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SPARC Report

1. Highlights for JSC

SPARC is making substantial contributions to the WMO/UNEP 2018 Scientific Assessment of Ozone Depletion, often in activities organised jointly with Future Earth/IGAC, GAW, and the International Ozone Commission. Direct contributions include:

- New insights into the trends and associated uncertainties in the vertical distribution of ozone have been provided by the SI2N and LOTUS activities.
- New coupled climate-chemistry model scenario runs, pivotal for understanding possible future changes in ozone and UV-B, have been organised in CCMI.
- Significant reductions in the CCl_4 budget discrepancy, an important topic for the governments, were found as a result of the report 'Solving the mystery of Carbon Tetrachloride (CCl4)' which involved academics and industry experts.

In addition, several SPARC activities aimed at improving our understanding of atmospheric processes helped provide valuable insights to the 2018 WMO/UNEP Assessment. These include:

- Early understanding of the anomalous quasi-biennial oscillation in 2016 in QBO-i.
- Improved understanding of stratospheric particles through the SSiRC and PSC activities.
- Updated knowledge of stratospheric temperature, water vapour and solar influence through ATC, WAVAS II and SOLARIS-HEPPA.
- The S-RIP activity is providing guidance for next-generation reanalysis systems and for users of current re-analyses. A series of papers has been published in ACP special issue and a final report is due in 2019.

SPARC continues to promote engagement in international research activities.

- SPARC aided the organisation of several thematic international training schools, according to the Capacity Building strategy (e.g., the IUGG training school on Stratosphere-Troposphere interactions and the ACAM training school) in addition to the large number of SPARC activity workshops/meetings.
- SPARC held a workshop on "WCRP grand challenges and regional climate change" in Incheon, Korea (79 participants), and contained an ECR symposium (50 ECRs).
- SPARC scientists participated in and benefited from several international field campaigns, such as the Balloon campaign of the Asian Tropopause Aerosol Layer (BATAL) during August and the StratoClim aircraft campaign out of Kathmandu, Nepal, in July/August 2017.

The SPARC International Program Office successfully transitioned from ETH Zurich, Switzerland to DLR Oberpfaffenhofen, Germany allowing for a continuity of the coordination of scientific and administrative aspects of the SPARC project and its activities in the future.

2. Primary science issues (next 3-5 years)

The primary science issues for the coming years can be considered according to the three themes laid out in the SPARC strategy: Atmospheric Dynamics and Predictability, Chemistry and Climate, and Long-term Records for Climate Understanding.

Atmospheric Dynamics and Predictability

- Enhance understanding of troposphere-stratosphere coupling in the tropics and effects on convection through the activity "Stratospheric And Tropospheric Influences On Tropical Convective Systems".
- Contribute to model development by identifying model requirements to resolve stratospheric teleconnection pathways, to simulate the QBO, to resolve gravity wave effects on circulation, and to represent chemistry-climate coupling.
- Enhance understanding on the role of the stratosphere in tropospheric prediction on the S2S time scale. Links to the WWRP project are made through the SPARC SNAP activity.

Chemistry and Climate

- Better understand the impact of the monsoon convection systems on the composition, radiation, and dynamics of the troposphere.
- Work with the new Grand Challenge on Carbon and Climate and develop a parallel SPARC initiative on the short-lived climate forcers in collaboration with IGAC and GAW.

Long-term Records for Climate Understanding

- Coordinate for the growing community of users of high resolution data, resolving fine atmospheric structures and processes, to promote the development of innovative applications of such data by facilitating the sharing of expertise on analysis techniques, data handling, and technical capabilities and limitations.
- Assess data sets for model validation, with careful quantification of uncertainties (e.g., 2nd Water Vapour Assessment, Observed Composition Trends And Variability in the Upper Troposphere and Lower Stratosphere).
- Propose strategies to harmonize the reporting of uncertainties of satellite data of atmospheric temperature and composition.

3. Issues and challenges:

- The major challenge in the coming years will be helping to formulate and then implementing WCRP's response to the review by its sponsors. This will certainly open up opportunities for better collaborations both internally within WMO and WCRP and externally with groups such as the Belmont Forum, Future Earth and industry groups. It is worth noting that (a) such collaborations have been occurring for many years and (b) the 2018 SPARC General Assembly is being co-organised with the JPI-Belmont Forum Climate group and closely coordinated with the IGAC meeting the previous week.
- SPARC is valued as an organisation that delivers valuable products to the community, such as question-driven workshops and reports, or coordinated assessments of observational and modelled data sets.
- It would be good to make the structure and management of the SPARC activities more clear and efficient. One option being discussed is to set up a panel with the co-chairs of the WMO-UNEP Scientific Assessment of Ozone Depletion and possibly other interested parties (WMO, UNEP) to promote workshops or reports on issues which are likely to be relevant to future assessments. As previously, each activity

would involve appropriate expertise from industry, academia and governments as was done for the CCl4 report.

- Such a panel would be complemented by other panels on, e.g., fundamental processes and long-term measurements. These should be organized with the needs of future assessments in mind and would help ensure the analysis of the large amount of model data produced in CMIP-6.
- Similar panels might be a good mechanism to strengthen links with internal and external groups. This could be a valuable way to deal with topics (e.g. predictability) in which many WCRP and other groups have a direct interest. The current initiative on Earth Energy Imbalance (led by CLIVAR and GEWEX, but with involvement of CLIC and SPARC) is a good example of this, and the collaborations in relation to S2S are heading the same way.
- A similar approach could be applied to broad initiatives on convection and on atmospheric dynamics which build on individual activities in various parts of WCRP.
- Telecons with the co-chairs of the core projects take place periodically and should continue. In the past year, SPARC representatives attended the CLIVAR and GEWEX SSGs in person and the CLIC SSG remotely.
- Links to the S2S project are made through SNAP. A representative of the S2S project attended the SPARC SSG meeting in October 2017. A major outcome is a Stratosphere Activity in the Phase II proposal of the international S2S initiative.
- SPARC have representatives on WDAC and WMAC.

How you see your community evolving?

- SPARC is a lively community that has deep roots. SPARC community members are concerned about the outcomes of the WRCP review and want to continue to naturally evolve through its activities and its links with external groups such as Future Earth/IGAC, the Belmont Forum as well as WMO/GAW and WMO/WWRP
- SPARC has received opposing messages from JSC in the past and the recent WCRP review regarding developing a major emphasis on atmospheric dynamics within SPARC. So far, SPARC has moved cautiously in expanding its scope to tropospheric dynamics because it requires expanding its community in collaborative activities. The WCRP review expressed strong concerns with advancing SPARC's scope in this direction. Thus, it is unclear how the community should evolve in this respect.
- We will continue the Capacity Development strategy to enhance Early Career researchers support in training schools and by supporting their participation in international workshops. Continue to cooperate with the YESS community. Keeping track of early career scientists who have participated in SPARC workshops is seen as an effective way to ensure that young researchers continue to grow into the SPARC community. This is seen as a source of candidates to become future leaders of SPARC activities.
- The SPARC community evolves naturally as activities start/end or as they change, e.g. more weather-focused researchers becoming involved in the Gravity Wave activity.

Liaison with WCRP

- This has worked well in the past year, with good communication with Boram Lee and Guy Brasseur in particular. Boram Lee regularly attends our co-chair/office telecons, and has been very helpful with the preparation of the GA. Her role was invaluable in the successful transition of the IPO from ETH Zurich (CH) to DLR-Oberpfaffenhofen (DE).

How will the current funding affect your community, your activities, your service

- SPARC uses its funding to cover travel to activity workshops and training schools, with a priority of providing support for early career researchers and researchers from scientifically developing countries.
- In the past few years, several opportunities to provide support for deserving scientists have been missed as a result of the low funding level (40 kCHF per year).
- The situation in 2018 is critical as no additional support has been provided by WMO or WCRP for the SPARC General Assembly. This is severely limiting the amount of support available to help scientists attend the SPARC GA and the SPARC workshops. This is completely at odds with publicly announced intentions which we support but are very hard to implement in practice. It is important that support is provided to achieve WCRP's laudable objectives.
- Looking ahead, it is critically important to ensure that WCRP's ambitious goals for the coming years is matched by its financial resources.