GLOBAL CHANGE
NEWSLETTER

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The International Geosphere–Biosphere Programme: A Study of Global Change (IGBP)
of the International Council of Scientific Unions

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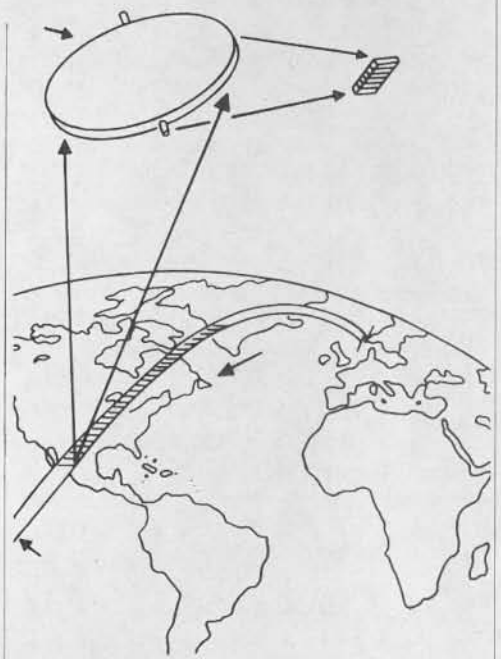
Importance of Space Observations for Global Change

Many scientists are now getting involved in conducting global scale research and are looking toward developing technologies to gain a more comprehensive view of the Earth system and how it is changing. As the underlying themes of the International Geosphere-Biosphere Programme (IGBP) have been defined and a programme of research becomes formulated, we must focus our attention on specific needs of the IGBP for global observation from space. A first study carried out by COSPAR (Potential of Remote Sensing for the Study of Global Change, Advances in Space Research 7 (1), ed., S.I. Rasool/ Pergamon Press, 1987) described in some detail the existing space capabilities, the upcoming programmes of various agencies and how a number of key data sets, acquired from space satellites, can be useful in Global Change Studies.

Now, in 1989, we are at a critical point not only in the definition of a focused research programme for the IGBP but also in the formulation of plans for space-based research — an integrated research programme developed by the various space



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agencies for the decade of the 1990s through the International Space Year (1992) and beyond. A close coordination between the two is obviously imperative. During a recent workshop held in April, 1989, an ad-hoc group

drafted an outline of the IGBP needs for remote sensing data. This needs will be further specified and a report included in the report to the Second meeting of the IGBP Scientific Advisory Council.

The major scientific issues identified in the IGBP for the understanding of the entire Earth system require observation of various processes on different spatial and temporal scales. This critically indicates that any global observation system should be conceived as an integrated system including both measurements from space, which are essential to provide viewing and coverage on regional to global scales, and *in situ* measurements (ground-based, airborne or balloon-borne), which are necessary for regional and local studies, subsurface sampling and validation of satellite remote sensing data.

In implementing the space component of the IGBP two time scales have to be considered. In the near-term (1990-1995) the programme will be based on:

– Data from existing satellites which include meteorological geostationary and polar orbiting satellites (GOES, Meteosat, GMS, INSAT, NOAA satellite, Meteor), Landsats, SPOT, Nimbus, ERBE, etc.;

– Measurements from U.S. space shuttle and Soviet Mir station;

– Already planned research missions (ERS 1, UARS, TOPEX/POSEIDON, NASA-Scatterometer, JERS); and

– Ground measurement networks for validation of satellite data.

In the longer term (1996 and beyond) we will have a new generation of space-observing systems based on polar orbiting platforms which will become available to scientists involved in global research. New observational requirements for the IGBP need to be identified now so that they can be incorporated in the design of this Earth Observing System (EOS). IGBP is in the process of preparing a comprehensive document identifying these observational requirements. This document should be ready by March 1990. For further information please contact: Dr. S. I. Rasool, Chairman, IGBP Working Group 1 on Data and Information Systems, Telephone: +1 (202) 453-1420; OMNET: I.Rasool; Telefax: +1 (202) 426-0754.

Acronyms

COSPAR ICSU Committee on Space Research
EOS Earth Observation Satellite System
ERBE Earth Radiation Budget Experiment (NOAA, NASA)
ERS ESA Remote Sensing Satellite
GOESI Geodynamics Experimental Ocean Satellite (U.S.)
GMS Geostationary Meteorological Satellite (Japan)
INSAT Indian National Satellite
JERS Japanese Earth Resources Satellite
NASA National Aeronautics and Space Administration (U.S.)
NOAA National Oceanic and Atmospheric Administration (U.S.)
SPOT Systeme Probatoire de l'Observation de la Terre (France)
TOPEX/POSEIDON U S/French Ocean Topography Experiment
UARS Upper Atmosphere Research Satellite (U.S.)

National IGBP Committees

Australia
Austria
Bangladesh
Belgium
Brazil
Canada
Chile
China (CAST, Beijing)
China (Academy in Taipei)
Colombia
Czechoslovakia
Egypt
Federal Republic of Germany
Finland
France
German Democratic Republic
Greece
Hungary
India
Ireland
Israel
Japan
The Netherlands
New Zealand
Norway
Poland
South Africa
Sweden
Switzerland
Thailand
United Kingdom
USA
USSR
Venezuela
Zimbabwe

IGBP Secretariat Staff News

Dr. Hassan Virji, atmospheric scientist on leave from the National Science Foundation, Washington, DC, started working at the Secretariat in May. Dr Virji was appointed Deputy Executive Director at the Special Committee meeting in Brussels in June.

Ms Suzanne Nash is the new Assistant to the Executive Director beginning in September. She has previously worked at Unesco and the International Herald Tribune.

Ms Elise Wännman has joined us as Finance Officer for the Secretariat. She has previously been working at the Institute of Microelectronics.

Ms Cecilia Edlund is one of our new secretaries. She joined us in August.

Ms Lisa Wanrooy-Cronqvist has started working as full time secretary. She has been a part-time helper at the office earlier.

Ms Hildburg Berglund has unfortunately left us and gone back to the Ministry of Foreign Affairs, which is a great loss for the secretariat. Hildburg has been instrumental in getting the IGBP Secretariat organized and will be greatly missed by all those involved in the international IGBP planning effort. She has been with us since 1 December 1987.

Ms Sophia Westlund has also left us. We are really missing her cheerful way of working and her willingness to do all sorts of job, even the dull ones.

To all friends in the Special Committee of the IGBP and the ICSU family, I just want to express how much I valued getting to know you and working together with you during my time at the IGBP secretariat. I wish all the best for the future to each of you personally, as well as the IGBP programme.

Hildburg

The IGBP GBOs Become RRCs

An ad hoc meeting of IGBP Working Group 2 "Geosphere-Biosphere Observatories" was convened in New York on 10-12 May 1989 under the chairmanship of Rafael Herrera. The meeting was charged with analyzing the responses to the proposals to create a network of Geosphere-Biosphere Observatories as brought forward in the IGBP Plan for Action (IGBP Report No. 4) The Special Committee reviewed the discussions on this issue during the first meeting of the IGBP Scientific Advisory Council (October 1988). The committee stressed that the top-tier GBOs were designed as regional research and training centres and not a global set of highly centralized monitoring institutes.

The New York meeting considered that a main purpose of each RRC is to facilitate regional research on issues important to global change. They will also develop strong synthesis and modelling programmes of relevance to regional priorities and the overall IGBP objectives. The research will include a variety of approaches such as monitoring, experimental manipulation, integration and modelling. The RRCs will also help to catalyze the integration of data from all regions at the global scale.

Facilitation of regional research will involve at least five activities. The RRCs will:

1. Promote cooperation among scientists of the region in a network fashion for the purposes of defining regional research questions of global significance, and facilitate that research is carried out in a coordinated way;

2. Provide data management of regional and global data sets;

3. Encourage the sharing of research results among network scientists and establish mechanisms for sharing the results with scientists from other regions;

4. Develop synthesis and modelling activities;

5. Establish training and exchange programmes, especially in the use of new technologies and in the area of data synthesis and modelling.

Cooperation among scientists is at the heart of the Global Change Programme. The RRCs will promote this cooperation from the beginning of the implementation phase of the IGBP. The initial task will be to make regional interpretations of IGBP's research plan. This will be done through a series of workshops within the region that are organized and run with the help of the region's RRC. A follow-on set of workshops will be held to promote cooperation as the research is carried out.

The RRCs will also promote cooperation between regional scientists and the IGBP's organizational structure that includes Coordination Panels, Working Groups and Scientific Steering Committees. This cooperation will ensure the appropriate siting and implementation of the core projects of the Global Change Programme.

The management of regional data sets is a major responsibility of the RRCs. This responsibility has many dimensions including:

1. Banking of critical subsets of data from regional research sites;

2. Control over the quality of that data;

3. Incorporation of appropriate data in regional geographic information systems that are in place at the RRCs;

4. Providing scientists with access to global data sets they need to interpret regional research results or to conduct between-region research and synthesis.

Help will also be available from the RRCs to various research groups within the region concerning their data management problems.

The contents of the regional data bases must be available to all scientists. The RRCs will encourage the sharing of research results by establishing easy-to-use communications networks within and among regions. Electronic communication devices, newsletters and scientific meetings will be among the tools used to achieve this goal of data exchange.

One of the major purposes of data exchange is to foster synthesis and modelling activities that will ultimately lead to predictions of the effects of global change on the capacity of the planet to support humankind. Each RRC will provide scientists with access to the computer hardware and software needed for synthesis and modelling. The RRCs will also promote training in modelling.

The training function of RRCs will include more than modelling. Other areas of training will include the use of new technologies. Training will most likely occur as short courses (weeks to a month), apprenticeship programmes (months to years), and exchange programmes between research sites in different regions.

Finally, when RRCs are fully developed they will foster communications of research results to regional resource managers and policy makers. This will be done in a variety of ways.

The suite of sites that will make up the global network of Regional Research Centers (RRCs) will be selected through a two-tiered process. The first level of selection is the identification of appropriate regions of the globe (about 10) in which RRCs will be located. The second is the choice of a specific site within each of the specified regions.

The report from the May meeting has been circulated to all national IGBP committees for comments. These will be discussed at the forthcoming meeting of the working group 28-29 September in Warsaw, Poland. This meeting is following a workshop hosted by IGBP, IIASA and the Polish Academy of Sciences. The workshop is also cosponsored by Unesco.

First Meeting of the Committee on Global Changes of the Past

The Scientific Steering Committee on Global Changes of the Past, established by the Special Committee at its meeting in Stockholm (October 1988), held its first meeting in Bern on 4-7 April 1989 to define a core IGBP programme in this area.

The decision of the group was to develop a strong programme of two distinct but related streams, aimed at establishing a vastly improved record of global variations in climate, biogeochemistry, and biomass and the interactions that link these fundamental Earth system parameters.

Stream 1

Stream 1 of the proposed core programme would focus on the last 2000 years of Earth history, with the goal of reconstructing the detailed history of climatic and environmental change for the entire globe for the period since 2000 BP, with temporal resolution that is at least annual and ideally seasonal. The period encompasses major climatic shifts between such features as the Medieval Warm Epoch, the Little Ice Age, and the general warming that has characterized global climate in the last centuries - the only period for which a written history is available, and the full period in which human impacts have become a recognized force in influencing the global environment.

The purpose is:

1. To provide a baseline of natural change against which human impacts can be measured;

2.To establish a record against which environmental signals from the more distant past can be calibrated and quantified;

3. To illuminate the connections and phase-relationships between bio-geochemical and climate changes in the most recent and most accessible period of Earth history; and

4. To provide a data base for testing numerical models of climate change and environmental processes.

Preliminary steps to meet this goal will require efforts to establish calibration and end-to-end data analysis procedures that will make intercomparison possible between various data sets, and to establish an agreed-upon chronology of climate and Earth system change during this period. There is a need to organize teams to collect and archive new data describing the Earth system and to stimulate establishing new laboratories and archival centers. There is an equivalent need to increase the educational opportunities regarding environmental data from the past, and in this way to increase the number of scientists and technicians that work in recovering and interpreting such data.

Stream 2

Stream 2 will concentrate, with coarser temporal resolution, on dominant changes in Earth history through a full glacial cycle: a period fixed by the anticipated results from planned deep ice-coring programmes in Greenland and Antarctica. The goal is to reconstruct a continuous history of climatic and environmental change through the time of the last full glacial cycle in order to improve our understanding of the sequence of events that control epochs of major climatic and environmental change. Coordinated studies will focus initially on

agreed-upon time slices and spatial regions.

Two types of reconstructions are envisioned:

1. The elucidation of long-term variations such as the transition from a glacial to an interglacial period as well as periods of "abrupt" climatic change and "short-term" fluctuations;

2. A more detailed examination of variations during the Holocene (last 10 000 years) to assemble regional and global environmental data from many sources.

The first step towards the goal for Stream 2 will be to collect existing data sets that bear on significant environmental changes of both short and long term during this period, and will put them in a form that allows intercomparison and study. As in Stream 1 this initial reconnaissance of what is now available will identify needs and data gaps.

New data will need to be collected to "fill in the gaps" from both long- and short-term records. Both field and laboratory data will need to be assembled and interpreted, and methods developed for cross-correlating data originating from different sites, methods, and archives.

The collected data will be used as inputs for environmental models. These include time-dependent global models to better understand the dynamic behavior of the environmental system, and coupled oceans, atmosphere, and biosphere models that describe regional differences in the environment.

Endeavors in both Streams 1 and 2 of paleo-reconstruction will need to be coordinated with the efforts of the IGBP Coordinating Panel 5 on Global Analysis, Interpretation and Modelling. Envisioned in both are studies involving historical records, tree-rings, lake sediments, ice and ocean cores, pollen records, loess and other eolian deposits, and geologic sediments of various kinds. Essential to both are the ongoing and planned national and international efforts, including these organized within INQUA, IUGS, IUGG, SCAR, and other organizations that deal in Earth system history.

Vegetation Imagery Diskettes Pilot Project

A basic data set of wide interest and use for study of change in vegetation imagery derived from operational satellite observations in several spectral bands is called Vegetation Index (VI). It is, however, not known yet exactly what vegetation characteristics are reflected in the empirical "index". One of the first pilot projects of IGBP Working Group 1 on Information and Data Systems is concerned with the development of computer based global vegetation data. This project is conducted in collaboration with the ICSU World Data Centre. As a first phase, VI data of the continent of Africa in four-week blocks for a four-year period will be condensed onto four floppy disks. Those can be read and manipulated by personal computers ranging from IBM XT to PS2 types.

Display and manipulation software that also includes raster-type geographical indexing is included, as well as several ancillary climatic, land-cover or land-surface data sets. With the cooperation of UNEP and UNITAR, workshops will be arranged for training research groups in Africa in using these data sets to conduct local research projects. Ultimately, all continents will be included and finally global data sets will be produced on CD-ROMs.

For additional information, please contact:
Herbert Meyers
National Geophysical Data Center
NOAA, E/GC1
325 Broadway
Boulder, CO 80303
USA
Telephone: +1-303-497 6521

National Committee Planning for the IGBP

by H.A. Mooney
Chairman, U.S. National Committee for the IGBP

At present there are almost 40 national committees contributing to the planning of the IGBP. Many of these committees have developed programme priorities for the involvement by their nations in the IGBP and are now working on specific operational plans. It is clear that the success of the IGBP will rest on both national and regional efforts combined with international coordination.

The 4th meeting of the IGBP Special Committee in Brussels on 13-17 June, 1989, was held in conjunction with 20 national committee representatives. The objective was to explore mechanisms for greater coordination among national committees and between these committees and the international planning effort. Definite plans were made to accomplish these goals. First, a meeting of all national committees has been proposed where the agenda would be a full discussion of the various national efforts and the development of plans for linking them, where appropriate, to fulfill global research objectives. Such a meeting should be held, at the latest, in conjunction with the next Scientific Advisory Council meeting in Paris on 3-7 September, 1990.

Within the next five months greater input of the national committees into the planning efforts of the Special Committee will be achieved by the circulation of working drafts of the documents prepared by the planning groups (CP, SSC, WG). The schedule for national committee response will be short because of the need to finalize the international planning process by March, 1990. However, if the expertise represented by the various national groups is to be fully utilized it is essential that a process be developed within the national committees to respond to these drafts.

Fourth Meeting of the Special Committee for the IGBP

Brussels, Belgium 13-17 June 1989

At the invitation of the Belgian National IGBP Committee, the Special Committee for the IGBP met in Brussels last June. In order to increase the communication between national and international IGBP planning efforts, chairmen of all national committees had been invited to attend the meeting. A brief report from the meeting as seen from the point of view of Harold Mooney, Chairman of the US Committee, can be found elsewhere in this issue.

The SC-IGBP noted the need to ensure that sufficient opportunities exist for national IGBP Committees to interact with the international IGBP planning groups. The report to SAC describing the core projects thus far identified will be reviewed by the SC-IGBP at their meeting in Moscow during 22-24 March, 1990, following which an ad hoc editorial committee will finalize the report in mid-April, 1990. Subsequently, the final version of the report will be sent to SAC participants in June 1989.

The SC-IGBP reviewed the activities of the IGBP planning groups. Salient issues in this regard are:

CP1 The SC-IGBP recommended that discussions be continued with IAMAP's Commission on Atmospheric Chemistry and Global Pollution (CACGP) to designate the International Global Atmospheric Programme (IGAC) as a core IGBP project. This agreement has now been reached, and CACGP and IGBP will appoint a joint Scientific Steering Committee for the project. This committee will develop a biological research component to enhance the present IGAC plans. The strong interest in the scientific community of developing a global change research programme on the Middle Atmosphere was also noted.

CP2 SCOR and IGBP have agreed that the Joint Global Ocean Flux Study (JGOFS) should be designated a core global change project. In order to ensure efficient communication, the Chairman of JGOFS, Professor B. Zeitzschel, has been invited to serve as an ex officio member on CP2. Similarly, Professors J. McCarthy and T. Nemoto are advisory members of the JGOFS Committee. The following scientists have been invited to be members of CP2: Prof. Takahisa Nemoto, Japan, chairman, Dr M. Abbott, U.S.A., Prof. Bert Bolin, Sweden, Dr Graham P. Harris, Australia, Dr P. Holligan, U.K., Dr. Pierre Lasserre, France, Dr Peter Liss, U.K., Dr L. Vere Shannon, South Africa, Prof. Shizou Tsunogai, Japan, Prof. M.E. Vinogradov, U.S.S.R., Dr. John D. Woods, U.K., Prof. Bernt Zeitzschel, FRG.

CP3 The SC-IGBP recommended that IGBP discuss the issue of the need for field measurement projects on water and energy exchange between vegetation and the atmosphere with the World Climate Research Programme. The Global Energy and Water Cycle Experiment (GEWEX) is of key interest to IGBP and CP 3. Subsequently, it has been agreed that WCRP and IGBP will appoint a joint Scientific Steering Committee for coupled field and remotely-sensed measurements to elucidate the interactions between vegetation characteristics, the hydrological cycle, and fluxes between terrestrial ecosystems and the atmosphere.

CP4 The SC-IGBP noted that workshops are planned to specifically address the question of the effects of climate change on agroecosystems and silvicultural systems. These workshops are to be held in Africa (the Cameroon) in November and in South America in 1990. A modelling strategy for terrestrial ecosystems has been developed through meetings of CP4 and at a SCOPE workshop held earlier in 1989. Strategy for field experimentation was developed at a meeting in Canberra in August. All these activities should lead up to definition of core projects in this area for presentation at the next SAC-IGBP.

SSC It was noted that the SSC has recommended that the core project on "Global Changes of the Past" be divided into two streams. Details on this are given elsewhere in this issue. The need to coordinate the efforts with other international endeavors was discussed. In particular, concern was expressed that the IGBP planning needed to be coordinated with similar activities proposed by an IUGS group. The components of core projects resulting from these activities will be presented at the next SAC-IGBP.

WG1 The need for closer contacts with the International Space Year (ISY) was discussed, and it was decided to investigate whether a formal relationship might be developed in which IGBP can serve as a source for scientific advice to the ISY. Close contacts need to be maintained with GRID (UNEP). The IGBP can possibly serve as a source for scientific guidance for the further developments of GRID. The SC-IGBP also noted that there was a need for a specific evaluation of IGBP needs for remotely-sensed data, and that such an evaluation should be included in the report to the

2nd SAC-IGBP. All other IGBP planning groups were asked to provide input to such an assessment.

WG 2 The SC-IGBP took note of a report from a meeting of the Working Group held in May 1989 (reported on elsewhere in this issue). It decided to rename WG2 as the Working Group on "Regional Research Centres" and charged the group with developing an implementation strategy for a network of regional Global Change research centres.

The SC-IGBP discussed fiscal matters and noted with considerable concern that secured funding was far less than projected. It noted, however, with gratitude the generous contributions from Shell Netherlands and IBM Sweden in addition to previous grants from ICSU, the Andrew W. Mellon Foundation, CEC, UNEP and Unesco and national contributions. It was decided to ask national ICSU members to consider increasing their financial commitment during the planning phase of the IGBP, to make additional requests to private foundations and to investigate possibilities of getting further support from the private sector. With regard to national contributions, special note was taken of a generous decision by the French government to pay USD 75,000 for 1989.

The SC-IGBP took special note of the need to involve developing countries in the IGBP planning effort and the IGBP Secretariat efforts to organize regional IGBP meetings in Latin America, Asia and Africa. In addition, the SC-IGBP, in response to a request from ICSU, requested the IGBP secretariat assist ICSU in developing proposals to UNDP for IGBP related effort in developing countries.

The SC- IGBP gratefully accepted the invitation from H. Curien, French Minister for Science and Technology, to hold the 2nd meeting of its Scientific Advisory Council in Paris 3-7 September 1990.

Joint Global Ocean Flux Study (JGOFS)

A Joint Announcement from the ICSU Special Committee for the IGBP Programme and the Scientific Committee on Oceanic Research of ICSU

The International Geosphere-Biosphere Programme (IGBP) of ICSU has as its overall goal

"to describe and understand the interactive physical, chemical and biological processes that regulate the total Earth system, the unique environment that it provides for life, the changes that are occurring in this system and the manner in which they are influenced by human activities."

The Scientific Committee on Oceanic Research (SCOR) has taken the initiative to establish a major global ocean research programme called the Joint Global Ocean Flux Study (JGOFS). The major goal of JGOFS is

"to determine and understand on a global scale the time-varying fluxes of carbon and associated biogenic elements in the ocean and to evaluate the related exchanges with the atmosphere, the sea floor and the continental boundaries."

The Science Plan for JGOFS is now being formulated and a Pilot Study in the North Atlantic involving at least seven countries will begin in March 1989.

The Special Committee for the IGBP has a Coordinating Panel on Marine Biosphere - Atmosphere Interactions which has identified three areas of oceanic research to receive priority consideration in the IGBP. Two of these are: characterization of the oceanic carbon cycle and associated links with the other elements known to be either limiting to biological productivity or of significance to climate, and; examination of linkages among biogeochemical cycles and the physical climate system that require characterization in order to, anticipation not only the effects of global change on these cycles, but also their feedback to climate.

In recognition of the similarities in the goals of these two programmes, and in the interest of making the most effective use of manpower and other resources during the planning and implementation phases of a large global-scale marine research programme, the SC-IGBP has invited SCOR, and SCOR has agreed, to designate JGOFS as a Core Project of the IGBP, in which the full responsibility for both of these phases is retained by SCOR.

We have also agreed that liaison between IGBP and JGOFS will be achieved by participation in all relevant planning meetings. The Chairmen of the SC-IGBP and of its Coordinating Panel on Marine Biosphere-Atmosphere Interactions are already Corresponding Members of JGOFS and have participated in its early activities. In addition, the Chairman of JGOFS, or an appropriate representative, will attend the future meetings of the Coordinating Panel. A number of joint activities are foreseen; one of these will be an IGBP/JGOFS international meeting on "Modelling Ocean-Atmosphere Interactions including the Effects of Primary Production in the Ocean" which will be held at the Royal Society in London in early 1990.

5 May 1989

James J. McCarthy,
Chairman SC-IGBP
Jarl-Ove Strömberg,
President SCOR

Linking Land-Surface and Atmospheric General Circulation Models

by Sandra Turner
IGBP Post-doctoral fellow, CSIRO, Canberra, Australia

A joint meeting of Coordinating Panels 3 (Biospheric Aspects of the Hydrological Cycle), 4 (Effects of Climatic Change on Terrestrial Ecosystems) and 5 (Global Analysis, Interpretation and Modelling) was held in Brussels 8-10 June 1989 and hosted by the Commission of the European Communities Directorate-General for Science, Research and Development (CEC-DG XXII) and the Belgian National Committee for the IGBP. The objective of the joint meeting was to identify the research areas of common interest and to develop a strategy to address these issues. The meeting discussed modelling needs of the three panels relative to terrestrial ecosystem, hydrological and atmospheric models and relevant field experimentation issues necessary to augment the modelling activities.

Three research areas were concentrated upon during the workshop. These were:
- Modelling the interface between the land-surface and the atmosphere.
- Ecosystem-hydrology interactions on the continental scale; development of a continental scale hydrological model.
- Biogeochemical elemental transfer issues of global relevance.

No comprehensive system model capable of predicting global changes in the Geosphere-Biosphere on time scales of decades to centuries exists. There are however prototypes for nearly all of the component parts. Linking these parts to obtain a reliable description of the entire Earth system will be a central task of IGBP. Existing atmospheric general circulation models (GCMs) require significant improvement in their treatment of land-surface interactions. This consideration was a major focus of this workshop.

One obstacle to the coupling of land-surface models to general circulation models (GCMs) is the difference in temporal and spatial scales which characterize the two. Climate models currently represent atmospheric circulation features on as large as 500 km grid-size cells distributed across the globe at integration time steps of hours to years. Biological models represent processes from cellular to ecosystem levels at spatial (e.g., < 1 km) and temporal scales (e.g., day to decades) different from those of the climate models.

Information transfer between the climate models and the ecosystem models need to resolve this scaling incongruence. The climate system must be decomposed into a spatial and temporal scale meaningful to ecosystem processes. Soil and vegetation characteristics of ecosystems which control energy, water, and biogeochemical fluxes from the land-surface to the atmosphere must be aggregated in a meaningful manner. The meeting identified following needs:

1. Linking ecosystem characteristics to the climate system through a Soil-Vegetation-Atmosphere-Transfer (SVAT) model. SVAT models translate land-surface information relative to surface albedo and roughness, water flux, and trace gas exchange into the planetary boundary layer to parmeterize the boundary conditions of the GCM's.

2. Development of models that simulate local climate. Fundamental to the downward linkage of GCMs to ecosystem and hydrological models is the development of models that simulate local climatic events. These models would translate the large-scale predictions of GCMs into spatially finer-scale inputs for the ecosystem models, transferring, for example, the even average drizzle into rainstorms in space and time.

3. Development of a global model of ecosystem dynamics. Changes in ecosystem dynamics resulting in alterations in composition or structural attributes of the ecosystem that affect fluxes of energy, water and trace gases are not well developed. Further research is needed to develop a spatially robust mechanistic model of these dynamics that is able to deal explicitly with cross-boundary transport of biotic material and incorporates disturbance processes that would influence ecosystem dynamics and biogeochemical fluxes.

4. Coupling of hydrological and ecosystem models. This two-way process requires the development of continental-scale hydrological models built in such a way that they can respond to data on key vegetation characteristics and inputs from the local climate simulator models.

5. Understanding the changes in the flux of key biogeochemical elements (e.g., C, N, H, and O): Processes such as biological fixation, incorporation into the soil system, mass transport in eolian and fluvial processes,

and gaseous emissions need to be coupled to ecosystem dynamics and hydrological processes. The spatial heterogeneity that these processes impose upon the land-surface gives rise to special consideration for global change studies.

The meeting also discussed data and validation issues which will support the coupling of the GCMs to the land surface. Important requirements include:

1. Satellite data-based distribution of present-day land cover will be required for the improvement in coupling of GCMs to the land surface.

2.Validation and improvement of SVAT models by means of field experiments is necessary to determine the accuracy of the models

3. Regional-scale field measurements will be necessary to relate conventional and satellite observations to SVAT model simulations.

4. Biogeochemical cycling issues must be addressed at the scales of landscapes and regions and incorporated into the global ecosystem models.

The recommendations of this meeting will be incorporated into the research framework being developed for the IGBP. These recommendations plus results from other similar planning meetings will form the basis of the core IGBP research projects to be described in the report to the Second SAC-IGBP.

IGBP Core Projects

At the Stockholm meeting 23-30 October 1988, the Special Committee decided to designate core "Global Change" projects in two categories with equal priorities (i) Core projects coordinated by IGBP itself or in collaboration with another body and (ii) core "Global Change" projects coordinated by another body. While others are being developed, to date four core projects have been identified by the Special Committee:

1. Changes in the atmospheric chemistry of the troposphere and its interaction with biological sources and sinks for trace gases on land will be the focus of a core project coordinated by a Scientific Steering Committee for the International Global Atmospheric Chemistry Programme (IGAC), jointly supported by the IGBP and the Commission of Atmospheric Chemistry and Global Pollution (CACGP) of the International Association of Meteorology and Atmospheric Physics (IAMAP).

2. Relating to the interaction among ocean biogeochemical cycles and the physical aspects of the climate system, a core project on the time-varying fluxes of carbon and associated biogenic elements within the ocean and across its boundaries is being addressed through the Joint Global Ocean Flux Study (JGOFS) of the Scientific Committee on Oceanic Research (SCOR). This is reported elsewhere in this issue.

3. Coupled field and remotely-sensed measurements will be made in a core project to elucidate the interactions between vegetation characteristics, the hydrological cycle, and fluxes between terrestrial ecosystems and the atmosphere. This project will be coordinated by a Scientific Steering Committee for land-surface field experiments, jointly supported by the IGBP and WCRP.

4. Improved records of past global variations in climate, biogeochemistry, and biomass and an understanding of the interactions that link these fundamental Earth System components will be the focus of a core project now being developed by an IGBP Scientific Steering Committee.

IGBP Planning Groups

CP1: Coordinating Panel on Terrestrial Biosphere - Atmospheric Chemistry Interactions
Chairman: Prof. Paul J. Crutzen, Max-Planck-Institute for Chemistry, P.O. Box 3060, D-6500 Mainz, FRG

CP2: Coordinating Panel on Marine Biosphere - Atmosphere Interactions
Chairman: Prof. Takahisa Nemoto, Ocean Research Institute, University of Tokyo, 1-15-1 Minamidai, Nakano-ku, Tokyo, Japan

CP3: Coordinating Panel on Biospheric Aspects of the Hydrological Cycle
Chairman: Prof. Siegfried Dyck, Division of Hydrology and Meteorology, Dresden Technical University, Mommsenstrasse 13, DDR-80 Dresden, DDR

CP4: Coordinating Panel on Effects of Climate Change on Terrestrial Ecosystems
Chairman: Dr. Brian H. Walker, Division of Wildlife and Ecology, CSIRO, P.O. Box 84, Lyneham, ACT 2602, Australia

CP5: Coordinating Panel on Global Analysis, Interpretation and Modelling
Chairman: Prof. Bert Bolin, Department of Meteorology, Stockholm University, S-106 91 Stockholm, Sweden

SSC: Scientific Steering Committee on Global Changes of the Past
Chairman: Prof. Hans Oeschger, Institute of Physics, University of Berne, Sidlerstrasse 5, CH-3012 Berne, Switzerland
Co-chairman: Dr. John A. Eddy, Office for Interdisciplinary Earth Studies, UCAR, P.O. Box 3000, Boulder, CO 80307, USA

WG1: Working Group on Data and Information Systems
Chairman: Dr. S. Ichtiaque Rasool, Office of Space Science and Applications, Code E, NASA, Washington, DC 20546, USA

WG2: Working Group on Regional Research Centers
Chairman: Prof. Rafael Herrera, Center for Ecology and Environmental Sciences, IVIC, Apartado 21827, Caracas 1020A, Venezuela

IGBP Meetings

Coordinating Panels

The IGBP Coordinating Panels are charged with the development of plans for core projects to be carried out during the IGBP implementation phase. A number of small planning meetings will involve members of the CPs but also other invited experts. Every attempt is being made to ensure that proper interactions take place with other ongoing or planned international activities. All meetings are by invitation only.

CP 1. Terrestrial Biosphere - Atmospheric Chemistry Interactions

Meeting of the Coordinating Panel
(Woods Hole, MA, USA)
25-27 October, 1989

The meeting will define the biospheric complement to the atmospheric chemistry programme of the International Global Atmospheric Chemistry Programme (IGAC) and refine the plans for the SCOPE/IGBP Workshop on "Trace-gas Exchange in a Global Perspective" to be held in February, 1990.

SCOPE/IGBP Workshop on "Trace Gas Exchange in a Global Perspective" and Meeting of the Coordinating Panel
(Stockholm, Sweden)
19-23 February, 1990

The workshop will (i) critically assess our understanding of the controls and interactions in the plant-microorganism-soil-water system, which regulate trace gas exchange with the atmosphere, (ii) assess the status of current techniques to derive fluxes from production rates and from concentration measurements, and explore the possibilities for the development of novel approaches to flux measurements, (iii) develop a foundation for the design of diagnostic and predictive models to describe the exchange of trace gases between the biosphere and the atmosphere. The CP 1 meeting will finalize the plans for a core IGBP project on "Biological, Chemical and Meteorological Processes that Regulate the Composition of the Atmosphere" as a expansion of IGAC.

CP 2. Marine Biosphere - Atmosphere Interactions

Ad hoc meeting on Coastal Seas
(Tokyo, Japan)
19-21 September, 1989

The meeting will develop proposals for IGBP initiatives in the area of coastal seas and land-ocean interactions. Special consideration will be given to (i) assessment of coastal and estuarine systems, especially anthropogenic effects and land-sea interactions, (ii) the role of marginal seas in biological production and inputs of material to the oceanic regions, (iii) land-sea interactions with special reference to riverine inputs to the shelf, and (iv) effects of large-scale events, such as sea-level rise and ENSO phenomena, on coastal regions.

"Modelling the Physics, Biology and Chemistry of the Upper Ocean, and its Interaction with the Atmosphere." A Joint JGOFS/IGBP Study Conference
(London, UK)
12-13 March 1990
(See announcement below.)

Meeting of the Coordinating Panel
Early 1990

The CP will prepare the report to the 2nd SAC-IGBP

CP 3. Biospheric Aspects of the Hydrological Cycle

Meeting of the Coordinating Panel
(Paris, France)
23-26 October, 1989

This meeting will continue discussion and writing of a draft report on a core IGBP project on "Biospheric Aspects of the Hydrologic Cycle". A portion of the meeting will be held jointly with the WCRP's GEWEX programme representatives. During this meeting, the ongoing and planned land-surface processes related field experiments will be reviewed. A joint IGBP/WCRP Scientific Steering Committee for coupled field and remotely-sensed measurements will be appointed. This Committee's main function would be to plan, coordinate and implement field efforts aimed at elucidating the interactions between vegetation characteristics, the hydrologic cycle, and fluxes between terrestrial ecosystems and the atmosphere.

Joint CP3, IAHS, IHP meeting
(Vadstena, Sweden)
June 1990

The workshop will focus on plant-water interrelationships in the scale interval from landscape scale up to GCM-scale. The workshop will develop an interdisciplinary conceptual framework for large-scale interactions between the hydrological cycle and the biosphere in different climate zones and relate problems of modelling and also develop an implementation strategy for the IGBP CP3's core programme related development of coupled large-scale hydroecological model.

CP 4. Effects of Climate Change on Terrestrial Ecosystems

Workshop on the Effects of Climate Change on Agriculture and Forestry together with ABN and CSC .
(Cameroon)
27 November - 1 December

The meeting will discuss outputs from present GCMs in relation to needs to evaluate effects on agriculture and forestry production and specify the needs for climate data from such models. The meeting will assess present methods to evaluate the effects on climate change on agriculture and forestry. Present simulation models and Geographic Information Systems for assessing climate change effects will be demonstrated for specific crops and regions in Africa. The meeting will also develop a draft report on IGBP research needs in this area. The discussions will take into account previous studies (e.g., FAO and IIASA).

Workshop on the Effects of Climate Change on Agriculture and Forestry in Latin America
1990

The meeting will have the same principal objectives as the regional meeting in Africa but will also further refine the research needs for the IGBP.

Meeting of the Coordinating Panel
(Cambridge, UK)
12-16 March, 1990

The CP4 will finalize the report to the 2nd SAC-IGBP.

CP 5. Global Analysis, Interpretation and Modelling

Workshop on "Modelling the Global Carbon Cycle"
(Hinterzarten, FRG)
18-21 October, 1989

The following key issues will be addressed: (i) how do we interpret the seasonal variations of carbon dioxide in the atmosphere in terms of exchange between the atmosphere, the terrestrial systems and the oceans, (ii) how do we model the role of the marine component of the carbon cycle and how can such models be validated against data, (iii) how can terrestrial ecosystem processes be described in a manner compatible with presently available as well as future models, (iv) which key features of the air-sea exchange of carbon dioxide are of importance for modelling the carbon cycle, (v) what do the spatial and temporal variations of carbon isotopes tell us about the relative importance of the key processes, and (vi) what are the response characteristics and sensitivity of the global carbon cycle to external disturbances such as those induced by human activities (e.g., fossil fuel burning, deforestation).

Meeting of the Coordinating Panel
Spring 1990

The CP will finalize the report on global modelling to the 2nd SAC-IGBP.

Working Groups

The Working Groups will assess current status of knowledge and future prospects for Programme activities in areas of interest to the IGBP. The Working Groups cut across the project planning activities of the Coordinating Panels and are concerned with all aspects of the IGBP.

WG 1. Data and Information Systems

Planning Meeting for "End-to-End Systems Study on Surface Temperature Data Set"
(Strasbourg, France)
November 1989

In order to develop a consistent and coherent land surface temperature data set a workshop is planned to analyze various algorithms used to compute surface temperature via remote sensing. The first planning meeting will be held in October to select the research teams currently active in this field, to define analytical procedure for an intercomparison study, and to make a first cut at determining the data set to be used for the test.

Meeting of the Working Group and 2nd Planning Meeting of the "End-to-End Study"
(Washington, DC, USA)
30 January-2 February 1990

The working group will draft the final report for the 2nd SAC. In addition, the second planning meeting of the workshop committee for the "End-to-End Study" will take place to select the representative data sets to be used in the study.

Workshop on "End-to-End Land Surface Temperature Data Sets".
(Strasbourg, France)
October 1990

Workshop to be held in coordination with ISLSCP to intercompare results from various algorithms used for determining surface temperatures. A common data set will have been analyzed by numerous research teams globally, and the results will be analyzed. The workshop will make recommendations for the best choice of algorithm, further research needed to better acquire surface temperature from remote sensing data, and a common methodology for monitoring surface temperature.

WG 2. Regional Research Centers

Workshop on Global Change RRCs together with IIASA and Working Group Meeting
(Warsaw, Poland)
25-30 September, 1989

The meetings will be convened to further discuss the concept of Global Change Regional Research Centres. On the basis of the discussions in Warsaw, the IGBP Working Group will prepare a revised outline, which will form the basis for a larger meeting tentatively scheduled for Bangkok in early 1990.

Workshop on Global Change RRCs
(Bangkok, Thailand)
March 1990

A major workshop in 1990 will

"Modelling the Physics, Biology and Chemistry of the Upper Ocean, and its Interaction with the Atmosphere"

A Joint JGOFS/IGBP Study Conference 12-13 March, 1990, the Royal Society, London

FIRST ANNOUNCEMENT

It has recently been agreed that JGOFS is to be a Core Global Change Project with the intention of fostering a closer collaboration between oceanographers and atmospheric scientists studying global change. A number of joint activities are foreseen, and the first of these will be an international meeting on "Modelling the physics, biology, and chemistry of the upper ocean and its interaction with the atmosphere" to be held at the Royal Society, London on12th-13th March , 1990.

Most of the contributions will be by invitation, but anyone who is interested in giving a talk should submit a title as soon as possible. Contributions about the uptake and fate of CO_2 will be specially welcomed. It is not intended to publish the proceedings.

A finalized programme will soon be available and a further announcement will then be made. In the meantime anyone who is interested in attending should contact Mike Fasham by telemail or at the address below. Some limited travel grants will be available for participants who cannot raise their own travel funds.

Members of the JGOFS community should be aware that the JGOFS North Atlantic Pilot Programme Workshop will be held at Kiel, W. Germany, immediately following the meeting (15-20 March).

Mike Fasham,
Institute of Oceanographic Sciences,
Brook Rd., Wormley,
GODALMING, SURREY, GU8 5UB,
U.K.
Telemail: M.Fasham (Omnet)

evaluate the draft report from the Working Group. Major interested organizations will be invited to attend, and the meeting will formulate a project document to be used in approaching suitable donor agencies. Participation of scientists from less developed countries will be essential to formulate the appropriate priorities. The final report from the Working Group will be included in the report to the 2nd SAC-IGBP.

Regional Global Change (IGBP) Workshop for South America January 1990 Bogota, Columbia

One of the important ways by which interest for Global Change issues can be stimulated, especially in LDCs, is by arranging IGBP conferences. Regional conferences are discussed for South-East Asia, Africa and South Asia. A proposal for a South American meeting was originally made during discussions with the South American representatives at the ICSU Generaly Assembly in Beijing (September 1988).

The workshop will include, among others, the following discussion groups:

Paleoclimatology; The role of land transformation processes in relation to global change; The role of the Amazonas in the global biogeochemical cycles; The role of oceans, including El Niño, in the global climate system; How will large river basins be affected by projected climate changes; Effects of climate change on arid zones; and The role of ecotone behavior as coordinator of climate change.

For further information contact:
Prof. Thomas Rosswall
IGBP Secretariat
Royal Swedish Academy of Sciences
P.O. Box 50005
S-104 05 Stockholm, Sweden
Telephone: +46-8-16 64 48
Telex: 17509 IGBP S
Fax: +46-8-16 64 05
Telemail: T.Rosswall (Omnet)

SSC. Global Changes of the Past

Meeting of the SSC
(Berlin)
23-26 January, 1990

The meeting will finalize the description of the core project for inclusion in the report to the 2nd SAC-IGBP.

List of IGBP Correspondents

The Special Committee for the IGBP has decided to invite each ICSU scientific member, and selected group of other bodies, to nominate a correspondent to the IGBP, if they so wish. Until now the following have been nominated:

CASAFA	F. W. G. Baker
IGU	V. M. Kotlyakov
IMU	J. L. Lions
ISSS	H.-W. Scharpenseel
IUGS	K. Hsü
IUPHAR	K. J. Netter
SCOPE	F. di Castri
SCOSTEP	J. G. Roederer
TWAS	C. Ponnamperuma

Brochure

Ms Laura Lee McCauley, presently with the University of Alaska in the U.S., has developed and coordinated the production of a brochure for the IGBP. The brochure, which provides a brief overview of the IGBP, can be ordered from the Secretariat and should be helpful in providing information to the general science community, science administrators and government agencies. The production has been made possible through financial support from the Committee on Earth Sciences (USA) and IBM Sweden.

Global Change related meetings

International Conference and Workshop Global Natural Resource Monitoring and Assessments: Preparing for the 21st Centure

24-30 September, 1989 Venice, Italy

For information contact:
Dr. H. Fred Kaiser, c/o USDA Forest Service, FIERR, P.O.Box 96090, Washington, DC 20090-6090 USA,
Phone: +1-202-447 2747

Remplissages Karstiques et Paleoclimats Höhlensedimente und Paläoklima

13-14 October, 1989 Freiburg, Switzerland

For information contact:
Commission de Spéléologie ASSN,
J.C. Lalou, 97, route de Suisse,
CH-1290 Versoix, Switzerland

Climatic Fluctuations and Their Socio-Economic Impact Concerning Countries Around the Atlantic Ocean

13-17 November, 1989
Toulouse, France

For information contact:
Dr Jean-Claude André, Centre National de Recherches Météorologiques, F-31057 Toulouse Cedex, France, Phone: +33-61-07 93 70, Fax: +33-61-07 96 00, E-mail: J.André (Omnet)

European Conference on Landscape-Ecological Impact of Climatic Change

3-7 December, 1989
Lunteren, the Netherlands

For information contact:
Drs. F.A. Eybergen, Dept. of Physical Geography, University of Utrecht, P.O.Box 80.115, 3508 TC Utrecht, Phone: +31-30-532054/532749, Telex: 40087 VLUUT, Fax: +31-301-531357

National Conference on Geosphere-Biosphere Change in Southern Africa

4-8 December, 1989
University of Cape Town, South Africa

For information contact:
South African IGBP Secretariat, Foundation for Research Development, CSIR, P.O. Box 295, Pretoria 0001, South Africa

Greenhouse and Energy; Australia's Options

4-8 December, 1989
Macquarie University, CSIRO, Australia

For information contact:
Ms Ann Whittaker, Greenhouse & Energy Conference Office, P.O. Box 93, North Ryde NSW 2113, Australia, Phone: +61-2-887 8204, Fax: +61-02-887 8197

World Conference on Preparing for Climate Change

17-21 December, 1989
Cairo, Egypt

For information contact:
Hind Sadek, Climate Institute, Suite 403, Pennsylvania Avenue SE, Washington, D.C. 20003, USA

Chapman Conference on Global Biomass Burning: Atmospheric, Climate, and Biospheric Implications

19-23 March, 1990
Williamsburg, Virginia, USA

For information contact:
Dr. Joel S. Levine, Atmospheric Science Division, Mail Stop 401B, NASA Langley Research Center, Hampton, Virginia 23665-5225, USA, Phone: +1-804-864 5692, Fax: +1-804-864 3800

Global Warming - A Call for International Coordination International Conference on the Scientific and Policy Issues facing All Governments

10-12 April, 1990
Chicago, IL, USA

For information contact:
Dr. Sinyan Shen, c/o SUPCON International, One Heritage Plaza, Woodridge IL 60517, USA, Phone: +1-312-910 1551

International Conference on the Role of the Polar Regions in Global Change

11-15 June, 1990
Fairbanks, Alaska, USA

For information contact:
Dr. Gunter Weller, Geophysical Institute, University of Alaska Fairbanks, AK 99775-0800, USA, Phone: +1-907-474 7954, Telex: 35414.

Beijing International Symposium on Global Change

9-12 August, 1990
Beijing, Peoples Republic of China

For information contact:
Prof. Zhang Peiyuan, BISOCC Conference Secretariat, Institute of Geography, CAS. P.O.Box 771, 100012 Beijing, China

Seventh International Symposium of the Commision on Atmospheric Chemistry and Global Pollution (CACGP) "Chemistry of the Global Atmosphere"

5-11 September, 1990
Chambrousse, France

For information contact:
Dr. Robert J. Delmas, Laboratoire de Glaciologie et Géophysique de l'Environnement, B.P.96, 38402 St Martin d'Heres Cedex, France, Phone: +33-76-42 58 72, Telex: 980131 F, Fax: +33-76-51 32 48

ProClim International Conference on Past and Present Climate Dynamics: Reconstruction of Rates of Change

24-28 September, 1990
Canton of Ticino, Switzerland

For information contact:
Dr K. Kelts, ProClim90, Postfach 7613, CH-3001 Bern, Switzerland, Phone: +41-31-21 21 14, Fax: +41-31-22 91 64

IGBP Postdoctors

IGBP has advertised a number of post-doctoral positions. The postdocs are expexted to work at the home institution of the Chairmen of CPs, SSC and WGs. The following post-docs have been appointed.

CP3 Dr. H. Baumert, Institute of Mathematics, GDR Academy of Sciences, Berlin, GDR

CP4 Dr. S. Turner, Department of Biology, The University of New Mexico, Albuquerque, NM, USA

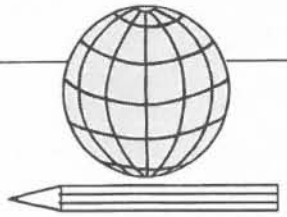
SSC Dr. A. Arquit, School of Ocean and Earth Science and Technology, Department of Oceanography, The University of Hawaii at Manoa, Honolulu, HI, USA

WG1 Dr. O. Arino, Laboratoire d'Etudes et de Recherches en Teledetection Spatiale, Toulouse, France

Congratulations

We congratulate *Professor Hans Oeschger*, a member of the Special Committee of the IGBP and the chairman of the Scientific Steering Committee for Global Changes of the Past to the American Seligman Award, the highest award in glaciology, which has only been given to 13 people before. He received the award for his important work on ice cores.

We also want to congratulate *Dr Claude Lorius* from Laboratoire de Glaciologie et Géophysique de l'Environement, who has received the Humboldt Award from the FRG. The award requires that he spend six months in the FRG. Dr Lorius is a member of the Scientific Steering Committee for Global Changes of the Past and intends to use at least part of his award working for SSC in Berlin.



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Editor: Gunilla Björklund, PhD

Newsletter requests and change of address information should be sent to:

IGBP Secretariat, Royal Swedish Academy of Sciences, Box 50005, S-10405 Stockholm Sweden. Telephone +46-8-150430, Telex: 17509 IGBP S,
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Office for Interdisciplinary Earth Studies
University Corporation for Atmospheric Research
P.O. Box 3000, Boulder, CO 80307-3000, USA

IGBP Secretariat, Royal Swedish Academy of Sciences
Box 50005, S-10405 Stockholm, Sweden.

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