about 2% per decade in the second half of the twentieth century, possibly with some recovery in the 1990s. The "dimming" seems widespread and "global" at least over land. Possible causes discussed include, in order of probability, anthropogenic aerosols, major volcanic eruptions, and increasing cloudiness. How much of the "missing" solar radiation is absorbed by the atmosphere or reflected back to space is a key question for climate research.

Following the formal sessions, convened by the authors of this report, a meeting of the participants encouraged them to prepare an edited proceedings of the sessions, and they accepted an offer by M. Roderick to prepare a bibliography on global dimming, which is now available at www.greenhouse.crc.org.au/crc/research/c2_bibliog.htm.

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FORUM

The EPICA Challenge to the Earth System Modeling Community

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One of our major aims as Earth systems scientists is to predict how the Earth will behave in the future, particularly in the face of changes imposed upon it as a result of human activities. These predictions are made using models and concepts that are in part derived from observation of how the system has behaved in the past. However, these observations, which come from paleo-records, are also one important tool for validating the models. The imminent appearance of a new ice core data set presents a unique opportunity for a test of our understanding, particularly of the climate/carbon system. Members of the European Project for Ice Coring in Antarctica (EPICA) and others here present a challenge to the modeling communities and other interested parties.

The Vostok ice core record [*Petit et al.*, 1999] has become an iconic data set. It presents the climate of the last 420 kyr, showing the rise and fall of Antarctic temperature through four complete glacial/interglacial cycles. The most striking finding is that CO_2 and CH_4, the two most significant greenhouse gases (after water vapor), also rise and fall, in a remarkably similar fashion. When Antarctic temperature is calculated including a correction for the climate of the water vapor source region [*Cuffey and Vimeux*, 2001], the correlation between CO_2 and Antarctic temperature over the last 150 kyr has an r^2 of 0.89!

As stated elsewhere [*EPICA Community Members*, 2004], the Vostok data set has become a compelling target against which other climate records and modeling efforts are measured. What is the significance of the apparent lower (glacial) bound of about 180 ppmv in CO_2, and of the upper (interglacial) bound of around 280 ppmv (and the equivalent bounds in methane)? Is the behavior seen fully consistent (as it looks) with the idea that the greenhouse gases are operating as amplifiers to otherwise smaller initiators? And which processes are responsible for the changes in CO_2 and CH_4?

These questions are not yet fully answered, but a number of ideas appear in the literature. In June 2004, the members of EPICA presented a long-awaited record (from Dome C) that extends the Antarctic climate record back to 740 kyr, with the prospect of up to a further 200 kyr to come [*EPICA Community Members*, 2004]. The data reflect very clearly a change of behavior just before the "Vostok era" that has been termed the mid-Brunhes event. In the earlier period, the glacial/interglacial cycles in Antarctic temperature are of much lower amplitude, with the interglacials particularly weakened (although of longer duration than the later ones). There is no obvious external explanation for this change of behavior.

In presenting their new data, the EPICA team extended the greenhouse gas records only by 20 kyr, to around 430 kyr. Trace gas analyses are under way but take much longer than do the measurements already published from the core; it is expected that a full record extending to at least 740 kyr will not be available until at least the end of 2004. The prospect of a substantially longer record poses some fascinating new questions: What will be the CO_2 and CH_4 concentrations in the weak interglacials of the earlier period? Will CO_2 still be at the standard "interglacial level" of 280 ppmv, or will it scale with Antarctic temperature and stand at about 240 ppmv (and similarly for methane)? Some authors have wondered whether CO_2 could have been on a long-term trend downward during the Quaternary; such a trend might have been responsible for changes in frequency and amplitude of climatic cycles during this time. Is any trend apparent over the last 800 kyr?

These questions are likely to be answered when the new records are completed. However, a group within both the ice core and modeling communities would like to use the imminent arrival of these records as a challenge. What do the modeling community, and others who are putting forward ideas, believe we will see, and why? The purpose of the "EPICA challenge" is not to find a right answer, and declare a winner; indeed with our present knowledge it is more than likely that someone can get the right answer for the wrong reason. Rather the idea is to provide an impetus for modelers to expose the assumptions and arguments behind their predictions, leading to a more open discussion once the data are revealed.

We therefore invite anyone interested in doing so to predict what carbon dioxide and methane will look like back to at least 800 kyr B.P., and to explain their reasoning, whether the result comes from a simple concept or from a full model run. Time is short, because it is possible that the first outline data sets will be available for presentation at the AGU Fall Meeting (13–17 December 2004). The data groups involved will endeavor to keep the data under wraps until then. Some modeling groups may like to submit their ideas in full to journals or at meetings. However, the PAGES International Project Office has also offered to collate and summarize responses that are received there before 15 November. To be included, please send your ideas with one figure and a short caption (200 words maximum, explaining why the main features occur) to Christoph Kull (christoph.kull@pages.unibe.ch).

The AGU Fall Meeting includes a Union session entitled "Climate of the past million years" (U01), and a summary of the submissions will be included on one or two posters at this session. A short article in the PAGES newsletter may also be produced. The EPICA Dome C temperature and dust data sets, extending 740 kyr back in time, are available from the World Data Center for Paleoclimatology (http://www.ngdc.noaa.gov/paleo/icecore/antarctica/domec/domec_epica_data.html). Data from the Vostok ice core for model testing can be downloaded from the same site (http://www.ngdc.noaa.gov/paleo/icecore/antarctica/vostok).

The EPICA challenge has no prize other than the prospect of a greatly increased understanding of the way Earth works. Fire up your computers, sharpen your pencils, and polish your crystal balls: the EPICA challenge is on!

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ABOUT AGU

AIP to Process AGU Renewals for 2005

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AGU is collaborating with the American Institute of Physics (AIP) to provide improved online renewal of your membership and subscription starting with 2005 payments.

The renewal process whether online or via mail will be easy for you. I would like to encourage each of you to renew early using the online form. You will be saving the Union money by cutting down on the cost of paper renewals. As a thank-you, members who renew within the first weeks will receive 2005 access without charge to the AGU Member Library of online back issues of all journals. At the same time you can help assure that your information has been correctly transferred to the new database. Great care has been taken in the transition; however, a check by you will assure your information is current.

To be sure you receive the e-mail announcement of the opening of the online renewal system, check your e-mail address in the current membership directory and correct it if necessary. The announcement will provide a link to your personal renewal page. You will be able to add or change journals, make contributions, pay your dues, and check and change your personal information. Your credit card will be checked while you are online. Any data you enter through the online renewal form will be automatically changed in the database. The system that controls online access to AGU journal and member services will normally be changed within 1 working day starting with the 2005 subscriptions for members using the online process.

A critical change with this transition is the assignment of a new AGU member number. Through the end of December 2004 you will continue to use your current AGU member number for all services, including online renewal. Sometime in December you will receive your new number. Beginning on 1 January you will use the new number for logging into all member services and journals. Your new number will also be printed on your *Eos* label.

AIP will be assuming responsibility for the order-related member service functions that currently take place at AGU headquarters. The representatives at AIP will be well versed about AGU products and services and able to respond quickly and accurately to your questions. Of course, the AGU Member Service Center will continue to be open to you, as it is now, for information, orders, or concerns.

I am excited about this collaboration. AGU has been a member of AIP for almost 20 years. Both organizations are familiar with each other's missions and operations. AIP has developed e-commerce technology that will be very useful to AGU. Furthermore, AIP has economies of scale and vast experience in dealing with library subscriptions. This means much faster processing for both institutions and individuals.

Please watch for the announcements and renew early.

—FRED SPILHAUS, Executive Director