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1994
July

STRATOSPHERIC PROCESSES AND THEIR ROLE IN CLIMATE

A Project of the World Climate Research Programme

Greetings

This is the first time that I have used the Greetings column to speak to you, the SPARC community. As you can see from this and previous issues of the SPARC Newsletter, SPARC is off to a promising beginning. You should already have received the report, **"Initial Review of SPARC Objectives and Scientific Issues."** National SPARC programmes are being established, SPARC Working Groups are hard at work, and SPARC sessions are being held at a number of international meetings with more being planned. SPARC is in the latter stages of what I would term its formative process. By this, I mean that the SPARC infrastructure is being established. Shortly, SPARC will be in its execution phase where there will be a much greater emphasis on realising SPARC objectives rather than planning how we should approach them. This is an exciting time for SPARC science. New and exciting data are being made available from UARS, aircraft missions, and Shuttle flights, as well as from more traditional sources. The importance of the stratosphere for climate is becoming more widely appreciated as is evidenced by its increased consideration in the upcoming IPCC report. Ozone depletion issues are still with us as will be clear in the upcoming WMO/UNEP Ozone Assessment. The question of what effects present (and future) aircraft operations have (and will have) on the atmosphere is getting increased attention around the world. SPARC is trying to position itself to help facilitate international efforts on these and other topics. Clearly, the financing of research in these areas will be predominantly from your national agencies, but hopefully SPARC can be of some assistance in coordinating international efforts and to stimulate some studies that have not yet received enough attention. We welcome your comments and suggestions of some of the areas that SPARC should address in this regard. The next meeting of the SPARC Scientific Steering Group will be held in Princeton, New Jersey, USA, during the period September 20-23, 1994. We welcome your suggestions and comments.

● Marvin A. Geller
SPARC Co-Chair

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SPARC in Action
National contributions to SPARC

Australia

The Cooperative Research Centre for Southern Hemisphere Meteorology (CRC-SHM) has been established in July 1993. The CRC, based on the main Clayton campus of Monash university, will be one of the principal university centres in Australia for research and graduate training in the meteorological sciences.

Participants are : Monash University, Bureau of Meteorology (BoM), CSIRO Division of Atmospheric Research (DAR), Cray Research (Australia), CSIRO Division of Applied Physics (DAP).

Specifically, there will be three research programmes :

- **A Stratospheric Ozone Programme** will focus on analysis and interpretation of stratospheric meteorological data (primarily from BoM operational global analyses), ground-based and satellite-based ozone data and measurements of stratospheric composition in order to investigate stratospheric transport and chemical processes affecting ozone. The development of an improved stratospheric analysis and modelling capability and modelling of ozone transport in significant situations such as the polar vortex breakdown will be conducted. Understanding of trends in stratospheric ozone will be sought using zonally averaged chemical-transport models.

- **A Programme of Global Transport Modelling** will develop an improved global transport model to infer sources of carbon dioxide and methane from observed concentrations.

- **A Programme on Southern Hemisphere Climate Dynamics** is aimed at developing a theory of the Southern Hemisphere circulation and its variability, and its impact on regional climate change thereby producing support for assessment of climate change and seasonal predictions.

The research in the Bureau of Meteorology (BoM) deals in particular with climate change modelling. The BoM supports, among other, the national network of ozone and solar radiation measurements. The BoM and CSIRO jointly manage the atmospheric monitoring programme of CGBAPS (Cape Grim Baseline Air Pollution Station). There is also satellite reception and processing facilities in Melbourne, Darwin, Perth and Antarctica.

The DAR studies involve atmospheric chemistry and radiation, climate and mesoscale modelling (chemistry and dynamics of ozone, CFCs and N_2O). It participates in a CSIRO Climate Change Research Programme (global climate models including atmospheric and ocean components, global transport models and mesoscale models).

The Monash University Centre for Dynamical Meteorology (CDM) deals with fluid dynamics, large-scale and mesoscale dynamical meteorology, cloud dynamics.

Cray Research is well-known for its progress in supercomputing. The CSIRO Division of Applied Physics is collaborating with the Boeing company in studying a potential impact on stratospheric ozone that high flying aircraft may have in the next century (laboratory studies of the aerosol reactions and the construction of a 2-D stratospheric model to allow ozone assessments on decadal time scales).

The CRC participates in 1994 in the NASA/NOAA ASHOE/MAESA mission based at Christchurch.

A Stratospheric Modelling Workshop (3-5 October) will be held in Melbourne.

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Austria

"Spectral measurements of Solar UV-A and UV-B Radiation in High Mountain Areas" have been performed during the last decade at the Jungfraujoch mountain research station, Switzerland, and compared with the measurements made at Innsbruck, Austria. This programme will be pursued.

Contact persons : Prof. Dr. W. Ambach and Dr. M. Blumthaler, Institute for Medical Physics, University Innsbruck, Müllerstr. 44, A-6020 Innsbruck. Tel : +43-51 25 07 24 21, Fax : +43 -51 25 07 24 29.

Composition of the SPARC OFFICE

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J. Mahlman (USA)
T. Matsuno (Japan)
J. Pyle (UK)
T. Shepherd (Canada)
S. Solomon (USA)
H. Tanaka (Japan)
R. Turco (USA)

Belgium

The Belgian Office for Scientific, Technical and Cultural Affairs finances several projects in the framework of its Global Change Programme :

SMAC : Spectroscopic Measurements of Atmospheric Changes, to understand and quantify natural and anthropogenic changes affecting the chemical composition of the atmosphere; to produce experimental data on the composition/evolution of the atmosphere to make them, after validation, available to the scientific community. (Prof. P. C. Simon - Belgian Institute for Spatial Aeronomy, Prof. L. Delbouille - University of Liège, Prof. R. Colin - Free University of Brussels).

ATMOS Antenna : Atmospheric Trace MOlecule Spectroscopy, to acquire, test and optimize software/algorithms of computation of synthetic transmission spectra of the atmosphere to fit to real observations; to analyse IR solar observations by the American ATMOS instrument in order to determine geophysical parameters characterising the chemical composition and physical conditions of the atmosphere; to integrate the findings into a geophysical databank (Dr. R. Zander - University of Liège).

Global modelling of the coupled chemical-climatic changes due to human activities, to develop a radiative-convective-climatic model including the main carbon reservoirs to investigate the natural and anthropogenic perturbations; to develop in particular a 2D-model of the stratospheric and tropospheric chemistry including advective, turbulent and wave transport and coupling with surface processes to investigate the dynamics of the stratosphere (Dr. J. C. Gérard - University of Liège).

Vertical ozone profiles and meteorological parameters obtained with balloons in Uccle, to measure ozone profile regularly and to study the ozone stratosphere/troposphere transfer (Dr. D. De Muer - Belgian Royal Meteorological Institute).

Contact person : Dr. E. Cantarella, Belgium Office for Scientific, Technical and Cultural Affairs, Rue de la Science 8, B-1040, Brussels, Belgium, Tel : + 32-2 238 36 11, Fax : + 32-2 230 59 12.

Canada

In the area of **modelling,** a project has been established to develop a 3-D Middle Atmosphere climate Model (MAM), including fully interactive chemistry. It builds on the existing GCM of the Atmospheric Environment Service (AES) and involves scientists from the AES and from McGill University, Université du Québec at Montréal, University of Toronto (UT), and York University (YU). It is supported by the Natural Sciences and Engineering Research Council of Canada as well as by the AES. When completed the model will become a community model; the first publicly released version should be available by the spring of 1996. MAM project's PI : Prof. T. G. Shepherd.

In the area of **measurements, lidar** measurements of gravity waves, temperature, ozone, aerosols and PSCs in the stratosphere and mesosphere are headed by A. I. Carswell (York University) and R. J. Sica (University of Western Ontario, UWO) in southern Ontario and at the NDSC observatory in Eureka in the Arctic. Sun **spectrophotometer** measurements of solar radiation have been made by C. T. McElroy (AES) on ER2 flights as part of SPADE and on the Space Shuttle (SPEAM-2 experiment); the instrument is also part of the experiment complement for ASHOE. As for **satellite** measurements, J. R. Drummond (UT) is the PI for the **MOPITT** instrument to fly on the EOS AM platform in 1998 (information on stratospheric-tropospheric exchange). A payload is under development for the Swedish **Odin** satellite, Swedish/Canadian/French/Finnish collaboration (chemistry of the stratosphere and mesosphere).

Not quite within the SPARC programme, but having an impact on stratospheric gravity waves processes, winds in the mesosphere are being obtained using radar by W. Hocking (UWO) at London, Ontario, and by A. H. Manson (University of Saskatchewan) at Sasketoon. **IR imaging radiometer** measurements of the OH nightglow are being made by R. P. Lowe's group (UWO) at London, Ontario, and Eureka. G. G. Shepherd (YU) is the PI for the **UARS WINDII** (winds and temperatures near the mesopause).

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China

SPARC-related activities have been conducted in institutions of the Chinese Academy of Sciences (CAS), universities, and the China Meteorological Bureau. **Monitoring of stratospheric aerosols** has been made in the Institute of Atmospheric Physics, CAS, since early 1980s with stratospheric balloons, lidars and a twilight spectrophotometer at Beijing area (40°N) (the Anhui Institute of Optics and Fine Mechanics is also involved).

Two projects named **"The Global Character of Solar - Terrestrial System over Antarctic Region"** and **"Research on Antarctic Climate"** supported by the China National Antarctic Committee and CAS are partly related to SPARC (monitoring of the Antarctic stratosphere with ozonesonde, ruby lidar, Brewer spectrophotometer, and UV-B meter). The coordinated observation started in early 1993.

A project named **"Basic Processes of the Middle Atmosphere and Their Function to Coupling of Upper-Lower Atmospheres"** funded by National Science Foundation of China is conducted in the Institute of Atmospheric Physics, Center for Space Science and Application

Research, Lanzhou Institute of Plateau Atmospheric Physics since 1993 including : monitoring and modelling of stratospheric processes relating to ozone variation and aerosol effects; monitoring and modelling of UV-B spectra; general circulation of the lower stratosphere and its relation to tropospheric climate.

Contact person : Prof. LU Da-Ren, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029, China, Tel : +86-1 2048922, Fax : +86-1 2028604 E-mail: ludr@bepc2.ihep.ac.cn

Czech Republic

The project **"Short-time changes of ozone and possibilities of their prediction in view of penetration of the harmful UV-B radiation"** is run by the Institute of Atmospheric Physics of the Academy of Sciences and by the Department of Meteorology and Environment, Faculty of Mathematics and Physics, Charles University. It seeks ozone response to rapid meteorological changes and strong solar-terrestrial events (to forecast deep short-term ozone anomalies). Also, the Ozone and Solar Observatory of the Czech Hydrometeorological Institute, Hradec Králové, is starting **UV-B monitoring** with a Brewer spectrophotometer. Gravity wave activity starts to be studied but only in the upper mesosphere and so is only indirectly related to SPARC.

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Denmark

The project called **"Ozone as a climate gas"** (1993-1995, which may be extended to the end of 1997) focuses on ozone changes in the atmosphere at northern latitudes and studies how these changes affect the climate at the Earth's surface. Included in the project are : a) analysis of ozonesonde measurements, b) analysis of satellite observations of column ozone, c) model calculations of ozone formation and distribution in the free troposphere, and d) calculations of changes in radiative forcing and surface temperatures due to changes in the ozone distribution.

The project is conducted by the Danish Meteorological Institute in cooperation with Norway, Finland, and Sweden (Project coordinator : Prof. Ivar S. A. Isaksen, Inst. Geophys., Univ.of Oslo, PO Box 1022, Blindern, 0315 Oslo, Norway)

Contact person : Dr. T.S. Jørgensen, Danish Meteor. Inst, Lyngbyvej 100, Copenhagen, D-2100, Denmark. Tel : + 45 - 39 15 74 10, Fax : + 45 - 39 15 74 60.

EUROPE

EC (European Commission)

The Directorate-General XII of the European Commission (EC) within the **ENVIRONMENT** research programme (1991-1994) supports research activities on stratospheric ozone depletion. The key components of this programme are :

(a) laboratory measurements of basic properties such as how fast different chemicals react and how light affects them;

(b) field measurements of important atmospheric properties;

(c) model studies, with the results compared to field measurements.

To gain maximum benefit from both the national and EC programmes, the EC is advised by the Science Panel on Stratospheric Ozone, made up of experts from EU and EFTA countries. To assist specifically in the coordination of the European programme, the EC supports the European Ozone Research Coordinating Unit based in Cambridge, UK.

During Phase II of the **ENVIRONMENT** programme (1994-95), 26 projects are supported on stratospheric ozone depletion and on UV flux measurements. Most of them compose the **Second European Stratospheric Arctic and Mid-latitude Experiment (SESAME)** (Jan 1994 - Dec 1995) built on experience gained during EASOE. The majority of scientists will be from Europe but other countries are also involved. Over 55 research groups will take part.

The **SESAME scientific goals** are to study :

- stratospheric chemistry of the chlorine, nitrogen, hydrogen and bromine families;
- role of PSCs and of sulphate particles in abetting the chemical destruction of ozone;
- evolution of ozone concentrations through the two winters (when and where losses occur);
- meteorological conditions most likely to favour ozone destruction.

A wide variety of instruments are being used, such as ground-based instruments, ozonesondes, research balloons, aircraft (TRANSALL, Falcon, ARAT, Geophysica) while satellite information will be also available. The strategy is to have a background set of measurements made by instruments operated throughout 1994 and 1995. On top of this, there will be three intensive periods of study in January-March 1994, September-October 1994 and December 1994-April 1995.

3-D chemical models of the stratosphere will be used in interpreting SESAME results. In addition, two models will be used to produce chemical forecasts of the stratosphere in real time, helping the planning of the measurement strategy for balloon and aircraft flights. Meteorological support will come from the ECMWF and national meteorological services.

Changes in UV-radiation resulting from ozone changes will be studied at a number of sites making both regular measurements and intensive coordinated

measurements in the more active phases of SESAME.

SESAME Phase I took place in early 1994. Eight balloons were launched from Kiruna, and both the TRANSALL and Falcon were also based there for short campaigns. The SESAME ozone dataset is now being examined in detail to find evidence of ozone depletion in the late winter.

Future activities. The 4th Framework Programme 1994-1998 of the EC has been adopted with a total budget of 12 300 MECUs.The part allocated to the specific **ENVIRONMENT** Programme is 1080 MECUs, of which 852 MECUs for Environment and Climate. The next call for proposals is scheduled for the early 1995.

Contact person : Dr. H. Ott or Dr. G. Amanatidis, European Commission, DGXII/D-1, rue de la Loi 200, B-1049 Brussels. Fax : + 32-2 29 63 024.

ESA (European Space Agency)

The Earth Observation programme of the Agency is managed by the Directorate for the Observation of the Earth and its Environment. There are three main elements of interest to SPARC :

- **The ERS-2 Mission**

Included on the ERS-2 satellite (to be launched in Dec 94-Jan 95) is the GOME (Global Ozone Monitoring Experiment) instrument nadir-observing in the frequency range of 240 to 790 nm, with a resolution of 0.2-0.4 nm, exploiting the DOAS (Differential Optical Absorption Spectroscopy) and SBUV (Solar Backscatter Ultra-Violet) approaches. Target species in the stratosphere include O_3, NO, NO_3, (also OClO, ClO and

Future SPARC and related meetings

Future SPARC meetings :

26-30 September 1994 : NATO ARW : "The Effect of the Mt Pinatubo on the Atmosphere and climate", Director : G. Fiocco (Physics Department University, La Sapienza, I-00185 Roma, Italy) Roma, Italy.

April 1995 : EGS General Assembly : Middle Atmosphere Science : Progress in the SPARC and UARS Projects, Conveners : A. O'Neill (CGAM, Dept. of Meteorology, University of Reading, PO Box 239, Reading RG6 2AU, UK) and D. Cariolle (EERM/CNRM, 42 Av. Coriolis, 31 057 Toulouse Cédex, France).

15-20 May 1995 : "Joint Symposium on Stratospheric Ozone". Organising Committee : J. Kaye (NASA HQ, Code YSM, Washington, DC 20546, USA) J. Pyle, S. Solomon, C. Zerefos, Halkidiki, Greece.

July 1995 : SPARC Symposium, IUGG General Assembly, Conveners : M.-L. Chanin (CNRS/SA, BP3, 91370 Verrières Le Buisson, France) and M. Geller (ITPA/SUNY, Physics Building, B-106, Stony Brook, NY 11794-5000, USA), Boulder, Co, USA.

4-15 September 1995 : NATO ASI on "The Stratosphere and its role in the climate system", Director : G. Brasseur (NCAR, PO Box 3000, Boulder 80307, Co, USA), Québec, Canada.

1995 : (Tentative) Joint US/Japan meeting on "QBO/ENSO Variations in the Global Stratosphere/Troposphere System", Conveners : T. Matsuno (Center for Climate System Research, University of Tokyo, 4-6-1 Komaba, Meguroku, Tokyo 153, Japan) and M. Geller.

January 1996 : proposed NATO ARW "Gravity Wave Climatology and Parameterization", Convener : Kevin Hamilton (GFDL, PO Box 308, Princeton, NJ 08542, USA), Santa Fe, NM, USA.

SPARC related meetings :

July 1994 : COSPAR Symposium "Middle Atmosphere and Global Change" co-sponsored by WCRP/SPARC, Hambourg, Germany

3-5 October 1994 : Stratospheric Modelling Workshop, Convener : R. J. Atkinson (CRC SHM, Bureau of Meteorology Research Centre, PO Box 1289K, Melbourne 3001, VIC, Australia), Melbourne, Australia.

15-18 November 1994 : Worshop on "Wind Observations in the Middle Atmosphere", Conveners : M. Geller and M. -L. Chanin, Paris, France.

July 1995 : SPARC related Workshops, IUGG General Assembly, Boulder, Co, USA :
- Gravity wave Sources and Parameterisation, Convenor : D. Fritts (LASP, University of Colorado, Boulder, CO 80309-0392, USA).
- Intercomparison of Middle Atmosphere Models, Convenor : S. Pawson (Institut für Meteorologie, Freie Universität Berlin, Carl-Heinrich-Becker-Weg 6-10, 12165 Berlin, Germany).

BrO under ozone hole conditions), PSCs and aerosols (see GOME-Interim Science Report : ESA SP-1151 September 1993).

• **The ENVISAT-1 Mission**

This satellite scheduled for launch in 1998 includes :

(i) **GOMOS (Global Ozone Monitoring by Occultation of Stars)**

This is a limb-viewing instrument to observe trace gas concentrations at altitudes from 20 to 100 km. By observing stars, an improved geographic coverage is obtained as compared to SAGE while retaining the inherent accuracy of the occultation technique. GOMOS observes in the UV/visible (250-675 nm) and in the IR (756-773 and 926-952 nm). Its main target is O_3, also NO_2, NO_3, aerosols (plus BrO, OClO and ClO in ozone hole conditions). The IR channels will be used to derive temperature and H_2O.

(ii) **MIPAS (Michelson Interferometer for Passive Atmospheric Sounding)**

This is a limb-viewing instrument to scan almost all regions, at altitudes from 5 to 250 km, to measure emission spectra in the mid-IR (4.15-14.6 μm) with a resolution of 0.035 cm^{-1}, to observe O_3, nitrogen oxides, fluorocarbons, C_2H_2 and C_2H_6, CO, CH_4, HNO_3, and HNO_2, etc., temperature, H_2O, aerosol.

(iii) **SCIAMACHY (Scanning Imaging Absorption Spectrometer for Atmospheric Cartography)**

This is a limb/nadir spectrometer (building on GOME) which can be also used for solar occultation. The spectral range is 240 nm to 2.38 μm, the resolution better than 0.25 nm in the UV and varies from 0.22 nm to 1.48 nm for visible/IR. In the limb mode, altitudes of 20 to 100 km are scanned. Through a number of retrieval techniques, both column depths and profiles are obtained (O_3, several nitrogen oxides, CH_4, CO and H_2O, plus some others under ozone hole conditions, temperature and PSCs (see the November 1993 issue of the ESA Bulletin).

• **Future missions**

The Agency plans to include an operational ozone monitoring instrument on the METOP satellites (joint with EUMETSAT). Also proposed for METOP (by France and Italy) is a high resolution temperature and humidity sounder, IASI, to replace current low resolution operational meteorological IR sounder; this will be a nadir-viewing interferometer in the spectral range of 645 to 2760 cm^{-1}, with a resolution of 0.5 cm^{-1}, to measure temperature and humidity profiles, also O_3, CO, CH_4 and N_2O.

Studies are initiated of instruments operating in the mm, the sub-mm and far IR regions to probe chlorine species and hydroxyls.

Future ESA Earth Observation missions are currently debated in Europe and will become much clearer next year.

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Finland

SPARC-related activities at the Finnish Meteorological Institute (FMI, Helsinki) include several projects :

- Stratospheric climatology by UV-Visible Spectroscopy (SAOZ observations of O_3, NO_2, and if possible OClO and BrO);

- Modelling and Measurements of Ozone and Aerosols in Northern Atmosphere (multispectral depolarization lidar and backscatter sonde observations) (part of SESAME);

- FMI Basic Long-Term Ozone Monitoring Programme (the Sodankyla (67.4° N, 26.6° E), and Jokioinen (60.8° N, 23.5° E) observatories);

- Ozonesondes during SESAME (to monitor ozone mixing ratios over Europe and Arctic);

- Behaviour of Atmospheric Ozone Influences in Finland;

- Digitalization of old FMI Radiosounding Data (1949 to 1964) to estimate trends in temperature and winds;

- Effect of Ozone on UV radiation in Northern Europe (to (1) refine radiative transfer models by introducing recent data on the extraterrestrial solar spectrum, absorption cross-section, scattering phase functions and distribution of various atmospheric constituents, (2) use observed UV data to test radiative transfer models);

- FMI Basic Long-Term UV Monitoring Programme ((1) to get time series of erithemal irradiances using 5 broadband radiometers, (2) to obtain spectral UV data from hourly scans at two observatories with Brewer spectroradiometers, (3) to participate in developing and standardising UV calibration and observation procedures);

- Effect of Ozone on UV-B Radiation in Northern Europe (to use predicted change of O_3 content, aerosols, cloudiness, etc. and to derive future UV radiation climate utilising tested radiation transfer models).

FMI is also participating :

- in the Odin (Sweden) Aeronomy science team, in validating light scattering models and instruments and in the campaign planning;

- in a Nordic project "Ozone as a Climate Gas";

- in designing STARTREK (the State Technological Research Centre's ground-based star-pointing imaging spectrometer), spectral inversion in the data analysis;

- in a British Antarctic Survey campaign, to measure ozone;

- in the ENVISAT-1/GOMOS Mission, in instrument performance and mission planning, forward modelling (atmospheric propagation), inversion algorithm development and ozone mapping.

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France

The Middle Atmosphere Programme entitled **PAMOY** is supported jointly by the National Center of Scientific Research (CNRS), the National Center for Space Research (CNES), and the Ministry of Environment. Its present content is articulated around 4 topics and has a large overlap with SPARC :

Polar Ozone. Mostly through an intensive participation in the coordinated European campaigns EASOE and SESAME. The contribution to SESAME involves the use of a number of lidars, SAOZ spectrometers... from several stations at both middle and high latitudes. CNES also contributes to such campaigns by launching a number of balloons with complex payloads in the Arctic.

Laboratory studies in molecular spectroscopy and heterogeneous chemistry, as well as 1-, 2- and 3-D modelling are also part of this theme.

Coordinator : J.-P. Pommereau, CNRS/SA, BP 3, 91371 Verrières-le-Buisson, France. Tel : +33-1.64 47 42 88, Fax : +33-1.69 20 29 99, E-mail : Pommereau@aerov.jussieu.fr

Dynamics, Physics and Chemistry of the upper troposphere and lower stratosphere. A radar and lidar network is being used to study coupling mechanisms and Stratosphere - Troposphere Exchange (STE) at mid-latitude.

Participation in the coordinated European effort on this theme within the Environment Programme of the EC (TOASTE 1 and 2, ESTIME campaigns...) and in the **"Aircraft Ozone"** national programme supported by the Ministries of Transport, Environment, and Higher Education and Research. It involves the use of aircraft borne experiments, on board the ARAT, and later on an AIRBUS 320 equipped with new sensors.

Two types of CNES balloons are adapted for STE studies : the Infrared Montgolfière (MIR) and the superpressurized balloons. A large-scale campaign, STRATEOLE, is being planned using 200 superpressurized balloons launched around the Antarctic in order to study interactions between stratospheric dynamics and chemistry in the vicinity of the polar vortex and the dilution of the Antarctic ozone hole.

STE project Coordinator : F. Bertin, CRPE, 4 Avenue Neptune, 94107 St. Maur-des Fossés, France. Tel : +33- 1 45 11 42 52, Fax : +33- 1 48 89 44 33.

STRATEOLE contact person : F. Vial, LMD-CNRS, 25 Rue Lhomond, 75231 Paris, France. Tel : +33-1 69 33 45 29, Fax : +33-1 69 33 30 05, E-mail : vial@ondes.polytechnique.fr

Analysis, validation and use of satellite data. Participation in the UARS Programme which involved the construction of WINDII (jointly with Canada), the validation of UARS profiles of ozone, aerosols, temperature and winds by lidars and balloons and the on-going interpretation of the data. Such a validation programme is now being pursued for POAM II.

Study of the solar spectrum variability (UV to IR) and measurement of the solar constant are made by regular SPECSOL flights on board ATLAS 1, 2, 3 and on EURECA.

Contribution to ILAS on board the Japanese ADEOS and to the Swedish satellite Odin. Contribution to ENVISAT-1 with the realisation of GOMOS and participation in IASI, MIPAS and SCIAMACHY to study stratospheric composition and structure .

Coordinator : P. Bauer, CNRS/SA, BP 3, 91371 Verrières le Buisson, France. Tel : +33-1 64 47 43 20, Fax : +33-1 69 20 29 99.

Long-term trends and natural variability. Study of different sources of variability (solar, volcanic, anthropogenic) with an ensemble of instruments (lidars, UV, IR and microwave spectrometers, SAOZ) operated routinely at the Observatory of Haute Provence (OHP) (44°N, 6°E) and on the Plateau de Bure (44°N, 6°E) (NDSC Alpine station). The OHP station was inaugurated as part of NDSC in May 1994, but data for some of the parameters have been archived since the early 80s. Implementation of two other NDSC stations are planned : La Réunion Island (21°S, 50°E) and Dumont D'Urville (67°S, 140°E) (latter at Dome C in the framework of the Concordia Station).

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Contact person : Dr. M.-L. Chanin, CNRS/SA, BP3, 91371 Verrières-le-Buisson, France. Tel : +33-1 64 47 43 75, Fax : +33-1 64 47 43 16, E-mail : sparc.office@aerov.jussieu.fr

Germany

The German Federal Ministry of Research and Technology (BMFT), together with the Deutsche Forschungsgemeinschaft (DFG) and several other agencies, is funding research in several domains of SPARC.

Aircraft-related studies : The DFG has implemented a Priority Programme **"Effects of Aircraft and Spacecraft on the Atmosphere"** which is complemented by the BMFT Integrated Research Project **"Pollutants Emitted by Aircraft".**

The BMFT has funded the construction of a **high-flying aircraft** STRATO 2C devoted initially to the studies of stratospheric ozone decrease. Instrument packages are now in preparation and the first operational flight is scheduled for late 1995. The aircraft is designed to fly at heights of 18-24 km for 8-48 hours. This capability will later be used for flights in the tropics to study stratospheric/tropospheric exchange.

Contact person : Prof. Dr. U. Schumann, DLR, Institute of Atmospheric Physics, PO Box 11 16, D-82230 Wessling. Tel : +49- 81 53 28 25 20, Fax : +49- 81 53 28 18 41.

Troposphere-stratosphere modelling : The BMFT Climate Research Programme has supported the development of GCMs including the middle atmosphere in Berlin (Institute of Meteorology,

Free University Berlin) and Hamburg (Max Planck Institute of Meteorology). The influence of the stratosphere on climate is studied there. It is planned to assess the recent state of troposphere-stratosphere general circulation modelling. Strategies for GCM intercomparisons/improvements related to SPARC are being developed.

Contact person : Dr. S. Pawson, Institute of Meteorology, Free University Berlin, Carl-Heinrich-Becker-Weg 6-10, D-12165 Berlin. E-mail : pawson@strat01.met.fu-berlin.de

Assessment of stratospheric temperature trends will include an assessment of the consistency of temperature trends with model predictions. The well-known stratospheric data series of the Stratospheric Research Group, Institute of Meteorology, FU Berlin, will be one of the important sources.

Contact person : Prof. Dr. K. Labitzke, Inst. of Meteor. Free Univ. Berlin, Carl-Heinrich-Becker-Weg 6-10, D-12165 Berlin. Fax : +49-30 83 87 1167, E-mail : labitzke@strat01.met.fu-berlin.de

UV-B monitoring : In coordination with the international organisations, Germany is establishing a UV-B network of monitoring stations.

Contact person : Dr. Quintern, DLR, Project Management Environment System Research (PT-USF), Südstrasse 125, D-53175 Bonn.

Important contributions to SPARC are made as well through the German Aerospace Programme and the ESA ENVISAT project.

The German SPARC group has been formed : Prof. Dr. K. Labitzke (chair).

Greece

Pure and applied research relevant to SPARC and funded from EC and other international organisations is concentrated at the Laboratory of Atmospheric Physics (L.A.P.) of the Aristotle University of Thessaloniki and involves :

- Global Change and Climate Change.

- Physics and chemistry of the ozone layer.

- Transfer of solar and terrestrial radiation in turbid and rural atmospheres.

- Solar UV-B and other spectral measurements, campaigns and modelling.

- Variability of the stratosphere and the troposphere on various time and space scales.

- Laser remote sensing of the atmosphere.

- Networking of stations for environmental monitoring.

L.A.P. hosts several activities of interest to SPARC such as :

- The WMO-GO_3OS Provisional Ozone Mapping Centre (POMC) which collects total ozone observations from about one hundred stations (30°N to 80°N) in cooperation with the NASA/TOMS ozone processing team and several scholars from different institutions. The near-to-real time ozone maps and related information are produced by L.A.P. and dispatched to more than 60 destinations.

- The Network for Ozone and Solar Ultraviolet Radiation (part of GAW) comprises nine peripheral monitoring stations in a wide range of atmospheric and exposure conditions and a core station at L.A.P.. At all stations the solar UV biological dose is monitored continuously together with the solar radiation (one minute resolution).

Contact person : Prof. Christos S. Zerefos, L. A. P. , 54006 Thessaloniki, Greece. Tel : +30-31 99 80 41, Fax : +30-31 283 752, E-mail : zerefos@olymp.ccf.auth.gr.

Japan

Information on ILAS. The Improved Limb Atmospheric Spectrometer (ILAS) is designed to provide data on the chemistry and dynamics of the middle atmosphere. It is based on the solar occultation technique and will be flown by the ADvanced Earth Observing Satellite (ADEOS) in early 1996 by the National Space Development Agency of Japan (NASDA). The measurements are made in the high-latitude stratosphere at 14 points per day along a certain latitude for each hemisphere (56-70°N and 63-88°S). The latitude varies depending on season. The mission life is 3 years. ILAS consists of two spectrometers : the IR (6.2-11.8 μm) spectrometer with a 44 detector array is to measure O_3, N_2O, HNO_3, NO_2 CH_4, H_2O, aerosols and, hopefully, CFC_{11} and N_2O_5. The visible channel (753-784 nm) with a 1024 detector array measures absorption by the atmospheric A band of O_2, from which temperature, pressure, and aerosol concentration are derived from the cloud tops to the upper stratosphere.

Validation measurements at Kiruna (September or November 1996) include atmospheric parameters and chemical species sensors (in-situ and remote measurements from large balloons). Ground-based remote sensing is also planned in Alaska, Kiruna, Syowa and other sites. ILAS profiles of gas species and temperature will be first examined using validation and other data available from cooperative researchers. The well-validated data for scientific use will be distributed to scientific communities after the completion of validation studies, probably around November 1997. An ILAS Science Team has been established and PIs have been selected, to carry out validation, analysis, algorithm improvement and scientific studies.

Contact person : Dr. Yasuhiro Sasano, Leader, ILAS Science Team, National Inst. for Environm. Studies, Japan Environm. Agency, Tsukuba, Ibaraki 305, Japan. Tel : +81-298 51 6111, Fax : +81-298 51 4732, E-mail: sasano@nies.go.jp

(An official Japanese report on SPARC activities is expected for the next Newsletter).

The Netherlands

Monitoring of ozone and UV changes. A receiver for TOVS satel-

lite data is operational at De Bilt and images of total ozone over Europe are routinely calculated from these data. Global TOVS data are regularly assimilated in a 2-D ozone column advection model that makes use of observed winds from ECMWF to derive 6-hourly global maps for climatological analysis and detection of trends and recently to study the relationship between ozone and potential vorticity.

Since late 1992, ECC ozone soundings are performed weekly at De Bilt and the data are archived in the WDC in Ottawa. UV is monitored with a range of instruments. Narrow band instruments in the UV-A (367nm-5nm FWHM) and the UV-B (306nm-4nm FWHM) from Kipp & Zonen are used for direct and global measurements. Spectral UV measurements are performed with a double monochromator, Brewer #100. The instruments are involved in the ECSTEP intercomparison programme. Work on a comparison of measured and modelled spectra of UV in the range 290-400 nm is ongoing.

Modelling transport and chemistry. Several models are available or in development for application in studies of global and regional changes in concentrations of atmospheric trace gases. An offline global 3-D chemical tracer transport model (CTMK) that uses ECMWF dynamics, is used to study changes in ozone due to aircraft emissions in the lower stratosphere/upper troposphere and the permeability of the Antarctic and Arctic vortices and to give an estimate of the exchange of air between the stratosphere and the troposphere. The meteorological forecast model HIRLAM (HIgh Resolution Limited Area Model) is being adapted for assimilation of observations of ozone and other trace gases. Some research is done with a T21-GCM. In the future these models will amongst others be used for studies with the data from the GOME satellite instrument.

Radiative transport calculations. A 1D radiative convective model has been used to study the effects of changes in ozone, other trace gases, clouds, etc. on the radiative balance using the fixed temperature and fixed dynamical heating concepts. The radiative scheme from this model has been implemented also in the ECHAM general circulation model. Another radiative transport model is being used for the evaluation of photolysis rates for the chemical transport models mentioned earlier.

Contact person : Dr. H. Kelder, KNMI, PO Box 201, 3730 AE De Bilt, The Netherlands. Tel : +31-30 20 64 72, Fax :+31-30 21 04 07, E-mail : kelder@knmi.nl

New Zealand

New Zealand's **stratospheric research programme** is coordinated through NIWA (National Institute of Water and Atmospheric Research). It aims to quantify the concentration and temporal variability of ozone and related trace species in NZ and overseas (including Antarctica) to ensure meaningful predictions of atmospheric and UV flux changes.

The selection of Lauder, a NIWA station, as the charter site for the International NDSC has resulted in the implementation of a number of joint experiments to complement NZ experiments. Instruments operated at Lauder include Dobson, balloon sonde, UV-Visible spectrometer, FTIR interferometer, OH interferometer, aerosol lidar, backscatter sonde, ozone microwave radiometer, water vapour microwave radiometer, UV spectrum, UV-B monitors, ozone lidar, and aerosol/temperature lidar, in cooperation with various institutes in the USA, Australia, Japan, the Netherlands, Italy, and France.

NZ has taken an active role in attempting to establish quality control methodologies, particularly with regard to UV-Visible spectroscopy. It hosted in May 1992 an international intercomparison campaign where nine groups deployed instrument systems at Lauder for a "blind/blind" NO_2 intercomparison campaign. In February 1993, UV spectrometer systems from Germany and Australia were brought to NZ to run side-by-side for two weeks, in order to relate European UV intercomparison measurements from Thessaloniki with UV spectral radiation measurements in the Australasian region.

Contact person : W. A. Matthews, NIWA, Lauder, Central Otago, NZ. Tel : +64-3 447 34 11, Fax : +64-3 447 33 48, E-mail : matthews@lauder.niwa.cri.nz

Russia

Ozone-related studies. A system has been designed to diagnose the total ozone field consisting of satellite (Meteor-3/TOMS) and ground-based monitoring techniques (40 filter ozonometer (M-124) sites, Dobson, Brewer and SAOZ at some sites) and data processing facilities, and ozone patterns are analysed in CAO (Central Aerological Observatory) daily (jointly with the University of Thessaloniki and within GAW in winter of 1992-93).

During the EASOE campaign, ballon-borne water and aerosol measurements were conducted by CAO at ESRANGE. Similar backscattersonde measurements were performed at Heiss Island (81°N, 58°E) and Dikson Island (74°N, 80°E) to study the effect of Pinatubo. An active participation in SESAME is also planned.

Ozone rocket and radiosonde measurements during the Antarctic spring continue at Molodezhnaya (68°N, 46°E) since 1987 to study ozone variability. Other research involves the analysis of ozone miniholes and anomalies, ozone trends as related to circulation changes (e.g., those in the Azores High region), stratomesospheric temperature trends from rocket and radiosondes.

Russian, Italian and German institutes are cooperating in equipping the Russian high-altitude aircraft "Geophysica" with stra-

tospheric research instruments (aerosol lidar, backscatter sensor, airborne remote sensing and in situ aerosol measuring system (ARIAS), UV fluorescent hydrometer, chemiluminescent ozonometer, airborne version of Fourier Transform Spectrometer-SAFIRE-A to measure O_3, H_2O, HCl, HF, OH, ClO, N_2O, HNO_3, CO, N_2O_5). The "Airborne Polar Experiment" (APE) using this aircraft was approved preliminarily in April 1994 by the ESF (European Science Foundation). For 1996-97, polar expeditions with the "Geophysica" and tropospheric aircraft IL-18D "Cyclone" are planned.

UV-radiation-related studies. A Radiative Transfer (RT) model for the inhomogeneous plane-parallel cloudless atmosphere was developed in CAO allowing for multiple scattering, absorption, ground albedo effects. Coupled with models of UV penetration into ocean water (P. P. Shirshov Institute), it will be used to study environmental effects (ozone, clouds, aerosol; marine ecosystems) on biological dose rates.

A UV radiation network of 8 sites (4 Brewer and 4 Russian-made SUVS-M) is planned to be implemented by 1995 in Russia (43-80°N). A computer data base was developed (CAO, also the Moscow Institute for Physics and Technology and Moscow State University) to store spectral UV and supporting measurements. Biological dose rates for varying time periods and wavelength bands can be calculated.

Effects of enhanced UV fluxes on crops, microorganisms, skin and eyes of simulated model animals are studied at the Institute of Medical and Biological Problems as well as reflection spectra of human skin.

A simulation model is being developed to estimate different losses and gains connected with ozone layer protection activities to choose an optimum version allowing for the change of the biosphere, reconstruction of industrial production and use of ozone-modifying substances. The ozonosphere and biosphere response to man-induced impacts will be simulated as well as "man-environment" feedbacks.

Contact person : Dr. Vyacheslav U. Khattatov, Deputy Director, CAO, Dolgoprudny, Moscow region, 141700 Russia. Tel : +7- 095 408 7484, Fax : +7- 095 576 3327, E-mail : caero@sovam.com

Spain

The Instituto National de Meteorologia plans to increase SPARC-related studies through :

- **Stratosphere-Troposphere wave Coupling.** The aims are the representation of the stratosphere in climate modelling, stratospheric variability effects on the troposphere, anthropogenic ozone changes and the UV change impact on the troposphere;

- **Transport.** Modelling of stratospheric transport and mixing is studied through the tropopause and its folds. Is also studied transport due to the Brewer-Dobson circulation and to the polar vortex dilution.

- Monitoring/determination/modelling/identification of causes of **Stratospheric Variability and Trends** in ozone, temperature, winds. UV change effects, aerosol forcing and aircraft exhaust impact are also one of the SPARC-related studies.

- **UV** radiative transfer models with development, optimisation and validation by field campaigns and UV climatology and prediction .

Contact persons : Dr. J. M. Cisneros, Inst. Nat. Meteor., Apdo 285, 28071 Madrid, Spain. Fax : +34-1 58 19 845.

Dr. M. Gil, INTA, Torrejon de Ardoz, Madrid, Spain. Fax : +34-1 62 70 317.

Sweden

The aeronomy/astronomy satellite Odin. A Swedish aeronomical-astronomical satellite (to fly in polar orbit sometime in 1997) is being prepared for recording polar ozone photochemistry with two instruments. The first is a submm-wave heterodyne spectrometer (limb-scanning, for aeronomic measurements) for selected spectral regions between 500 and 580 GHz to record O_3, ClO, water vapour, CO, etc. Also limb-scanning is the complementary UV-visible-near IR spectrograph measuring high-altitude NO, stratospheric NO_2, aerosol layers and O_3. A stratospheric balloon flight of the prototype heterodyne instrument is also planned for the winter 1994/95 from ESRANGE, Sweden, during SESAME. The balloon radiometer will contain two high frequency channels (557 and 575 GHz) and thus provide the possibility to measure ClO, H_2O and N_2O profiles as well as providing an opportunity to test the Odin instrument.

Contact person : Assoc. Prof. Donal Murtagh, Dept. Meteorology, Stockholm Univ, S-10691 Stockholm, Sweden. Tel : +46-8 164 345, Fax : +46-8 157 185.

Ground-based measurements of stratospheric composition using mm wave spectroscopy. A permanent aeronomic site has been established in Kiruna. In its initial phase, this activity is based on the cooperation with a Russian research group providing the radiometric instrumentation. The plan is to measure O_3 and ClO. The heterodyne detection technique provides the altitude distribution of the gas for day and night unaffected by the presence of light-scattering aerosol layers. Stratospheric and mesospheric ozone and related species are also being studied by mm-wave remote sensing at the Onsala Space Observatory.

Contact person : Prof. Georg Witt, Dept. Meteorology, Stockholm Univ, S-106 91 Stockholm, Sweden. Tel : +46-8 16 43 43, Fax : +46-8 15 71 85.

Monitoring of total ozone and UV radiation. The Swedish Meteorological and Hydrological Institute monitors total ozone at Norrköping (Brewer) since 1988

and Vindeln (Dobson) since 1991 and UV-radiation (Brewer spectroradiometer and broadband filter instruments) at Kiruna, Umea, Borlänge, Norrköping and Lund. It also participates in international intercomparisons of ozone and UV-instruments. Total ozone data are reported to WODC (WMO), EASOE and SESAME.

Contact person : Weine Josefsson, SMHI, S-601 76 Norrköping, Sweden. Tel : +46-11 15 81 83, Fax : +46-11 17 02 07, Email : wjosefsson@ smhi.se

SPARC contact person : Assoc. Prof. Donal Murtagh, Dept. of Meteorology, Stockholm University, S-10691 Stockholm, Sweden. Tel : +46- 8 164 345, Fax : +46- 8 157 185.

Switzerland

The project **"Trans-Tropopause Exchange of Atmospheric Constituents"** seeks to provide an improved understanding of mid-latitude trans-tropopause exchange.

The objectives are to undertake an observationally-based diagnosis of flow phenomena related to trans-tropopause exchange in northern mid-latitudes, estimate the planetary-scale seasonal-mean mass exchange across the extratropical tropopause, seek a better understanding of dynamics of streamers/intrusions, examine the contribution of mesoscale processes using both observations and simulations, provide information on the trans-tropopause transfer (including temporal variability) of atmospheric ozone.

The approach is based on the diagnostic analyses of observational data sets (ECMWF-analysed fields, METEOSAT imagery, Arosa and Payerne ozone series), theoretical studies and numerical simulations with a high resolution mesoscale model.

Contact persons : Drs. H. C. Davies, Ch. Schär, J. Stähelin, Inst. for Atmos. Physics, ETH, HPP Hongerberg, 8093 Zurich, Switzerland. Tel : +41-1 371 1864, Fax : +41-1 371 1864.

United Kingdom

Laboratory studies in atmospheric chemistry

In March 1994 the Natural Environment Research Council (NERC) announced its intention to develop an integrated programme of research in atmospheric chemistry. A central component of the programme will be a range of laboratory based studies integrated with parallel programmes of modelling and field measurements. Novel laboratory based research in any topic of relevance to understanding the chemistry of the troposphere, stratosphere, or mesosphere is to be encouraged. The main research areas of interest identified to date are :

- mechanism of stratospheric O_3 depletion;

- oxidizing capacity of the atmosphere and oxidation mechanisms;

- formation and chemistry of clouds and aerosols;

- spectroscopic studies relevant to monitoring atmospheric constituents;

- development of new mathematical modelling methods for chemistry of the atmosphere;

- development of novel instrumentation.

NERC wishes particularly to generate interaction between scientists involved in all aspects of atmospheric chemistry, particularly in areas related to those in which NERC is supporting field and modelling work such as the European Stratospheric Ozone projects (EASOE and SESAME). It is expected that the titles of the first series of projects to be supported on this programme will be announced in the near future.

Contact persons : Mr. N. Collins, NERC, Polaris House, North Star Av., Swindon, SN2 1EU. Tel : +44-793 411513, Fax : +44-793 411 545.

Prof. D. Baulch, School of Chemistry, Univ. of Leeds, Leeds, LS2 9JT. Tel : +44-532 336564, Fax : +44-532 336565.

USA

DOE (Department Of Energy)

During the past year the U.S. Department Of Energy has launched a research programme to evaluate potential impacts of energy use and consumption on stratospheric and free-tropospheric ozone. This research is focused on those areas where major scientific unknowns exist and where impacts on human populations are potentially large. Specific elements within this category include lower-stratospheric and free-tropospheric ozone chemistry/dynamics at temperate latitudes, as well as the associated physics and chemistry of UV radiation transmission. Evaluations of past measurements and measurement uncertainty are major features of this effort, as are the uncertainties associated with current chemical models and chemical-reaction schemes.

Within this programme DOE has recently funded some 25 proposals from the DOE Laboratory and university communities to pursue various aspects of this field. This group of efforts addresses a diversity of subjects, including :

- accuracies and uncertainties of past ground and satellite-based ozone measurements;

- sensitivities and uncertainties associated with chemical parameterizations in current stratospheric chemistry models of ozone depletion;

- the relative importance of atmospheric transport as a determinant of mid-latitude, lower-stratospheric ozone levels;

- the contribution of halogen radicals to ozone chemistry in the free troposphere;

- stratosphere/troposphere coupling : the contribution of stratospheric ozone to mid-latitude, tropospheric ozone levels;

- refined trend analyses of ozone and surface UV radiation;

- statistical analyses of short-term, mid-latitude ozone minima;

- the influence of trace gases and aerosols on UV transmission.

Research progress in these areas will be reported periodically as results become available.

Contact person : Dr. M. R. Riches, Department of Division, Acting Director, Environm. Sc. Div. , ER-74, Office of Health and Environm. Res. , Office of Energy Research, Washington, DC 20585 USA. Tel : +1-301 903 3264, Fax : +1-301 903 8519, E-Mail : mike.riches@mailgw.er.doe.gov

NASA (National Aeronautics and Space Administration)

NASA is supporting many significant investigations related to the role of dynamics and chemistry of the stratosphere in climate :

Stratospheric observations :

- ground-based : support to NDSC, UARS correlative measurements

- aircraft measurements : in the past AAOE, AASE, AASE-II, SPADE; in the future ASHOE, MAESA

- shuttle measurements : ATLAS, SSBUV

- satellite measurements : TOMS (Nimbus 7 10/1978-5/1993, METEOR-3 8/1991-present, Earth Probe estimated launch 7/1994, ADEOS estimated launch 2/1996, Russian TOMS follow on estimated launch mid-1998. SAGE (AEM-2 SAGE I 1979-1982, ERBS SAGE II 1984-present, possible Russian SAGE III late 1998, space station SAGE III expected late 1999, EOS CHEM 2003). UARS (since 9/1991). SBUV/2-jointly with NOAA-incl. NOAA 9, NOAA 11, NOAA 14 (due for launch 11/1994). EOS CHEM-scheduled for launch 2003, includes HIRDLS, MLS, SAGE III, ACRIM, SOLSTICE.

Modelling and global data analysis :

- two-dimensional stratospheric assessment models

- three dimensional chemical/transport models

- analysis of global constituent and dynamical data sets

- general circulation modelling of the troposphere and stratosphere, and stratospheric analyses

Laboratory studies :

- spectroscopy, kinetics, and photochemistry.

In 1994, NASA is undertaking a Subsonic Aircraft Assessment programme which will clearly be a principal element in the SPARC activity to set out an overall measurement strategy to gain an improved understanding of stratospheric-tropospheric exchange and to aid in the assessment of the impacts of subsonic and supersonic aircraft on the stratosphere. Other specific areas for close cooperation between NASA and SPARC are seen in the assessment of stratospheric temperature trends, in the stratospheric model intercomparison activity, organisation of relevant workshop/meetings (including as wide a scientific participation as possible), facilitating the free exchange and availability of stratospheric data, and in global surface UV flux studies.

Contact person : Dr. J. Kaye, NASA HQ, Code YSM, Washington, DC 20546 USA. Tel : +1-202 358 0757, Fax : +1-202 358 2770, E-mail : jkay @ mtpe.hq.nasa.gov

NOAA (National Oceanic and Atmospheric Administration)

The NOAA Environmental Research Laboratories (NOAA/ERL) are closely involved in many of the U.S.A. field programmes relevant to SPARC (AAOE, AASE, AASE-II, etc.) with responsibility for PI instruments on these aircraft campaigns and analysis and interpretation of results. NOAA is also among those playing a leading part in the implementation of the NDSC. The Atmospheric Chemistry Project of the NOAA Office of Global Programmes backs internal NOAA research in this domain as well as providing a considerable number of extra-mural grants. NOAA also has a major role in ensuring the continuity of satellite monitoring. NOAA/GFDL (Geophysical Fluid Dynamics Laboratory) is prominent in the development of stratospheric dynamical and chemical models. Through monitoring of the atmospheric circulation by the NOAA Climate Analysis Center and the preparation of annual climate assessments including Northern and Southern hemisphere stratospheric winter summaries based on NMC (National Meteorological Center) analyses, is a valuable contribution to SPARC. CAC also provides experimental forecasts (30 days in advance) of likely UV radiation using satellite ozone information, meteorological data and cloud forecasts from the NMC computer model.

Contact person : Dr. S. Solomon, NOAA Aeronomy Laboratory, R/E/AL 8, Bldg. 24, Rm. 2109, 325 South Broadway, Boulder, CO 80303 USA. Tel : +1-303 497 34 83, Fax : +1-303 497 53 73, E-mail : solomon@aztec.al.bldrdoc.gov

NSF (National Science Foundation)

NSF plans to implement a Middle Atmosphere Research Initiative (MARI) to improve fundamental understanding of the chemistry and physics of the natural and anthropogenically perturbed middle atmosphere (MA), with emphasis on the interaction of this region with the lower atmosphere. MARI will bring together researchers in the aeronomy of the upper atmosphere with those dealing with the stratosphere. Among the key issues to be studied within MARI are :

- MA radiative properties including vertical structure of the spectral solar flux, CO_2 radiative transfer, non-LTE processes, aerosol impact, exothermic reactions.

- Photochemistry (chemical families, trace metals, laboratory studies of photolysis rates and mechanisms, kinetic reactions rates at low temperatures, reactants with exited states, ionic or neutral clusters).

- Heterogeneous chemistry (laboratory studies, field campaigns and modelling of aerosol composition, phase and formation, relation to trace gas growth).

- 2 and 3-D modelling including photochemistry and dynamics and trajectory models.

- Gravity waves fluxes and divergence, turbulence and mixing using such techniques as the Advanced Electro-Optic System (AEOS) based on Doppler/temperature lidars, airglow instruments and ST radars.

- Mechanisms of coupling between equatorial phenomena (QBO, SAO, ENSO) and high latitude variations using the Pacific ST radar network, aircraft and other techniques.

- Polar vortex (radiative driving, vertical motions, degree of isolation, interaction with planetary waves).

- Planetary wave generation and characteristics, sources of tides, interaction of waves of all scales).

- Coupling between atmospheric regions.

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Acronyms

AAOE : Airborne Antarctic Ozone Experiment

AASE : Airborne Arctic Stratospheric Expedition

ACRIM : Active Cavity Radiometer Irradiance Monitor

ADEOS : Advanced Earth Observing Satellite

ARAT : Avion de Recherche Atmospherique et Télédétection

ASHOE : Airborne Southern Hemisphere Ozone Experiment

ATLAS : ATmospheric Laboratory for Applications and Science

ATMOS : ATmospheric Trace MOlecule Spectroscopy

EASOE : European Arctic Stratospheric Ozone Experiment

ECMWF : European Center for Medium range Weather Forecast

ENVISAT : Environmental Satellite

EOS : Earth Observing System

ERS : Earth Resources Satellite

ERBS : Earth Radiation Budget Satellite

EURECA : EUropean REtrievol CArrier

FWHM : Full Width Half Maximum

GAW : Global Atmospheric Watch

GOME : Global Ozone Monitoring Experiment

GOMOS : Global Ozone Monotoring by Occultation of Stars

HIRDLS : High-Resolution Dynamics Limb Sounder

IASI : Infrared Atmospheric Sounding Interferometer

IR : Infrared

MAESA : Measurements for Assessing the Effects of Stratospheric Aircraft

METOP : Meteorological Orbiting Platform

MLS : Microwave Limb Sounder

MOPITT : Measurements Of Pollution In The Troposphere

NDSC : Network for Detection of Stratospheric Changes

NWP : Numerical Weather Prediction

POAM : Polar Ozone and Aerosol Measurements

PSC : Polar Stratospheric Cloud

SAGE : Stratospheric Aerosol and Gas Experiment

SAOZ : Système d'Analyse par Observation Zenithale

SESAME : Second European Stratospheric Arctic and Mid Latitude Experiment

SCIAMACHY : SCanning Imaging Absorption Spectrometer for Atmospheric CartograpHY

SOLSTICE : SOLar STellar Irradiance Comparison Experiment

SPADE : Stratospheric Photochemistry, Aerosol, and Dynamics Exploration

SBUV : Solar Backscattered Ultra-Violet

SSBUV : Shuttle Solar Backscatter Ultra-Violet

STEP : Solar-Terrestrial Energy Programme

TOMS : Total Ozone Mapping Spectrometer

TOVS : TIROS Operational Vertical Sounder

UARS : Upper Atmosphere Research Satellite

UNEP : United Nations Environment Programme

UV-A : 320-400 nm UV Wavelength Interval

UV-B : 280-320 nm UV Wavelength Interval

WMO : World Meteorological Organisation

Report from the Joint Scientific Committee (JSC) of WCRP

The JSC met for its 15th session in Geneva on 14-18 March 1994. M.-L. Chanin, who attended part of the meeting, presented the situation concerning the development of SPARC and its connection with the other WCRP Projects. She first highlighted a number of new scientific results that reinforced the significance of SPARC within WCRP, and presented the six research initiatives decided at the Cambridge SSG meeting. The choice of those was appreciated as a future contribution to the overall climate issue.

Within the modelling activity, the plans for an intercomparison of the performance of models including the stratosphere, the studies of the dynamical aspects of stratospheric/tropospheric interactions and the effects of stratospheric boundary were noted as a major priority. As a complement of these studies, the Working Group on Numerical Experimentation (WGNE) is planning an intercomparison of (deterministic) predictions of stratospheric activity (including a sudden warming) at lead times of a few days produced by operational NWP (Numerical Weather Prediction) models. The close relationship with the Atmospheric Model Inter-comparison Project (AMIP) and the offer by the U.S. Department of Energy Programme for Climate Model Diagnostis and Intercomparison (PCMDI) to provide the infrastructure for storing data sets from the simulations, for generating various diagnostics and display results were highly praised.

The JSC agreed to the inclusion of a further member in the SPARC SSG, namely Dr. T. Shepherd (University of Toronto, Canada). Furthermore the term of appointment of Pr. T. Matsuno was extended until 31 December 1996, which is the date of expiration of the appointment of all the present members of the SSG, whose names are given in page 2 of this Newsletter.

Letter from UNEP : WMO/UNEP ozone assessment

We received this letter from Nelson Sabogal, UNEP Programme Office Scientist :

"The scientific community plays an immense role in the protection of the ozone layer, which began when scientists advised on the nature and existence of the threat to the layer that protects, in part the life on our planet. Supported by scientific evidence, the countries adopted on 22 March 1985 the Vienna Convention for the Protection of the Ozone Layer and on 16 September 1987 the Montreal Protocol on Substances that Deplete the Ozone Layer, subsequently amended in London (1990) and Copenhagen (1992).

This year the scientific community from developed and developing countries has been updating the Scientific Assessment of the Ozone Depletion. This Scientific Assessment will have thirteen chapters, several of them related to the four principal research themes of SPARC.

Many SPARC SSG and WG members are active in these assessment activities, for example, Dr. J. Pyle is co-author of Chapter 3 "Polar Ozone" and of Chapter 4 "Tropical and Midlatitude Stratosphere"; Dr. I. Isaksen is co-author of Chapter 6 "Stratospheric Ozone" and Chapter 7 "Tropospheric Ozone"; Drs. K. Labitzke, V. Ramaswamy and S. Solomon are co-authors of Chapter 8 "Radiative Forcing and Temperature Trends"; Dr. M. Geller is lead author of Chapter 11 "Subsonic and Supersonic Aircraft Emissions", and Dr. J. Pyle is co-author of this Chapter. Dr. S. Solomon is lead author of Chapter 13 "Ozone Depletion Potentials, Global Warming Potentials and Future Chlorine/Bromine Loading", Dr. I. Isaksen is co-author of this chapter".

Step meeting in Sendai

The Eight Quadrennial International Symposium on Solar Terrestrial Physics (STP) was held in Sendai, Japan, during the period June 5-10, 1994. This was the first time that this meeting has been held independently from the COSPAR Symposium. This STP Symposium was organised closely around the structure of the Solar-Terrestrial Energy Programme (STEP). Thus, there were sessions on the Sun, the magnetosphere, the thermosphere/ionosphere, the middle atmosphere, and solar variability effects as well as on informatics, modelling and simulation, long-term measurements, and experimental techniques. A unique feature about the STP Symposium is its stimulation of interdisciplinary attendance by scheduling tutorials and topical reviews in plenary sessions while scheduling parallel sessions with topical contributions. Thus, there is an opportunity to gain a background in the various aspects of the solar-terrestrial system while also specializing in the latest happenings in your field.

A unique aspect of the Eight STP Symposium was its greater reliance on poster papers than had been the case at previous Symposia. More than two-thirds of the papers were poster presentations. The posters were introduced by rapporteurs, were displayed for several days where there was about one-half day for poster viewing without competing sessions, and some of the highlight poster papers were then selected for oral presentation. This seemed to work quite well. This also allowed a great deal of territory to be covered in a week. There were 453 oral and poster presentations during the symposium, and there were 292 attendees. That's more than 1.5 papers/attendee.

The Sendai International Center was a wonderful facility in which to meet with everything necessary for a successful meeting conveniently accessible. Our Japanese hosts did everything possible to make our time in Sendai away from the meeting pleasant including providing free excursions to Mt. Zao or Matsushima Bay and the Zuiganji Temple.

The middle atmosphere sessions included papers showing recent results of middle atmospheric effects of the eruption of Mt. Pinatubo, wave coupling in the equatorial middle atmosphere, in-situ observations of middle atmosphere electrodynamics, stratosphere-troposphere exchange, planetary wave coupling, and polar processing as modelled and seen in UARS data. There were presentations of solar influences on the middle and lower atmosphere, UARS observations of mesospheric and lower thermospheric dynamics, and influences of intense highly relativistic electron precipitation events. There were also very many oral and poster presentations on several other middle atmosphere topics. There were about one hundred papers on topics relating to the middle atmosphere presented at the Symposium.

There were several organisational meetings held in association with the Symposium. One topic of discussion was what future SCOSTEP programmes should follow after STEP in 1997. One such programme was approved. This was a modelling and data analysis follow-on to STEP. Several other possibilities were also discussed. One that is particularly relevant to SPARC is a programme emphasizing equatorial processes and their global coupling. Efforts will be ongoing to propose these future programmes so that two or three may be officially adopted at next summer's IUGG meeting in Boulder, Colorado.

● Marvin A. Geller

Announcement of a joint symposium on stratospheric ozone

Location : Halkidiki, Greece

Dates : May 15-20, 1995

Programme : This symposium will focus on the study of ozone depletion, particularly in the lower stratosphere at middle latitudes in both hemispheres. In recent years, ozone depletion has reached unprecedented levels, and considerable progress in understanding has been achieved through field measurements (including EASOE, AASE I and II, and UARS). The intent of the meeting is to provide a forum for the exchange of current ideas and scientific findings. The meeting is being organised through SPARC and WCRP and sponsored by EC, NASA and WMO.

Local Organiser : Prof. C. Zerefos.

Organising committee : Drs. J. Kaye, J. Pyle, S. Solomon and C. Zerefos.

For further information, please contact : Dr. C. Zerefos, Laboratory of Atmospheric Physics, Aristotle University, Campus Box 149, Thessaloniki 54006, Greece.

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NATO summer school in Canada in 1995

A NATO Advanced Study Institute (ASI) on "The stratosphere and its role in the climate system" is planned to take place at the Laurentides, Québec (Canada) on September 4-15, 1995 under the directorship of Guy Brasseur. It will provide tutorial lectures on dynamical, radiative, and chemical processes in the stratosphere and their importance for the climate system.

Organising Committee : Dr. G. P. Brasseur (U.S.A.), Dr. M.-L. Chanin (France), Pr. D. Ehhalt (Germany), Pr. I. Isaksen (Norway), Dr. R. LaPrise (Canada), Dr. P. J. Rasch (U.S.A.).

Key tutorial speakers will be : Dr. S. Solomon (U.S.A.) for chemistry, Pr. J. Holton (U.S.A.) for dynamics, Dr. J. Kiehl (U.S.A.) for radiation. Lectures on experimental and observational aspects will be given by Dr. C. Rodgers (UK), Dr. A. O' Neill (UK), Dr. U. Schmidt (Germany) and others.

Approximately 60-70 students (with either recent Ph. D. or at the end of their graduate work) will participate actively through informal presentations.

A book entitled "The Stratosphere and its role in the climate system" is planned to be published in the NATO ASI series as an output of the school.

Director of the ASI : Dr. Guy P. Brasseur, NCAR , P.O. Box 3000 Boulder, CO 80307, USA, Tel : +1-303 497-1456, Fax : +1-303 497-1415, E-mail : brasseur@ncar.ucar.edu

To our readers

We appreciated your response to the first SPARC Newsletters, and we hope that you will continue to send your comments and the news from your own research relevant to SPARC. We are striving to reach every one who is interested in the SPARC programme. We would appreciate your sharing this Newsletter with your colleagues who may be interested in our programme.

We will appreciate it if those who are not on our mailing list please fill out the inside form in order to be inserted.

SPARC Office (SPARC Office, CNRS, Service d'Aéronomie, BP 3, 91371 Verrières-le-Buisson, FRANCE) with your current address and comments.

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Comments.....

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