CRU CORRESPONDENCE
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1. 0826209667.txt
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##########

From: "Tatiana M. Dedkova" <tatm@insec.quorus.e-burg.su>
To: K.Briffa@uea.ac.uk
Subject: schijatov
Date: Thu, 7 Mar 96 09:41:07 +0500

Dear Keith, March 6, 1996

I and Eugene received your E-mail of 04.03.1996. This day I talked over the telephone with Eugene and he asked me to send an answer from both of us.

Thank you for the information concerning proposals to the INCO/COPERNICUS. We agree with your strategy used and we hope that this proposal will not be rejected.

The results of INTAS-RFBR proposal will be known at the beginning of May. We know that they received many proposals and a competition is high (only 1 in 10 proposals might get money). Of course, you included in as a participant. Fritz is a coordinator from the INTAS countries.

This year our laboratory received two small grants (approximately 8,000-10,000 USD per year) from the Russian Foundation of Basic Researches (RFBR) for the next three years: the first one for developing the Yamal supra-long chronology and the second one for developing tree-ring chronologies from living trees growing at the polar timberline in Siberia (together with Vaganov's laboratory). These money are very important for us as they will allow to maintain the staff of our laboratories.

I and Valery Mazepa were in Krasnoyarsk during one month and together with E.Vaganov wrote the manuscript of book "Dendroclimatic Studies in the Ural-Siberian Subarctic". The problem now is to find money for its publication. If we find enough money soon (20 million roubles), the book will be published this autumn. We analysed 61 mean ring-width and 6 cell chronologies which we intend to publish in form of tables in the Appendix. We can send to you all raw measurements which were used for developing these chronologies.

Of course, we are in need of additional money, especially for collecting wood samples at high latitudes and in remote regions. The cost of field works in these areas is increased many times during the last some years. That is why it is important for us to get money from additional sources, in particular from the ADVANCE and INTAS ones. Also, it is important for us if you can transfer the ADVANCE money on the personal accounts which we gave you earlier and the sum for one occasion transfer (for example, during one day) will not be more than 10,000 USD. Only in this case we can avoid big taxes and use money for our work as much as possible. Please, inform us what kind of documents and financial reports we must represent you and your administration for these money.

I and Eugene have a possibility to participate in the Cambridge meeteng in July, but we need extra many and special invitations. If you do not have enough money to invite both of us, Eugene does not insist upon this visit.

The best wishes to you and Phil.

Yours sincerely Stepan Shiyatov

2. 0835015638.txt
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##########

From: "Tatiana M. Dedkova" <tatm@insec.quorus.e-burg.su>
To: k.briffa@uea.ac.uk
Subject: schiyatov
Date: Mon, 17 Jun 96 08:47:18 +0500

Dear Keith,
     I have bought the tickets from Moscow to London and back. My arrival to London (Heathrow Airport) is by flight SU 245 (Aeroflot Company) on July 19. Departure from Moscow is at 20.10 (local time), arrival to London is approximately at the same local time. As I know, Evgeny Vaganov did not bay tickets until now, but he informed of my dates and can bay tickets the same flights. My depature from London to Moscow is on August 1 by the Aeroflot Company flight SU 244 at 09.00 of local time.
     Please, inform me how can I arrive at Cambridge from London? Is there the program of this meeting? We must be ready to do some reports? For example, I can prepare a report about the progress in developing the Yamal supra-long chronology and together with Evgeny about dendroclimatic investigation in the Ural-Siberian subarctic.
     Rashit Hantemirov and Alexander Surkov will go soon to the Yamal peninsula (June 24). This summer they want to collect subfossil material from areas which are much more remote and situated at higher latitudes. We hoped to use some money of the ADVANCE project. But we have not received this money until now and the program of collecting during this summer will be reduced.
     Some days ago I received an information that the INTAS-RFBR project was rejected. The competition was very high.

     Sincerely yours   Stepan Shiyatov

3. 0835819980.txt
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##########

From: km_king@ccmail.pnl.gov
To: F028@uea.ac.uk
Subject: URGENT RESPONSE NEEDED - Early Detection Work
Date: Wed, 26 Jun 1996 16:13 -0700 (PDT)

Dr. Jones,

I am contacting you on behalf of Dave Bader and Tim Barnett regarding a couple

action items in support of early detection on climate change. Based upon the anticipated award for NOAA support during fiscal year 1997 on climate change data and detection, DOE has authorized the Pacific Northwest National Laboratory (PNNL) to utilize existing funding through 9/30/96 to conduct a meeting of the experts, and to begin preliminary investigations.

PNNL would like to place a contract with you as soon as possible to provide support through 9/30/96. In order to place a contract with you, I need to submit a statement of work and signed cost proposal to our Contracts Department. If you could please fax this to me as soon as possible on (509) 375-2698, it would be greatly appreciated.

I thought your activity my look something like the following (feel free to change/edit):

Scope of Work

Dr. Phillip Jones shall begin initial work in support of the pilot project identified in the Early Detection of Climate Trends report. He shall prepare for and participate in a meeting on greenhouse signal detection, to be held in Washington, DC on September 17-18, 1996. In addition, Dr. Jones shall conduct a preliminary analysis ?????? (please provide input)

Deliverables

Prepare for and participate in 9/17-18, 1996 meetings on greenhouse signal.

Provide a summary report on the preliminary analysis of ?????? on or before September 30, 1996.

Also, for your information the current plan for the meeting is for September 17-18, 1996 at the Courtyard by Marriott - Greenbelt, 6301 Golden Triangle Drive, Greenbelt, MD. (301) 441-3311, fax: (301) 441-4978. Government room rate is $89/day.

When you provide your cost estimate, it would be appreciated if you could provide your hourly rate, in addition to travel estimates for the September meeting. To expedite the process, it is very helpful if can include documentation to support your hourly rate.

Please feel free to contact me with any questions. My phone number is 509-375-2861, fax is 509-375-2698.

Thank you,

Karen

4. 0837094033.txt
##########

From: Alan Robock <alan@atmos.umd.edu>
To: Phil Jones <p.jones@uea.ac.uk>
Subject: Re: your mail
Date: Thu, 11 Jul 1996 10:07:13 -0400 (EDT)

Dear Phil,

It looks like you have found Baitoushan. Vol. 2 lists Kuwae as VEI 6 in

1452 +/- 10 AD. How accurate are your dates? By the way, Chris Newhall thinks 1600 is the Parker volcano on Mindanao in the Philippines. He hasn't published that so far, as I know.

Could you please define "utter prat" for me? Sometimes I think we speak the same language, and sometimes I'm not so sure.

I'm doing fine. We have a new building with nice new offices. I'm going to Australia next week with Sherri and Danny, and after the meeting, will visit Cairns, Adelaide, and New Zealand. I'm looking forward to skiing on a volcano, if it stops erupting.

Alan

Prof. Alan Robock   Phone: (301) 405-5377
Department of Meteorology   Fax: (301) 314-9482
University of Maryland   Email: alan@atmos.umd.edu
College Park, MD 20742   http://www.meto.umd.edu/~alan

On Thu, 11 Jul 1996, Phil Jones wrote:

> Alan,
>   Thanks for the quick response. We'll expect something from Melissa
> in the next few weeks. I also hope our copy of the 2cnd edition arrives
> soon. In our maximum latewood density reconstruction from the polar Urals
> to AD 914, the most anomalous summer is AD 1032. A lot of other volcano
> years are there with summers of -3 to -4 sigma such as 1816,1601,1783 and
> 1453 (I think this later one is Kuwae that is being found in the Ice Cores
> in the Antarctic. However 1032 is 6 sigma and it may be the Baitoushan
> event which you say is 1010 +/- 50 years or the Billy Mitchell event.
>
>   I hope all's well with you.
>
> Cheers
> Phil
>
> PS Britain seems to have found it's Pat Michaels/Fred Singer/Bob Balling/
>   Dick Lindzen. Our population is only 25 % of yours so we only get 1 for
>   every 4 you have. His name in case you should come across him is
>   Piers Corbyn. He is nowhere near as good as a couple of yours and he's
>   an utter prat but he's getting a lot of air time at the moment. For his
>   day job he teaches physics and astronomy at a University and he predicts
>   the weather from solar phenomena. He bets on his predictions months
>   ahead for what will happen in Britain. He now believes he knows all
>   there is to know about the global warming issue. He's not all bad as
>   he doesn't have much confidence in nuclear-power safety. Always says
>   that at the begining of his interviews to show he's not all bad !
>
> Cheers Again
>
> Phil
> Dr Phil Jones
> Climatic Research Unit   Telephone +44 (0) 1603 592090
> School of Environmental Sciences   Fax   +44 (0) 1603 507784
> Norwich   Email   p.jones@uea.ac.uk
> NR4 7TJ
> UK
> --
>
>

5. 0837197800.txt
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From: Keith Briffa <k.briffa@uea.ac.uk>
To: Neil Loader
Subject: Cambridge details
Date: Fri Jul 12 14:56:40 1996

>Date: Fri, 12 Jul 1996 12:05:15 +0100
>To: "Tatiana M. Dedkova" <tatm@insec.quorus.e-burg.su>
>From: Keith Briffa <k.briffa@uea.ac.uk>
>Subject: Cambridge details
>Cc: Neil Loader
>
>At 08:47 17/06/96 +0500, you wrote:
>>Dear Keith,
>>   I have bought the tickets from Moscow to London and back. My arrival
>>to London (Heathrow Airport) is by flight SU 245 (Aeroflot Company) on
>>July 19. Departure from Moscow is at 20.10 (local time), arrival to London
>>is approximately at the same local time. As I know, Evgeny Vaganov did not
>>bay tickets until now, but he informed of my dates and can bay tickets the
>>same flights. My depature from London to Moscow is on August 1 by the
>>Aeroflot Company flight SU 244 at 09.00 of local time.
>>   Please, inform me how can I arrive at Cambridge from London? Is
>>there the program of this meeting? We must be ready to do some reports?
>>For example, I can prepare a report about the progress in developing the
>>Yamal supra-long chronology and together with Evgeny about dendroclimatic
>>investigation in the Ural-Siberian subarctic.
>>   Rashit Hantemirov and Alexander Surkov will go soon to the Yamal
>>peninsula (June 24). This summer they want to collect subfossil material
>>from areas which are much more remote and situated at higher latitudes.
>>We hoped to use some money of the ADVANCE project. But we have not received
>>this money until now and the program of collecting during this summer will
>>be reduced.
>>   Some days ago I received an information that the INTAS-RFBR project
>>was rejected. The competition was very high.
>>
>>   Sincerely yours   Stepan Shiyatov
>>
>>
>>
>>
>>
> Dear Stepan ,
>   I have sent your message on to Neil Loader who is organising
>the logistics for the Cambridge meeting. By the time you arrive you could
>still get the underground to London and take a train to Cambridge. This will take
about 3 to 4 hours and so you will not arrive until very late. You may
>wish to stay in a hotel near Heathrow - for the night and take a train in
>the morning. It will not be advisable to go into London and search for a
>reasonable hotel at that time . If you go to information at the airport they
>will arrange for a hotel and courrier service to and from the hotel. It is
>best to ask when you arrive. You could also phone me and/or Niel to let us
>know your situation. My home phone number is (01953 851013). Niel will
>probably give you a contact number in Cambridge. You will need money only for
>your travel and hotel expenses until you get to Cambridge. I will refund this
>and give you additional funds when I arrive on Saturday evening. If you need
>to, you will be able to change money in Heathrow when you arrive.
>   Please let me know if any of this is not feasible. Perhaps Neil or
>someone here can book you a hotel room if you decide whether or not to go
>to Cambridge the same night you arrive.
>   I will send this message to Neil and he may contact you seperately.

>Let me know your thoughts on this .
>   As for the meeting - if you wish to give a presentation on the Urals
>and Taimyr work that would be good. The main reason you are coming is to meet
>everyone and to discuss further work plans - so do not worry about a talk.
> It's up to you. After the meeting I thought you might like to come back
>to my house near Norwich for a day or two or have a holiday in and around
>Cambridge. We can discuss this later. Fritz Schweingruber will not now
>come to Cambridge.
>   Thats all for now - I look forward to hearing from you
>   best wishes
>   Keith
>

6. 0839635440.txt
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##########

From: John Daly <daly@vision.net.au>
To: n.nicholls@BoM.Gov.Au
Subject: Re: Climatic warming in Tasmania
Date: Fri, 09 Aug 1996 20:04:00 +1100
Cc: Ed Cook <drdendro@ldgo.columbia.edu>, NNU-NB@palais.natmus.min.dk,
k.briffa@uea.ac.uk, Mike Barbetti <mikeb@emu.su.oz.au>, zetterberg@joyl.joensuu.fi,
rjf@dar.csiro.au

Dear Neville,

You mentioned to me some time ago that in your view, the 11-year solar cycle
did not influence temperature. There have been numerous attempts by
academics to establish a correlation, but each has been shot down on some
ground or other. I remember Barrie Pittock was especially dismissive of
attempts to correlate solar cycle with temperature.

Have you tried this approach?

Load "Mathematica" into your PC and run the following set of instructions -

```
data = ReadList[ "c:\sydney.txt", Number]
dataElements = Length[data]
X = ListPlot[ data, PlotJoined-> True];
fourierTrans = Fourier[data];
ListPlot[Abs[fourierTrans], PlotJoined -> True];

fitfun1 = Fit[data,{1,x,x^2,x^3,Sin[11 2 Pi x/dataElements],
                Cos[11 2 Pi x/dataElements]},x];
fittable = Table[N[fitfun1], {x, dataElements}];
Y = ListPlot[fittable, PlotJoined -> True];
Show[X, Y]
```

The reference to "c:\sydney.txt" is a suggested pathname for the following
set of data - which is Sydney's annual mean temperature.

16.8 16.5 16.8 17 17 16.7 17.1 17.4 17.9 17.4 17.2 17.1 16.9 17 17.2
17.2 17.4
17.6 17.6 17.6 16.7 17.1 16.8 17.4 16.8 17.3 17.8 17.5 17.1 17.2 17.6
17.3 17.1
16.9 16.9 17.3 17.3 17.3 17.6 17.5 17.4 17.2 17.1 17.3 17.2 17.2 16.9
17.5 17.4
17.2 17 17.5 17.4 17.5 17.7 18.3 17.8 17.4 17.2 17.4 18.3 17.3 18 18.1
 18 17.5
17.3 18 17 18.2 17.4 17.6 17.5 17.4 17.1 17.4 17.3 17.5 17.7 18 17.8
18 17.4

17.8 16.8 17.5 17.4 17.6 17.6 17.2 17.4 17.9 17.9 17.6 17.7 17.8 17.7
17.6 17.8
18.3 18 17.6 17.8 17.8 17.8 18.1 17.9 17.5 17.8 18.3 18 17.7 17.3 17.5
18.5 17.4
17.8 17.7 17.8 17.7 18 18.5 18.2 17.8 18.1 17.5 17.8 17.8 18 18.6
18.1 18.1
18.6

So Far so good.

"Mathematica" first plots out the data itself (see Atachment 1)

The first part of the instruction set lets "mathematica" do a Fourier Transform on the data, ie. searching out the periodicities, if there are any. The result is shown on Attachment 2.

The transform result shows a sharp spike at the 11 year point (I wonder what is significant about 11 years?). The second part of the instructions now acts upon this observed spike (the Cos 11 bit), to extract it's waveform from the rest of the noise. The result is shown as a waveform in attachment 3, the waves having an 11-year period, with the long-term Sydney warming easily evident.

Attachment 4 shows the original Sydney data overlaid against the 11-year periodicity.

It would appear that the solar cycle does indeed affect temperature.

(I tried the same run on the CRU global temperature set. Even though CRU must be highly smoothed by the time all the averages are worked out, the 11-year pulse is still there, albeit about half the size of Sydneys).

Stay cool.

John Daly http://www.vision.net.au/~daly

Attachment Converted: c:\eudora\attach\Sydney.gif

Attachment Converted: c:\eudora\attach\Fourier.gif

Attachment Converted: c:\eudora\attach\Solar1.gif

Attachment Converted: c:\eudora\attach\Solar2.gif

7. 0839858862.txt
##########

From: Tom Wigley <wigley@meeker.ucar.edu>
To: dgm@lamont.ldgo.columbia.edu
Subject: Re: Your help, please?
Date: Mon, 12 Aug 1996 10:07:42 -0600 (MDT)
Cc: trenbert@ucar.edu, boville@ucar.edu, branst@ucar.edu, kiehl@ucar.edu, francisb@ssec.wisc.edu, rjcicero@uci.edu, covey@triton.llnl.gov, tom@astra.tamu.edu, curry@cloud.colorado.edu, pdadd@nassgiss.giss.nasa.gov, gates5@llnl.gov, graumlich@ccit.arizona.edu, dennis@atmos.washington.edu, barafu@mace.wisc.edu, tkarl@ncdc.noaa.gov, lindzen@wind.mit.edu, liu@pacific.jpl.nasa.gov, sloman@wind.mit.edu, jm@gfdl.gov, rcm@lanl.gov, meehl@ucar.edu, berrien@global.sr.unh.edu, dickm@atmos.washington.edu, neelin@nino.atmos.ucla.edu, newell@newell1.mit.edu, north@csrp.tamu.edu, obrien@masig.fsu.edu, peltier@atmosp.physics.utoronto.ca, rtp1@midwiy.uchicago.edu, ram@ucsd.edu, randall@redfish.atmos.colostate.edu, erasmu@atmos.umd.edu,

cddhr@nasagiss.giss.nasa.gov, alan@atmos.umd.edu, njrosenberg@pnl.gov, sarachik@atmos.washington.edu, schlesin@uiatma.atmos.uiuc.edu, schneide@cola.iges.org, shukla@cola.iges.org, esmith@metsat.met.fsu.edu, rsomervi@icsd.edu, turco@yosemite.atmos.ucla.edu, waliser@terra.msrc.sunysb.edu, wallace@atmos.washington.edu, walsh@wx.atmos.uiuc.edu, wang@climate.asrc.albany.edu, "P.D. Jones" <p.jones@uea.ac.uk>, drdendro@lamont.ldgo.columbia.edu, k.briffa@uea.ac.uk, mhughes@vms.ccit.arizona.edu, rbradley@climate1.geo.umass.edu, Tim Barnett <tbarnett@ucsd.edu>, jfein@nsf.gov, Ben Santer <bsanter@rainbow.llnl.gov>, dgm@ldgo.columbia.edu

Dear Doug,

In response to Jay Fein's e-mail re den-cen, here are some points (which may merely echo where you are already).

(1) Why study den-cen? Reason is: improve understanding of climate system to aid in detection and prediction. You should read Ch. 8 (detection) of IPCC WGI SAR in this regard.

(2) How to study den-cen? Models and observed data are equally important. Models (coupled O/AGCMs) can only give the internal component of variability, instrumental and paleodata give internal-plus-external.

(3) How useful are paleodata? I support the continued collection of such data, but I am disturbed by how some people in the paleo community try to oversell their product. A specific example is the ice core isotope record, which correlates very poorly with temperature on the annual to decadal timescale (and possibly also on the century timescale)---question, how do we ever demonstrate the usefulness or otherwise of ice core isotopes on this timescale?

There are other well known proxy data issues that need careful thought...

(a) Sedimentary records---dating. Are 14C-dated records of any value at all (unless wiggle matched)?

(b) Seasonal specificity---how useful is a proxy record that tells us about a single season (or only part of the year)?

(c) Climate variance explained by the proxy variable--close to zero for ice core isotopes, up to 50% for tree rings, somewhere in between for most other indicators. How valuable are such partially explained records in helping explain the past?

(d) Signal-to-noise problems---a key issue is, what role has external forcing had on climate over the past 10,000 years. There is a tendency to interpret observed changes as evidence of external forcing---usually unjustifiably. Few workers in the area realize that paleo interpretation has a detection aspect, just like interpreting the past 100+ years---only much more difficult. More work is needed on this.

(e) Frequency dependence of explained variance---the classic example here is tree rings, where it is exceedingly difficult to get out a credible low frequency (50+ year time scale) message. Work in this area could reap useful rewards.

(f) Coverage---what about den-cen data from the oceans? We need much more of this, especially in regions that might provide insights into mechanisms (like NADW changes).

(4) Causes. Here, ice cores are more valuable (CO2, CH4 and volcanic aerosol changes). But the main external candidate is solar, and more work is required to improve the "paleo" solar forcing record and to

understand how the climate system responds both globally and regionally
to solar forcing.

I hope these very hasty ramblings are helpful

Cheers,
Tom

P.S. I've added Ben Santer, Tim Barnett, Ed Cook, Keith Briffa, Malcolm
Hughes, Ray Bradley and Phil Jones to your mailing list.

On Thu, 8 Aug 1996, it was written:

> Dear Colleague:
>
> Doug Martinson is the Chair of the NAS, Climate Research
> Committee's Dec-Cen panel. He and his Panelists are drafting a
> Decadal-Century Climate Variability Science Plan (a US CLIVAR
> contribution). Doug and his Panel are trying to get the broadest
> possible scientific input for this Plan. Doug's approach is one
> that I strongly endorse. In this reagrd he asked me to solicite
> your comments on highest priority science questions and asks also
> for some help regarding examples of published work that would be
> useful for the Plan.
>
> I know you are busy, but urge you to think about this and comment.
> Doug's committee meet in mid-September, so to be of most use to
> him, your comments should be received by the end of August.
>
> Please email to Doug with a cc to me.
>
> Doug Martinson: dgm@lamont.ldgo.columbia.edu
> Jay Fein: jfein@nsf.gov
>
> Thanks very much. Jay
>

8. 0841293339.txt
##
##########

From: T.Osborn@uea.ac.uk (by way of Tim Osborn <T.Osborn@uea.ac.uk>)
To: t.osborn@uea.ac.uk
Subject: No Subject
Date: Thu, 29 Aug 1996 00:35:39 +0100

From: CPCMB::F055   11-JUL-1995 10:53:56.46
To: MX%"pierce@cirrus.ucsd.edu"
CC: F055
Subj: Re: Hi and questions

Dave

You're right, smoothing the P-E field is a much bigger change than adding
a bit of noise, or the statistical model feedback. But some papers give the
indication that the strong instability/variability of the thermohaline
circulation under traditional mixed boundary conditions cannot possibly
occur when a more realistic SST condition is used. Yet that's not true
of some current models - e.g.:

- some LSG/EBM configurations still oscillate,

- the Manabe & Stouffer 1988 coupled model had two stable states,
- Mikolajewicz and Maier-Reimer 1994 still could collapse NADW even with a reduced coupling of 16 W/m**2/K (I note your caveat about the lack of scale dependence though),
- the Stocker et al 1992 zonally averaged coupled model had multiple equilibria,
- the OPYC/ECHAM2 coupled run (Lunkeit et al) shows what appears to be a temporary collapse of NADW.

The answer is that the stability depends on the relative buoyancy forcing of heat and fresh-water, as you've pointed in both you're papers. Freeing up the SST increases the stabilising (not static stability, but stability of the model's state) effect of the heat flux - but doesn't GUARANTEE that it will be stronger than the fresh-water flux effect. To be realistic, the fresh-water flux used should ideally be the observed flux - I agree that a diagnosed field hides model errors. Its similar to the flux correction or no flux correction dilemna of coupled models - do you want a realistic state with unrealistic processes, or a possibly unrealistic state with realistic processes. Either way, the response of the model to perturbations cannot be guaranteed to be realistic. The best current way is to do both. Then, with luck, the real world will lie between the two answers obtained.

The SALFLU_EBM file is not readable yet, although it is there.

You have some interesting papers on your WWW page - the Marginal Sea model looks very innovative. Also, the LSG/EBM experiment with the open Panama Isthmus shows good results. What P-E forcing field did you use for that run, and what small-scale coupling coefficient?

Cheers,

Tim Tim Osborn, CRU, UEA, UK

9. 0841418825.txt
##########

From: Keith Briffa <k.briffa@uea.ac.uk>
To: Jean-Claude.Duplessy@cfr.cnrs-gif.fr (Jean-Claude Duplessy)
Subject: Re:
Date: Fri Aug 30 11:27:05 1996

At 13:52 27/08/96 -0500, you wrote:
>Dear Keith,
>
> I have been asked to write a white paper on the possibility for the
>paleo community to interact with CLIVAR.
>
> Evidently part of the jow has been made during the Venice meeting,
>but I would like to know if you have somme recent recent work of yours that
>I could include in this paper.
>
> Any suggestion woulmd be welcome.
>
>Best regards
>
>jean claude
>
Dear Jean-Claude

It is good news indeed that these initiatives are now meaningfully underway to join the palaeo , pure climate , and modelling communities. I will join the short CLIVAR/PAGES meeting (24/25 Oct.) and a colleague - Tim Osborn will attend the larger meeting from Oct.28-Nov.1. As for question about new results , Ed Cook and I have a paper in press describing an initial attempt to reconstruct a North Atlantic Oscillation index back into the 1700s using tree-ring chronologies in Europe and North America. I will have a copy sent to you. Otherwise we have a paper soon to come out in an American book describing our early analyses of the growing Russian data. This work, developing the density network is progressing well and we have some very good reconstructions of growing season degree days- excellent spatial maps over western siberia going back several hundred years. We recently published a paper in Nature describing a 1000-year summer temperature reconstruction in the northern Urals and a brief but interesting paper demonstrating a strong volcanic influence in the tree-ring density data when they show extreme low density over large areas. We have very interesting developments from these areas of work but they are only now being written up.

The usefull thing to stress is that these researches are in progress and the development of the tree-ring network is continuing well and is already providing patterns of past climate variability in northern Europe/Russia and at a number of special locations- nortern Sweden/Finland, Yamal, and Taimyr we have already got continuous 2000-year chronologies and have the potential (indeed we already are) to build 7-8000 year series at ech location.

I will send you some reprints/preprints and an overhead that shows the present state of the northern chronology network. Any stress on the importance of future collaboration btween us and the Russians would be wellcome. I have just heard that a proposal I submitted to Copernicus to do just this was to my amazement ruled not relevant to the programme!

I look forward to seeing you in October. Very best wishes. Needless to say, if I can offer any help with drafting the white paper or similar I am happy to oblige.

cheers

Keith

10. 0842992948.txt

##########

From: Keith Briffa <k.briffa@uea.ac.uk>
To: Gary Funkhouser <gary@LTRR.Arizona.EDU>
Subject: Re: russian data
Date: Tue Sep 17 16:42:28 1996

Gary,

it's great to hear from you. The stuff you are doing is very interesting to say the least. From the details you give the precip. stuff looks the more relevant for the Holocene though I note that you don't have a manuscript yet. The other stuff is of course interesting but I would have to see it and the board would want the larger implications of the stats clearly phrased in general and widely understandable (by the ignorant masses) terms before they would consider it not too specialised. I suspect that this might not be straight forward. Are you not being (in the time honoured Don Graybill fashion) too demanding of the response function results when you say deriving a transfer function is not justified? We all strive for perfection but does it exist? Seriously , it would be easier as regards publication policy to get the Editor to accept a reconstruction/reconstruction based paper than one describing chronology inferences.

I don't know whether this is any use but I hope you'll send us something. I also hope life going O.K. for you these days. I can't see me getting to

Tucson for some considerable time and I don't suppose you have any plans for cruising this way so I'll see you when I see you.
keep in touch and let me know what you you decide.
the best to you
Keith

At 16:44 11/09/96 -0700, you wrote:
>Keith,
>How's it going?
>
>I've been working on some of the data that Don collected with
>Shiyatov, Mazepa and Vaganov in the late 80's and I was wondering
>if you thought any of it might be appropriate for The Holocene - or
>if you have any ideas about where we could go with it.
>
>I already have a fair draft dealing with the Kyrgyzstan juniper
>chronologies. Although I wasn't able to get any climatic
>reconstructions out of it, the material has some interesting
>properties similar to some of our long-lived trees in the southwest
>US. For example, autocorrelation in the series increases as a direct
>function of stand elevation, there is a shift from high to low
>frequency variation with increasing elevation, and the
>intercorrelation among the highest elevation stands is greater
>than that for the lower stands.
>
>Maybe this means that the lower altitude sites are responding
>to more local conditions (precipitation), while the higher stands
>are responding to a more regional (temperature) signal. Response
>function analyses with the indices may suggest this, but again,
>it's not strong enough to justify developing a transfer function.
>
>The draft is about 2500 words plus figures and tables. Stepan hasn't
>seen it yet, but I can't imagine that he will change it very much -
>I know that Valeri didn't find any great climate responses either.
>
>There are also 12 chronologies from central and southern Siberia, some
>which are pretty close to Jacoby's Mongolian sites. I was able to
>build 3 precipitation reconstructions - one has about 50% explained
>variance for a May - June season. I haven't composed a draft yet and
>although Gordon's dealing with temperature, a couple of the
>chronologies are of comparable length and I want to look at our
>low frequency variation relative to his.
>
>Jeff Dean and I are headed to the White Mountains this Friday for
>a little 5-day collection trip. Thanks for your time, Keith.
>
>Cheers, Gary
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>fax: (520) 621-8229
>e-mail: gary@ltrr.arizona.edu
>

11. 0842996314.txt
##########

From: Keith Briffa <k.briffa@uea.ac.uk>
To: Mike Salmon <m.salmon@uea.ac.uk>
Subject: Re: shiyatov
Date: Tue Sep 17 17:38:34 1996

Dear Stepan
    I have received the receipts. Thankyou.
Unfortunately I have also heard that our request to COPERNICUS was not successfull. I am very disappointed about this. The letter I recieved said that the proposal " was not considered relevant" so you can imagine that I am seriously exploring what this is all about. I have just returned from a PEP3 meeting in Paris . I tried to emphasise how important the Russian work is and , of course , our collaboration. I am relly angry that our proposal was not considered by referees - just rejected by the committee.
   Thanks for the piece for the Web page - It is already on. It is now more important than ever that we publish some papers over the next few months on the different aspects of the network reconstructions and the long series. Have you considered my suggestion to think about a long,detailed paper on the Yamal work for submission to The Holocene? I am happy to help as much as possible with such an effort. I am glad you are safely home and I send my best wishes to you all.
                    Keith

12. 0843161829.txt
##########

From: Gary Funkhouser <gary@LTRR.Arizona.EDU>
To: k.briffa@uea.ac.uk
Subject: kyrgyzstan and siberian data
Date: Thu, 19 Sep 1996 15:37:09 -0700

Keith,

Thanks for your consideration. Once I get a draft of the central and southern siberian data and talk to Stepan and Eugene I'll send it to you.

I really wish I could be more positive about the Kyrgyzstan material, but I swear I pulled every trick out of my sleeve trying to milk something out of that. It was pretty funny though - I told Malcolm what you said about my possibly being too Graybill-like in evaluating the response functions - he laughed and said that's what he thought at first also. The data's tempting but there's too much variation even within stands. I don't think it'd be productive to try and juggle the chronology statistics any more than I already have - they just are what they are (that does sound Graybillian). I think I'll have to look for an option where I can let this little story go as it is.

Not having seen the sites I can only speculate, but I'd be optimistic if someone could get back there and spend more time collecting samples, particularly at the upper elevations.

Yeah, I doubt I'll be over your way anytime soon. Too bad, I'd like to get together with you and Ed for a beer or two. Probably someday though.

Cheers, Gary
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The University of Arizona

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phone: (520) 621-2946
fax: (520) 621-8229
e-mail: gary@ltrr.arizona.edu

13. 0844968241.txt
##
##########

From: "Tatiana M. Dedkova" <tatm@insec.quorus.e-burg.su>
To: k.briffa@uea.ac.uk
Subject: Rashit
Date: Thu, 10 Oct 96 13:24:01 +0500

Dear Keith,
enclosed are data concerning Yamal chronology.
1 - list of samples: 139 subfossil samples (checked only),
covered time span from about 350 BC and 18 samples from living
trees (jah- from Yada river, m- and x- Hadyta river, por- from
Portsa river);
2 - general chronology (1248 BC - 1994 AD). I have some little
doubt about 360 BC - may be it is false. It was found that
in chronology I sent you before 155 BC was false ring;
3 - ring widths of living trees from Yada and Hadyta;
4 - ring widths of living trees from Portsa. Some of them didn't
include in chronology, because were not measured at that time;
5 - ring widths of subfossil trees. Zero means that ring didn't
find on sample.
I don't send description of collection sites, deposits and etc.
for the present. Some details you can find in our article
(Shiyatov,...., Loosli). By the way, do you know something about
its fate?
Please, inform me if you have any questions about these data.
Sincerely yours,
Rashit Hantemirov

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M;WR:K/TCP<6L$&;]">M*ZU7U+SH=(MS=J/2\N,>8H?F`;^CU=WH\'D*W<WRQ
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M'P?:V5JU")OELJ`A0:V1XR+#M@;/IK(.*HLR^5P&6*%4+?**&.:A`0^A5Y`5
M8)^1MQW!>>CI)[%NYWN2D`&+1G^ZPZM`,6?L`/KBQ2??)0'//-DKL^N2ABR:
MK"@TWT@UP(DC$5?S3S05/*@'ERYUL?*7+YB"\2S7I@@`LIFMO#7&6Q\6*LD0
MMCAS\PK9,OX1>"-(7=HL$]=((FT5!7-MRY<HT?*HT>U?V5]>FI_Z*2X(_A_X
MKO&O$VX,36_V2<&D4Z357ASDL2DS.]OV\$[]5;`1/R4?DH,_?KV:0ZC%A(=
MH/7@'P7+UI'B9>T99@1<@K)!TG@Y;/G@'\?XT"=03;(MR/W]*.L$#&22+40J
M6ND,C(Y`MFN+/RNH'BY(5\;U"QDR!PVY/&GDU%,R/<NQAR21I+VT/%7(N$37
M62O$+]5O#K@<R:88$58UJH9[D8>I]%A2[>""*6N"@^.M<LE\"7\W0+RGYHUO
M7")^N-KHLQ$=%`*5/1_OBT(7N#/<M_.2U5"&5=^6XU[54;NKO/]@)(2MPX8W
M'J$2(\82^L?GIA:SQY4?2#B9<5N7[^_X*$C2,TB90OS",KF\M+=./]K#%F&%
M*[^0DN/0EF>M4)'Y*=+]$H&2.B0>(WTAML9,M.F)=QL+(Z%,M/4D,=G1N&=J
MP>./V8#,Q#+CVZS"F6F"$$:^@JP+J>D9]1`B%LKEQ#,#*6"5JEOF;A:*J2(<
MUG(M/3Q]$#XYWOB_W-2/$,0-@B9!ARU2VC/`AA.9XVJL0VUX[^Q#[D2;5."L
MW$)$"V(SE%-M;EW%3<0/[PP?&)%53P9XD)N?Z@4LUQE4C8OSGL_4&1!B6?Q'
M]N,/849=(N-YB&U#AB10F,.Z,>PYG"J/UI\RS_9UYD-7#P[/$`7X;NU?LT'C
M8X-F])*.?V:%)O,'FYHY8;AM6/AKK-$(C5J@'H%#&Q5%2JWK;^PLNEPQHCAF
M?K@/\-=_;^L^U$BLE#,G><9^P7U8IZS&B@6R@<K-]MVA\UA6#F[LD6L7&8.Y
MC@&BNCC[EI.X-\,&B]]J=7PK]S,U8<7&W(BOSB=6!;AU#,_TS(^G!ON,`:L4
MR[YA;4'%7Q6&Z4_44[B7:T]A#!J8,VKT>RXB_U9]Q=;AG(FQ0<WK($=?'X
MZ)K+!9D$KQ&9=R_030OU6&MET5X(<)?\Y<>K6-P<IA%\E`#',#/'&N2=`#YL
MC2VT=@CA[4'AEO[SQN-<8)R2;F[;XGKG'Y_8^2[*%%,K"018Y"FY5RB4Q.FQ
M_]0X$EQY-QT$4AKQFP.JLVC=PXQWX6RWZ)2G+;+(``RW_U_!4((FR+@'/2.#
M6KU>SX($\,)99S[Y6=5)=;H5*MOW$?_L'@7!(461;W3M!72@'C$_OT'0AS@N
MFI`;!LJ->N?=PA_(M)0..15'FULLVD#^U^Q[\533<_9;PS)33YQ*-5:7$4&(
M_XXDXI$FQ;!;JA`8<MIZ&M;+UJIYU1%CJ*`4XXQ.U153-G^N=OZY+RWY0FC?
M:O*-%*F&M'A_6M*NR5.4T5A6<<`RO?];E:CW8J\"L[`$,@'".5=3T=@MFJB6
M,Z9O]",JR+:5\L"^M5GIRFUTN4^AS$TA.W;V&[BD]UE5_742W($[,)88-7S[
M=L%4.(#;5:C,;O\UZ8<NG@EDZ?+<Q=(V^'ZR:FY)%Q7]FJY/&:]DPG%FLP
M2&SF^HTC8&_`H+5EZ&^"+>G+F@FR1<X_/)ZR_/7)S&0"9<0:J_]:N5K;JI(8
M`_CGBM9K7C.+^84(]]V:![=$%QFI<6A.?NX@=(D>A"HCY-^PF_)5586MI)_
MMMJ^S\BO_NE+:OXQ$LKCS#U)3F@9TX+F[@MGI78$-;9IO\L6K7GQ,Y(G,B9AT
MFC@.7.)UHKSW1T_KN?"G\3+?-&=MH(G<*.R_-Q0X;T-(59:G;;;>N37+[3(Y

M@]OW]D/:T1A*#;)?QQ%9MKS7K\<_I)25ZU1E;4V'B98.M?M4']35]%<`4F!C
MX#TT\3K<0N_Q634#K*)H=M.`YQ50T-H`?52[@62X#)#+OGOVD+C,>YK7GDQ
MT=\VL;8.\J$O5;6F\@WL5N"]LX(T!C:@>NC0[6:7;J]W]1AP'3?]&5$:[;70
ML56U3Y-,AFL[PT3A'C?P%RLDB93^5HGZ9`8AES.9CK'!_@E[M'C]^T?,#MXQ
M?Z@2?MY15<\="47Y3PNL]A76V/+27+IA^,:*UJKI]-]%^V'312EWF4\7E01=
M`SZTSADZ49]1'X5'3&N=(C^VF97)6_?A$^W+UY=,+=SZ^]7NV%[0J:9V.&MZ
MK->_.E;,G'ZK`?@^E9.`')*!",$ZU6)>DL7/[[]EC]_L:Y]5[?`F7_?@AOK1
MG#7=N62^:L-9R?A#%/%<&*URHC_52\G^X<WW=6,MAU\7RZ<C%.[&,,=6+6:[
M,,_ZSIBRU7'A$Q6B@H.O*1[U9^_A49($<>A6<TBY&F"TXH%_`_]5^%/%J2%O
MJM]J6MNL^RR,._M4!!'/X4T9+&4YO&]D)_/'<^9:Z1_`ODC]?A'!(/Z.O-:\
M3CJUHY:B[KB9]=G%TX<V-'$NZQC:9Q^4<6S'_E6*X4R,6&W&9J);+9PMJTY_
MIK@PPA2H:;_YJ4O?/+@&/(#@NKRXXVJNTO.*R=[9:#Q&B$-F+9L;:VK[7[^
MM8AMM*^Y8V_W^-/?/$]6^W<6693_YBY5Y2(+[[]N-][_?A!)6Y?M-<8$YW=X
MO'/G[)LPQ>K5%2+"9PH^G#;NEM;\#1$R,<!=TB]?@33O*,<4?"TEL&S_AR2@
M+2-B,Z8HU?@'QG8]N?4K\7);L<LA8LD+><>:_Z`1]0R5DG+,.=**X6$FSE[8
MRWQQ+^%<>LT?J@1A1RTH+E]B=#^6[M/P`YV@?W];IPI+7"=FZ!K/3WK(GOX.
M1[_\:L_&'SVY)K<5)E&V-B$!;,R@<.`!&ZN#6<_3_/\``8.HJ`!X&`0`0`0";
M9%-*(0T1``"Q+@``XV5PAP``(````$Q)5DE.1RY25TT``-)<:KD```NE<W*Q
MW:M3IN)#^-`8`I-V22=85@,1`)48C`]@1,-N\YS=[]_1@8`Q#F^I7_#OM9&V
MG/6'^=N?A_<?#&]M^'];?V_E_3&<6_[_OX-^YM_S?^-_W_Z_;^RV7LV+-NV.
M6QBV,VPX^;[L_EFO9H\Z_[@^K)_-V;RSYLV;.]O/+9'VC3Q[+CWX\.%.I9V-
M/CYVX/R-MC6!N$?D>K(^$:?G@TR/R-5&O>#3S[X](T]>^Y\.!H;X*`GYPCXV
M%Q\!_WRE,6\Q]KI'P@F#CLE"EJ5S]GMDJC&O<CPX#'X_.['DURVO+:V,K&`U
MB-/A5^>#P1[(OO?]\&.\?&`H5N/B[VX<UN/5<;_W%NGU0RL?/F+WP4?UBV[C
M+A!(VGE,>+CPCG@\@;<4<=-.S+;Q_V%LW:UTM]DMY<D,7X,78Z'&DSE-EANY
MQ@?1<LP<ZWR7/8\4%\(M&_:N7IPA5Y@F#@\C>YOU>%SFEX4YM(='M=,_&=<P
M:F(MRW&&OOB8*8U*/4%4+:63T"_<)N8K(9OK@9_L9W983"WQO$)0/F=D:H[5
MNSJ-LLS#',F`GW!C3W,!R3F8KKF2XN5P?;;R8,M1O.1!P/)PJ!PR!'9[#3V4
MCB=KY,LT9?PP\A.G'DW@?8O&8,/A\+3+,8L@DH6^\S!J`Z/?B]1I%^.#LA@I
M$!P!`OV@0.XD$#;?F"!S(3*(]X`$\,<H8Z(?0XOO$YD)(L,$2+,FQ,;L+[R(
M_+QI0T^).XD.S;H\PRG#`4-AACM[;CV[Q&=C;>1J1E!X631@\K'\6YQI\2X1
M-!#DX@3Z9H(R*:\('/#\S-2]2Q0#;Y&I>8P^%ZAH@WD2`+(EJ0C]R8.4K4.E
M*K[+@HQ,:&EC`!V<1"&%5O;PP>\C3\1HWEP!6$ER`*-D0D`TE]D;5#2-G;4+
MHY$'0?T*',,8#L`<'"'ZFRY`=,-KB7`?,MW48HPR!8S,RBE3MR_B6[<@@;
MH:QZG8<LPP1AB$GDPV$14C6*AX+WR#;3CPF"'AP$60:.5`6@22/X-)(<WR?
M`A,R$LAO`M]C*.O^L]!M9,>A5I%C9H,4)T=2$*9+`RM2&`#W[S@G6+N7UD;+
M9@:3[LF"_'E!QD!%J4:-$C`9+CWDR>0,4'2G#$K%"^HJB0:N4;3SXQ`OT`2!
M*68X6W)'P#KZZV&#GU+-,C!):[(`K<O(`O,>2`+S\Z$:"XL-W#Q'*`RL:U
M;R/MW#:QR\?D1Z8OJ)ZL>:'YSL?;&-"0_NL;C'PR>/#U&#>=M&%Q<@+=&"OT
M3VQK8R-\#%O@&N:'GB:``O=(OFB<3H,JCPOV-/W>?KS0U('I:'X?#:-^C_MN
MD#V,,05<WDHK1\X\FK9[&SJ"5:D!<^G%]FA&QV80V[9M5`_JT+9;1E9<;4/^
MKU&B6Z/?B]&&++]&.$R)S0P9R,?"%CC<&15L;AHHX4W;0)FU*&O2.8*EI40B
MVI^RI46/DLEXAS8_`Q*\$?&P%<H<9##]Q_TI$Y1S&I7X)CTQBG<V*:)@Z9C
M'PT-/"9]G=5[$I>3]BHH<JY;HY?%LMI`]TO67$+-P\+`9^*6+H<T'C].GY+.
M4[N(;8A8B#MSHWA?N[_$"R=P$U6E!>Y\`GGO/S=0GJ=LL!2/IIR6Q:8'/%YR
M<V^E2;#P'>(_.EM&BAN]>S(^>S(W4R+/]Z]C!`#F?3P$KY(5Z4'Q45Y9,`UE
M^&D@QFJ1IYJ,<;FLX\(*UZ(S)=>C1[(Q71I0,(57)?E!^W`MWD&^FF+!&F?:
MNB#8V1M40M1.B1^.G1@ZB/$1Z=[#X0RS<T"(A@)MPT\53%EO&)FKA8.$=H(#
ML_,E0QCG1G&YIZ<D@V1D2L+;5-18S129\OSE5:QK84/?(U'A&EO53&A?%6[B
M/%;8*I[8/^\-IJ`MC19ZS2M$_F$HZ:->//YB:-1E9S3:,0RJ$?%0]DT'I89C
ME49!H-/#9<])82KU438#&RE%MKU+3T<7&I1)3%+%X)L<7-$.-#O5'&:HS>#1
MG"FMFJVR1AH0CH$AZ,I",XB,.!Q^^11TA\HIQ/#[8<J1;E;OLJJ2\NSBD-T7
M'ZFY8]+*L4$5&*CH!$<:G-&-XH[AJU44^CS6<&XOFZH>C&D<6F?\H]@V;08A
M>49&)HSYWW5:(W8FL_&[?^FJ_Y-87:)R%C3HP:4;A+$(D).-F3LC7`Z7JE'D
MDAU6N757``;N369!S]YG><XCTM!E--N878QD?]$"VYI(&5&L;D7VI.W-0:JR
M;+#U*><-A/MT=\#H&.,(048D$11E64KD>`*CTS0*:9*0:6H$[F%>,-DU'CG9
M,U9K,;X@581JI#<RJG4PF*[D!$)B;1UT^%YJ_81S""N,$H`O\Q<68P).Y-`)
M*K]'O3-N]F:*&8;SAA7SQ:B>1,9$<VS7VM#OE/Y`7\;>EI5OQH\!O'AZ9$G
M,>,+WXTAKB0/@D>$A[*I.##6Y,%Z#O(.L+>;^^J^>N&#92'F0EU(P@^VEE!P
MTURB:GTV/T3.*ZM!KV&\^K4+<\&+Q62?DIODVSVH&P&G@,YAYH^&C+0!XF:
M(TA0K[F9?)5>'W>5;B:K@!9<*WJ1C#;<8W\HSG7!#D)!RY*'E0H&&F4Q6C&
M3;=R6E4_G)H'U>=JQ.T:^$(.9C84!<.M)&J)S--W-%6Q$?+WU,PG:F@E8A>9
MS/"-Y7&5%$`FYX2OO-^$6/NJ`COH+?""WC]06Q1O%1)%>+"-F5_7U66+B2TI

M&U5UWDL[,T4\W@!II12'<.=U,UFU5!FE_%+#$7AKU8_ZF).8SN$MH>H;M*/U
M3ZQ\-E$^FN1B(3JV3A:)SX.9J\J9M/'.R&M*%>9%CEK!KX8ASPJC-U5Q'3-'
M')'U7B=<5*.1B</S&SH(EK94@W5QXQ1\`>Z^5G;^UK(U@`=[1WT2<E;\G;2Q
MD<'`J@<L/;4\:\INYG!/&0+U;5&2&<FDB>6++@X#7-39"558!LI]_@0J%1!N
MXEW+H5`9JEU7%3ZI]"XO$MH%6.1=)LBB\$-(*)\>C'DP'5.DO-TM;YQ>,BQ/
M-\+-?G5?@U9W"K937!3CZ8^H.(!;SJGOGB-/II#HOXW$$<1!MPM\/TW5$RIA
MK&+6VI5YILVI<3>;>1ZB+TJ/)6Q]+`RXD'DH0F][FO-]XV+WGH]<$X+7;])P
M80^`C.<G=`_MC`.0V2$,/ATSCGSB]9\,>L<RU@&TQX1'`.#BC_D#%8AI\>8#
M;G0^&:_AG$B0",6S2%"&'D^O>IA)ZQL1(\+*-%6[62S5DWF'+QO#&_!5[7P>
M%;"$6.DQH:B3P<,8@=G=0Y=C"[3=N,-XT:!')RC4&>[5<;M-G"5&CSS=>&V]
MZ2DXQ<!/A<F!%<;:K9H)Z8'-'9Q10&0KE;^,WI7_BD;&43C[R(ADH.$Q*=:.
MO*5_:C+:9*IE7(@)0&S$`)O@!"XDM2?VI:;%QZX$QC2_`RJ]<16-/TFUD"*Q
M9L(.S`=HPE0BR'?0&ME/B@J`^4N\XMD2/L9H%E^J1ABW0H:Y6/2\]$II-\-/
M'K!4M)G^&F_V'L+B5&&OM@H5(@.ISN:A0V7Q)P(H#^*1]0%H>@3+F,P:J=2U
M3@TW=*U(2Z8F@S&7!.*$R,ZD_:@S@P=J=Q71\8Y44UU`31XF7J_-8<[+^+O^
MMA!R6%KE6/#-!%`M@L1Z(>#84M)F"B-FCTD@X2UZEP6^2!UD%R@`Y[CA((`1
M@OKMV>[1QT'>L\?D&,1@;MT&*O&\['GAL31DO(7%A\M-T<=ZS:%//T_]V[&%
M2-#:!E(X8@<@N>&]U!S8!DC28X].#=&`438)DGESR#]RM/`%Y@BY^*@4:1!%
M68;Y74J(S^I%6F9),_&./@W>A12U3B.RH%C9H<]':H$BN12$;IGBDS``35.9
M4!66F(=^2&`$!,D@M)5ZCR/BI#;4!&:]!2=S2XD`+V&E^24_8RT6Y.#4K.:H
MS,&+%Y1_%2_M>2O%`ILHGI4MY^>6^4I8^9A00#JGB(H0CZ00^I"-7)7*1Z0P
M"$A,5/OA(+PQAGN'_>2`$@MD'ER0'V]D^CNV_RD^^UV_Q^DGT6V@,4CF/#3,
M[B,QQR"7`^`4TNUS-G:Y$@C]Q0D1DHLL,\&/T;0P<\(3'3P=HC-4$/<9)O,5
M`.XJ=(E0B36/SF!+Y<WYIYLCI-$(I1YP#H.1'.+L>5U$P41)"8B*HF),C%M&
M@0P=P=D>4:N>%6/.Z1YX2@5<S&*VB`36#0FQYT$>E`"=J@WW>J[4QD>R?!V[
ME_"$4)`+R7*N%87-$LNBF7+QJ!!YIKD-1"Q^&[=AJ/E_:5.:F.]&$&Q/1;BE
MAT=[GAP$-=V:%M=?AR\C7&@%2WA2&JI+/+KCCOM5HQN5Q$KV>=?4EZU76IH`
MCJ7LGTR(F0[I7M%!I8.WE1E9>YH^H5T?3SDZE$JC1.:9Z`ZY/6*;1/K%@],!
M14,UL5Y;`NZ_,QR!4>_TR1I9)KDL'5;0/.NAI[*ZKGK\:GO=+=70_>R\OFNH
M8VXZAC[#/_>7E,<71F3T?%-;5"/M6\#5<J*GCAH#2(I[TLAN+5PP@.I>:>4S
MGSSRJNQ'^F:/[$PG=(;&8#4TE1#6[/3D3&55#RS2G3--A]Z:\O)/3;B*1<[M
MCZJLE$9GV$Y5&:D^8[GJ7@6[*4+IX`Z6NH8[0E"=_>9=K+I;#I,WQU4<*?Q-
M87TUNS*M;T<UGM<$OT>%,GFS#O/6C*H/72F:[/_>5@Q0TFO[7#S:JY33K-5P
M-BO;7FO,D"B]$G5U@4@ZW1-$QIECSE!,4R3'H/WK>EY*>S-1(N`HZH+TW%6T
MZEV732:+?<KX4R?V[*5TD%L-`_7?_-RNOR[/5':>8%)=)>2]E"/;M>KLUHC4
M?P8?\7F"-#!/57M[W(XD9>6`SV+6IA'&5JZG"/G@75P.)X:[/L"E./D.(R;I
ME3&@3SJK6A",*06NL(28?06WLD0<'77AH\^QLR/RX`11<#SG^%`5_\`TXU[_
M&R>D&G/^?N#2PJ2KM%35%1?TF/P?,+J4F]Z/ANJS$Q'Q@XX1R,'!MH[F)P=<
MQK)>.2\S=TPU?LW,Z[/48M4NZ!^7*4Z#R]HN<C;&NB([HKJ!S*<;V90-]K@
MF5>WM/&7:)#W#^95[JHC#VH2*XF[MTFDJ1%`<O0"S5V:B.9]'W]J"?>Y'L24
M"0?+F>U,M6WR#K2`XO7;I^G\:GYO6MB"B>WB9ZM&V^3>V74\W^21B$+LE(^T
M0$@+2JH1_LD>LN6#H0Q2JH3610>JS9FWK9'%:F^0"1<5>$]4+ZXIU7>LA;5V
M_5O5@!E==TT\UJ2;`>?C9=U[V5XQ5#+ZL#=^!6C`)MA\[T."FM//'KE*B-3V
M:'1=[KJ\OH7#,R?3SYIBBO5D8]3DU!?Z]-0MK**AW2TYJ@M:\]3`DZMZ&1*W
MKO,/8,IOU-?/X#[[4HRZUZA\KYS80]F,^>$0-@!WW^-2^:(#F__V`"JO53U+
MF*]$OGDW147<&%@X`-V`2P`X>(=-;J?XM(:TR/L*[!<60IR3<8FM:PC'-ENO
MFIXQD:Q[SPC3"NLKV>A`7&8(\A?P)MO<T"H`AJYG]6!Z.-(#X\X4GINB&7$!
M.>JNV;_Q<AKNCX.5T7ZT">;/O-MV;:";>*2C.J_QRN$`KYS1#5_"T?]]4+K
MZ[S1?G9N.S_&I9_AA-48EO:`G5?ATQ:VB5E<^!`NS(EA1/3=WS^+"UPS0Q:E
M;KGMET%EKSZMUS/ZB_,6T\PI1@[=K^'7^TN%1@K^'-S/)>49GG0*YMXL_0K*
MJ3G5BL9?^%]?+S_#Q%3$-1."LUAR>SSPV(@X96>"<ZOYHGBJO1<T5T\'(NUD
M5!4]41DB6H`B0_ID?JBUG@>6E;)YY).`[7\9DY55@FETUT,-)GB7<&#J)P`>
M!@$`$`$`G*U,2B$'$@``_2T``.QI`]```"````!03U(N4E=-``"%IGC\```,
M)'MVD>&M:G3>I5_\T!@53=DDDC"M1(8@(X%SAMS,S9_WJ'0Z'0>\A_A[M;(V
MF[\?Z\:_O_J?A&M]_O_I]_O_M_Q:(^__O\I_PG7^=_[6_Q_Y_K_3[%_N6B<
M_=Y]N_W1_N?=Q%NO@QF?M]^T/];[./MC\]^QC[%OH'PO]F_V%S<7&'SOX89N
MM/N]&!Q;'VM?8T-:C7/U^_9M]>_TPOAO[`_V:^TK[#B3C[._HR,/O;[[!QT9Q
MIYP,LNNH@]1]SX:BSH\>\GH#BMSJ7?%\\'8`QO>AA^L_<6DQI\:_Z,IX<[&`
M#2PY5UA,2<AE:B&M-K<?,G$A^1G^<CN!A_VETHR"YR.+_?!#&2AN7I"3]CNP
M8Q8ZQN/M<\$[#TM\#'H&5/=YPGAT",`7%;8^80/'T67'N<)&XP@&!G^3KJ!
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M:!"'A^1AATGI,#269<I;@2%HH'K3^3]3FNEN#:7<5Z1>8"6@R.>TN5FY2>BG

MU(-K'AV0<%+%_1W5ZZL\G5(2A-$!90_VH^U/W0P[M,K3%H^WE,1P>;CAY7!A
M\63HH[K+U^L#'/&[PW"/AAMG[.I0AP=3O7W.0$)C$N/";?=L/R-/\7/#7NRD
MU`+6\`_SG@'Y_@!_DP-U:``X<NF-XB;S;,ZY>^HG92EC,CG=V=[YF;:CFHU:
M<#6@SH(:'4VBP<OGF8"A^=D`.7S&]7WK$8QN]^YC.8P.P'_Q`W"$Y[2+#O98
M,.RX-`XG.HW(2?%IML?Z+\&^#TNMQH=&$1'%XMD+RB^QHL?8*?^Z%)X+]0S`
M:>C1S;@"KA@/A/!3!<YWP)L[`:2.,!`Z6Z.:5TV6_KP'\^(&_6RM(<T,G!8&
M<'#Q\M4IF\3X;GEZ4S?_]3-TS4$5AUDA)C<9:!6Q,%LLMP=+#LH"`N6W.HPS
M4=X!GD8(`TNC#SW6?-TRA,+%HJ$TYI/B80^(V\.C#JA(YX4@$CDID#FT8&E1
MOD::"G"2(',VDD8V'FQV@1B.Q+C?$N,:*"8<D/`MWD(@,6EFD;BV.O*F0]EQ
MJ9R5M#'PMT;^M<[[&JPZ0.ZXFE82^"RR.HM`R&Z`U#/88EX</*LT3/T=H&7+
MG0@X@?*&JV]KA/-E[#"$HBMAE#^5_NH`PO$C:@;J`BWR#)!`P$98=)$H'Y@_
MFZ$K/^0ET(IHD801]2/?R@R>(D%`(DC)KBE",GHBE<DK8HB<B2HA(DIKB'FV
M6<E;\(1/YK'N@[T;J`SS^='J[IVU%%K2S'@1(4MD1;;NMWH@D8[\A^FE]D/!
M;-T<G=%R2CP)9RSVKU;L'^&U2/D6?V)5D[CXW?,I4*-[/'T?S=#HO)Y>ND[;
MM#ZG,Q@Y$+&30]9W11$HQ]+$.!LY^Z@GLHT]$8:34PX.TY6,/\^2-/Y2&`OP
MZ0D[=*8DW"1R,'8&TVKIDB:6DY3J1%%(9`^VH\-7>WAJ]9H!''\``(DH>Y4OI
MM;#3V3L1G/'90;C`T2),(J64L%-;CM1M$P\VD6E+2"$%W2J#NX<\8`0%S$8!
M4?4G8/*@1>R$%&-"'RNL;*IL)<(6(6T0OO2A_<*)9UN\\D/<#YC0(Y0?<+`4
M+2;TYA?G-0>;4B,!R6T2M*4U#WT!VG1,)L@$?C3XTA%Z;4PMC%#AAR!QR1+I
M:.PM/H$;/L`IFQ`"G72AEB\2NTXF[%$#!BL@R2"BKD/X8?W/A\^9\/G%J7#G
M_Y<(QD&+2,*"<-`0`&V#=&(SB0)>$CA"04<"I0TV#+H)S"$5V4=W<:2M<F,-
M!;!&T'`R@5#!G64;TH.G*83)'J8(+IJ"_"#R"8X)])W(,=V#&P(2(3U1$;BM
M%"LGFII^HI'2^;Z_*_V%%O*+M@NYD4%".F(W[0KY$@E1M.3_J[J?U^7&`PNI
M/PLL83N>UJK:&@?2Y72ROMQ8\]764;EFHWZF:EK=]\M/OL?E%.5C#0"I`D@\
M6I`DK3A"V4=(PDY;D*&RN7<1V^%'H86]7S&8KKW'R@?KJ4+RM(%O*$TRX\)*
MAQ1(9Y*D,G'Z'5"0W+T"T9IS^E/+?Q4\MI..M)9B@Q;>_W*Z(J^BECKI5_K?
MLP$=3+DCO/50LP*CS(YXJ+U+/\U,E79CR,S/-NF@G+.(%@R+B42.C^XRPR^"
MVHEM&<4VEC-07I:N0VLVI`]%WYJ/.*<LT0UDMGC.W&P.$\E1T,K$I;@*6(1,
MTGJ;U)[:19AG,E`9*)#,5;>.=IZ&$\KQ`_2D]2Y=%SDTGNAG(B:<J9=$5L6&
MU#,IK(Z?BH$EG@Y1``S@26NF&3BH,``%PHK"%.?:08SF@RR^=!,D$M!<,()O
M-1'#DX3#BI/0QC2`5TD`OK".CK_L/+7\Q<PUJ)'W)A]B33PQ6V;(;T1W(V@B
M%B4:HY8]!M;QRCZDK(LI%1R4$H?F]0G!FM%0)H:<Y0^:!2=#AE]!I,7<]/..
M'-J$&IN)N'L)9AJ=]S6Z(IQ8ADPOAKSHO4[O4]@>H0>OV/?-NO]7$S[O?3LU
M8PIY!SKI=ZZ_R</BLCIY>?9QLX&>EA/-?@RM_/E=\^;^9"ADGG=EO+\U$_S/
MM+/%>+X,6Q]3VB#ZH4:T^DQ$1)@Y:\CP)HF@A"DA)T;W%8KQ(V:C&_N@4M51
M')S41%-J1Y11:T(<&8Q+0_FAR*4P]PQ_T'E?PCS1@RSXI-QU1^(*[X._Q#`V
M3C3,BP'%#--J>VJ4!,G9;-1$IF;!S1V-RVV0.K5#*XO4&'"H%O3*S85!YZB#
MC,V2J%T9UPR;&6/+*A14PTR"2/$I`/['BN\.E`"<+,IR1`(,)F`KE11M.2"0
M&XF^M*<8&$D5I.S90@AH3JZ/9TH7;Q/VC\($\:?<)F]`NF31WT4%VJ2*RKPH
M\F77\YH5"%;[/TM0_DYJ0.:&R,DZ9PZ1L-#](##J#BE6O0"M.WRGLX<1W'I8
M!TU7%2]U[5B1)\E?G#BWJ#R$,/0>6]^CQ]_S5DT=,Z>MB:FA],)-2+6K$/L4
MF0$)FAB.144V>X"`HXJ"+(46?0-*<;A)5J#[CQRFJ;.^MX\U\?%1PT-P'M!Y
M:_^H#?Z/0YK?MU3DY5&X\3B1DCOI<1\C&[U'CEA"U4%LF^.J,NH:\2?U.UP
MI8/8WDFEMY]%(K;RD7V=JYLNH')3R559]!HX4&`6]W#*F%U-"O)!BK#A(,=8
M\,*+':@G+K/J@6,5_M)OHT)W%/FW['-F@^#,!J7J/$9EL&L9U/6+:C?5$>6)
M#H=T9#KBJ4;J\?$&`ZM0BD70ZA31;*D\;.[R<BJ*06`E^0PI<F;J"$5>K,GK
MC]UR!.Q%X]2#&>U`"XVT?ZY5!Y.-K;NE#-F#.U^IK^^N^/JG5-[_AO<+7C\
MED'19[50Q!,,\&\.(354CV_K!>8;I5V:ZY12SIPCIHMO*H@1AU%`(,.J',Q^
MF_:D9[40^7[%VM$,T7T>HBF5*CZG7'K>=0U^P14833.N:-9J`W(Q98'6PJ:;
M]-?KF)K:WGD42Z<2ZAR;U-V'"9K4L>CG;^,=WXS@:TFMWU`!>I2%%-N..W32
MS*M4<Z4>)0QTFY7>U`F*6@J*Y'3&OW<J(K;4GR9OJN"!FDM[[0*(AL76RPTP
M&L^JTT<M57=`9>L4Y8ZXX9V[9YMFP>DP8*C\9J0BE!87<9];T"!Z2<.KE*8'
MNE'91Z2*J&JTR6G,U5,7*GPE.+$MBAC*IOMZ(?H@I1)7T4&`7)SI\YE?TQCY
M+_W:LB>549.:H+_2;2P@3V-5>_EG47U^A7TU+3$&O4XF*/G^2T/E(+D8GGK+
M?%.$&%RPXFIRQ=VS_VJ>AB]4COBI9V5,B:5'KPXEOR\7W9D82..;%1)`HJL7
MHVJ^Z9\=O@ND/3Z.A%$Y-6_0MR!809/:@V@,IVI&_"N39P-&&PH.\RU[#O+,
M-9(:\1E8JF?U1T1"A&SEFLI%D8V*WCNL>DK=Y])6]_FC0"EK.6VY!J`UA9'
M#6IPN`D0AOI,)XU2(`D\(RVI+/BL2D]-.CP:4\I/U5M#A<:0Z,,GH2BI<L),
M1B'MK>`=*(DD&Q7CX2G977S1_C:+A9CS2$!#<EX+:K=&$]$YO;:*51C3MX/V
M*J#CG.S9-U9EBG`Z?=U?O-5H]T9IRNQ<@T4%:3O[,X#>@M9=H5LA55\VYRG+
MLDV%*VEG$:9=.K=LP=QA=V/4E.JKG`728Q\(E47H*_:+!F"@CQ`&%!J+/*"&
M:.3BJ+**-D1==QNQ@=3:#Q#<;T<#"'#?".*R8%MHJ/TK0\,65XF$2R[B`5),
MR#JGL9.YBIH8A@VQ$K3*@Q`S(L,I.8$6D?,3MX54^V;46'%]\$/'#N1KIW=U

```
M>>7<U2Q9)W8.LU,A@PC9*X]X-C+`8O>]&A!T1JU^$+*;<B>4[B'M*&,<TV+U
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M^X7YL`XJ4OP[[$K7693VU,;NL[NR5J6_O;]3_>%1FS/ZVJ9'OYK]EQ;=)T50
M<EUKE4U77KVMGUCM1#QQB:O"<SZR_(Z+$52ZV===3SZO41@!UI"&;\I*N%*"
M,Z7Z?'C0H`>U5/W]30&:@>%5.W<PY5&G"YM\J^B-C9G1.+YR]2HO\DUL\`+X
MVS@E1:+U3I0H/=:SNS%T/[/FCS*TI^TIW<L/RMY'Y[JNFYBH/=HSMZKF34OH
MRW*HI7?>"NWJ6V^1B\^*V4D.T?U,):I#$Q51"A/.P_`AT58<,]6'">,TS*C?
M*1L<PD>E55VOJJV<6%&#PH[K2MU=W0>K5;=C5D5.''4LNLAN*'AVCE"*_7I<
M10/JKJ^0A$W@-8Z7'<_-=Q(<5"T;KP8/;,(5K\Z_`8/4%$G;F.Z5,85.HRM:
M:=MPFK8K*A`Y)V]1G;E<$GW-Z\&LB]?FIR;:L"FG*9%$6ORK(OP9N71@B=HG
MAFVW=;.+'#0)%>%ZRF&B&HZJY>IK_+D\3`\.8?>1X6HC4T_20`L?5`\9YX'C
M^?%#,N"0!IFD*`/F9'=%#:7BCR`3TFWS5PD*2:H:[B"F+GXFCOCOJ3\4L=A6
MRB\"!*X6-3L>V<0P3%$FN[S%6.:;(,6MUM,&)GY3[W=5?GWX9E5/ZO3%5XJK
MG7YZ+'1\/RR14!B^:DZG)B1OWB(O/402U!KN9_J]090I#898;52:!"`5%B=W
M9AW@^WK,MJKV55!0=M/E6VUT)Y3V)^Q\4M<"[>]6*GZ:\1%=I7+U;`T3H+H:
MS>UC/K-TJG+=U</KHA#\4RJA+J,?+W6:>Q=X2_&WW:DKK73H`+#XFK-==O"S
M2*LJ0YJE=,)#-5C#[7KQ;JJS!EJJO7@);P]L!15HG=>Y=GIO[QEZ9J/F=#-N
M@]73*)]=.%4JCN^WJN7O]U,>?UXPC\Z;Q/A;L5,/_-'^O6W>*#(0E+(]:M:J
MLD_JQ\U8G5G-?/E>+<7UZK72_`0BLU"9.&49$KG%7*JTZINLD<TVZ[$TTPW#
MN/=\X]XY^XD9/<P[E)VEK9\4:K&@?"#7?[':;Y4S8O'MB(PX"-0Z1\"/[7D,
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M&L8CT0O5\>I,U>(J$:]3(M[5$,F/*22\MJO2B6,F*W.QEXSF8[Y'2&%2E>!9
M]]*&;_)0R?"G?SXQW7@ORJ(F/7\5@X.K&-A!VTRJE?VIY!S8/UO'0*G#^HC1
M;E_*BRR5^4H5U#E^/[/R-?'K<R43^LY.+55%V\=-'YXOX/5-N_;\VC^44V_C
MVUX20Q-[U5%Z\.'YZ"D[Z=U<.#G]7P/]67"WKIK;]_[=66K'[M`_?6DC\A),
MU5:OSR6YWIBO)XH]%%MYB*J.[@=>5?M+M._*\00SZHW.A`$4M7"$L=15QC;X
M^..X^UY@BO+#W,;TB2CO?1:2"WO:KKX=.,-Y!7*ZX.X^NB+X49YE"-N?[S[R
MD;";.<QCK-.<KP><V5/BF53.#EVXP?K\/F2S<NJ$+PJT^/Z<C+LQ=E)S9]Y0
M0I$=GY&Z:R7>BY":$8IA-0`RLTII3'"\Z/)"SX2C'N5)H7D+R+CBAF^YJJK8
M<<RF+\U7V,*6",E[[S%M4*&J8\@QOZ_T8.HI`!X&`0`0`0"<7%%*(=1U```W
M2`$`W8V8>P``(``  %,M1D]3+E)730``ZR[-#0``&="#=I7!1+%.V_TOO[:`
MP_JDDDDD8:U$A(1P-G#;VJJNW?LT0<`8[S/9I#P]VMLD;3G@_J\W_O_Y'P_U
M76_]_^_G_BE*YKY_^_O]6_Z6U_VO_M3_K_Z_S_BM>UC^IOS>O.4\UKSO?-8/
M![YSOF=^:KYC?G,1Q_+5\KWRM/+4\N>;F_F(^W8Z/_/^/,='R\OYY'YV/S4_
M.T=+KS-!^8_U\>5V/!UP/S'-KH^;U%8!_CX2/'U/5Q[Z]_,]\W@^I/AK8'PO
M'C\>;CST4ECPU3[R/S@>_ML<0=]B*71X^/4QXF\<"I]]H5.5`1V^!5JIH/'P
MCPU54/!HS'Y-6UW'@K>*S'M!Z^/\>E'8[=E7B\3<>#%B&S1PV+5N_F_R*/UF
MH0H#4T-V??7'CXKJJ%"HVGZ2+![FE$7'NU<VA>T?J:+1QC<->@_T8,1<8;5[
M&TN+$XM@T;OQRC<'%GD>;S@?#8H_'RM&"_0P4Z%T"Q)=6)*/?V>)+O\XDA>7
MO-<<K>]:<K2_G8I?SS&1^8PW11V^8Z:MLUK>HZ^]<9KN.RX.RC\Z'=QU,>/Y
MGSIZ*^:YY6/-YR.NCI;<\U'@Z1]A8UJ.II6F1U,86HZFW!Z&F;4O:+]><C)D
MJ)ZIYV.9'YO6,O\=['=1=+%'XRC\-*QAZCX1UD>_CU7!4F/2'S9Y0H_%QML^
M><\\SY7)PN'@[-U`Z@5UCT)H;F*"#NHYJ\W%?HX(XCK?LV6QZR*"<N/]@T*T
M:P9R/)#CT/!NNW'C([+1Y2\]'$UD>/XZJ+J[K/?0^5H?G%-#T<7*W-I%C[`9
M4Z&JM'5ZPH_'RJ>'7@[H8C^?=B*Y<'!"%>:="C_OE39%<YA;"CZ^HQIKHATL
MXF,U>)BO+K$QNG]8F`CL.3G<)-HOUT+SN:J,B$<(Y)(25V*+*$/(RZ]&:V,V
MVC>9%ED98XRV9%(8RLZ52>M!!4HEQU!S##`5T\$Y@XRI#P"N9CP>QC7CX;BB
M.H\>/E&<';39]A-G&,T_..]C.R,0VA]@FY*559XHSUQG]CV<?[AQA8J*WZ?G
M1W73?`4UL>>P4>=N_\(PPBR]1-:*7LTZL+#4@[CDBMFA0&TUCC\K[7E$ZK$(
M1C10*QLV"G3HY32L8%_`_91V7:24(Y,&TA=1A^D5J^#;'FBH+[@B:TZ**T>"
M+/ZB[.4BYR]E&.;<\O$O8_;'N3J$&9Z87G\.>\H;HQ16B[@9*^G/%'C[E`-T
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M)SEW*!OAR!KL4B:62<HOLGE+V=3:U>43>J2EJ'1CQY25C_'T;104=`1XF<R]
M2AQ-P;M+2&(=E1)(!C"R\&UNV6#:NJ96#:$!/](68RS;B[4LL.@A?+,J5=A7
MJ1ERC-#&=KI_,?Z&0GD=30YF8ST[+*SM+E+G*7'>C)GLYQ:'(#HHG4P5%G5C
M-)D^VT>OCRN3>?LJ.(]STX-HH;JH0.QR>A#MTVT]T6B*/A4=<*;Z*)2/L*@Q
M^1A"A@N2G`LWR2DX*%.*`A%Z.E.&XM.L4-CF]7C,"P$(OM%&S<4ZJF?DU8+3
MJT?)2GEC3&,2&K#!9&MFM.JRDZT>]Z?,=%HHX_1UA:Z11\X;LRI8CU-2G(2$
M08/"R7I&]@_X<'K9E`CHN_2*C\=$4M^3=W@U7BQO>FH2N;]PV0J^ZC3+8GQ-
M4I7CR01\KUX[&II$DXHYA7<)'(6<"Y[2Q20!H<K+/@4K`2:A/34VI^:E.71_
M-)4@N^H?@>T\+4:&LC!\Q4YQDV;!+4,NVVV4KDV3;+UM-->S0&HZD<W13)Z-
M3)Q1U-/;7;=K5W`7T[F\G!]<VA8-J@S;W;7-7;;LO$V2%M.\:CGS3K?4WCWI
```

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M-UNUG-MS;#J?,*VK#<:Q0+#=E$X-ZEAV]0+)HE.(F,GW.UL/R4-)MGC*5TYU
M=G/YM,;V%:"F!W!=I1E;*)[9RL"O9PW8/!RF*:/GL^;J[]14,X;#=*,*!_WG
M6[TW6-8KXO$TNJS;WX:^=84R_#IM-U;FQ),J-DAI-RJ_V3G2T4-G-/-3E?D\
M>$;7"Q*;%'^7;T9?;M]RK`3F1;>/>;ZSD[N<AB7]_9V*K'*T&>G5UYO:MH2>
M1=9+)9!UA6]0'*^X=-5>/"D`OZ47)1;6$ZN`D;VN":J9**<46*-H6#T=ANBD
MMCX%NXP4H_AR9>OB@;_]MITCCAVJ/8BEU998\-X?AB3P\JV/Z`LM!DA;%[J@
M=S\'\V#QBG92N@[(C\Z+']'01VL/*4?Z&5V'@O7"\>Q5:'@>U2R9P[L%F)C@
MAEIACXR77-._2Y;)W53&&*]-W5'N>93CQ=.W0X%:EWR&/0,UM2S#%BK-_P8
MO2R;IHV3J:EQ%4Z,!ANJ62>O$YX-XKM+J)#JKX<[=:.B8?)#1;)8[4[0"](,
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M.UFCBBBUG!9&HR-#(<,!O3F03%3UO%8S5[;"4VGC!Y4K-+%%L+4.RA"J\#G6
M&P678E!/X5"=<-9<PO:B13RKMM+6'F`<`6\BP+^5=HH'OYUO'NJ/[+V^L2[(
M5:O-,0F4OJZ[)@B+PE^>BLZXGN>7BT"!U6EC0@0FP1"$V36B,^N:6MVH$MPI
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M5NVQ\@.0\>4&UT^0),\FH4X$(_/A4N5(`Y5>#0FN5K%I%"A4RB:(_.^B?1IX
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M2P?BD(^$1_*"VT*:.<M"![B4)1T<**@E^&8"O"PMCQ\<"$N_2EQQQB@GA2BP
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M-N1*A,\2<YLI@;/AD`QL!"XU\>55Z_HOHG>2OM5"M:#!@:+.SQ73FC-YI18^
MSO(*F6'318H!A,RQ:W9\]K+58*P'W!QX>L]X-T"CGNPR*&].6.?-&+N:((<!
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M8_KC+CR$?X8`RG.@LO&4V.?&8+!]#"AZ&`"%#PN"CS9:Y6H!/Y'9#X#,<!:W
M886=EIMH/$@7N))=#I#I,*<>GCRH2*,@%V6S[@HL,_]2HBZ70<MC!5SD933J
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From: Fred Pearce <100713.1311@CompuServe.COM>
To: keith briffa <k.briffa@uea.ac.uk>
Subject: new sciwentist feature
Date: 13 Oct 96 10:32:49 EDT

Keith,

This is my first draft of the dendrochronology feature. I wonder if you have time
to go through look. I hope you recognise the quotes, but please makes changes if
they think they misrepresent you. And if you can answer any of the questions in

square brackets that would be most useful.

Ideally, can you not change the full text but make notes, remarks, answers referring to it.

As ever, haste is of the essence.

Regards

--Fred Pearce

It was one of the largest volcanic eruptions of the past 10 000 years. Mount Changbai [correct?] in China blasted 50 cubic kilometres of rock into the air and deluged much of the far east with hot pumice. Radiocarbon dated the explosion at early in the 11th century. But it took Keith Briffa, sitting in his office in Norwich and juggling data from tree rings round the world, to pinpoint the precise year: 1032.

Volcanoes scatter the atmosphere with dust that deflects sunlight and cools the world beneath for a year or more. And when the world cools, trees grow less. That year's growth rings are smaller and less dense.

By analysing those rings, Briffa and his colleagues at the Climatic Research Unit in the University of East Anglia have charted these sudden and dramatic shocks to the climate system, from Changbai to Pinatubo in 1991. Larches in the forests of the northern Urals, for instance, have revealed that 1032 was the coldest summer there in a thousand years, more than 6 degrees cooler than the long-term average. Four of the five coldest summers in Europe and North America during the past four centuries (1601, 1641, 1669, and 1912) coincided with known major volcanic events. "We are pretty certain the fifth one, in 1699, did too," says Briffa. "But the geologists haven't found the volcano yet."

It is clever work. But the science of tree-ring analysis, dendrochronology, is more than just a party piece for botanists. Every ring in every tree round the world contains a memory of the climate the year it was formed. Reading these rings holds the potential, Briffa believes, to answer one of the most vital questions of our time: has human activity started to warm the planet?

With colleagues in laboratories and field stations from Dublin to eastern Siberia, he has within the past year [correct?] begun an attempt to construct a history, year by year, of temperatures across northern Europe and Asia over the past 10 000 years, right back to the waning of the last ice age. The tam, funded by the European Union, hope to help show whether the warming seen across the planet in the past century, and especially since around 1980, is within the limits of normal natural variability, or the start of man-made global warming.

For climatologists, the search for an irrefutable "sign" of anthropogenic warming has assumed an almost Biblical intensity. The leading figures of the UN's Intergovernmental Panel on Climate Change (IPCC), claim that, in all probability, they have seen it. Last summer [ed: 1996], the IPCC's scientific working group, chaired by former UK Meteorological Office boss Sir John Houghton, concluded that "the balance of evidence suggests a discernible human influence on global climate". But it is like the "balance of evidence" suggesting BSE causes CJD. The judgment is far from "beyond reasonable doubt". The case remains "not proven".

Many researchers most intimately involved in the search are still far from sure how the probabilities balance. And some of the sharpest concerns are coming from the places where the original early warnings of global warming emerged in the mid-1980s. Places such as Briffa's base at the Climatic Research Unit in Norwich, and the Scripps Institution of Oceanography in California.

Few investigators doubt that the world has warmed recently. Nor that the enhanced "greenhouse effect" of pollution from gases such as carbon dioxide, will warm the

planet. But in the past five years, climate researchers have growing increasingly aware of how little they really know about the natural variability from which they must pick out the "signal" of human influence.

One prominent IPCC researcher concerned about this gap in knowledge is Simon Tett from the Hadley Centre for climate modelling at the Meteorological Office, home to one of the world's five leading global circulation models, capable of recreating a mathematical version of how the atmosphere works and of running simulations of climatic changes over decades or even centuries. He says that "in the past, our estimates of natural variability have been based on climate models." But this autumn [date?], he says, those estimates have been thrown into turmoil by a paper published in the journal The Holocene. In it, Tim Barnett of the Scripps Institution of Oceanography, part of the University of California at San Diego, compared model estimates of natural temperature fluctuations over the past 400 years with the best evidence from the real world -- from instruments in the past century and "proxy data", such as Briffa's tree rings, from before that.

The result was bad news for the modellers. The two models examined -- one German, the other American -- generated a natural variability of around 0.1 degree C per century. This was less than half that revealed in the proxy data. "Of course we don't have to believe the proxy data. They certainly have problems attached to them. But my belief is that they both models, and proxy data too, underestimate real variability," says Barnett

The models' error was not, perhaps, too surprising. As Barnett points out, they do not include vital "forcing" mechanisms that alter temperature, such as solar cycles and volcanic eruptions. Nor can they yet mimic the strength of the largest year-on-year variability in the natural system, the El Nino oscillation in the Pacific Ocean, which has a global impact on climate.

Nonetheless, the findings should serve as a warning, Barnett says, that "the current models cannot be used in rigorous tests for anthropogenic signals in the real world". If they are they "might lead us to believe that an anthropogenic signal had been found when, in fact, that may not be the case."

Barnett knows how easily this can happen. He was a lead author for a critical chapter in the last IPCC scientific assessment, which investigated "the detection of climate change and attribution of causes". It formulated the IPCC case that the evidence points towards a human influence on climate, but it warned repeatedly that great uncertainties remained. "We wrote a long list of caveats in that chapter," says Barnett. "We got a lot of static from within IPCC, from people who wanted to water down and delete some of those caveats. We had to work very hard to keep them all in." Even so, when the findings were first leaked to the New York Times, it was under the headline "Scientists finally confirm human role in global warming".

Suggestive though the evidence may be, Barnett and his co-authors insist that the uncertainties, especially concerning natural variability, have to be answered. And so, suddenly, the modellers are queuing at Briffa's door to find out what his tree-ring data shows about the real world beyond the computer simulations. "Five years ago, climate modellers wanted nothing to do with the palaeo community," says Briffa with a grin. "But now they realise that they need our data. We can help them to define natural variability." He has already collaborated with Barnett. Tett paid his first visit to the dendrochronology lab in November [1996].

And so to the forests of Europe and Asia where, over the next [how many?] years Briffa will coordinate the work of colleagues in a dozen countries who hope to dramatically increase the available proxy data on past climate change. Much of the best data so far has come from the forests round Lake Tornetrask, on the northern border of Sweden, deep inside the Arctic Circle. This is near the northern limit for Scots pine, a place where their growth rate of the trees can be massively altered by small perturbations in summer temperatures. The result is dramatic differences in the thickness and density of tree rings.

The head of this work is Professor W [full first name?] Karlen [ed: acute on e], a geographer at the University of Stockholm, who over many years has taken cores from living trees and from logs and stumps hauled from old peat bogs. Despite the harsh climate, there are living trees here up to 600 years old. And the chronology can be extended ever further by analysing the dead trees. So far the climate reconstruction is complete for more than 1400 years before the present; the aim now is to extent it up to 8000 years.

The best data, says Briffa, comes from analysing both ring width and the maximum density of wood in each ring. By firing X-rays through the wood, researchers can now analyse the density of rings as little as 30 microns across -- the equivalent of a tree's girth growing by a centimetre every century. The growth of cell walls late in the growing season creates the densest wood and, says Briffa, "appears to depend directly on the average mean temperature".

Even so, ring growth is a product of many factors, including the genetics of the tree, past climate, the age of the tree and soil moisture. The relationships between ring growth and summer temperature are not a precise. But comparisons between the recent rings and known climatic data show that the rings can capture at least half of the summer temperature variability.

The temperature graphs produced at Tornetrask show "pronounced variability on all timescales, from year-on-year variations right up to century-on-century," says Briffa. On the longer timescales, for instance, they show 20 major cooling periods during the past two millenia, including long spells between 500 and 850, between 1100 and 1350 and between 1580 and 1750, the little ice age. There were also long warm spells between 900 and 1100, known as the medieval warm period, and 1360 to 1560. [ed: show graph from NERC paper].

Further back, early results suggest a strong warm era from 4000 to 3300 BC, and a cool period ending around 5070 BC. But there are intriguing gaps, for which no tree rings can be found. These, says Briffa, "suggest some major calamity that destroyed trees. Volcanoes, perhaps, or a rapid rise in the water tables." A 19-year gap between 1130 and 1111 BC, for instance, coincides with volcanic ash showing up in Greenland ice.

"What all this means," says Briffa, "is that the old image of the 10 000 years since the end of the last ice age -- the Holocene era -- as climatically tranquil looks increasingly inaccurate." Hence the intense interest in the EU project, which will attempt to reconstruct those 10 000 years of climate right across northern Europe and Asia, from Ireland to the Sea of Okhotsk, from the borders of Mongolia to shores of the Arctic Ocean.

During the past summer, helicopters flying low over the tundra have spotted logs in hundreds of small lakes in the Tornetrask region of northern Sweden. Karlen has donned his diving suit to help remove samples of timber from the freezing waters [did he?]. In northern Finland, local diving clubs picked some 3000 samples from lakes.

In the Arctic wastes of northern Siberia, a major survey is being conducted on the Taimyr peninsula, the largest stretch of frozen tundra in Eurasia and far north of today's tree line. There are well-preserved logs buried in river sediments here that grew between 5000 and 8000 years ago. On the Yamal Peninsula, just east of the Ural mountains on the shores of the Arctic Ocean, wood dug from the permafrost grew in conditions so cold that some summers temperatures never exceeded the threshold for growth of about 5 degrees C, so no growth rings formed. Nonetheless Yamal is the only site so far found that yields tree rings right through a gap at 300 BC. "Interestingly, the Yamal rings show this to have been the coldest period in the entire run," says Briffa.

Other, less detailed, surveys are being carried out across the whole of the north of the two continents. And this winter the timber is being analysed at laboratories in Copenhagen and Birmensdorf -- the Swiss home of Fritz Schweingruber, one of the

world's top tree-ring analysts. The project will also carry out new analysis on the large numbers of samples of ancient oak already stored in laboratories in Ireland, Britain, Germany, Poland, the Netherlands and Sweden. The oak has been dragged from bogs and river beds, or liberated from archaeological sites and even the beams of old houses over the past 30 years.

"There is a massive amount of data on existing European oak rings. But much of it was done in the 1970s, and then not updated," says Briffa. One of Britain's biggest collections, at Sotterley Park near Lowestoft in Suffolk [Keith: who runs this?], has ring data going back to 1580. "But it stops in the 1980s, missing the recent major droughts. We have got to update that information."

Already, the first long data sets are starting to emerge from Siberia. Last summer [ed: 13 July 1995], Briffa, Schweingruber and Stepan Shiyatov of the Institute of Plant and Animal Ecology at Ekaterunburg in the Russian Urals published a paper on "unusual 20th-century summer warmth in a 1000-year temperature record from Siberia". A complete tree-ring chronology from AD 914, pieced together from larches on the Yamal peninsula, suggested that average summer temperatures since 1901 have been higher than for any similar length of time during the chronology. It estimated that from 1600, the depth of the little ice age, to the present day there has been a 1.14 degrees C warming. The first eight decades of the 20th century were 0.13 degrees C warmer than the next warmest period, nine centuries before in1202-91.

The chronology also showed that Europe's "little ice age" extended east of the Urals, but that the medieval warm period did not. But these long trends disguise sharp short-term anomalies. The 11th century seems to have been a particularly turbulent time in the Urals. 1032, the year of the Changbai eruption, yielded the coldest summer in a thousand years. But the following year was the second warmest of the millenium, at 2.11 degrees above the mean.

Tree rings are not the only source of proxy temperature data. Layers of ice laid down annually in permanent ice sheets, such as those in Greenland and Antarctica, carry a temperature record in the isotopic composition of the ice. Corals also have a temperature imprint, and even sediments on continental shelves can be mined for climate information. The most work, so far, has been done on ice sheets. American and European researchers in the Greenland Ice Sheet Project (GISP), for instance, have drilled for 3 kilometres into the ice pack, going back more than 100 000 years. Besides plotting the course of the last ice age, they have found evidence of constant climate shifts during the past 10 000 years.

Briffa says tree rings and ice cores "complement each other, focusing best at different timescales." Tree rings show annual and decade-to-decade variations very clearly. But they do not go back so far, and are not so good at spotting change from millenium to millenium. Ring analysis seems to smooth out long-term trends, probably because trees slowly adapt to these changes, disguising them." On the other hand, ice-core data shows up long-term trends very clearly, but is poor at showing single-year changes. The melting and refreezing of ice in the surface of ice packs means that the ice from individual years tends to mingle together.

The patterns of temperature change revealed by these different methods will probably always remain too fragmented to reveal unambiguous trends in global average temperatures. But this may not matter. "Frankly, global averages are not central to the issue of attributing climate change," says Barnett. "What will ultimately prove whether or not we are altering the climate will be the patterns of temperature change -- geographical patterns, seasonal patterns and vertical patterns." It is not how much it warms, but where, that will be vital.

Under the IPCC umbrella, Barnett and Phil Jones of the CRU have formed a small "detections group", to look for these tell-tale patterns. "We are systematically looking at the patterns, past and present, of all the main forcings on climate," Barnett says. They will investigate how the world's climate systems respond to volcanoes, to changes in the ocean circulation, to solar cycles and so on. "Then we will compare those patterns with what we are seeing today. What we hope is that the

current patterns of temperature change prove distinctive, quite different from the patterns of natural variability in the past." And if that turns out to be the case, he says, "we will be able to close down this issue of attribution, perhaps within three to five years."

Here, the climate models will again come into play. If current climate change also accords with what the models predict from global warming, then the "hand of man" will indeed look to be on the planet's thermostat.

The models all suggest that anthropogenic global warming will show a very distinctive pattern. For instance, they predict that anthropogenic warming will be greatest in the northern latitudes of the great continental land masses, such as Eurasia. And that makes the finding of Briffa's team that summer temperatures in northern Siberia are higher than for a millenium potentially extremely important. And the prospect of further data from this region to confirm that finding so intriguing.

Briffa grins at the prospect. "The trend seems to be accelerating. We are getting reports back from Stepan, our man in the Urals, that it was warmer this spring on the Yamal peninsula there than ever before, and tree growth has been absolutely fantastic. It is a major warming, like nothing seen there for a thousand years -- and it is what the climate models predict." Caution prevails, but the elusive pattern of man-made global warming may just be emerging amid the larch groves on the sunny hills of northern Siberia.

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From: Keith Briffa <k.briffa@uea.ac.uk>
To: tatm@insec.quorus.e-burg.su
Subject: the Yamal data
Date: Wed Oct 30 17:45:53 1996

Dear Rashit,
       As always I seem to have been away bullshiting and politiking in various meetings for weeks! I try to convince myself that this is of use to us as a dendrochronological community but I am not so sure how much that is really true these days. I have the data you sent and I had to get someone here to decode it for me . That is fine now so I would like to try and reformat and RCS it . I will be back in touch soon. Your paper is in review for Denrochronologia. I am very keen to get a much more detailed paper in The Holocene dealing with this stuff and I hope you and Stepan will consider this - perhaps for some time in spring next year. Sorry I wasn't in touch sooner. Please give my regards to Stepan and Valerie.
             very best wishes
                          Keith

16. 0846781264.txt
##########

From: Keith Briffa <k.briffa@uea.ac.uk>
To: tatm@insec.quorus.e-burg.su
Subject: the Yamal data
Date: Thu Oct 31 12:01:04 1996

Dear Rashit,
In looking at the data I now see that you have only sent data from abot 350bc onwards. What is the situation with the earlier data. I am very interested in the details of the 1st millennium B.C. and especially this period from about 500 to 100 B.C. We still have a gap in the Tornetrask data at about 350 B.C. I was of the opinion that this period was very low growth in the chronology of yours shown by Stepan in Cambridge - but it does not seem so low in the chronology he gave me. What are your thoughts on this and is it possible to get the earlier data when you are happy with them?Thanks very best wishes

Keith

17. 0847838200.txt

##########

From: Keith Briffa <k.briffa@uea.ac.uk>
To: Eugene Vaganov <evag@ifor.krasnoyarsk.su>
Subject: Re: message from Vaganov
Date: Tue Nov 12 17:36:40 1996
Cc: tatm@insec.quorus.e-burg.su

Eugene
I have not received my copy of the book. A message to Malcolm is the best idea. I have been experimenting with the Yamal data mostly trying to fit RCS curves - and am finding problems with recent local chronologies behaving oddly - i.e. too much growth in recent years makes it difficult to derive a valid age/growth curve. I have produced a rcs standardised curve for taimyr and will fax a copy to you. I will send comments to you and stepan on the two papers reviewed for dendrocronologia on the development of the yamal and taimyr chronologies. I have made major changes to the tracheid paper and need to type and send the new version to you - also there are problems understanding some bits - I will ask specific questions. How goes the organisation of the Krasnoyarsk meeting?
Stepan /Rashit I have had some comments on the Yamal paper that I will try to email tommorow.
best wishes
Keith

At 13:41 12/11/96 +0000, you wrote:
>Dear Keith
> How are you? Did you receive the material
>(chronologies on Siberian subarctic) from
>Stepan? Several days later I'll send to you
>some additional data (several samples) on
>Taymir supra-long chronology, which make
>more deep in sampling the interval around
>500-1000 year.
> There are a few questions to you.
>1. The volume of "Radiocarbon" with proccedings
> reach Krasnoyarsk with some months delay, so
> can you send me by fax (007)(3912)43-36-86
> the content of volume (only for references)?
>2. What about the draft of paper which I gave
> you in Germany (paper concerning the compa-
> rison of tracheid dimension, cell wall thickness
> and density)?
>Best wishes,Gene.
>

18. 0848679780.txt
##

From: gjjenkins@meto.gov.uk
To: p.jones@uea.ac.uk, deparker@meadow.meto.govt.uk
Subject: 1996 global temperatures
Date: Fri, 22 Nov 1996 11:23 +0000 (GMT)
Cc: llivingston@meadow.meto.govt.uk, djcarson@meadow.meto.govt.uk,
ckfolland@meadow.meto.govt.uk

Phil

Remember all the fun we had last year over 1995 global temperatures, with early release of information (via Oz), "inventing" the December monthly value, letters to Nature etc etc?

I think we should have a cunning plan about what to do this year, simply to avoid a lot of wasted time.

I have been discussing with David P and suggest the following:

1. By 20 Dec we will have land and sea data up to Nov

2. David (?) computes the December land anomaly based on 500hPa heights up to 20 Dec.

3. We assume that Dec SST anomaly is the same as Nov

4. We can therefore give a good estimate of 1996 global temps by 20 Dec

5. We feed this selectively to Nick Nuttall (who has had this in the past and seems now to expect special treatment) so that he can write an article for the silly season. We could also give this to Neville Nicholls??

6. We explain that data is provisional and how the data has been created so early (ie the estimate for Dec) and also

7. We explain why the globe is 0.23k (or whatever the final figure is) cooler than 95 (NAO reversal, slight La Nina). Also that global annual avg is only accuirate to a few hundredths of a degree (we said this last year - can we be more exact, eg PS/MS 0.05K or is this to big??)

8. FROM NOW ON WE ANSWER NO MORE ENQUIRIES ABOUT 1996 GLOBAL TEMPS BUT EXPLAIN THAT IT WILL BE RELEASED IN JANUARY.

9. We relesae the final estimate on 20 Jan, with a joint UEA/MetO press release. It may not evoke any interest by then.

10. For questions after the release to Nuttall, (I late Dec, early Jan) we give the same answer as we gave him.

Are you happy with this, or can you suggest something better (ie simpler)? I know it sound a bit cloak-and-dagger but its just meant to save time in the long run.

Im copying this to DEP and CKF also for comments.

Cheers

Geoff

19. 0848695896.txt
##########

From: Wolfgang Cramer <cramer@nis.pik-potsdam.de>
To: Mike Hulme <m.hulme@uea.ac.uk>, VXT_COPR@luecology.ecol.lu.se (I. Colin Prentice)
Subject: Re: EU proposals
Date: Fri, 22 Nov 1996 15:51:36 +0100

Hm, clearly coordination between the two (if it really ends up as two) groups is absolutely essential, otherwise we would look entirely stupid. The first thing that comes to my mind is that nitrogen would be emphasizing a component of our overall idea which otherwise would not receive great attention - hence it could be, perhaps, amalgamated. They probably see it the other way around: In their problem, climatic variability comes second in importance. My view on this is that all of our model intercomparisons have shown that models essentially do crazy things with interannual variability, simply because nobody ever has tested them for that in any detail. Esser's model would probably be the last candidate to use here, since it is "less mechanistic" than any of the others - in fact, Colin and I seemed to agree to "not necessarily" include it into this proposal. These are just some thoughts for the moment.

I just finished a very first, rough draft of our outline, and I attach it to the end of this message. I have just sent it to Martin Heimann, but I have still not yet talked to him. I also send this whole thing to Colin, hoping that he will catch the thread through it without problems. Gerard Dedieu is the one I want to approach next - Alberte is already talking to him about this in the context with other things.

Cheers,

Wolfgang

On Nov 22, 14:12, Mike Hulme wrote:
> Subject: EU proposals
> Wolfgang,
>
> This email (see below) has just arrived from Andrew Friend. I wonder if we
> are in danger of competing amongst ourselves here, or is the role of N
> sufficiently far away to avoid problems? Do you want me to talk with Andrew
> again or shall I wait for you to get back to me next week after contacting
> Martin? Would Gerd Esser be one of 'our' C modellers?
>
> Looking at the call for proposals it seems that 'Theme 1.1.1 Basic processes
> in the climate system' fits best for us since there is a specific item (5)
> which states: 'studies of global budgets of greenhouse gases with
> particular emphasis on fluxes, transformations and stroage in the biosphere,
> lithosphere and oceans.'
>
> If not here, then maybe under '1.1.3 Climate variability, simulation

of
> climate and prediction of climate change' since there is an item (4)
> 'Development, validation and application of models for important
> climate-related quantities such as mean sea-levels, storm and surge
climates
> and carbon cycling.' But here there is an emphasis on European
approaches.
>
> About EU politics, Balabanis is the guy for ESCOBA, but that doesn't
mean he
> is necessarily the one for us. Troen handles a lot of the climate
projects
> in 1.1.1, 1.1.2 and 1.1.3. We have quite a bit to do with him. But
it
> depends if there is someone else on carbon etc. Maybe Balabanis is
the
> place to start.
>
> Regards,
>
> Mike
>
> **********
>
> Dear Mike
>
> Thank you very much for your hospitality the other day. I enjoyed my
visit and
> look forward to continued collaboration. With regard to ESCOBA, this
project is
> in domain 1.1 of the Environment and Climate Programme, and is thus
the
> responsibility of Balabanis.
>
> Has there been any progress with regard to a new proposal? I have
contacted
> Gerard Dedieu, and he says that he will have to think about the idea
some more.
> Meanwhile, I have received an invitation from Gerd Esser (another
ESCOBA
> partner) to put together a new proposal to look at 'The role of
nitrogen in the
> carbon balance of the terrestrial biosphere' for submission in
January. A
> couple of the other ESCOBA partners have expressed interest in this
proposal.
> Part of the new project will be to use global process-based carbon
models, such
> as our Hybrid model, to assess the biospheric sink for C (and its
geographical
> distribution) over the period 1750 to 1990. I guess there could be a
role for
> an improved climatology here.
>
> I could investigate further the current intention with regard to
climatology in
> this project if you wish.
>
> Andrew
>
>-- End of excerpt from Mike Hulme

Global, spatially explicit assessment of the interannual variability in terrestrial carbon storage

VERY FIRST, INCOMPLETE draft for a new research proposal to be submitted to the European Union for the second phase of the Third Framework "Environment and Climate"

Goal

A critical uncertainty in assessments of global change impacts and feedbacks is the source/sink relationship for carbon between atmosphere and the terrestrial biosphere, and particularly its interannual variability. Recent advances in modelling of atmospheric and biospheric processes, combined with significant progress in data gathering for climate, CO2 and O2, now allow for a dedicated experiment that is likely to reduce this uncertainty. Equilibrium approaches to the simulation of global carbon fluxes are no longer adequate for this, since empirical studies are showing both a long-term trend and a significant interannual variability of CO2 fluxes, which appear to be most strongly driven by climatic impacts on terrestrial vegetation.

Experimental design

For a time period of several decades, we propose to perform a simulation of biospheric carbon fluxes using:

- a range of currently available biospheric models (ongoing intercomparisons indicate that there is no clear best approach' - therefore this project will use several approaches <<<and we would like to include the CESBIO people for the testing of all model outputs against global seasonal fPAR observations - or does this overload the project?>>>),
- a realistic, historical high-resolution climatology (which so far does not exist - a recent IGBP-workshop has however clearly identified the need for it and what would be necessary to achieve it within a short time-frame),
- a land use map from currently available observations <<<or from satellite?>>>,
- a 3D atmospheric transport model for the calculation of net CO2 concentrations at the stations where these are observed <<<and of course those measurements themselves>>>.

Land use and different climatic elements will be combined in factorial combinations to investigate the role of each element in the full system response.

<to be continued... A critical question to me at this time is whether the project should go for two timeframes: if there is, in addition to the timeframe of available CO2 measurements, also a 10 year timeframe, then we could compare all models against available seasonal fPAR profiles from satellites and hereby assess their capacity to recover other aspects of biospheric dynamics. Another question is whether we should also throw in a GCM experiment to allow for future scenarios.>

Expected results

- Improved understanding of the global carbon cycle - realistic seasonal and interannual simulations are essential for identifying regional responses of the terrestrial biosphere
- From that: Improvements of mitigation assessments such as those required by the IPCC

ú Global, historical, high-resolution climatology which is required by other assessments of impacts of global change

Consortium participants
Contractors
ú Potsdam Institute for Climate Impact Research (PIK), Potsdam, Germany (Wolfgang Cramer): Project coordination, experimental design and analysis
ú Climatic Research Unit, University of East Anglia (CRU-UEA), Norwich, UK (Michael Hulme): Development of a global high-resolution historical climatology
ú Max Planck Institute for Meteorology (MPIM), Hamburg, Germany (Martin Heimann): Atmospheric transport model, ocean component, analysis of results against measurements, TBM simulations using SILVAN
ú possibly a fourth one (CESBIO, Toulouse?) if we decide to go for a significant remote sensing component

Subcontractors

ú Department of Ecology, Lund University, Lund, Sweden (I. Colin Prentice): TBM simulations using BIOME3
ú Institute of Terrestrial Ecology, Edinburgh, UK (Andrew Friend): TBM simulations using HYBRID
ú Department of Chemistry, Frankfurt University, Frankfurt, Germany (Gundolf H. Kohlmaier): TBM simulations using FBM
ú Sheffield University, Sheffield, UK (F. Ian Woodward): TBM simulations using Sheffield-DGVM or DOLY
ú (if politically possible:) Center for Resources and Environmental Studies, Australian National University (ANU-CRES), Canberra, Australia (Michael F. Hutchinson): Development of suitable scaling algorithms for climatic data assimilation

20. 0850159177.txt
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From: "Tatiana M. Dedkova" <tatm@insec.quorus.e-burg.su>
To: k.briffa@uea.ac.uk
Subject: from Rashit
Date: Mon, 9 Dec 96 14:19:37 +0500

Dear Keith,
we received your letters concerning our paper for Dendrochronologia and three long chronologies.
1. As regards individual ring width data of living trees from Yamal we would remind you that you have them. Stepan gave to you in England one diskette. There are data for Larix sibirica from three sites (KHA - from Khadyta river, 67812'N 69850'E; JAH - from Yahody river 67807'N 69854'E and POR - from Portsa river 67827'N 71800'E) and for Picea obovata from two points (SCH - Shtshutshya river 66849'N 69850'E and KHD - from Khadyta river 67807'N 69854'E).
2. We would be very gratefull if you can do some corrections and additions in the paper for Dendrochronologia. We did not quite understand what we have to do on missing rings? Just enumerate years when missing rings occur? If so, these are following years:

Year absent		%	ind %	Year absent		%	ind %
-1172	1 of 4	25%	51	700	2 of 8	25%	31

-1171	1 of 4	25%	12
-1168	1 of 4	25%	13
-1142	1 of 5	20%	50
-1127	1 of 5	20%	15
-1126	1 of 5	20%	10
-1029	1 of 10	10%	57
-1021	1 of 10	10%	55
-988	1 of 10	10%	17
-987	1 of 10	10%	12
-986	2 of 10	20%	17
-971	1 of 12	8%	44
-969	1 of 12	8%	67
-964	1 of 12	8%	14
-899	1 of 10	10%	29
-886	1 of 9	11%	42
-882	4 of 9	44%	5
-860	1 of 11	9%	20
-823	2 of 8	25%	18
-792	1 of 6	17%	15
-547	2 of 5	40%	61
-543	1 of 6	17%	91
-318	1 of 5	20%	29
-294	1 of 5	20%	66
-292	1 of 6	17%	24
-288	1 of 6	17%	61
-287	2 of 6	33%	25
-261	1 of 5	20%	30
-248	1 of 5	20%	13
-246	1 of 5	20%	25
-241	1 of 5	20%	12
-239	1 of 5	20%	25
-139	2 of 7	29%	9
-119	1 of 7	14%	14
-118	1 of 7	14%	11
16	1 of 8	13%	26
49	1 of 9	11%	11
134	1 of 22	5%	33
143	4 of 21	19%	7
155	1 of 21	5%	54
207	1 of 16	6%	54
426	1 of 6	17%	19
492	1 of 9	11%	19
493	1 of 9	11%	16
495	1 of 9	11%	16
536	1 of 12	8%	38
546	1 of 12	8%	12
579	1 of 16	6%	41
589	1 of 19	5%	31
596	1 of 18	6%	22
598	1 of 18	6%	51
623	3 of 17	18%	6
636	2 of 17	12%	32
637	4 of 17	24%	9
639	3 of 17	18%	9
640	7 of 17	41%	7
644	1 of 18	6%	22
646	2 of 18	11%	26

707	1 of 9	11%	31		
718	1 of 8	13%	33		
773	1 of 8	13%	38		
777	1 of 9	11%	67		
814	3 of 9	33%	12		
816	3 of 9	33%	10		
818	3 of 10	30%	14		
867	1 of 11	9%	34		
903	1 of 11	9%	12		
904	1 of 10	10%	30		
914	1 of 9	11%	25		
915	1 of 9	11%	61		
959	1 of 10	10%	59		
1006	1 of 12	8%	28		
1007	1 of 12	8%	28		
1170	2 of 12	17%	8		
1259	1 of 10	10%	28		
1270	1 of 11	9%	36		
1278	3 of 11	27%	15		
1290	1 of 10	10%	44		
1300	1 of 9	11%	18		
1302	1 of 9	11%	58		
1323	1 of 7	14%	18		
1334	1 of 8	13%	53		
1342	1 of 9	11%	8		
1347	1 of 9	11%	14		
1380	1 of 12	8%	38		
1453	5 of 13	38%	9		
1456	1 of 13	8%	20		
1460	1 of 13	8%	24		
1466	1 of 12	8%	30		
1529	2 of 7	29%	10		
1560	1 of 7	14%	6	living	
1714	1 of 11	9%	49	1 of 16	6%
1718			73	1 of 16	6%
1730			45	1 of 20	5%
1732			28	2 of 20	10%
1739	3 of 9	33%	50	1 of 20	5%
1742			23	3 of 20	15%
1749			57	1 of 20	5%
1752			67	1 of 21	5%
1755			72	1 of 21	5%
1783			39	1 of 22	5%
1788			83	1 of 22	5%
1789			92	1 of 22	5%
1795			102	1 of 22	5%
1806			68	1 of 22	5%
1808			97	1 of 22	5%
1812			35	1 of 22	5%
1814			54	1 of 22	5%
1815			30	1 of 22	5%
1816	2 of 3	67%	2	16 of 22	73%
1817			33	1 of 22	5%
1818	3 of 3	100%	4	14 of 22	64%
1819			22	6 of 22	27%
1820	1 of 3	33%	9	12 of 22	55%
1824	1 of 3	33%	66		
l i	v	i	n g		
1825	2 of 22	9%	38		
1828	1 of 22	5%	47		
1831	5 of 22	23%	28		
1833	4 of 22	18%	31		
1837	1 of 22	5%	49		

mail.1996

1867	3 of 23	13%	21
1882	1 of 23	4%	39
1883	1 of 23	4%	50
1884	1 of 23	4%	29
1885	1 of 23	4%	28
1889	1 of 24	4%	20
1891	1 of 24	4%	32
1903	2 of 24	8%	46
1934	1 of 24	4%	45
1946	1 of 24	4%	46
1947	1 of 24	4%	40
1967	1 of 20	5%	102
1971	1 of 20	5%	50
1975	1 of 20	5%	40

We have to note that frequency of missing rings on increment cores of living trees higher, because on samples of subfossil trees we try to find this kind of rings on whole disc.
Some periods are notable for missing rings: 988-964 BC, 882 BC, 143 AD, 623-646 AD (especially 640 AD), 814-816-818 AD, 1453 AD and beginning of 1800th AD.
3. Stepan ask what about book by Bailey?
Best wishes,
Rashit

21. 0850162662.txt
##########

From: Keith Briffa <k.briffa@uea.ac.uk>
To: tatm@insec.quorus.e-burg.su
Subject: the paper
Date: Mon Dec 9 15:17:42 1996

Dear Rashit and Stepan
Thanks for the message and the missing data info. I will make some additions and include a plot/list of these missing years. I assume you don't mind me including your plot of the recent Yamal curve and statistics about crossdating with Polar Urals. I'll send ammended paper as soon as possible. Thanks for the quick reply. Do you have a working fax?
best wishes to you all
Keith

22. 0850320678.txt
##########

From: Tim Carter <tim.carter@fmi.fi>
To: d.viner@uea.ac.uk (David Viner - Climate Impacts LINK Project)
Subject: ECLAT 2
Date: Wed, 11 Dec 1996 11:11:18 +0200
Cc: m.hulme@uea.ac.uk

Dear David/Mike,

Thanks for sending me the ECLAT 2 proposal. First, let me say that I support the idea of a continued role for activities co-ordinating and facilitating the provision of climate change information for EC impacts research and other related research and policy. ECLAT 2 is one way of achieving this, but the fact that it is a Concerted Action Initiative imposes some limitations.

The major limitation is that CAIs are not supposed to involve original research. They are networking activities, with a view on forging research links and developing new research projects. In my view, there is a need for a number of targetted research activities on scenario development, that might be covered by the themes of the workshops you are suggesting in ECLAT 2, but which would be best served by some dedicated research projects. It really isn't satisfactory to wait until the end of ECLAT 2 before embarking on research. Many of the key topics are already known, and although research may be proceeding in some of these areas (especially in downscaling techniques, scenario development techniques, etc.), what is still lacking is co-ordination across Europe in the selection and application of climate change scenarios in impact assessment. In my view, there are two areas in sore need of targetted research:

(1) A project to analyse all available information from GCMs and historical data, which will provide some uncertainty bounds on the anticipated future climate in Europe (by region) for use in policy as well as in impacts assessment. Such a project should involve GCM groups (interpreting the GCM outputs), scenario developers (who can apply methods of generalising across a lot of GCM predictions and emissions scenarios, etc.), and a few impact analysts, who can advise on suitable scenarios for use in a variety of applications (entry level or basic scenarios).

(2) A project to develop guidelines for impact analysts on the application of climate change (and related) scenarios in European impact assessments. This work would need to be linked closely to any co-ordinated, entry-level scenarios selected for use in EC projects.

However, unless you have a project proposal in the pipeline at CRU (?) I don't think there is now time to develop a new proposal to meet the 15 January deadline.

Comments on the draft document:

1. It is unclear to me how Figure 1 relates to the text. The arrows are not well differentiated in the fax version I have, and the boxes are not explained.

2. Similarly, Figure 2 is also misleading. It implies that there is a large transfer of information from the CC modelling community to the CC impacts community, but surely the whole function of the ECLAT SE would be to act as a filter in this transfer. Note that the title of the figure should be revised.

3. PLEASE REMOVE the reference to ECLAIR - there is no such name! This was a light- hearted emailed suggestion for ECLAT 2, not for Martin's CA which doesn't have a name to my knowledge.

4. In the suggested steering committee, I would strengthen the representation of the impacts community. This could be done by time horizon: e.g. one hydrologist to cover a range of time periods from sub-daily to century scale; one forester or soils expert for the long term, one agriculture person for the medium term (maybe I could represent this community), desertification/erosion/fire risk person for short to medium term and/or an integrated assessment person (perhaps three or four persons). You should try to avoid the group being dominated by GCM'lers (do all GCM groups have to be represented?)

You might ask Ib Troen if there would be any opportunity to obtain EC funding BEFORE THE FIFTH FRAMEWORK CALL FOR PROPOSALS for a targetted research topic, if this was strongly and urgently recommended by a task group workshop. Might there be special funding from DG XI, ENRICH or the Environment Agency?

Best wishes,

Tim

****
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