. fully encompass the ERA-40 result (see panel C). On the other hand, there is some real similarity in the low-frequency component of the 2m temperature changes in ERA-40 and PCM (look at the similar responses to Agung, Chichon, and Pinatubo in panel B!)

The bottom line is that PCM's 2m temperature changes are reasonably consistent with those in ERA-40, even at sub-global spatial scales. This suggests that formal regional-scale detection work might be useful. If you are interested, perhaps we could collaborate on such work. A collaboration would also involve the PCM group at NCAR (to whom I'm copying this email).

The second figure that I've appended shows the global-mean changes in synthetic MSU channel 2 temperatures in PCM and ERA-40. The message is pretty much the same as for 2m temperatures: PCM's "envelope" of possible changes in tropospheric temperatures largely encompasses the ERA-40 results, except during a few large El Nino and La Nina events. Once again, there is surprising similarity in the low-frequency component of the model and reanalysis T2 changes.

It would be fun to take these simple comparisons a little further!

With best regards,

Ben

--

PCMDI HAS MOVED TO A NEW BUILDING. NOTE CHANGE OF MAIL CODE!

Benjamin D. Santer

Program for Climate Model Diagnosis and Intercomparison

Lawrence Livermore National Laboratory

P.O. Box 808, Mail Stop L-103
Livermore, CA 94550, U.S.A.
Tel: (925) 422-7638
FAX: (925) 422-7675
email: santer1@llnl.gov

Prof. Phil Jones
Climatic Research Unit Telephone +44 (0) 1603 592090
School of Environmental Sciences Fax +44 (0) 1603 507784
University of East Anglia
Norwich Email p.jones@uea.ac.uk
NR4 7TJ
UK
