

# WCRP REPORT

World Climate Research Programme



ICSU  
International Council for Science

## Report of the 21<sup>st</sup> Session of the Scientific Steering Group for the WCRP Stratosphere-troposphere Processes and Their Role in Climate (SPARC) Project

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## Opening Session and WCRP/SPARC Update

The 21<sup>st</sup> Session of the SPARC Scientific Steering Group (SSG) took place from 19-21 January 2014 in Queenstown, New Zealand, after the SPARC General Assembly held from 12-17 January 2014.

**Greg Bodeker** (co-chair of SPARC) opened the meeting, particularly welcoming the new SSG members: Mark Baldwin, Edwin Gerber, Thando Ndarana, Kaoru Sato, Martin Schultz, and Seok-Woo Son.

**Tony Busalacchi** (chairperson of the Joint Scientific Committee (JSC) of WCRP) then began his presentation by mentioning how impressed he was by the consistently high quality of the science presented at the SPARC General Assembly, as well as the sense of community, engagement with early career scientists, and, more generally, the SPARC leadership over the past few years. He discussed the outcome of the 34<sup>th</sup> JSC meeting (see SPARC newsletter no. 42) as well as the WCRP Grand Challenges which provide new research foci and the basis for a new structure within WCRP, synthesizing input from across the four core projects. Differences in terms of the implementation of the Grand Challenges exist and all projects have been asked to develop and articulate the implementation strategy for the Grand Challenge(s) they host/lead (the engagement of SPARC in the Grand Challenges is discussed below). Another question is whether WCRP can influence the timing of the Intergovernmental Panel on Climate Change (IPCC) assessments, and whether WCRP should aim to produce synthesis papers prior to these assessments. Presently, the idea of a joint workshop between WCRP and the IPCC, similar to the workshop that took place after the 4<sup>th</sup> Assessment Report, is being discussed with Thomas Stocker, co-chair of Working Group I of IPCC. Such a workshop would serve to evaluate the achievements of the 5<sup>th</sup> Assessment Report and to discuss emerging research topics that require more focus. Tony ended his presentation by discussing a new United Nations Environment Programme activity called PROVIA, officially sponsored by the World Meteorological Organisation (WMO), which is to fulfil a similar role to that played by WCRP for IPCC Working Group I.

Over the past four years the WCRP sponsors (WMO, the Intergovernmental Oceanographic Commission (IOC), and the International Council for Science (ICSU)), have had major planning meetings to review their research programmes. They identified the need to be more agile in responding to user needs and to better support adaptation, mitigation, and risk management activities. From 2008-2010 the WCRP JSC deeply reflected on the outcomes of these meetings, developing several community white papers to better define WCRP's strategy to address these issues. The Grand Challenges will provide the main framework of this strategy, while the Working Group on Regional Climate (WGRC) will provide a vital interface with the Global Framework for Climate Services (GFCS).

While the individual International Geosphere-Biosphere Programme (IGBP) projects will each sign a memorandum of understanding with Future Earth, WCRP as a whole will sign one memorandum of understanding. This reflects the fact that WCRP is more than just its core projects and is accountable to two sponsors besides ICSU (WMO and IOC). WCRP intends to continue relationships with the IGBP projects and develop further relationships with new Future Earth initiatives as they arise. WMO will meet with ICSU to clarify the role of WCRP within Future Earth, particularly in terms of observational sciences which currently do not seem to be well represented in the programme, and to ensure that physical climate research is continued. Future Earth presently has a 10-year horizon (2015-2025).

## **New SPARC Activities**

**Hans Schlager** presented a new activity focused on Atmospheric Chemistry and the Asian Summer Monsoon (ACAM; a joint activity with IGAC (International Global Atmospheric Chemistry)). The Asian monsoon impacts the lives of more than a billion people and there is concern about the effects of the rapid population and economic growth that has taken place in this region over the past few decades. It also affects regional air pollution through convective transport of surface emissions into the upper atmosphere and it is thought that this transport of aerosol and trace gases might lead to changes in cloud properties and in turn the entire hydrological cycle, as well as affecting the transport of air pollutants into the stratosphere. The coupling of source regions with topography and dynamics/meteorology is not well understood and experimental studies in this region are challenging. Improving collaborative efforts within the international community is thus essential, and the aim of ACAM is to form a new research community including as many regional scientists as possible. An ACAM side meeting was held at the 2012 IGAC Science Conference, which was then followed by the first ACAM workshop held in Kathmandu, Nepal, from 9-12 June 2013, where a majority of participating scientists came from the region. Since this workshop, activities have started in earnest, with the aim of attracting as many scientists from the region as possible. Further workshops will be held on an annual/biannual basis with some specifically aimed at training young scientists from the region. ACAM also aims to promote data sharing and to help develop field campaigns in collaboration with local scientists. IGAC and SPARC have approved ACAM as an emerging activity, while the group develops their goals and structure. Michelle Santee will act as official SPARC liaison to the activity.

**Marv Geller** proposed a new SPARC activity focusing on the use of high-resolution radiosonde data to analyse fine-scale atmospheric structures. During a workshop that took place at Stony Brook University, New York, USA, in May 2013, research using these data and how these observations may be collected in future were discussed. Several articles, for example in EOS and SPARC newsletter no. 42, have been published about the many uses of high-resolution radiosonde data. The National Oceanic and Atmospheric Administration (NOAA) will make all US high-resolution radiosonde data freely available (with a 1-2 month lag) and it was highlighted that it would be valuable if other countries could follow suite. While data from Indian radiosondes have been obtained cost free for the period 2004-2013, data from 1951 exist but will not be made available cost-free. The British Atmospheric Data Centre (BADC) has access to high-resolution radiosonde data from the UK and can likely also make these data available soon. For promotion to an emerging activity, the SPARC SSG has asked for a more refined proposal, including scientific goals, links to other activities such as GRUAN (GCOS Reference Upper Air Network) or GEWEX (Global Energy and Water Exchanges Project; another WCRP core project), as well as possible capacity development activities.

## **Emerging SPARC Activities**

**Ed Gerber** presented the status of S-RIP (SPARC Reanalysis Intercomparison Project). The activity's implementation plan was discussed, as well as the outline of the final report in which about 100 scientists will be engaged. A link to the data from the nine reanalyses to be investigated can be found on the S-RIP website (<http://s-rip.ees.hokudai.ac.jp/resources/data.html>). These data are on a common grid and available

from the BADC. There are also plans to provide user-friendly online analysis tools. S-RIP was approved as a full SPARC activity.

**Greg Roff** presented progress made by SNAP (Stratospheric Network for the Assessment of Predictability). The goals of SNAP are related to stratospheric predictability and the activity aims to answer the following questions: (1) Are stratosphere-troposphere coupling effects important throughout winter or only when major stratospheric dynamical events occur? (2) How far in advance can major stratospheric dynamical events be predicted to add skill to tropospheric forecasts? (3) Which stratospheric processes (resolved and unresolved) need to be captured by models to gain optimal stratospheric predictability? For example, sudden stratospheric warmings (SSWs) can be very accurately predicted five days in advance, ten-day predictions prove to be reasonable, while 15-day predictions aren't yet useful for correctly predicting the evolution of the atmosphere and SSWs. Tropospheric predictability is not as good as in the stratosphere and there is potential to make improvements. Ensemble simulations from six or more models will be studied in this activity, therefore providing a comprehensive statistical analysis. All data will be placed on a common grid and made available on the BADC. While both activity co-leaders (Andrew Charlton-Perez and Om Tripathi) are funded until the end of 2015, the activity may not need to come to an end at this time and SPARC would like to have an additional co-leader to possibly provide some overlap. S2S (Sub-seasonal to Seasonal Prediction project; a joint activity between WCRP and the World Weather Research Programme) is very interested in results from the SNAP activity because at the moment S2S has relatively little expertise in the stratosphere. While the activity was accepted as a full SPARC activity, some thought is needed as to how the activity should evolve after 2015.

## **Other SPARC Activities**

The meeting continued in the same format that was introduced at the 20<sup>th</sup> SSG meeting, such that the activity leaders provided a short written report in advance of the meeting that included main scientific achievements of the past year, as well as an outlook and financial request for travel support for meetings for the coming year. These reports, distributed among all participants prior to the meeting, were the basis for the discussion of the activities at the meeting.

**Michaela Hegglin** (new activity co-leader) reported on CCMI (Chemistry Climate Modelling Initiative; a joint activity between IGAC and SPARC). In addition to many modelling groups running simulations for the activity, they are also working on improving the diagnostic tool developed for the SPARC CCMVal-2 activity. This tool, now called the ESM (Earth System Model) diagnostic tool, is being developed with more focus on climate diagnostics, to be used for instantaneous model validation of both CCMI and any future CMIPs (Coupled Model Intercomparison Project). The aim is to run this tool online on the ESGF (Earth System Grid Federation; an open source effort providing a robust, distributed data, and computation platform, enabling world wide access to scientific data). For collaboration between CCMI and AEROCOM (Aerosol comparison between Observations and Models), see below.

Michaela continued by reporting on the SPARC Data Initiative, whose final report will be completed in 2014, when the activity will also come to an end.

**Johannes Staehelin** reported that the SI2N (SPARC, IO3C, IGACO-O3 (Integrated Global Atmospheric Chemistry Observations), and NDACC (Network for Detection of Atmospheric Composition Change)) activity will also finish by the end of 2014. The SI2N special issue jointly organised between *Atmospheric Chemistry and Physics*, *Atmospheric Measurement Techniques*, and *Earth System Science Data* will remain open for submissions until September 2014. The possibility of a workshop focused on the upper troposphere/lower stratosphere (UTLS) was discussed, since many open questions about this region of the atmosphere remain. The workshop could potentially be organised between IGACO-O3, NDACC, GAW, and the SPARC SI2N, Data Initiative, and WAVAS-II activities since none of these activities have comprehensively looked at data quality and trends in the tropopause region to date.

SOLARIS-HEPPA (SOLARIS: Solar Influences for SPARC, HEPPA: High Energy Particle Precipitation in the Atmosphere), represented by **Bernd Funke**, is organising a special session at the European Geophysical Union's 2014 meeting and the 5<sup>th</sup> International HEPPA meeting, which will take place in Karlsruhe, Germany, shortly thereafter in May. In addition to what is already planned within CCMi, SOLARIS-HEPPA will carry out detailed co-ordinated analyses of solar forcing within the CCMi simulations. And, also in collaboration with SCOSTEP (Scientific Committee on Solar-Terrestrial Physics), who have a sub-project studying the uncertainty associated with solar forcing more generally. Furthermore, SOLARIS-HEPPA will also provide solar forcing data for CMIP6 - both for the past and the future (with several future scenarios likely being produced).

DynVar (Dynamical Variability) was represented by **Elisa Manzini**, who reported that Ed Gerber had been selected as a new co-leader. DynVar has proposed that several diagnostics be included in CMIP6 so that features such as gravity waves can be properly assessed and compared. A new SPARC activity, the Quasi-Biennial Oscillation Initiative (QBOi) was proposed at the last SSG meeting (see newsletter no. 41), however, at the moment this is being developed within DynVar.

**Dian Seidel**, representing the Stratospheric Temperature Trends activity, discussed some recent advances that the activity has made, including the fact that the UK Met Office has released a technical note about their Stratospheric Sounding Unit temperature dataset and the possibility of using the radio occultation dataset as a reference dataset, particularly in the UTLS where these data are of very high quality. Another question that was raised was whether stratospheric temperature data should be included in Obs4MIPs (an archive of observations for assessment of climate model output).

**Karen Rosenlof** indicated that WAVAS-II (Water Vapour Assessment II) will make its upper tropospheric water vapour data sets available to GEWEX as well as to the wider community through the SPARC Data Center (as was done for WAVAS-I). The activity will finish by the middle of 2015.

**Quentin Errera** will become the new leader of the Data Assimilation activity, while the Gravity Waves activity is still looking for a co-leader to join **Joan Alexander** (also SPARC co-chair).

With the publication of its final assessment report (see <http://www.sparc-climate.org/publications/sparc-reports/sparc-report-no6/>), the Lifetimes of Halogenated Source Gases activity has come to an end.

**Markus Rex** reported that the first scientific workshop of SSiRC (Stratospheric Sulfur and its Role in Climate) was very successful.

## **WCRP Advisory Councils**

**Kaoru Sato** presented an update on the WDAC (WCRP Data Advisory Council). An important priority for WDAC is the Essential Climate Variable inventories that are vital to the Global Observing System Information Centre and wider community as a whole. The Committee on Earth Observation Satellites is producing ECV's following GCOS (Global Climate Observing System) data guidelines and monitoring principles. There was some discussion as to whether WDAC would need to form a task team to deal specifically with reanalyses, however, for the moment a dedicated website (reanalysis.org) has been providing the necessary information for the reanalysis community. Surface flux data is a key gap within WCRP and it was recommended that WDAC lead a new effort to solve this problem. Finally, there was also some discussion related to the quality of data going into Obs4MIPs.

**Joan Alexander** then continued by reporting on the WMAC (WCRP Model Advisory Council), which to date has held two meetings. WMAC endorsed the ESGF as the main mechanism to be used for data exchange. It was also highlighted that although the CMIP6 timeline is very demanding it is essential that a strategy for significant model development and improvement be devised. To this end, WMAC has encouraged the establishment of several prizes and summer schools to promote model development. In terms of SPARC activities, WDAC encouraged the Gravity Waves activity to liaise with the Working Group on Numerical Experimentation (WGNE) on surface drag analyses, and there was some discussion about the choice of scenarios for the reference CCMi simulations (RCP6.0). WMAC also suggested that the CORDEX (Coordinated Regional Downscaling Experiment) model error evaluation framework be reconsidered. The possibility of organising several workshops was discussed. One idea was to focus on model parameter sensitivity (or model tuning), a subject about which data assimilation may be able shed some light. Another idea was to have a combined workshop focused on dynamics-physics coupling in models, since different communities usually address physical parameterizations and dynamics separately.

## **SPARC Contributions to the WCRP Grand Challenges**

SPARC will contribute to the Grand Challenge on 'Clouds, Circulation, and Climate Sensitivity' in two ways. This Grand Challenge aims to reduce climate sensitivity uncertainty, which is thought to stem largely from the way in which models represent clouds. A recent analysis by Bony et al. [2013] showed that circulation biases (dynamics) are crucial, not just changes expected from thermodynamics. **Ted Shepherd** reported that the entire range of models will be needed to improve our understanding of clouds and circulation patterns. This Grand Challenge cuts across the WCRP community and includes five initiatives (see [http://www.wcrp-climate.org/documents/GC4\\_Clouds\\_14nov2012.pdf](http://www.wcrp-climate.org/documents/GC4_Clouds_14nov2012.pdf)). SPARC will take a leading role in the 'Changing Patterns Initiative', which has several foci. The further planning of this and the other initiatives was discussed at a small kick-off workshop that took place in late March 2014 in Ringsberg, Germany.

SPARC will further contribute to this Grand Challenge through the work of CCMI and AEROCOM, looking at aerosol forcing and its effect on cloud and circulation changes. Producing species-by-species aerosol emission data sets for such simulations will be a difficult task and AEROCOM and CCMI will work together, particularly under the umbrella of the AerChemMIP of CMIP6. For this, Climate Model Output Rewriter (CMOR) tables will need to be provided to CMIP6; a matter that was discussed at the CCMI workshop held in Lancaster, UK, in May 2014.

To further address the matter of systematic model bias related to atmospheric modes of dynamical variability, **Marc Baldwin** proposed that a workshop be organised in Grindelwald, Switzerland, in September/October 2015. This workshop would be similar to the SPARC Brewer-Dobson Circulation Workshop held in 2012, but would aim to include the wider WCRP community (CLIVAR, CliC, GEWEX, and WGSIP). Possible funding sources included SPARC and national science foundations. **Dian Seidel** discussed a workshop on “The Width of the Tropics: Climate Variations and Their Impacts”, she proposed organising as an American Geophysical Union (AGU) Chapman conference to take place in summer 2015.

SPARC will contribute to the Grand Challenge on ‘Cryosphere in a Changing Climate’ through the Polar Climate Predictability Initiative (PCPI). **Cecilia Bitz** and **Ted Shepherd** made a presentation mentioning that the disagreement between models and observations is substantial and opposite at the two poles, and that the polar regions may contain sources of predictability on both seasonal and decadal time scales. For PCPI, which consists of 6 activities each led by two co-leaders, the global reach of WCRP is very important. The activities are mostly still in the planning stage, although one group organised a session at the Fall 2013 AGU meeting and a workshop of PCPI leaders and other key people was planned to take place in Boulder, Colorado, USA from 3-4 April 2014.

Finally, SPARC will also contribute to the Grand Challenge on ‘Regional Climate Information’ through the work of DynVar and SOLARIS-HEPPA.

## **Feedback About 5<sup>th</sup> the SPARC General Assembly**

**Veronika Eyering** and **Adam Scaife** presented feedback about the SPARC General Assembly from the Scientific Organising Committee. The conference programme, one-minute poster presentations, and the combination of overview and contributed talks were all very well received. It was suggested that it might be valuable to have poster clusters focusing on SPARC activities and possibly have the posters hanging for more than one day, with more time allocated to the poster sessions.

It was discussed whether an invited (45 minute) talk at the next General Assembly could be announced as a prize to honour scientific publications that solve key SPARC science questions, just as WMAC is setting up prizes for model development. Examples of questions important to SPARC include: (1) Is interactive chemistry necessary for surface climate prediction (that is, is a fully coupled atmosphere-ocean-chemistry model required)? (2) How much does UV irradiance vary across the solar cycle and what impact does this have on surface climate? (3) What is the role of the stratosphere in systematic model bias (*e.g.* errors in the stratospheric jet)? (4) Does a good representation of the stratosphere improve decadal prediction of surface climate? (5) What is the regional impact of stratospheric

geoengineering? (6) What is the mechanism by which extra-tropical stratospheric circulation affects surface climate? (7) What is the role of the stratosphere in the surface temperature hiatus? (8) Do changes in the cryosphere impact the stratosphere-troposphere system? It would be somewhat challenging, however, to decide whether one paper answers a particular question or not, since the science behind any one question may have been built up by a large number of people. It was thought that the SSG could decide whether and to whom the prize would be awarded in a fair and justifiable way.

## **Presentations From Other WCRP Bodies**

**Detlev Stammer** made a presentation about CLIVAR (Climate Variability and Predictability; a WCRP core project), which is presently going through a transition phase, including a change to their logo. CLIVAR now has three international project office nodes (in Italy, India, and China), raising some challenges concerning optimal organisation, and a US-CLIVAR project office. CLIVAR has several regional activities (ocean basin-wide) as well as a few global activities, one of which is focused on paleoclimate and another on how observations can be used to initialize climate forecasts on various time scales. CLIVAR also has several core panels and a regional sea-level rise activity that is under development. **Elisa Manzini**, who participated in the 2011 and 2013 CLIVAR SSG meetings, highlighted the benefits of a close collaboration between CLIVAR and SPARC, in particular with DynVar in terms of regional climate and decadal climate prediction.

**Veronika Eyring** reported on WGCM (the WCRP Working Group on Coupled Modelling) and CMIP, a sub-group of WGCM. The CMIP panel had their first CMIP6 planning meeting in Aspen, Colorado, USA, in August 2013. The CMIP6 experiment protocol will take the form of a core set of simulations called the CMIP DECK (Development, Evaluation, and Characterisation of Klima), with a large number of satellite MIPs (Model Intercomparison Projects) focusing on particular aspects of the climate system. The CMIP6 experimental design will be finalized at the next WGCM meeting in October 2014. Veronika noted that CMIP6 is aimed at supporting research going into the WCRP Grand Challenges, but that within the Grand Challenges there is very little focus on biogeochemistry. To fill this ‘gap’, CMIP6 will work closely with the IGBP AIMES project (Analysis, Integration, and Modelling of the Earth System), which will become part of Future Earth as of 2015. WGCM will also work closely with WGNE and all the MIPs, including CCMI, to develop climate metrics for model benchmarking and routine model evaluation. The CMIP6 historical forcing data sets will need to be ready within one year and SPARC will contribute to this through the provision of an ozone database (CCMI) and solar forcing (SOLARIS-HEPPA). DynVar will also contribute significantly to CMIP6 through, for example, providing some diagnostics required for model assessment.

WGSIP (WCRP Working Group on Seasonal to Interannual Prediction, presented by **Adam Scaife**) works closely with WMO Global Forecast Producing Centres, operational centres responsible for real-time weather forecasts. They have been working together on the Climate-system Historical Forecast Project (CHFP), an experimental framework for sub-seasonal to decadal predictions of the complete physical climate system. A series of hindcasts is now available in an online database (14-15 hindcasts, with seven models including a resolved stratosphere). Initial results show that the predictability of several extra-tropical features, such as the North Atlantic Oscillation (NAO), Arctic Oscillation, and Antarctic Oscillation, have improved significantly. Until very recently, seasonal forecasts of these oscillations did not

have much skill, largely because of high internal variability. With recent model advances, however, the NAO can now be predicted fairly well 1-4 months in advance, and the skill improves with more ensemble members. It is hoped that forecasts of extra-tropical regions will be as skilful as current tropical forecasts within a few years. WGSIP has also been investigating decadal prediction and found that proper initialization of ocean and surface air temperatures is important for predictability of the first five years simulated, while thereafter forecast skill is much lower. They have also been testing the feasibility and usefulness of initializing different components of the climate system, not only the ocean but also land surface or the stratosphere. No structure presently exists to provide real-time decadal forecasts, and the possibility of doing so is presently under investigation (*i.e.* providing such forecasts once per year, with several centres contributing to the effort). Further research is focused on exploring whether the operational use of satellite limb measurements could improve forecasts through data assimilation processes. At present these observations are not assimilated in real-time, and it remains uncertain as to whether many of these space-borne measurements will be continued.

## Other Presentations

**Geir Braathen** reported on GAW (Global Atmosphere Watch) and its activities of relevance to SPARC. GAW consists of several tens of global stations and hundreds of regional and contributing stations which all produce key atmospheric measurements that are used to produce several WMO products, for example the WMO Aerosol and Antarctic Ozone bulletins. The MACC (Monitoring Atmospheric Composition and Climate) project was mentioned as possibly being of interest to SPARC. This project is assessing models using GAW and NDACC tropospheric ozone data and also aims to improve the dialogue between modellers and those making measurements in these networks. Of significant relevance to SPARC is the fact that the WMO would like to have a more defined standpoint on geoengineering. They will be organising a workshop dedicated to further developing this, to be held later in 2014. Scientists active in this field are invited to contact Geir for further information and the possibility of participating in the workshop. The workshop will also be relevant in the context of answering the question regarding which UN body should be responsible for the knowledge basis of geoengineering.

**John Burrows** presented an update on COSPAR (COMmittee on SPace Research), which is made up of eight separate commissions, of which commissions A and C are most relevant to SPARC. He encouraged participation in the next COSPAR meeting, taking place in Moscow, Russia, from 2-10 August 2014. COSPAR is currently involved in a review of the status of atmospheric observations from space in which they will make several recommendations regarding the development and continuation of these measurements. SPARC, in particular, could help define the consequences of *not* having certain observations since crisp and compelling scientific-based reasons are needed to justify the launch of new satellite missions at present. It is possible that climate-continuity missions from NASA may provide an avenue for the continuation of limb observations in future and there is some hope that Canada will have satellite missions replacing the OSIRIS and ACE-FTS instruments; international support of this would certainly be useful. It was also suggested that it would be important to exploit the International Space Station (ISS) as a useful observational platform.

**Mike Kurylo** started his presentation on NDACC by asking for input from SPARC and WCRP to assist in NDACC's development and reassessment of its measurement systems. In

particular, it would be valuable to receive information regarding priorities and where potential solutions to existing problems may lie. A major issue for NDACC is the fact that agencies provide funding to make measurements, but not necessarily to put the data obtained into the right format for transferal to databases or for any further evaluation. Tropospheric ozone and water vapour observations are new foci for NDACC. As are aerosol sonde observations, which to date have largely been campaign-based in nature, but which could be very useful for satellite validation. NDACC is considering establishing these observations at a few selected NDACC sites. Finally, frost point hygrometers have recently been added to the NDACC network in cooperation with GRUAN. A large number of UV/visible spectrometers are no longer operating within NDACC and this is of considerable concern.

## **New SPARC Implementation Plan**

**Joan Alexander** presented key input for the new SPARC Implementation Plan, focused on the 2015-2020 period, which needs to be completed by the end of 2014. The previous plan dates to 2009. The new plan will address important changes both in SPARC and in WCRP as a whole. The new implementation plan will be based on the “Whole Atmosphere Approach” since many of the waves, modes, and transport mechanisms that communicate climate signals and teleconnections extend across or through traditional atmospheric layers such as the troposphere, stratosphere, and mesosphere.

Theme 1 of the new SPARC Implementation Plan, ‘Chemistry in climate’, would aim to improve our understanding of the interactive role of atmospheric chemistry in the climate system. This demands both new and continuing observations along with chemistry-climate model development and validation.

Theme 2, ‘Atmospheric circulation in climate’, would include theoretical and observational studies of dynamics and atmospheric variability, underpinning the science of shifting regional circulation patterns and the likelihood of extreme events. At present, changes in atmospheric circulation patterns are a key uncertainty in climate prediction and this theme would aim to reduce this uncertainty.

Theme 3, ‘Long-term records for climate’, would cover activities concerned with creating, analysing, and interpreting climate data records created from ground- and space-based observational records.

## **SPARC Contribution to GFCS**

**Vladimir Ryabinin** presented this agenda item. SPARC’s contribution to the GFCS needs to be developed. At present only WCRP’s contributions have been clarified. In 2009 the 3<sup>rd</sup> World Climate Conference established a high level task force on GFCS, which produced a report in 2011. An extraordinary meeting of the WMO Congress led to the development of the Intergovernmental Board on Climate Services, which adopted the GFCS Implementation Plan and its annexes, as well as the Compendium of GFCS projects, which are to be funded through the GFCS Trust Fund. A main focus of GFCS is capacity development since more than 70 countries around the globe little or no basic climate services. There is also a strong need to improve how information is provided to users and, to meet this requirement, a User Interface Platform is being established. WCRP was tasked with looking at the science

required and the main gaps that need to be addressed within GFCS. This includes cooperation with the meteorological forecasting community to develop seamless weather-climate predictions. Nine out of the 40 activities proposed in the annex of the GFCS Compendium have so far been taken up in the final implementation plan, with some resources allocated. WCRP will also be involved with activities focused on improving regional systems for providing climate services. Current plans don't fully exploit how WCRP Grand Challenges can contribute to the GFCS plans, and this will need to be discussed in future.

## **SPARC Capacity Development**

**Thando Ndarana** and **Carolyn Arndt** reported on a short Capacity Development workshop that took place during the SPARC General Assembly. The workshop helped define the objectives of SPARC's Capacity Development activity, which are to:

- Develop tailor-made solutions for SPARC's involvement in different regions
- Stimulate bottom-up initiatives,
- Help build lasting and sustainable hard/soft skills related to conducting SPARC-related research in each region,
- Build on existing networks and structures to facilitate the required learning environment.

The following actions were proposed for 2014: (1) a survey will be carried out to establish where scientists are involved and interested in SPARC activities, focusing on developing and emerging economies; (2) representatives from different regions will help collect information, particularly within the context of where SPARC research may fit into the regional research scene and in terms of what capacity development programmes/activities are already underway; (3) based on the information gathered, a two-day SPARC Capacity Development workshop is envisaged (possibly with around a dozen participants, to be identified at a later stage), with the aim of developing a firm plan for SPARC with a time horizon of around five years. It was suggested that researchers from developing countries provide as much information as possible, in particular, identifying the state of current SPARC research in their region (or lack thereof). This will help with preparations for the workshop and hopefully will provide a better idea of where gaps lie, what requirements there are, and where best we might place resources. The SPARC Capacity Development effort should benefit from SPARC science as well as improve regional science capacity. It will be important to ensure that solutions are not imposed, but rather that those involved have full ownership of the activity. To ensure this plan moves forward, possible funding mechanisms (within WMO and other institutions) will need to be identified.

## **SPARC items**

The SPARC Project Office is presently funded until the end of 2015. **Thomas Peter** will submit formal proposals to the SPARC Office sponsors asking for an extension of funding to cover the 2016-2017 period.

Although a NASA proposal to continue support of the SPARC Data Center (SDC) for a further three years was turned down, NASA did provide some resources for **Peter Love** (SDC manager) and **Marv Geller** to visit the BADC to discuss the transfer of the SDC to the BADC. A memorandum of understanding has since been signed and the data transfer will be completed by the end of 2014. Peter Love is now working at the Australian Antarctic

Division, with support to work about 10-20% of his time for the SDC for one year. Under the new system, a SDC scientist is not included, but a contact person at the BADC will be assigned. In turn, SPARC will need to nominate a liaison person who would answer any questions that come from BADC. Data access will be administered by the standard BADC rules and all submitted data will need to be in BADC format with proper documentation. Each SPARC activity will need to submit its data separately to the BADC, after having established a data management plan (a process that is designed to be simple and not very time consuming). Importantly, the UK Natural Environment Research Council is willing to act as a publisher of DOI's of all SPARC datasets. At present, a mirror (for faster access and backup) of the SDC exists, but this will likely no longer be necessary with the SDC hosted at BADC.

The first SPARC Annual Report was produced in 2012, with the aim of providing an overview of SPARC's activities and an avenue for following SPARC's evolution over time. Given the warm reception of the Annual Report by the WCRP JSC and its success in general, it was decided to continue with the production of the SPARC Annual Report (see <http://www.sparc-climate.org/publications/programme-plans/>) for the 2013 SPARC Annual Report).

**Greg Bodeker** is no longer able to continue as SPARC co-chair. **Joan Alexander** warmly thanked him for the enormous amount of time he dedicated to SPARC, including the preparation of the very successful General Assembly. As of February 2014 he has been 'outgoing co-chair', with **Ted Shepherd** as 'interim co-chair'. **Neil Harris** will join Joan as co-chair from September 2014.

## **Next SPARC SSG session**

The next SSG Meeting will take place from 12-16 January 2015 in Granada, Spain.

## List of participants

J. Alexander – SPARC SSG Co-chair  
J. Arblaster – SPARC SSG Member  
C. Arndt – SPARC IPO  
M. Baldwin – Theme leader  
C. Bitz – PCPI Representative  
G.O. Braathen – Ex-Officio WMO/GAW  
G. Bodeker – SPARC SSG Co-Chair  
J. Burrows – Ex-Officio COSPAR  
A. Busalacchi – WCRP JSC Chair  
V. Eyring – SPARC SSG Member  
B. Funke – Activity Leader  
M. Geller – Ex-Officio SCOSTEP  
E. Gerber – SPARC SSG Member  
M. Hegglin – Activity Leader  
M. Kurylo – Ex-Officio NDACC  
P. Love – SPARC Data Center Representative  
E. Manzini – Activity Leader  
T. Ndarana – SPARC SSG Member  
K. Rao – SPARC SSG Member  
M. Rex – Activity Leader  
G. Roff – Activity Leader  
K. Rosenlof – Activity Leader  
V. Ryabinin – Joint Planning Staff for WCRP  
M. Santee – SPARC SSG Member  
K. Sato – SPARC SSG Member  
A. Scaife – SPARC SSG Member  
H. Schlager – Activity Leader  
D. Seidel – Activity Leader  
S.-W. Son – SPARC SSG Member  
T. Shepherd – SPARC SSG Co-Chair  
J. Staehelin – SPARC IPO Director (Zürich)  
D. Stammer – CLIVAR Representative  
G. Stiller – Activity Leader  
S. Tegtmeier – Activity Leader  
L. Thomason – Activity Leader  
F. Tummon – SPARC IPO (Zürich)

# Session Agenda

*Sunday 19 January 2014*

<b>08:30 to 10:00 Registration and start of programmatic discussions</b>		
08:30 - 08:45	Registration and welcome	Co-chairs
08:45 - 10:00	Programmatic discussion with activity leads - identify actions and commit people to them.	Co-chairs and activity leads.
10:00 -10:30 <b>Tea/coffee break</b>		
<b>10:30 to 12:30 Programmatic discussion continued and reports</b>		
10:30 - 11:30	Programmatic discussion with activity leads - identify actions and commit people to them	Co-chairs and activity leads.
11:30 - 12:00	WGSIP report and discussion	Adam Scaife
12:00 - 12:30	WGCM and CMIP report and discussion	Veronika Eyring
12:30 -13:30 <b>Lunch (provided)</b>		
<b>13:30 to 15:00 Discussion of emerging SPARC activities and transition to full activities</b>		
13:30 - 14:15	S-RIP - SPARC Reanalysis/analysis Intercomparison Project	Ed Gerber
14:15 - 15:00	SNAP - The Stratospheric Network for the Assessment of Predictability	Greg Roff
15:00 -15:30 <b>Tea/coffee break</b>		
<b>15:30 to 17:30 Closed session of the SSG</b>		
15:30 - 17:30	(1) Election of new SSG members, (2) Discussion of election of co-chair to replace Greg Bodeker when his term expires, (3) Nomination of a formal representative to WGRC	Co-chairs, SSG members, JSC chair, IPO director and JPS contact point

## ***Monday 20 January 2014***

<b>08:30 to 10:00 Registration and start of programmatic discussions</b>		
08:45 - 08:45	Registration and welcome	Co-chairs
08:45 - 09:00	GAW Update	Geir Braathen
09:00 -10:00	WCRP Update including Future Earth and discussion	Tony Busalacchi
10:00-10:30 <b>Tea/coffee break</b>		
<b>10:30 to 13:00 Addressing WCRP Grand Challenges</b>		
10:30 - 11:00	New SPARC-IGAC activity ACAM	Hans Schlager
11:00 - 11:45	Aerosols in the Clouds, circulation and climate sensitivity Grand Challenge	CCMI – Veronika Eyring and Michaela Hegglin
11:45 - 12:00	Atmospheric dynamics in the WCRP Grand Challenges	Joan Alexander
12:00 - 12:20	Proposed workshop on Atmospheric modes of dynamical variability	Mark Baldwin
12:20 - 12:40	Changing Patterns Initiative in the Cloud, circulation and climate sensitivity GC	Ted Shepherd
12:40 - 13:00	Interactions w/CLIVAR on Regional Climate/Decadal Prediction	Elisa Manzini
13:00-14:00 <b>Lunch (provided)</b>		
<b>14:00 to 16:00 New SPARC Science</b>		
14:00 - 15:30	Discussion of outcomes of the General Assembly. What specific actions need to be taken and who will commit to doing them? Implications for the future of SPARC.	Adam Scaife, Veronika Eyring, Julie Arblaster, Michelle Santee, David Fahey, Kaoru Sato
15:30 - 16:00	Polar Climate Predictability Initiative (PCPI) update	Cecilia Bitz and Ted Shepherd
15:00-15:30 <b>Tea/coffee break</b>		

<b>16:30 to 17:30 WCRP Advisory Council Reports</b>		
16:30 - 17:00	WDAC report and discussion	Kaoru Sato
17:00 - 17:30	WMAC report and discussion	Joan Alexander

***Tuesday 21 January 2014***

<b>08:30 to 10:00 SPARC Operations</b>		
08:30 - 08:45	The future of the SPARC Project Office	Joan Alexander
08:45 - 09:00	Discuss request from Stefan Brönnimann for SPARC support for conference on the great Tambora eruption of 1815 (Bern 7-10 April 2015)	Co-chairs
09:00 - 09:30	Ongoing management of the SPARC Data Centre	Marv Geller, Peter Love and co-chairs
09:30 - 10:00	Discussion of requested new SPARC activity on the use of high resolution radiosondes to resolve fine-scale structure in the atmosphere	Marv Geller, Peter Love and co-chairs
10:00 -10:30 <b>Tea/coffee break</b>		
<b>10:30 to 12:30</b>		
10:30 - 11:10	Programmatic discussion with activity leads - identify actions and commit people to them	SPARC co-chairs and Project Office
11:10 - 11:30	NDACC update	Mike Kurylo
11:30 - 11:50	WCRP and SPARC contribution to GFCS	Vladimir Ryabinin
11:50 - 12:10	CLIVAR update	Detlef Stammer
12:10 - 12:30	COSPAR update	John Burrows
12:30 -13:30 <b>Lunch (provided)</b>		
<b>13:30 to 15:00</b>		
13:30 - 14:15	Capacity development in SPARC	Carolin Arndt and Thando Ndarana

14:15 - 15:00	Discussion of revision of the SPARC Implementation Plan	SPARC co-chairs
15:00 -15:30 <b>Tea/coffee break</b>		
<b>15:30 to 16:30</b>		
15:30 - 16:00	Review of 2013 action items by the SPARC Project Office	Johannes Staehelin
16:00 - 16:30	Meeting closure and summary of action items	SPARC co-chairs