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STRATOSPHERIC PROCESSES AND THEIR ROLE IN CLIMATE
A Project of the World Climate Research Programme

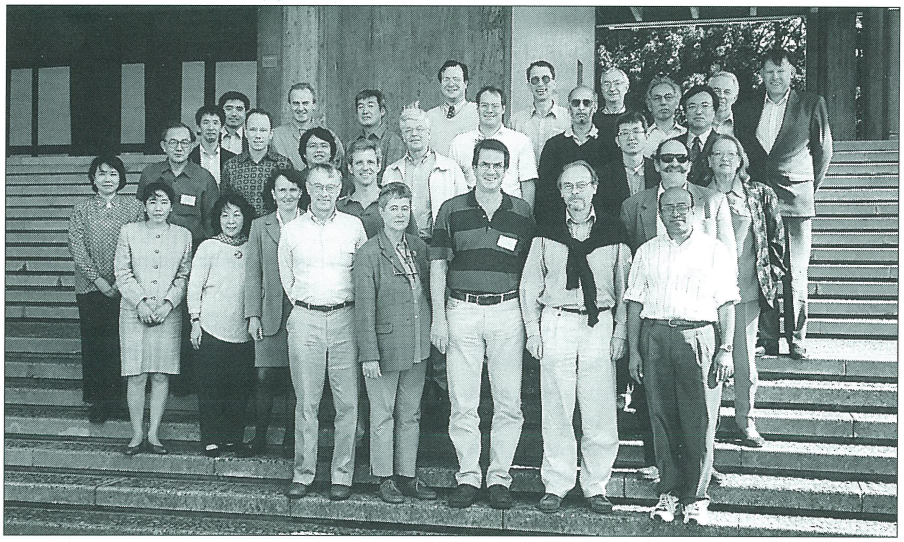
Sixth Session of the SPARC Scientific Steering Group

Nagoya, Japan, 26-29 October 1998

by **Marie-Lise Chanin,** Co-chair SPARC SSG (chanin@aerov.jussieu.fr)

At the kind invitation of Professor Hiroshi Tanaka, the sixth session of the SPARC Scientific Steering Group was held at the University of Nagoya, in Nagoya, Japan, October 26-29, 1998. Professor Marvin Geller, Co-chair of the SPARC SSG, opened the session by welcoming all the participants. He warmly thanked H. Tanaka for the organisation of the SSG meeting in his University and congratulated him for having succeeded in obtaining such a generous support for a large number of participants both from the government and the University. He also particularly welcomed the attendance of several Japanese scientists.

The SPARC Co-chairs reviewed briefly the discussions relevant to SPARC at the nineteenth session of the JSC of the WCRP which took place in Cape Town in March 1998 (see report in Newsletter 11). Specific emphasis was given to the importance of improved water vapour measurements in the upper-troposphere/lower-stratosphere and a request was made to SPARC and GEWEX to assess various in-situ and remotely-sensed measurement possibilities. This recommendation was taken into account by SPARC (see further in this report). A request was also made by the JSC for a review of solar forcing as a source of climate variability mechanisms. This is being considered as part of the new initiative of SPARC on "Stratospheric aspects of climate forcing" and information on this issue is being assembled for presentation at the next JSC. A proposal was made to document changes of temperature and height of the tropopause. This issue has been discussed since the JSC and should lead to some new SPARC activity. Finally, the general recommendation of the JSC to increase cooperation between WCRP and IGBP was noted.



Participants to the SSG and Nagoya University staff. From right to left: 1st row: V. Ramaswamy, D. Kley, U. Schmidt, K. Labitzke, J. Gille, C. Granier, J. Banno, K. Hirano, R. Sato. 2nd row: M.-L. Chanin, M. Geller, M. Takahashi, A.R. Ravishankara, T. Shepherd, R. Vincent, W. Randel, H. Kanzawa, M. Baldwin, I. Imamura, H. Tanaka. 3rd row: R. Newson, J. Miller, H. Sasano, K. Kodera, Y. Koshelkov, D. Karoly, P. Canziani, T. Tsuda, A. O'Neill, F. Hasebe.

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In this respect, SPARC already co-operates extensively with IGAC (cf. further in this report).

A large part of the session was dedicated to reviewing the progress in projects and activities being organised under SPARC auspices. The projects as described in the Implementation Plan (finalised in July 1998 and published as a WCRP Report No. 105, in November 1998) were presented and discussed. Additional information on the development and planning of these projects is given in the following paragraphs.

Stratospheric Indicators of Climate Change

The highlight for the two first projects (the assessments of stratospheric temperature trends, and understanding ozone trends) under this topic was their contribution to the WMO-UNEP Ozone Assessment which benefited from the continuous efforts of SPARC in this area. The water vapour issue had its highlight too with a very successful workshop held in Boulder in August 1998.

• Stratospheric Temperature Trends Assessment (STTA)

V. Ramaswamy reviewed the main motivations for setting up this project within SPARC. He gave a progress report of the 1998 activity which was mainly focused on finalising the WMO-UNEP chapter on Assessment of Stratospheric Temperature Trends for which he and Marie-Lise Chanin were the lead authors. As a result of the continuous activities undertaken by SPARC since 1992, it was widely recognised that the stratospheric cooling trend was much better documented now than in the last WMO-UNEP Assessment.

For the future, the plans for STTA are the following:

- addition of further years to the data archive
- reduction of uncertainties in datasets, improvement of consistency amongst the datasets
- search for causes of the middle and upper-stratospheric trends using models and observations
- runs of transient GCM simulations with appropriate forcing and their evolution over the period of available data, and comparison of model time series with observations
- detection and attribution of trends, with a particular focus on potential anthropogenic causes, from within stratosphere or originating in troposphere
- forcing of the surface-troposphere system
- response-forcing relationship (vertical and horizontal)

To conclude, V. Ramaswamy stressed the need to monitor globally the variations and secular changes in the concentrations of radiatively-active species in the stratosphere on a continuous basis and to test, evaluate and improve models, and the diagnostic interpretation of model-observation comparisons.

• Understanding Ozone Trends

Neil Harris prepared a report on the recent activities of SPARC in improving the understanding of ozone trends. In his absence, his report was presented by M.-L. Chanin.

Assessment

The main activity in the last year has been the final preparation, editing and publishing of the SPARC-IOC-GAW Assessment of Trends in the Vertical Distribution Of Ozone. The report is now available as SPARC Report No. 1 and will also be published as WMO Global Ozone Research and Monitoring Project Report No. 43. This report was made available to authors of the WMO-UNEP Assessment as that assessment was being prepared.

Future Ozone Measurements

Action in this area has been more or less subsumed into the development of a report for the Integrated Global Observing Strategy (IGOS) for the Committee on Earth Observing Satellites (CEOS). The original request by CEOS was to focus on "Long Term Measurement of Stratospheric Ozone" but the group working on this report (Co-chaired by Jack Kaye and Chris Readings) broadened its scope to include those parameters necessary for understanding of ozone changes. Both space and ground measurements are to be considered by IGOS.

Understanding Ozone Trends

There were few new results to report concerning our ability to understand the causes of the observed trends (role of chemistry and dynamics, importance of regional changes, etc.). It is clear from the 1998 WMO-UNEP Assessment that some effort is required as there seems to have been considerable confusion on this issue. A workshop may need to be held in the second half of 1999 with a view to identifying some activities which could be presented at the Ozone Symposium in 2000. This should be a joint activity with IOC and GAW.

• Stratospheric and Upper-Tropospheric Water Vapour

John Gille reported on the SPARC Workshop "Upper-Troposphere/Lower-Stratosphere Water Vapour", held at NCAR, Boulder, Colorado, USA, from 26-28 August 1998. As evident from its title the workshop was intended to cover stratospheric and upper-tropospheric water vapour and members of the GEWEX and of the IGAC communities were invited and attended. The workshop convened by Sam Oltmans, David Hoffmann and John Gille was a landmark, both in terms of its attendance, and the quality of the papers and the discussions. A detailed report of the workshop will be published in 1999 as a SPARC report.

Notable was the review of the plans for a **SPARC Water Vapour Assessment (WAVAS)** which Dieter Kley and Jim Russell kindly accepted to conduct. D. Kley presented his plans and most participants in the workshop were enthusiastic about such an enterprise. WAVAS will address the issue of the concentration, distribution and variability (including possible trends) of water vapour in the upper-troposphere (UT) and lower-stratosphere (LS). The main question, clearly related to the role of water vapour in the greenhouse effect, is to determine whether the UT water vapour concentration is under thermodynamic or under dynamic control, and to understand what controls the LS water vapour concentration.

The questions put forward by Dieter Kley are twofold: what do we know about processes that control the concentration, distribution and variability of UT and of LS water vapour and how well do we know what we know?

The WAVAS results will be published as a SPARC report. It will consist of three main chapters:

Chapter 1: Instrumentation and data sets (Profiling instruments, Group-based aircraft sensors, Satellite sensors)

Chapter 2: Data quality (Evaluation and Comparison)

Chapter 3: Distribution and variability

Stratospheric Processes and their Relation to Climate

• Gravity Wave Processes and their Parameterisation

Bob Vincent reported on the high resolution radiosonde initiative and the Convective Excitation of Gravity Waves Experiment (CEGWE) Campaign.

The high resolution radiosonde initiative

Fourteen countries have now joined the project and have archived radiosonde data in the stratosphere at the required high resolution. The time is now ready for data analysis and intercomparison of results with the purpose of identifying sources of gravity waves. A package of IDL analysis programs have been made available by Bob Vincent to the participants on the anonymous ftp site: (ftp://bragg.physics.adelaide.edu.au/pub/atmos/rvincent/) and a web site has been set up: (http://www.physics.adelaide.edu.au/atmospheric/radiosonde_project.htm).

A workshop where results are presented and compared, and for establishing plans for a project report, will be held in Cosener's House, Abingdon, UK, on 15-16 July 1999.

CEGWE

Originally proposed in 1996, the plan has evolved significantly over the last two years (see article by K. Hamilton in SPARC Newsletter 9). A detailed planning document is now available at http://www.gfdl.gov/~kph/cegwe/report. A planning meeting was held in Boulder in June 1998 which resulted in a strong endorsement of the Darwin region in northern Australia as the site of the experiment. The question of resources for the experiment was also discussed.

It was foreseen that the US would support the studies of gravity wave generation, dynamics of deep convection and cloud chemistry. The European component would involve an integrated atmospheric chemistry, climate and transport experiment making use of the M55-Geophysica and possibly the DLR Falcon. The Australian contribution, in addition to providing the infrastructure, would focus on meteorology and characterisation of convection, gravity wave/convection interaction, gravity wave propagation in the middle atmosphere and aerosol studies. It is expected that the experiment will also attract the participation of scientists from other countries (representatives of Canadian and Japanese research institutions have been involved in the initial planning meetings).

The most recent development is the possibility of merging CEGWE with CONTACT, a campaign led by NCAR/ACD and originally planned with for French Guyana to study convective transport, radiation budget and atmospheric chemistry in the tropics. In this respect, joint discussions were organised in Boulder in December 1998 with the following goals:

- Prepare a statement of scientific objectives of both CEGWE and CONTACT
- Determine the facilities required by chemists and meteorologists
- Identify synergies and possible conflicts between the experiments
- Identify others who should be involved in planning of the experiment
- Prepare a document for funding agencies

• Stratosphere-Troposphere Exchange (STE)

A status report was given by Ted Shepherd who confirmed that the key issues, as laid out in the Implementation Plan, are:

- quantification of mid-latitude STE and its seasonal evolution for various tracers (esp. O_3, H_2O)
- characterisation of mesoscale tracer structure
- water vapour and tropical tropopause
- understanding reasons for poor performance of models in UT-LS region.

Ted Shepherd identified the elements missing to reach these objectives: Accurate measurements of tropopause characteristics (i.e. temperature, pressure, and height) and of trace species in UT-LS region, measurements of tropical winds (for transport), measurements of water vapour and condensed matter at the tropical tropopause, and comparison of measurements and models. He suggested to add a possible "STE" component to CEGWE (or a parallel experiment) focusing on particle formation and dehydration. A possible European role, including use of Geophysika aircraft, in such a campaign, could be explored.

Another SPARC workshop on STE did not seem necessary at present, as the IUGG/IAMAS symposium (July 1999) on "Chemistry and transport in UT-LS" offers the opportunity to discuss the issues involved. Consideration needs to be given whether a separate dynamics/transport-based initiative is required.

• Upper-Tropospheric/ Lower-Stratospheric Chemistry

The presentation by A. Ravishankara on the joint SPARC/IGAC Laboratory Activity was mostly concerned with the role of peroxyl radicals, RO_2, in producing ozone in the UT region. He gave a short review of the status of ozone loss in the LS and ozone increase in the UT and raised the question of the exchange between the two regions and the need to quantify it (see below). The objective of this joint effort with IGAC is mainly to quantify the role of RO_2 and since both kinetics and cross sections depend on the radical "R", the first action will be to critically evaluate the existing data and to run chemical model experiments. A working group has been formed with this purpose in mind. Data have been collected and have been exchanged. A meeting has been held in Paris in December 1998 and should lead to the preparation of a peer-reviewed assessment paper.

Further activity will be the organisation of a "gas-phase" workshop in summer/fall 1999. The question was raised of whether or not it is timely to approach in an organised manner the question of modelling the ozone budget in the UT. Claire Granier was asked to contact the community to know if GCM modellers would be ready to join efforts for GCM output intercomparison in a manner similar to GRIPS, in order to reveal shortcomings in our understanding. This should be carried out as a joint SPARC/IGAC activity.

• Physics and Chemistry of UT-LS region: the Tropopause Issue

The recent activity common in the preceding areas has been in line with the recommendation made at the WCRP Conference in August 1997 for a better understanding of physics and chemistry of UT-LS region, including STE of energy, water vapour, and chemicals. This activity was related essentially with the preparation of Chapter 7 of the 1998 WMO/UNEP Ozone Assessment, for which the lead authors were Ted Shepherd and A.R. Ravishankara. A review paper on the current understanding of the lower-stratosphere ozone depletion is being prepared and possibly a book will be published as the output of this work.

The major missing information for a better understanding and quantification of ozone transport and its variability in the polar vortex, the mid-latitude lowermost stratosphere and across the mid-latitude tropopause led to the conclusion that SPARC should be encouraged to devote more attention to the "Tropopause issue". It was agreed that SPARC should encourage the organisation of a NATO ARW on this topic as the timing seems to be right for a "paradigm shift" and is crucial in relation to stratospheric effects on climate. Peter Haynes has kindly accepted to organise such a NATO ARW, and a proposal to NATO should be prepared soon.

• The Quasi-Biennial Oscillation (QBO) and its Role in Coupling the Stratosphere and Troposphere

The results of the workshop held in La Jolla, CA, in March 1998 were presented by Mark Baldwin. They were reported in SPARC Newsletter 11 (and therefore will not be detailed here) and will be published in Review of Geophysics. M. Baldwin presented also some new results on the stratosphere-troposphere oscillation and gave the floor to Dr Takahashi to present his successful simulation of the QBO in a 42-level GCM giving for the first time results quite similar to the observations.

The main issue of discussion was whether a specific SPARC initiative on the QBO should be taken up and whether it should be related to the question of trends in dynamical activity. The consensus was that it was premature and that a new workshop should be planned in two years. In the meantime the Symposium on the "QBO and internal Gravity Wave" organised during the IUGG in July 1999 will offer the opportunity for further discussion.

Modelling Stratospheric Effects on Climate

• Intercomparison of Stratospheric Models (GRIPS)

The Progress Report prepared by Steven Pawson and Kunihiko Kodera was presented by K. Kodera, including an account of the discussions which took place at the 3rd GRIPS Workshop held in NASA/GSFC in March 1998 (see Newsletter 11). The progress accomplished in the Phases 1 and 2 of GRIPS and the plans for phase 3 and beyond, were also summarised.

Progress with Phase 1

Many of the groups have now prepared a comprehensive diagnostic of their model simulations, based on the AMIP standards. This is very useful for the interpretation of the models and should be made available to the community.

In the Climatology Project, some changes occurred recently: one model (UGAMP) has been withdrawn (as it is now obsolete), and the GISS group has joined in. Data from three groups (CNRM, LaRC, UKMO) have been replaced with newer (longer) model runs. A manuscript for submission to Bulletin of the American Meteorological Society is being prepared, and a SPARC report documenting the models is planned for early 1999.

Good progress has been made on investigating troposphere-stratosphere connections and the availability of longer runs allows more models to be analysed. Within EuroGRIPS, a reasonably detailed study of sudden warmings in four models has been undertaken. A paper should be completed this year. The theme of tropical oscillations and waves was the basis of extremely interesting discussions at the 1998 GRIPS workshop. The representation of semi-diurnal tides has been intercompared in several models.

Progress with Phase 2

The radiation scheme intercomparison was delayed because of problems compiling a good water vapour climatology. The other trace gases and boundary conditions are fixed. It is hoped that some results will be available by the 1999 GRIPS workshop. The diagnostics of gravity wave drag await the results of the preceding task. Some experiments showed that the models respond very differently to the specified mesospheric forcing, suggesting a sensitivity to the resolved dynamics and physics.

Plans for Phase 3

A proposal has been submitted as an experimental sub-project for AMIP in early 1997. It is still on hold, awaiting the results of Task 2 and indications from AMIP that they are ready to proceed with accepting experimental proposals and collecting the data. It is of interest to the climate modelling community. This longer-term plan (Phase 3 and beyond) includes the following components:

- Sensitivity of the GCMs to the imposed ozone distribution: specified concentrations and observed "trends".

- Volcanic aerosol forcing experiments.

- Trace gas change experiments (CO_2 and well mixed gases).

- Investigation of the transport characteristics of the models (precursor to coupled climate-chemistry experiments) and their interpretation in the context of the model formulations.

- Interactive chemistry-climate simulations.

This plan will be discussed at the March 1999 GRIPS workshop in Reading and at the GRIPS workshop during the IUGG in July 1999.

The SSG discussed the proposed plans and suggested that GRIPS consider studying the response of different models to solar forcing, for example by intercomparing runs with imposed solar maximum and solar minimum irradiation. GRIPS was also encouraged to proceed as soon as possible with the interactive chemistry-climate simulations.

• Stratospheric Reference Climatology

William Randel reported on the data sets which are presently available (see Randel's paper in this issue). After establishment of the SPARC Data Centre, these data will be available from there.

The current/planned activities are to set up a climatological data base at the SPARC Data Centre and to perform detailed comparisons of circulation statistics to determine data quality and uncertainties. A SPARC report detailing data availability and data quality inter-comparisons is to be published early in 1999.

Phase 2 of the project concerning the climatology of constituents, in cooperation with UARS Climatology, will be developed soon.

New issues for SPARC activities

Three new issues were discussed at the previous SSG, among which only one has started to be implemented: the "stratospheric aspects of climate forcing". The issue of "trends in dynamical activity in the stratosphere" was found to be premature. Regarding the study of "penetration of UV radiation in the lower-stratosphere and troposphere", detailed plans, to be drawn up in conjunction with IGAC, are still awaited. The SSG stressed the importance of making progress in this area and in implementing appropriate joint activities with IGAC.

• Stratospheric Aspects of Climate Forcing:

David Karoly reminded the SSG that the Working Group on Coupled Modelling (WGCM) is coordinating coupled climate model intercomparisons with prescribed forcings which include increasing greenhouse gases and increasing tropospheric sulphate aerosols, but no agreed on stratospheric forcings. The objectives of SPARC activity in this area are:

- to provide to the climate modelling community estimates of appropriate parameters which determine stratospheric aspects of time-varying climate forcings,

- consolidate existing information and provide best estimates of time-varying distributions over 1880-present, together with estimates of uncertainties,

- provide datasets and software.

A new group was convened by David Karoly; its membership is at this date as follows:

Ozone: Neil Harris, V. Ramaswamy, William Randel, Susan Solomon.

Stratospheric aerosols: Alan Robock, Lamont Poole, Georgiy Stenchikov.

Solar forcing: Joanna Haigh, Gary Rottman, Judith Lean.

Climate modellers: John Mitchell, Jim Hansen, Steve Pawson.

The status of the work is that ozone data sets of zonal mean anomalies are to be provided by S. Solomon and W. Randel based on SAGE profilers and TOMS column tendencies which require to be combined and assessed. For stratospheric aerosols, it was decided to use the data from Sato *et al.* (1993). The Robock and Free (1995) data set will be used to scale Pinatubo/El Chichon. For solar forcing, Hoyt and Schatten (1993) and Lean *et al.* (1995) will constitute the total solar irradiance time series. The question of how to take into account the variations of solar spectrum with time is still to be discussed.

The group will produce a SPARC technical report with numerical data sets and software by the end of 1998 and a peer-reviewed paper describing the data sets so that they would be acceptable for use in IPCC assessments; a draft report of the paper was presented to WGCM meeting in Melbourne in October 1998.

Co-operation and joint activities with other programmes:

IGAC

As noted earlier, joint activity is underway in the framework of UT-LS chemistry. Claire Granier informed the SSG about the development of GTOP: Three ozonesondes stations have been set up in Surinam, Nairobi and in Indonesia and are of interest for SPARC. On the other hand the altitude range expected to be covered by the network of lidars is likely to be too low for SPARC concern. It was decided to address to the Chair of IGAC a letter of support stating the interest of SPARC for the UT-LS ozone measurements in the tropics.

Due to the pressure of events on IGAC, as all IGBP programmes in 1999, for the preparation of their Integration and Synthesis Report, it is likely that SPARC would have to take the initiative on some issues, as has been the case for the UT-LS Water vapour assessment.

GAW

John Miller gave a presentation on the Global Atmosphere Watch (GAW) of which the objective is to coordinate the monitoring and research of the changing atmosphere. The purpose of GAW is twofold: to understand the impact of atmospheric chemistry on climate change and to evaluate the influence of atmospheric chemistry on the environment. Recently GAW completed the implementation of the GAW Strategy Plan up to 2000 and, in that framework, six new GAW Global observatories and a ozone/UV network in South America have been established. The two Scientific Advisory Groups (SAG) with which SPARC should co-operate are that for ozone led by Ivar Isaksen and that on UV monitoring led by Paul Simon. During the year 1998, GAW co-operated with SPARC on the assessment trends in the vertical profile of ozone (the results of which are being published both as a SPARC and GAW reports, as noted earlier).

GCOS

The requirements for measurements of atmospheric climate parameters within the Global Climate Observing system (GCOS) have been discussed at the recent meeting of the AOPC (Atmospheric Observation Panel for Climate). M. L. Chanin, who attended the meeting, noted the requirements presented in the name of SPARC: in addition to greenhouse gases, aerosols and clouds, the need for water vapour and ozone measurements in both the troposphere and lower stratosphere was stressed. The use of new techniques (GPS, use of commercial aircraft) was strongly supported. In that framework a letter of support for the extension of the MOZAIC Project will be sent by the SPARC Co-chairs to the European Commission. It was suggested to add CO and NOx to the list of constituents to be monitored in GCOS.

M. L. Chanin reported also about a debate concerning the upper limit required for the radiosondes within the Global Upper-Air Network (GUAN). The wish expressed by the SPARC community to maintain the 5 hPa requirement was, in the end, maintained in the final GCOS statement.

SCOSTEP

Bob Vincent briefed the SSG on the three projects which, since the end of STEP, are more or less closely related to SPARC: EPIC (Equatorial Processes Including Coupling) which has some connection with CEGWE, PSMOS (Planetary Scale Mesopause Observing System) and ISCS (International Solar Cycle Studies). The last is clearly concerned with the compilation of the time-varying distribution of solar UV and total irradiance carried out in the framework of the "stratospheric aspects of climate forcing" initiative. As mentioned earlier J. Lean has accepted to be the liaison with ISCS, in the SPARC group.

Following the end of R. Vincent 's mandate in the SCOSTEP Bureau in 1999, the SPARC Co-chairs suggested that a letter be sent by the Executive Director of WCRP to the President of SCOSTEP in order to ensure the presence of a representative of WCRP in the SCOSTEP Bureau after 1999.

IAMAS

Karin Labitzke mentioned the importance for SPARC of the next IUGG General Assembly (see announcement in this issue), and the numbers of IAMAS and ICMA symposia and workshops of interest for SPARC, some of them being co-sponsored by SPARC.

COSPAR

J. Gille described the future "SPARC related" satellites: SAGE-3, in 1999, Envisat, ADEOS-2 and EOSPM in 2000, Metop-1 in 2001, EOS-CHEM in 2002, SMILES in 2003. He noted that wind observations from space were totally absent and suggested that the requirement for these needed to be strongly underlined. The discussion of transforming some of the "research observational systems" was raised by A. O'Neill. SPARC should prepare its requirements for both the ozone issue and the climate issue to report at the next JSC.

Presentation of Japanese results

Five short presentations were given by Japanese scientists attending the SSG meeting:

- Global morphology of gravity wave activity using GPS/MET occultation data by T. Tsuda.

- Presentation of SOWER first results by F. Hasebe.

- Status of Improved Limb Atmospheric Spectrometer (ILAS) validation activities and some results of preliminary scientific use by Y. Sasano.

- Progress of the STAJ SPARC Project, "Stratospheric change and its role in climate" by O. Uchino, Y. Makino and H. Kanzawa.

- Progress of the EA Stratospheric Ozone Project: "ozone depletion mechanisms and modelling" by H. Nakane.

Future SPARC activities

The planning for the SPARC workshops which should take place in the next year and the organisation of the SPARC General Assembly to be held in Mar del Plata, Argentina, November 6-10, 2000, were reviewed.

Pablo Canziani, as the Chair of the Local Organising Committee, attended the whole meeting during which both organisational and scientific matters were discussed on several occasions.

A O'Neill accepted to Chair the Scientific Organising Committee. He will name in the near future co-conveners on the four major issues in line with the SPARC ongoing programe:

-Stratospheric indicators of Climate Change

-Stratospheric processes and their relation to Climate

- Modelling stratospheric effects on Climate, and

- Changes of UV irradiance and its consequences

this last issue being the subject of a large number of research projects in South America.

Letters seeking support, mostly for students from developing countries, will be issued by the SPARC Office in the next few months and addressed to the main national and international funding agencies.

A web site will be in place next March (http://sparc2000.at.fcen.uba.ar) and the first circular will be distributed in summer 1999.

SPARC Office

The SPARC Office in 1998 added two important tasks to its regular activities: the editing of both the Implementation Plan (WCRP Report No. 105), and the SPARC No. 1 Report. Both documents are available on the web page and have also been widely distributed. The SPARC Office, particularly Céline Phillips, put in a lot of time and effort during the preparation of both reports. Updating the directory, preparation of the mailing lists for both the Implementation Plan and the SPARC No. 1 Report and regular contact with the SPARC community were other time-consuming tasks. The preparation of the newsletters benefited from the help of Yuri Koshelkov, mostly from Moscow. The year 1999, with the production of several reports, the organisation of a number of workshops and preparations for SPARC 2000, including the efforts to seek sponsorship, will also be extremely busy and the need for a full time position in the SPARC Office is more acute than ever.

SPARC Data Centre

Marvin Geller informed the SSG that the SPARC Data Centre has been funded by NASA at SUNY/Stony Brook for three years at $60K/year. In order to operate within this funding envelope, a 6-month delay was built in to allow for both payment of salaries and purchase of computer equipment. A search is now underway for a SPARC Data Centre scientist. This will be a 1/2 time position. A modest workstation will be purchased along with some capability for mass storage.

The first task will be to identify key SPARC data holdings and to build a web page with pointers to these data holdings. In the next stage, some SPARC-unique data will be collected and stored at the Data Centre. The SPARC Data Centre will also have the capability to execute simple computations to supply tailored data products and also to carry out routine calculations in support of SPARC projects.

Next session of SPARC SSG

The seventh session of the SPARC Scientific Steering Group will be hosted by the French Space Agency, CNES, in Paris, France, and a date has been provisionally reserved for 2-5 November 1999.

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Climatologies of stratospheric constituents derived from UARS data

by **William Randel**, NCAR, Boulder, USA (randel@ucar.edu)

The Upper Atmosphere Research Satellite (UARS) has been obtaining measurements of a number of important trace constituents in the middle atmosphere since its launch in 1991. Two of the instruments, the HALogen Occultation Experiment (HALOE, Russell *et al.*, 1993) and the Microwave Limb Sounder (MLS, Barath *et al.*, 1993) have continuing measurements to the present time. HALOE provides observations of stratospheric CH_4, H_2O, HF, HCl, O_3, NO and NO_2, while MLS measures O_3, H_2O, ClO and HNO_3. Other UARS instruments, the Cryogenic Limb Array Etalon Spectrometer (CLAES, Roche *et al.*, 1994), and the Improved Stratospheric and Mesospheric Sounder (ISAMS, Taylor *et al.*, 1993) also measured a number of trace constituents during their lifetimes (until April 1993 and July 1992, respectively). Detailed validation papers for these UARS constituent data are available in a special issue of Journal of Geophysical Research ("Evaluation of the UARS data", April 1996).

The long-time record and near-global coverage of these data allows the opportunity to derive global, seasonal cycle data sets representative of climatological structure. An effort has been undertaken to provide the research community with "climatological" means of these constituent data, together with temperature and aerosol data. This effort is termed the UARS Reference Atmosphere Project, headed by Dr. John Remedios of Oxford University. These constituent data will also be included in the data base constructed by the SPARC Reference Climatology Project. Here we show some examples of these climatological data to demonstrate their utility. We focus on results for ozone (O_3), methane (CH_4) and water vapour (H_2O), as these constituents are valuable for input to radiative schemes and validation of model transport behaviour in the stratosphere.

Brief details of the data analysis is as follows. The satellite measurements are first averaged in longitude (zonal