

An overview of the SPARC Core Project for the GEWEX SSG meeting 2019

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Atmospheric Dynamics + Predictability

Chemistry + Climate



Long-term Records for Climate Understanding



SPARC Activities



SPARC activities:

- Bottom-up approach: the community proposes new activities
- Activities extended only if new science questions arise.
- Activities can produce reports, published by SPARC.
- Major contributions to IPCC and to UNEP/WMO Ozone Assessments





SPARC Activities



SPARC activities:

- Many activities contribute to large assessment reports (e.g. IPCC; UNEP/ WMO Ozone assessments; CMIP project contributions)
- Most SPARC activities are self-organised with ideas coming from the research community, and provide network opportunities centred on topical research
- Capacity building through involvement of ECS in activity leadership, organisation of training schools, travel support opportunities for ESC
- SPARC has established collaborations with other communities, i.e. other WCRP core projects, WWRP (esp S2S), GAW, IGAC, Future Earth, ...







Anderson et al. (2017): Comparison of CCMI models to HCHO aircraft observations

→ Missing sources of nitrogen oxides and oceanic acetaldehyde is the cause of a general low bias in the models.

Highlights the importance of in-situ measurements for the validation of chemical processes and emission databases used in CCMI simulations.



Dhomse et al. (2018): Analysis of 155 simulations from 19 models, including single-forcing sensitivity experiments and different GHG scenarios (RCPs) to determine recovery dates and main drivers. → This suite of CCMI-1 simulations formed the basis for the first revision of projected ozone recovery dates since the 2010 WMO Ozone Assessment.



Wales et al. (2018): Comparison of 14 CCMI models against observations of organic and inorganic bromine species in the tropical UTLS

 →clearly demonstrating the importance of explicitly representing VSLS to correctly estimating inorganic bromine in the lower stratosphere.





WMO Ozone Assessment chapter leads Finishing LOTUS report





- Simple merging of trends but uncertainties need to be carefully considered
- Post-2000 show significant +2-3%/dec trends in upper strat at NH mid-
- lat, significance of SH (+2%/dec) and tropics (+1%/dec) are close
- Results in reasonable agreement with other recent studies (i.e., Harris
- et al., 2015; Steinbrecht et al., 2017) but uncertainty estimates vary





interim report published as journal publications:

- 1) Overview of the S-RIP project
- Climatology and interannual variability of dynamic variables in multiple reanalyses evaluated by the SPARC Reanalysis Intercomparison Project (S-RIP)
- 3) Assessment of upper tropospheric and stratospheric water vapour and ozone in reanalyses as part of S-RIP

final report to be submitted for review, soon







Stratospheric Sulphur and its Role in Climate (SSiRC):

overview paper on stratospheric aerosols

Kremser, S., et al. (2016), Stratospheric aerosol—Observations, processes, and impact on climate, Rev. Geophys., 54, 278–335, doi: 10.1002/2015RG000511.





- Be better prepared for the next large volcanic eruption
- Discussion forum through a wikipage
- Bridge between observational and modelling communities
- Example: After Agung or Aoba eruption in 2018





 \rightarrow Greatly facilitated the preparation and performance of field campaigns in Asia.

<u>Water vapour (WAVAS)</u>: Special Issue on Water vapour in the UT and middle atmosphere <u>https://www.atmos-chem-phys.net/special_issue830.html</u>

<u>Gravity waves</u>: Successful proposal for 2-year ISSI project: "New Quantitative Constraints on Orographic Gravity Wave Stress and Drag".

QBOi: successful 'hindcast' of the 2016 QBO disruption

Stratospheric Network for the Assessment of Predictability (SNAP): Completed the chapter for the S2S book (Eds: Robertson and Vitart) on our understanding of stratospheric predictability Is now a full sub-project of the S2S project



SPARC General Assembly 1 – 5 October 2018, Kyoto, Japan





- Kaoru Sato (U Tokyo)
- Masato Shiotani (Kyoto U)
- Shigeo Yoden (Kyoto U)

382 participants from 31 countries, 120 ECS 60 participants received travel support > 400 poster presentations (traditional focus of SPARC GAs)

Jointly organised with Belmont Forum / JPI Climate projects



Miyako Messe

ack-to-back with





Themes for the 2018 SPARC General Assembly

Provides an opportunity to celebrate SPARC's achievements and to look to the future while building on our traditional strength:

- Connections of Atmospheric Composition and Chemistry to Weather and Climate
- Climate Prediction from Weeks to Decades
- Role of Atmospheric Dynamics for Climate Variability and Change
- Atmospheric Impacts and Interactions related to Tropical Processes
- Advances in observation and reanalysis datasets
- SPARC Science for Society

→ Roundtable discussion on the future of SPARC



outlook: SPARC plans for 2019



SPARC workshops & meetings:

14 workshops and meetings already in planning2 summer schools (Kuala Lumpur & Beijing), one in cooperation with Belmont Forum7 overview papers drafted/planned for 2019



Co-organised with UNEP, WMO/GAW, Scientific & Technical Panels of the Ozone Assessment

The Symposium's purpose is to provide a forum for scientists and technologists to explore and present information on the potential causes of the increased CFC-11 emissions. This information will provide a firmer scientific basis for discussions amongst the Parties of the Montreal Protocol in the coming years.



SPARC Outlook



Lessons from SPARC General Assembly

- Strong community support for SPARC and its activities, based on attendance, discussions, and evolution of presented research
- Attendees baffled by WMO/WCRP reorganisation (not by need for new strategy)
 - why is it needed?
 - why think about breaking up something that's working?
 - why is it taking so long?
- Focus of research is naturally moving toward being more societally relevant
- Critical to keep composition integrated with atmospheric dynamics & transport



SPARC Outlook



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Background

- Urgency of current issues the clock is ticking for climate change and air quality
- Paris Agreement: move from providing information for society to decide whether to act on climate change, to providing information to help society decide how to take action.

We have 12 years to limit climate change catastrophe, warns UN

Urgent changes needed to cut risk of extreme heat, drought, floods and poverty, says IPCC

Overwhelmed by climate change? Here's what you can do

In model pathways with no or limited overshoot of 1.5°C, global net anthropogenic CO2 emissions decline by about 45% from 2010 levels by 2030... (SPM)

Air pollution is the 'new tobacco', warns WHO head

Exclusive: Simple act of breathing is killing 7 million people a year and harming billions more, but 'a smog of complacency pervades the planet', says Dr Tedros Adhanom

• Dr Tedros Adhanom Ghebreyesus: Air pollution is the new tobacco. Time to tackle this epidemic

Tobacco impact on health first shown in 1950s. 1.1 billion people still smoke.



SPARC's concerns



- WMO & WCRP reorganisation is wasting precious time
 - Two years for WCRP and counting
 - WMO reorganisation making it harder
 - Too many options, all of which will take time to adapt to
 - Looking forward to clarity with new chair/ vice-chair
- Keep composition and transport/dynamics in WCRP
 - Backward step
 - Biogeochemical cycles have to be 'covered' (through partnerships)
- Build on our strengths (communities) to produce good results
- Aim is to encourage better research, not have a 'better' structure
- Don't alienate academic research 90% of WCRP people are from universities or research institutes, not met agencies



SPARC's hopes



- Strong role for research communities is kept in WCRP
 - All core projects engender much loyalty do not throw it away
- Provide environment which fosters better collaboration between WCRP activities, with other WMO projects, and with external partners
 - Critical for some of the problems the world faces
- Several potential topics exist
 - Convection / monsoon, climate and biogeochemistry, near-term climate......
 - S2S is a good example of how such collaboration could work
 - Build these up from existing strengths
- SPARC will collaborate closer with GAW and IGAC anyway,
 - e.g. on short-lived climate forcers
- Develop combined science / social science research agenda
 - WCRP role is to promote basic research, not develop services



Developing broader themes



- Building links with CLIVAR/GEWEX monsoon panel
 - Andy Turner / TianJun Zhou initiative thanks
- Several topics where there is a SPARC interest/role, e.g.
 - QBO in lower stratosphere and influence on MJO (w. GASS, GLASS?)
 - Monsoon/convection impact on UTLS composition (near and remote)
 - Model analysis projects of CMIP-6 data (and possibly CCMi data)
 - Storm tracks in SE Asia
 - An S-RIP2 component
 - Predictability on seasonal to decadal timescales
- End-of-cycle re-assessment of DynVAR plans to renew priorities for research in atmospheric dynamics and how that best works with other initiatives.
 - Likely increased emphasis on extreme events, internal atmospheric variability & DynVarMIP analysis (incl. autumn 2019 workshop)
 - How best to work with CLIVAR, GEWEX, WWRP, S2S, etc.

Thank You!



SPARC Stratosphere-troposphere Processes And their Role in Climate