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

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Report on the 14th Session of the SPARC Scientific Steering Group

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N. McFarlane, SPARC IPO, University of Toronto, Canada (Norm.McFarlane@ec.gc.ca)
D. Pendlebury, SPARC IPO, University of Toronto, Canada (diane@atmosp.physics.utoronto.ca)

The 14th session of the SPARC Scientific Steering Group (SSG) was held at the NOAA Earth System Research Laboratory in Boulder, CO, USA at the invitation of A. Ravishankara, Co-chair of the SPARC SSG. In opening remarks, **A. O'Neill** noted the range of activities and initiatives that have engaged SPARC over the past year, and future activities. SPARC has played a central role in the forthcoming 2006 ozone assessment as well as in the new WCRP–IGBP initiative on Atmospheric Chemistry and Climate (AC&C). The importance of understanding and characterising variability in detection and attribution of climate change, as well as in medium and long-range prediction, motivated the development of a strong new initiative on this topic.

Summary of SPARC activities in the past year

In addition to production of newsletters and special reports, (such as the ASAP report, published early in 2006) the SPARC IPO helps to organise and facilitate SPARC workshops and meetings that enable progress in the range of activities in the SPARC programme. In the past year there were a number of SPARC sponsored and related workshops and meetings, several of which are discussed below and/or in separate reports.

The high quality of the ASAP (SPARC Assessment of Aerosol Properties), produced early in 2006 under the joint editorship of L. Thomason and T. Peter, was noted by a number of SSG members, but considering the cost of producing such reports and the desirability of updating them, the usefulness of continuing this activity was discussed. It was noted that past SPARC reports have been found to be widely useful, and are natural places to document and assess current knowledge in ways that are complementary to the publication of reviews in refereed journals. However, review papers and SPARC newsletter articles may be useful ways to address the evolution of the relevant fields, and to update the knowledge base. T. Peter noted that review papers on some of the topics in the ASAP report are planned and these will go beyond what is included in the report.

T. Peter, on behalf of K. Carslaw and K. Drdla, reported on the progress of the SPARC Polar Stratospheric Clouds Assessment (SPA). The SPA hopes to address the uncertainty in the conditions necessary for solid-phase PSC formation and denitrification, to improve the treatment of PSCs in large-scale models by making it more physically based, to provide recommendations for how to treat PSCs in models, to set standards for defining PSCs so that intercomparisons are more meaningful, and to unite the available data sets to provide a universal data set that is not instrument specific. The list of chapters and outlines for them were assembled at the kickoff meeting in May 2005. Although some setbacks have been encountered, including the withdrawal of some co-authors, the first draft of chapters is expected by March 30, 2007. A planning meeting will follow in April of May 2007, and the assessment should be completed by the end of 2007. This should provide sufficient time for recommendations to be submitted and for SPA to be used in the 2010 Ozone assessment.

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ICSU International Council for Science

The SPARC-IPY Activity proposal was submitted in October, 2005 and approved by the IPY joint committee as Activity No. 217 (http://www.ipy.org/development/eoi/proposal-details.php?id=217). A major goal of this activity is to document the dynamics, chemistry and microphysical processes within the polar vortices during the IPY period. It includes a number of sub-activities as a result of the clustering of IPY proposals undertaken by the IPY JC. Also, SPARC-IPY is linked to other IPY activities (IASOA, POLARCAT, PANSY, ORACLE-O3). The data assimilation component of SPARC-PY is substantially funded but many of the components and linked activities are awaiting funding decisions.

Outcomes from the JSC meeting

The 27th session of the WCRP Joint Steering Committee was held in Pune, India in March 2006 and reported upon in SPARC Newsletter No. 27. A. O'Neill reviewed the SPARC presentation and the JSC response. As this session of the JSC was held in conjunction with a corresponding meeting of the IGBP, overlapping interests and collaborations between the two overarching programmes were explored in a single joint session.

The new collaborative initiative on AC&C, jointly led by SPARC and IGAC on behalf of WCRP and the IGBP, was discussed at length and received strong endorsement of its action plan. This new activity was also described in SPARC Newsletter No. 27, wherein the timeline for development of this initiative was laid out. The AC&C initiative is progressing as anticipated. A planning meeting was held in Boulder, CO in August, 2006 to define questions concerning initial scientific problems to be addressed, interactions among contributing and related projects (CCMVal, AIMES, AEROCOM, ACCENT), what has been learned to date, and ways of addressing problems (*e.g.* specification of CCM simulations, relevant data sets and achievement metrics, and interactions between measurement, modelling, and theory communities). The proposal to launch a new initiative on dynamical variability was also put forward to the JSC and strongly approved. In the intervening months this initiative has engaged the thinking a number of people in the SPARC community (see below).

In a short presentation dealing with WCRP JSC perspectives **A. Ramaswamy** noted that the two original foci of the WCRP were (a) to determine the predictability of climate and (b) to determine the effect of human activities on climate. The WCRP role in advancing the first of these is well perceived and appreciated but its role in the second is not, despite substantial WCRP contributions to it. This misperception of the contributions of the WCRP is being addressed through a series of proactive measures to elevate the profile of the WCRP. These include: (a) a global survey of scientists, agencies, sponsors and end-users to seek direction from the community; (b) opening a dialog with SBSTA to address gaps and identify advances; (c) exploring the potential partnerships/deliverables with other international research organizations, and with other sectors (ESSP, World Bank, private sector) on the various issues concerning climate change; and (d) an ICSU review of the WCRP.

Among the issues that remain in need of enhanced attention are improvement of the global observing system, better understanding of the role of GHGs and aerosols in forcing climate change, and understanding the role of land use change and natural forcings such as solar variability and volcanic eruptions. To be successful in addressing the issue of determining human influence on climate the WCRP must be able to contribute in fundamental ways in providing deliverables such as identifying "dangerous" interference with climate and "tipping points," producing and communicating credible regional climate information, and assessing the needs of the end-user community.

The WCRP activity on Anthropogenic Climate Change (ACC), outlined in SPARC Newsletter No. 27, is a key component of this new approach. The ACC activity will streamline WCRP's climate change research activities, link them within the different WCRP projects in order to present the WCRP's climate change research as a coherent whole, and link with other international and national research. While maintaining high scientific rigour, it is important for the WCRP to engage in a dialog with the "Stakeholders" to help provide appropriate deliverables to the "end-users."

Assessments (*e.g.* the IPCC AR4 and 2006 WMO/UNEO Ozone Assessment) permit identification of key gaps in the science and plans for advancing research, and therefore the knowledge base. SPARC is making key contributions to these assessment activities and with the AC&C initiative, which is an important input into ACC. Also key to ACC is participation by CCMVal, ACCENT and AeroCom.

Review of Assessments

A special presentation by **S. Solomon** summarised the process and the results from the Fourth IPCC Assessment (AR4). The report is structured with climate change drivers (natural and anthropogenic), observations (including paleo), understanding and attributing climate change with rigorous statistical comparisons of data and models, projections of future changes (long and short term), and robust findings and key uncertainties. Of particular interest to SPARC are the effects of downward transport from the stratosphere of such species as ozone, the magnitude and reasons for the recent stratospheric water vapour trends, the level of stratospheric ozone forcing, the importance of the stratosphere in reconciling the temperature trends in the troposphere, and the role of forcing agents such at CO_2 on NAM/SAM and how this relationship may change in a future climate. A fifth assessment (AR5) will likely occur and WCRP can play a role in defining its timetable and structure. A proactive involvement of SPARC would be useful at this development stage to ensure that proper attention is given to the role of the stratosphere.

M. Giorgetta reported on the recent WGCM/AIMES meeting (September 25-29, 2006, Victoria, Canada). A major focus was anticipating modelling needs for the next IPCC assessment (AR5). Assuming that AR5 is to be completed in 2013, modelling groups must soon decide on what model systems and which climate change projections to use. The Earth System Models (ESM) workshop at the Aspen Global Change Institute (July 31-August 3, 2006) was held in anticipation of the WGCM/AIMES meeting. In addition, a WGCM questionnaire was sent to major modelling groups to assess the general characteristics and status of models that may be used for AR5. The Aspen workshop brought together participants from the WCRP, IGBP communities and the IPCC TGNES (Task Group on New Emission Scenarios) and TGICA (Task Group on Data and Scenario Support for Impact and Climate Analysis).

A major outcome of the workshop was a draft proposal for the experimental design for 21st century climate change experiments, which includes both short-term and long-term components, and an attempt at assessing the general characteristics of the models that would be best suited for these purposes. Shorter term experiments (2005-2030) would focus on weather extremes at regional scales and air quality, and use high resolution and vertical domains adequate to represent stratospheric processes, hopefully with the capability of including chemistry and aerosols interactively, but with a single GHG concentration scenario. Since a central objective of this class of experiments is to quantify variability and identify changes in extremes, large ensembles of model runs will be needed. The longer term experiments (to 2100 and beyond) will focus on climate change for given CO_2 scenarios, climate change feedback, and will help to determine stabilization emission scenarios. These experiments will use coupled ESMs of conventional resolution with small ensembles, with the option of allowing coupled GCMs without fully functional carbon cycles to participate. A major objective of these experiments will be to identify possible emission scenarios that are consistent with the climate changes that are projected to accompany a specified stabilised GHG concentration scenario.

The assistance of SPARC is needed for the success of the proposed modelling activities. The majority of the coupled ESMs will likely require specified ozone fields and/or fields of ozone depleting substances (ODS). These could be supplied from output of 21st century CCM projections carried out under the auspices of CCMVal. Also, through the SOLARIS activity, it may be possible to provide consistent solar forcing projections. The different time scales of the IPCC assessments (2013 for AR5) and the WMO/UNEP Ozone Assessments (2010 for the next assessment) make it important to coordinate supporting modelling activities. In many cases the same modelling groups may be contributing to both assessment processes.

SPARC Themes

Chemistry-Climate

T. Shepherd gave an overview on the CCMVal activity. Over the past two years the aim of CCMVal was to assess the current generation of CCMs to support the WMO/UNEP Ozone Assessment for 2006. Two scenarios, past (1960-2004) and future (present-2100), were used to study stratospheric temperatures, transport characteristics, ozone, variability and trends, and inorganic chlorine loading. The past (REF1) studies have shown reasonable agreement with observations in temperature trends, total ozone trends and variability, although there is a greater spread in ozone trends in polar regions, and improved transport charcteristics (*e.g.* methane concentrations, mean age of air, and the tape recorder) compared with previous model comparisons, but substantial differences in terms of inorganic chlorine Cly. The differences in Cly are key to diagnosing the inter-model differences in ozone hole recovery.

The future runs (REF2) are multi-model projections of ozone recovery in the 21st century (13 CCM groups participated). While there is a wide spread in the predicted evolution of ozone, the CCMs agree in several important respects. Global total ozone is projected to increase to 1980 values before a corresponding decrease in Cly due to GHG-induced cooling, except Antarctic spring ozone which is predicted to follow halogen concentrations and recover later (~2065). In the tropics, CCMs predict ozone less than or equal to 1980 values even when Cly decreases, likely due to increases in tropical upwelling resulting in decreases in tropical lower stratospheric ozone. The ozone evolution in the 21st century is mainly determined by decreases in halogen amounts and continued cooling of the global average stratosphere due to increases in GHGs.

Successful mechanisms for model evaluations were found to be: a restricted set of standard well-tested core diagnostics (with some more exploratory ones pursued as research topics); common reference simulations with forcing data sets (*e.g.* SSTs, GHGs) available to all participating groups; archiving of the model data in a central data base (the British Atmospheric Data Centre is now the standard data centre for CCMVal); and evaluation of diagnostics obtained from various observational data sets. The first coordinated assessment of CCMVal and ozone was finished in time to be included in the WMO/UNEP Assessment. Multi-model evaluation also proved to be an advantage since it provided a range of model uncertainties, and, in some cases, has allowed groups to identify and correct previously unrecognised model errors. It was found that holding regular workshops and using the world wide web for sharing model and forcing data and discussion, were effective means of communicating between the participating groups.

For the next phase of CCMVal several improvements will be implemented. First, a common diagnostic package designed specifically for CCMVal will be written and implemented. This will facilitate the calculation of the process-oriented diagnostics. In addition, scenarios and forcing data sets will defined much earlier to allow for more time to run the models, and a more detailed evaluation of models may be written prior to the 2010 Ozone Assesment. Other improvements include switching to a standard file format, standard processing packages, better cataloging and archiving techniques, and better coordination between similar projects such as AEROCOM and ACCENT. The addition of validation data sets available on the database would also be a great asset. It is also hoped that a threshold level of performance for those models that are used to make predictions will be defined and implemented.

In the near future, CCMVal plans to further analyse the REF1, REF2 and SCN2 simulations in terms of changes in dynamics (N. Butchart *et al.*), processes in the UTLS (A. Gettelman, T. Birner *et al.*), dynamical containment of Antarctic ozone depletion (H. Struthers, G. Bodeker *et al.*), assessment of chemistry (R. Salawitch, M. Chipperfield), and other studies. The working group will also focus on developing the diagnostics package, interacting with the new SPARC initiatives such as AC&C and Dynamics, suggest a strategy for CCM simulation for the next Ozone and IPCC Assessments, coordinate a SPARC report on the evaluation of CCMs, provided enough diagnostic work has been done. A CCMVal workshop will be held in Leeds, UK in June 2007.

Stratosphere-Troposphere Dynamical Coupling

Dynamics Initiative

Three key issues in the role of the stratosphere on climate are stratospheric ozone depletion and recovery, the effect of the stratosphere on tropospheric variability, and the effect of solar variability. Dynamical variability plays a very significant role

in all of these. Although CCMVal includes a dynamical component, the computational constraints of CCMs limit the scope of study, and while validation diagnostics for chemistry, transport and radiation are fairly clear, the dynamics diagnostics still contain uncertainties in quantifying key processes.

While many of the basic principles of atmospheric dynamics are understood, in practice understanding variability is difficult. Because the atmosphere is inherently chaotic, dynamical variability can occur independently of external forcing and with a wide range of time scales. Therefore, in order to obtain meaningful statistics to define climate change, long simulations are needed. The dynamics initiative will be complementary to CCMVal and use a hierarchy of models to allow more extensive experimentation to understand circulation variability and changes. (Interactive chemistry is not a requirement for the study of dynamical variability.) The initiative would study such dynamical mechanisms as downward influence and its response to climate change, the effect of the stratosphere on tropospheric variability, and the response of the stratosphere and Brewer-Dobson circulation to climate change. Modelling issues such as robustness to resolution and vertical domain, and the dependence on parameterised processes, will also be addressed.

Stratospheric dynamics is a critical component for understanding chemistry-climate interactions, and may have an important impact on tropospheric climate. Known problems in these models stemming from dynamical issues are the cold pole problem, the uncertainty about the role of parameterised gravity waves, and the lack of stratospheric warmings and tropical oscillations such as the QBO. Models do not in general accurately reproduce the observed interannual variability in the winter polar regions. Documenting and understanding model biases is fundamental to prediction and climate projection. **F. Sassi** discussed a new model inter-comparison project with a set of baseline experiments to help define the model biases, and this activity would greatly benefit from international coordination. **P. Kushner** also suggested follow-on experiments that add a prescribed SST perturbation to represent global warming.

P. Kushner presented a recent proposal on stratospheric dynamics (see Newsletter No. 27) under the SPARC stratosphere-troposphere dynamical coupling theme. The focus is on dynamical changes stemming from changes to wave driving, particularly the Brewer-Dobson circulation, in response to climate change. Also, there is evidence that a realistic stratospheric representation is required to accurately simulate air-sea interactions and predict changes to the tropospheric circulation. A worthwhile goal of the new SPARC dynamical variability initiative is to persuade modelling centres to make a resolved stratosphere part of their coupled models, and, in the same vein, for SPARC to give more attention to coupled atmosphere-ocean atmosphere modelling.

Task Force on Seasonal Prediction

M. Baldwin reported on the recent activities of the Task Force on Seasonal Prediction (TFSP) in the context of the problem of seamless prediction (weather through to climate time scales), which is central to the WCRP strategic framework, COPES (Coordinated Observation and Prediction of the Earth System). Currently, there is untapped seasonal predictability due to interactions (and memory) among all the elements of the climate system (Atmosphere-Ocean-Land-Ice). The goal of the TFSP is to identify the current limitations of the climate system models and observational data sets used to determine seasonal predictability. The TFSP draws on expertise from all WCRP core projects (CLIVAR, SPARC, GEWEX, CliC), and WGNE and WGCM. SPARC's role in the task force has been to advocate for the inclusion of the stratosphere as having memory in climate system, recognise the stratosphere's role in seasonal prediction, and to define "seasonal" as beginning with a 7-10 day period and longer.

The third and final meeting of the TFSP will be held in Barcelona 4-8 June 2007, after which the project will be headed by CliVar. The SPARC community is strongly encouraged to participate, advising the TFSP on exploiting the statistical predictability afforded by the Arctic Oscillation during winter, the effect of stratospheric NAM/SAM on tropospheric weather, and using stratospheric conditions to improve forecasting skill out to a timescale of 15-20 days. It is also important to note that many NWP centres already include the stratosphere in their forecast models for data assimilation reasons, so it is important to have a good representation of the stratosphere. A follow-on to the 2003 Whistler meeting on the role of the stratosphere-troposphere coupling will be held in Santorini in September 2007. This will be an AGU Chapman Conference on the Role of the Stratosphere in Climate and Climate Change, and also sponsored by SPARC, NSF, and possibly USAF, NASA, NOAA, RPI, and ESA.

M. Baldwin also mentioned the role of the QBO on hurricanes, a topic taken up by **M. Geller**. He presented new work that uses a new ISCCP product to show that the QBO modulates tropical deep convection such that during its easterly phase, deep convection is enhanced in regions that are especially prone to deep convection, and deep convection is suppressed in adjacent regions. The early result look very promising but there is much more work to be done.

S. Yoden presented several studies on the linkages between stratospheric phenomenon and tropospheric phenomenon, such as the QBO and Stratospheric Sudden Warmings (SSWs), El Niño and SSWs, the predictability of stratosphere-troposphere coupling during an SSW, and a study on the seasonal dependence on trend detectability in different regions of the atmosphere. For example, due to the occurrence of SSWs and the high degree of internal interannual variability at the winter pole, and the variability of the breakdown of the polar vortex, longer time records are needed for the winter NH to determine trends. Indeed, since the summer is dynamically quite different, the use of an annual mean to detect a trend in this region may be suspect. There is evidence of seasonal dependence of internal interannual variability in the tropospheric climate system due to such nonlinear processes as the influence of snow cover on surface temperature, precipitation from monsoons, *etc*.

Detection, Attribution and Prediction

W. Randel reported on the recent SPARC activities pertaining to this theme. At the Trends meeting in October 2005, there was agreement in regard to omitting stations with apparent biases and homogeneity problems when determining trends from historical radiosonde data. These problems are due to changes in radiosondes and result in discontinuities in the record when compared with MSU4 data. There was also an initial look at updated satellite data

sets and it was decided to ask Carl Mears (MSU) and John Nash (SSU) to join the working group to provide their expert knowledge. Overall comparisons suggest biases in the SSU15x channel trends compared to the MSU4 data. A draft outline of an observations paper was drawn up.

A second meeting of the SPARC Temperature Trends Assessment group took place in July, 2006. The meeting focused on issues pertaining to SSU data, which has evidence of uncertainties in the trends, particularly after NOAA-14, due to instrumentation, satellite drift relative to measurement time, and the construction method of the data set, which changes in 1998. There appears to be an unphysical nature to the trends after 1996 compared to MSU4 and radiosondes for SSU26, 26x and 15x, and it is important to understand this data for future reanalyses. Comparison with lidars may be useful since they provide accurate vertical temperature profiles between 30-80 km, and several stations have relatively long (and continuing) records. However, these measurements have a lot of variability in monthly data between stations so that it is difficult to constrain satellite trends.

For the future, the Trends working group will continue to update the radiosonde data sets, and will further analyse the historical satellite data, ideally with an independent compilation of SSU data. Careful consideration will be given to the possibility of merging AMSU data (after 1998) with the satellite record, since the last SSU instrument ended in 2005. The use of GPS as a climate monitoring tool will also be looked into. A complete observations paper for SPARC, using the revised SSU data sets, is in the planning stages, along with the systematic comparison of observations to models, including those from CCMVal. The next Trends meeting will be in April 2007 in Washington, DC.

A short discussion to evaluate the effectiveness of the SPARC theme structure followed the theme reports. There was agreement that the themes themselves gave a useful general structure for individual process studies and projects, but that some of the processes, particularly solar variability, were not given enough emphasis, and that SPARC must do more to reach out to these communities. It was also clear that SPARC's interests are moving beyond the stratosphere itself through collaborative projects, in order to deal with issues such as coupling, downward influence and solar variability. One community that SPARC has not connected well with yet is CliC, although **K. Steffen** attending the meeting and gave a special seminar on CliC activities.

Cross-Cutting Issues

TTL Workshop

N. McFarlane reported on the SPARC-GEWEX/GSCC-IGAC Workshop on modelling of deep convection and its role in the TTL, held in June 2006 in Victoria (see full report in this issue). The purpose of this workshop was to bring together researchers from the SPARC community, the GEWEX-GCSS community (modelling of deep convection), and the IGAC community (atmospheric chemistry), to set the stage for a collaborative research programme to better understand the role of deep convection in determining the structure and composition of the Tropical Tropopause Layer (TTL). It is important to the stratosphere because it sets the chemistry, water vapour, short-lived species (*e.g.* bromine), and aerosols and precursors (*e.g.* sulfur) of the lower stratosphere. An initial working group consisting of the workshop organising committee plus Leo Donner, as a representative of the cumulus parameterization community, was formed to move forward on the basis of these ideas.

SOLARIS and Solar Variability

K. Matthes reported on the recent SOLARIS activities and **K. Kodera** gave a presentation on the importance of solar variability. SOLARIS is a continuation of the solar variability study started under GRIPS (GCM-Reality Intercomparison Project for SPARC), and is joint with CAWSES under the modelling component of Theme 1 (Solar Influence on Climate). However, unlike GRIPS, which used Atmospheric GCMs, SOLARIS will use middle atmosphere CCMs, either alone or coupled with an ionosphere. A report on the recent SOLARIS meeting may be found in this newsletter. K. Kodera also presented evidence of correlations of ice core data (a proxy for temperatures) and solar variability; evidence that a solar influence on climate through stratospheric dynamical processes may be important for centennial time scales.

Data Assimilation

S. Polavarapu reported on the recent SPARC Data Assimilation Workshop, held at ESTEC in Noordwijk, the Netherlands from 2-4 October, 2006. As with previous workshops, the core of participants was data assimilators, with invited speakers from other key communities, encouraging active discussion between the DA community, users of DA and experts from other fields. This year the themes were transport errors, polar processes, and the TTL. Linkages through CCMVal and IGACO were also discussed, along with a special discussion on the International Polar Year (IPY) activities (see report in this issue).

The goal of the SPARC-IPY proposal, entitled "The Structure and Evolution of the Polar Stratosphere and Mesosphere and Links to the Troposphere during IPY," is to document the dynamics, chemistry and microphysical processes within the polar vortices during IPY, with a focus on the stratosphere-troposphere and stratosphere-mesosphere coupling. The outcome will be a well organised data set of measurements and analyses of the polar stratosphere during IPY. The SPARC Data Assimilation Working Group will contribute to the IPY effort by archiving assimilation products at the SPARC Data Center, and link to available observations, including mesospheric data and ASSET data for validation and comparison, and linking to other IPY activities such as PANSY or IASOA. A key need is making links with special purpose measurement campaigns for validation or reanalysis.

Report from the SPARC Data Centre

The SPARC Data Center holds data archives from SPARC projects, and is in the planning stages to hold the IPY-SPARC DA data. In order to accommodate the large amounts of new data expected and new restrictions due to some of the SPARC-IPY data, upgrades to the hardware have been proposed, and password protection will be implemented. Funding for the Data Center is secured to Feb 2007, and a renewal proposal is approved, although exact funding is still unknown. The SPARC Data Center mirror site, led by M. Shiotani and S. Yoden at Kyoto University, Japan, now has a new server and FTP policy issues at the university have been solved. The mirror site is the safest option as a back-up for the data, and secures a fast connection from different locations.

From left to right: 1st row: *S. Hayashida, K. Rosenlof, E. Manzini, S. Polavarapu, J. Waters, D. Pendlebury, A. Ravishankara, P. Kushner, J. Burrows;* ***2nd row:*** *V. Ramaswamy, V. De Luca, P. Rasch, S. Doherty, T. Peter, S. Liess, T. Shepherd, J. Perlwitz, K. Matthes, N. McFarlane, K. Kodera, A. O'Neill;* ***3rd row:*** *M. Giorgetta, D. Hartmann, P. Haynes, G. Braathen, F. Sassi, M. Baldwin, S. Yoden, M. Geller;* ***4th row:*** *A. Gettelman, W. Randel, M. Kurylo*

SPARC's Role in Earth Observation Programmes

The intent of the session on Earth observations programmes was to provide the SSG with and overview of current observations programmes and encourage a discussion on how SPARC might influence planning and take advantage of future mission opportunities.

M. Kurylo discussed activities within NASA's Atmospheric Composition Focus Area. Five (Aura, Parasol, Calipso, Cloudsat, and Aqua) of the seven A-Train satellites have been launched and the remaining two (Glory and OCO) will be launched in 2008. Since its launch in 2004, Aura measurements have led to a number of important advances in knowledge, not only of atmospheric composition but also of features of atmospheric circulation and processes. **J. Burrows** summarised recent developments in monitoring atmospheric species with SCIAMACHY limb measurements. He also discussed aspects of validation and applications of limb products, detection of polar stratospheric clouds and analysis of BrO using comparison with model results. **S. Hayashida** discussed the future Japanese plan for remote sensing from space in relation to SPARC. The Superconducting Submillimeter-wave Limb-emission Sounder (SMILES) of the Japanese Experiment Module (JEM) on the International Space Station (ISS) will be ready in 2009. This is a space demonstration of sub-millimeter limb-emission sounding of the atmosphere, one of its objectives being to provide global observations of trace gases in the stratosphere.

M. Kurylo also reported on the NPOESS sensor plan and highlights from the September, 2006 meeting of the Steering Committee of the Network for Detection of Atmospheric Composition Change (NDACC – formerly NDSC). NDACC maintains long-term, quality-controlled records and can provide records for extra climate variables such as aerosols and ozone, and working on relevant water vapour measurements. Unfortunately, due to budget constraints, NPOESS has been reduced in scope by removing several sensors. The importance of the measurements provided by these sensors is recognised by the NPOESS IPO and it is examining ways to restore them.

G. Braathen, on behalf of IGACO and WMO, presented a rational comprehensive system for integrating, coordinating, and accessing satellite data. Provision of data to end-users involves a plethora of procedures and data centres. He reported on the status of the Integrated Global Atmospheric Chemistry Observations (IGACO) theme to address this issue.

Among issues raised in general discussion was the question of how SPARC can take advantage of mission opportunities to encourage programmes to address gaps in stratospheric measurements. While there are a plethora of satellites in various stages of planning and production, few will focus on the stratosphere. The loss of limb measurements from NPOESS is significant. Beyond the lifetime of Aura and Envisat, what measurements of ozone will be available during the crucial anticipated ozone recovery period? Identifying future measurement gaps and possible ways of addressing them was noted as a priority for SPARC. It was decided that a BAMS article, authored by prominent members of the SPARC community, would be an ideal way to alert funding agencies to the serious impact that may result from a permanent loss of key satellite measurements.

Next General Assembly: **E. Manzini** presented the local arrangements made so far for the next SPARC General Assembly in 2008 in Bologna, Italy. The facilities in Bologna will allow for a maximum of 418 people, with room for approximately 140 posters. Estimated costs for the conference, though somewhat higher than for previous SPARC General Assemblies, are reasonable for the range of services they will cover. These include conference room rentals, technical support, catering for lunch and coffee breaks on site, a conference dinner at the Palazzo Re Enzo, a shuttle bus to the conference site, on line conference registration, website creation and maintenance, and taxes and contingency funds.

It is now time to start arranging the conference website and registration, catering, funding and sponsorship strategies and other financial management plans through the SPARC IPO. It is also time to firm up plans with contracts through the Local Organising Committee (E. Manzini, C. Caganzzo, S. Corti, F. Fierli) and to begin with the scientific arrangements. The Scientific Organizing Committee will be led by Thomas Peter and Peter Haynes.

Location of the next SSG meeting: After some discussion it was decided to hold the next SSG meeting in Bremen or Berlin, Germany during late September, 2007, with the gracious help of John Burrows and Ulrike Langematz.

Closure of the Session

The 14th Session of the SPARC SSG was closed at noon on Thursday, October 12, 2006. The SSG unanimously thanked A. R. Ravishankara and LeAnn Droppleman for organising the excellent local arrangements for the session at NOAA, and Jeanne Waters, Gabriella Accatino and Victoria De Luca for support during the workshop.