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UNEP

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

WORKING GROUP I TECHNICAL SUPPORT UNIT
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August 22, 2003

To: Global Coupled Climate Modeling groups: UPDATE

Dear Colleague,

Thanks for your interest in IPCC and for your helpful responses to our previous letter on coupled model stabilization runs for the Fourth Assessment Report (AR4). We were happy to hear that so many groups are planning to provide results for this report , and we are writing to provide an update on coupled model stabilization runs to be requested based on the feedback received.

We again want to emphasize that the runs being introduced here are not intended to be the only type of model run used in the AR4. In assessing all relevant literature, the AR4 will clearly include many different types of coupled model runs designed for different purposes. Work being done under the auspices of the WCRP such as the CMIP2 and 20C3M projects together with new runs of the SRES scenarios to year 2100 will all provide valuable contributions.

Further, in addition to the set of runs done for intercomparisons, research-mode analyses carried out within each modelling group or across a few groups (e.g., carbon cycle model comparisons, runs with coupled chemistry, etc.) will also surely be published and we look forward to hearing about those.

However, the purpose of this request is to address long runs. The Parties to the United Nations Framework Convention on Climate Change (UNFCCC) have made their interest in stabilization very clear, and some modelling groups have informed us that they would like to begin their long runs very soon. That is why we have contacted you.

Based on your responses, we would now like to propose that modeling groups carry out the following three types of GCM runs as one form of input to the AR4:

1. A "committed climate change" run using 20th century climate simulations which groups have already performed or intend to perform that conform to the 20th Century Climate in Coupled Models (20C3M) simulations being coordinated by CMIP, but extended with constant concentrations, at contemporary levels, for the time period at least 2000 to at least 2050. This run extends by 50 or more years your already-planned 100 year run. It should be considered a physics test, as its goal is to elucidate how the climate system is likely to respond in the next few decades due largely to what is already in the atmosphere. As the main purpose here is to extend 20C3M to evaluate the associated committed response of the next few decades, this run could be of shorter duration than others (see below).

2. A nominal "550 ppm stabilization" run using, as a starting point, the end of the 20th century simulations as in 1 above, followed by prescribed concentrations that would be based on the SRES B1 emissions for the period 2000 to 2100 and extended with constant concentrations, at year 2100 values, for the time period 2100 to at least 2200. The actual CO_2 values from 2100 onward are not expected to be exactly 550 ppm, however, the B1 scenario has been chosen because many modeling groups have already used it, it is close to a doubling of pre-industrial CO_2 (as used in many studies), and it provides a policy-relevant range of stabilization options when taken with the next run.

3. A nominal "750 ppm stabilization" run defined as above but with prescribed concentrations that would be based on the SRES A1B emissions for the period 2000 to 2100, and again extended with constant concentrations at year 2100 values, for the time period 2100 to at least 2200. You will recall that we had asked your views on A1B versus A2, and we also received helpful input at the TGCIA meeting in July regarding what the impacts community might be most interested in. Some of you have recently raised the question of whether A1FI would be better than either A1B or A2, as it produces a bigger signal and extends fully to the upper end of the SRES range. Some of you also noted the desirability of comparisons to the TAR runs, where A2 was used. We note the following points:

    • A1B and A2 have very similar net forcings out to 2070 (see Table II.3.11, page 823 of the WG1-TAR), allowing comparison with the TAR runs over 70 years from 2000-2070. A1FI is higher than either by about 2050.

    • A1B does not stabilize concentrations, but does have decreasing emissions towards the end of the century and has been suggested as a proxy SRES stabilization (Swart et al, *Global Environmental Change*, 2002). A2 and A1FI are continuing to increase at that point.

    • A2 and A1FI have methane concentrations about double present-day values while A1B does not. Thus the uppermost end of SRES would imply a considerably larger contribution to the total forcing in 2100 from methane in those cases than in A1B. This may be difficult to reconcile with current observations of stable methane concentrations.

Thus based on the various comments received we are recommending A1B for the initial set of runs. The minimum set of requested simulations would be (i) a 20th century and committed climate change run to at least 2050, (ii) a B1 based scenario from 2000 to 2200, and (iii) an A1B based scenario from 2000 to 2200.

However, groups that would like to do so are welcome to add a fourth stabilization run based on A1FI to year 2100 followed by constant concentrations to 2200 (at a CO_2-equivalent level of about 1500 ppm).

Some groups have asked for sulfate concentrations to use as a reference for their runs, as in the TAR. Please contact us if you would like the sample data and documentation (ipcc-wg1@al.noaa.gov).

We note that as in the SAR and the TAR, a range of projected climate changes <u>over all assessed scenarios</u> will need to be developed. For example, it is highly likely that some new socio-economic and emission scenarios will be presented quite late in the assessment process, as Working Group III evaluates possible mitigation options in their own assessment process. Simple Climate Models (SCMs) and possibly Earth Models of Intermediate Complexity (EMICs) will be used where appropriate to derive the estimated range of climate change for such scenarios. It should be noted that in our planning for AR4, we are also proposing to have sections that explicitly discuss in more detail than previous reports the connections between AOGCMs, SCMs, and EMICs.

There is great interest in predictability issues as a new and important aspect of the model runs for the AR4. We would therefore strongly encourage modeling groups to run multi-member ensembles for each of the long runs above. If it is possible to do longer runs, continuing the stabilized simulations to year 2300 that would help to investigate longer term effects.

We propose to restrict model participation using criteria agreed by the TGCIA in May 2000 and modified to include the more recent development of 20C3M. That is the models must:

- Be fully coupled 3D ocean–atmosphere GCMs,
- Have performed a multi-century control run (for stability reasons),
- Have participated in CMIP2 (but please note that runs can be submitted to CMIP2 at any time),
- Have participated in 20C3M, and
- Be carefully documented (internal reports sufficient but peer-reviewed documentation preferred)

The models preferably should:

- Have performed a 2xCO2 equilibrium mixed layer run,
- Have participated in AMIP,
- Have a resolution of at least T40, R30 or 3ºx3º,
- Consider explicit greenhouse gases (e.g. CO_2, CH_4, etc.) and aerosol forcing.

Because of the need to assess progress in our understanding of climate sensitivity as a key aspect of the climate system, it will be necessary for all modeling groups to archive their calculated radiative forcing used in the long runs described above. We attach a proposal (Appendix A) for how this might be done, and would appreciate your feedback.

We also attach some information about IPCC rules of procedures which affect the timetable and deadlines to which we have to work (Appendix B).

In making the above proposals we recognize that this will require a substantial effort on the part of your modeling group. We are extremely grateful for the cooperative spirit shown in the past by the climate modeling community and are confident that this will continue and become again a major contribution to our assessment.

Please note we are explicitly seeking your response on Appendix A, and we would value your thoughts on any other aspect of this letter. Please respond via email to us via e-mail to ipcc-wg1@al.noaa.gov.

Kind regards

Susan Solomon, co-chair IPCC WGI

Qin Dahe, co-chair, IPCC WGI

Appendix A. Proposal for Radiative Forcing Calculations

1. Online Approximation to Forcing:

The objective is to approximate radiative forcing for the major radiatively active species using online calculations during model integrations. The models should be configured to save monthly mean net shortwave and longwave fluxes at the surface, top of atmosphere (TOA), and 200mb. The net fluxes at 200mb will be used as surrogates for the net fluxes at the tropopause. The archived fluxes should correspond to the radiative heating rates interacting with the remainder of the model physics.

At 10-year intervals during the integration, for a period of one year, a second set of diagnostic radiative calculations should be performed using the same state information as the interactive radiative calculations. The differences between the diagnostic and interactive radiative fluxes will provide estimates of the radiative forcing. The diagnostic calculations should include (1) a calculation with all radiatively active trace gases and sulfate set to the same values as the 19th century control integrations; and (2) separate calculations for each species at current concentrations with the other species held at 19th century values.

2. Reference Calculations:

A separate computation is necessary to quantify the differences between these approximate forcing estimates and the standard definition of forcing with the tropospheric state held fixed and the stratosphere adjusted using fixed dynamical heating. An additional set of diagnostic calculations should be performed at the same decadal interval for one-year periods. In this second set, the tropospheric state parameters should be set to values from a monthly mean climatology derived from the 19th century control integration. The stratosphere should be adjusted via the fixed dynamical heating derived from the control integration. Net fluxes should be archived at the surface, TOA, 200mb, and model tropopause for all species reset to control values and for each individual species set to current values. In addition, the net fluxes at the model tropopause should be computed using current model state information and concentrations of radiatively active species. These calculations can be performed either during the model integration or using offline RT codes with complete state information archived from the model.

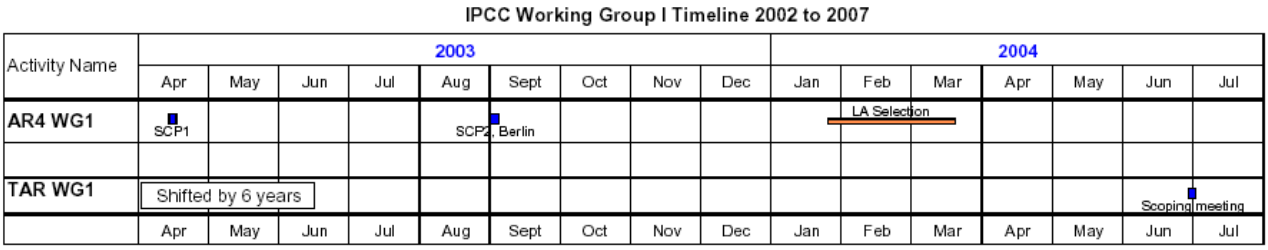
Please let us know if your group would plan to do part (1) only or parts (1) and (2) above.

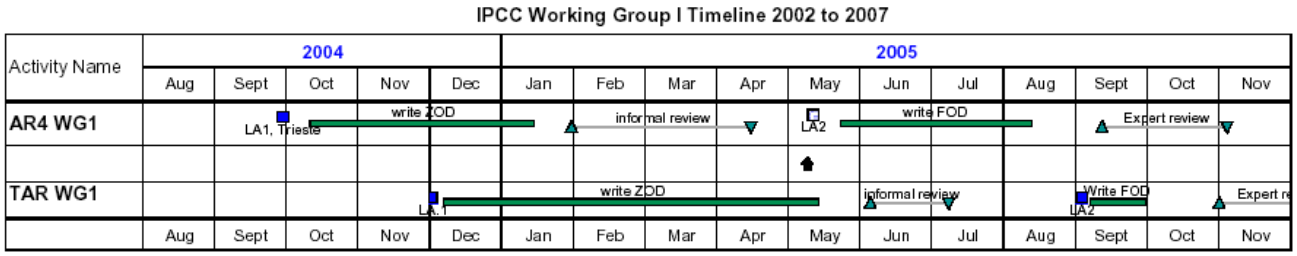
Appendix B. IPCC Procedural Information and Timetable

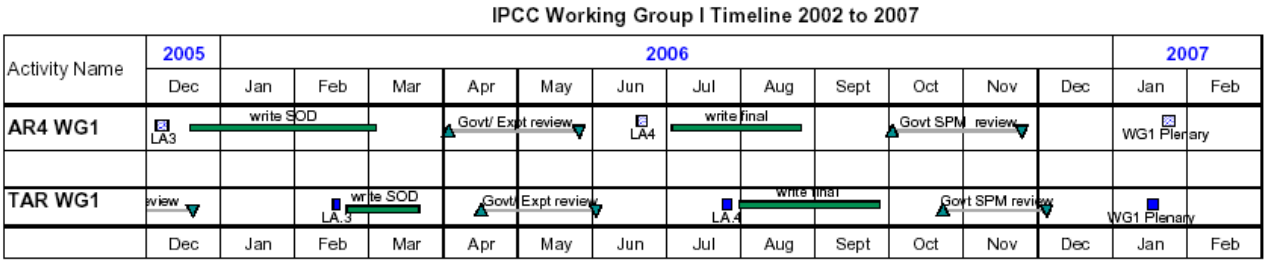
The first WG I Lead Authors meeting is scheduled for September 2004 and, to be most effective, results and documentation should be available in near final form by then. Submission of results to the IPCC Data Distribution Center (DDC) as soon as practical would facilitate their use in impacts studies for the WGII assessment.

The second WGI Lead Authors meeting is scheduled for May 2005, and that would be the latest date when the above intercomparison runs could be considered. Also at this stage all runs would need to have appropriate accompanying written material to meet IPCC rules of procedure (preferably published or in press peer-reviewed papers, although in some circumstances lead author teams may choose to accept well-documented internal reports, see below). All such written documentation must be available for examination by reviewers of the first draft, as is required by IPCC rules of procedure, see below. This sets a deadline for submission of accompanying written material of May, 2005, so that it is available for the lead author teams who would write the report.

See below for a detailed comparison of TAR and AR4 timelines. While the scoping process is earlier in AR4, the timing of the first and subsequent drafts is only a few months different (i.e., from May, 2005 through Jan., 2007), shifted of course by 6 years.







Relevant extracts from IPCC Procedures:

"4.2.3 Preparation of Draft Report

Preparation of the first draft of a Report should be undertaken by Coordinating Lead Authors and Lead Authors. Experts who wish to contribute material for consideration in the first draft should submit it directly to the Lead Authors. Contributions should be supported as far as possible with references from the peer-reviewed and internationally available literature, and with copies of any unpublished material cited. Clear indications of how to access the latter should be included in the contributions. For material available in electronic format only, a hard copy should be archived and the location where such material may be accessed should be cited.

Lead Authors will work on the basis of these contributions, the peer-reviewed and internationally-available literature, including manuscripts that can be made available for IPCC review and selected non-peer review literature according to Annex 2 and IPCC Supporting Material (see section 6). Material which is not published but which is available to experts and reviewers may be included provided that its inclusion is fully justified in the context of the IPCC assessment process (see Annex 2).

ANNEX 2

PROCEDURE FOR USING NON-PUBLISHED/NON-PEER-REVIEWED SOURCES IN IPCC REPORTS

Because it is increasingly apparent that materials relevant to IPCC Reports, in particular, information about the experience and practice of the private sector in mitigation and adaptation activities, are found in sources that have not been published or peer-reviewed (e.g., industry journals, internal organisational publications, non-peer reviewed reports or working papers of research institutions, proceedings of workshops etc) the following additional procedures are provided. These have been designed to make all references used in IPCC Reports easily accessible and to ensure that the IPCC process remains open and transparent.

1. Responsibilities of Coordinating, Lead and Contributing Authors

Authors who wish to include information from a non-published/non-peer-reviewed source are requested to:

a. Critically assess any source that they wish to include. This option may be used for instance to obtain case study materials from private sector sources for assessment of adaptation and mitigation options. Each chapter team should review the quality and validity of each source before incorporating results from the source into an IPCC Report.

b. Send the following materials to the Working Group Co-Chairs who are coordinating the Report:

- One copy of each unpublished source to be used in the IPCC Report

- The following information for each source:

- Title
- Author(s)
- Name of journal or other publication in which it appears, if applicable
- Information on the availability of underlying data to the public
- English-language executive summary or abstract, if the source is written in a non-English language
- Names and contact information for 1-2 people who can be contacted for more information about the source.

2. Responsibilities of the Review Editors

The Review Editors will ensure that these sources are selected and used in a consistent manner across the Report.

3. Responsibilities of the Working Group Co-Chairs

The Working Group Co-Chairs coordinating the Report will (a) collect and index the sources received from authors, as well as the accompanying information received about each source and (b) send copies of unpublished sources to reviewers who request them during the review process.

4. Responsibilities of the IPCC Secretariat

The IPCC Secretariat will (a) store the complete sets of indexed, non-published sources for each IPCC Report not prepared by a working group (b) send copies of non-published sources to reviewers who request them.

5. Treatment in IPCC Reports

Non-peer-reviewed sources will be listed in the reference sections of IPCC Reports. These will be integrated with references for the peer-reviewed sources. These will be integrated with references to the peer reviewed sources stating how the material can be accessed, but will be followed by a statement that they are not published."