SPARC

41st Session of the WCRP Joint Scientific Committee

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Online

WORLD METEOROLOGICAL ORGANIZATION

United Nations Educational, Scientific and Cultural Organization

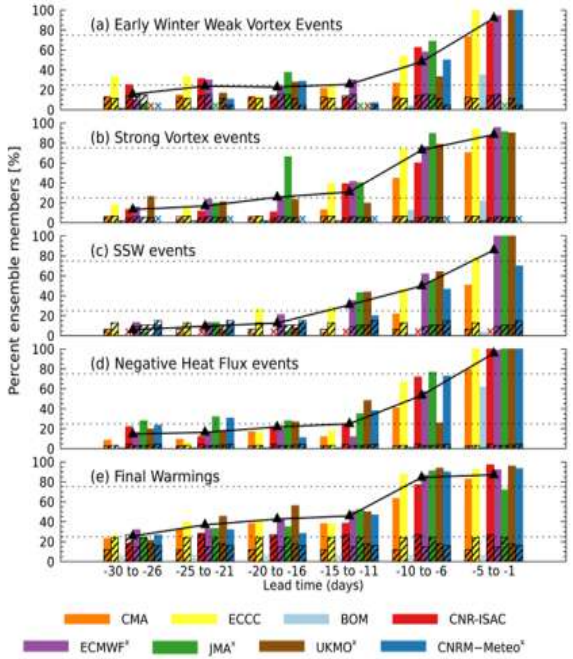
Intergovernmental Oceanographic Commission

International Science Council

WCRP World Climate Research Programme

Progress and achievements

- Understanding/documenting stratospheric variability and stratosphere-troposphere coupling in sub-seasonal to seasonal prediction
- Progress in understanding atmospheric processes such as gravity waves, the QBO, Asian monsoon, analysing long-term trends and atmospheric composition; solar variability as a source of decadal climate predictability
- S-RIP report on reanalysis inter-comparison (currently in review)



Domeisen et al (2020). **The role of the stratosphere in subseasonal to seasonal prediction: 1. Predictability of the stratosphere.** JGRA, 125, e2019JD030920.

- Currently 7 open SPARC-related journal special issues / collections with 35 papers published since January 2019 (over 73 in total); additional: about 10 papers in S2S special issue with relation to SPARC's SNAP activity.

Progress and achievements

- SPARC/IO3C/GAW "Report on Long-term Ozone Trends and Uncertainties in the Stratosphere" (contribution to WMO/UNEP Ozone Assessment 2018)
- Summary on the CFC-11 increase in 2019 (Vienna symposium report published in SPARC newsletter; helping UNEP produce update for Montreal Protocol parties)
- Successful training schools in Kuala Lumpur (MYS) and Hong Kong (CHN)
- 11 funded workshops and >30 funded participants from > 20 countries.

Report on the International Symposium on the Unexpected Increase in Emissions of Ozone-Depleting CFC-11

Neil R.P. Harris[1], Stephen A. Montzka[2], Paul A. Newman[3], with generous contributions from the Symposium attendees

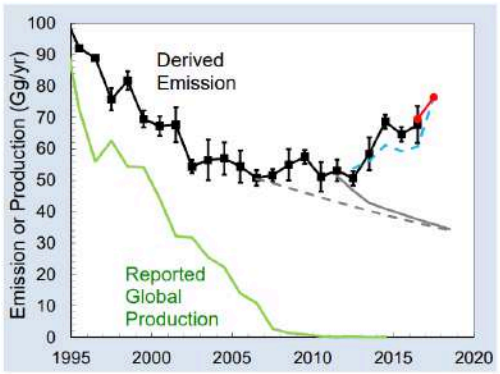


Figure 1: *Global CFC-11 emissions derived from NOAA atmospheric observations with a three-box model (black squares) considering a 57.5-year lifetime[2], and production magnitudes reported to the United Nations Environment Programme (UNEP, green line). Red points represent updated values to Montzka et al. [2018] presented at the Symposium [Montzka], while the dashed blue line represents emissions approximately corrected for the upper end of estimated circulation changes. The dashed grey line shows expectations given measured global changes through 2005 using a data derived release fraction of 3.2% per year of CFC-11 from the bank extrapolated forward, and the solid grey line is a WMO scenario projection [WMO, 2014] that was constrained by observational data through 2012 (rescaled here to be consistent with a 57.5yr lifetime) [as in Montzka et al., 2018].*

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Future plans

Reflects SPARC SSG meeting in Dec 2019

- SPARC is currently developing a new strategy (current is 2016-2020)
- Tentative science questions SPARC is looking to contribute to:
  - How will climate change on interannual to centennial timescales?
  - How can prediction of weather and climate-related extreme events on sub-seasonal to decadal (S2D) timescales be improved?
  - How/ why is atmospheric composition changing over time and what are the impacts?
  - *NB These need to be folded into new WCRP structure. So in a (partial) holding pattern as that becomes clearer.*
- Strong desire for new structure to facilitate collaborative activities
- Strong support for a major WCRP interpretative initiative to make sure existing datasets are fully used – could produce the quickest results – would build a community of data users in all countries – would involve measurements, process and global models, data analytics.
- Strong concern that a large model initiative ***on its*** own would not produce results in time and would drain resources – not against it in principle

Links to the WCRP Strategic and Implementation Plans

- Outline plan has great potential
- SPARC science is essential to meeting the new WCRP goals
- SPARC/whole atmosphere science naturally forms one of the yellow pillars
- No reason to sunset, but SPARC work more have more impacts with extra opportunities for integration provided by the Light Houses
- Capacity building, climate science and society better if pan-WCRP plan
- *Review/assessment of SPARC operation is needed (part of new strategy)*
- Immediate actions
  - Communicate with SSG, activity leads and community (telecons, newsletter, etc)
  - Set up representative SPARC group to explore where SPARC science contributes in new WCRP – form basis for new SPARC strategy
  - What would be in LHs, what with other groups, what internal to SPARC?
  - Participate in broader WCRP planning (LHs, pillar definition, etc)

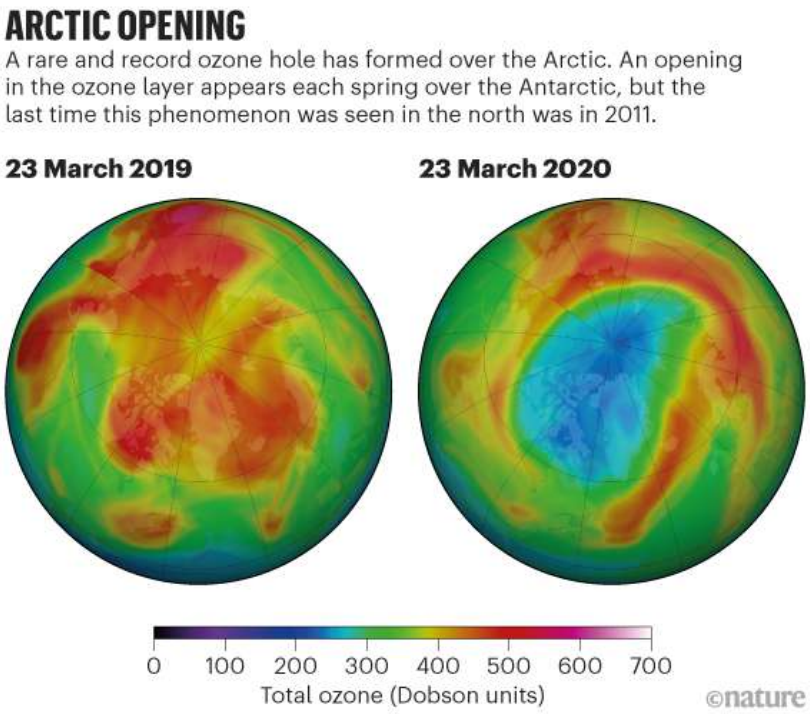
Emerging SPARC issues

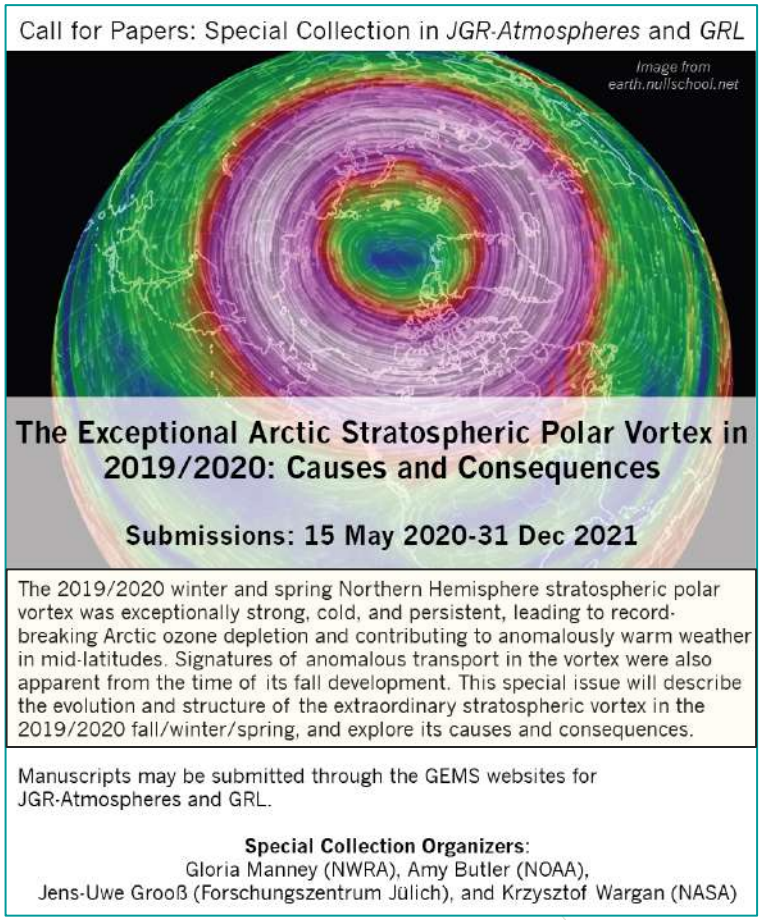
- Looking for 3rd co-chair (Americas), replacing Judith Perlwitz, and a representative for African community
- Refreshing leadership in SPARC activities
  - Refresh leadership for on-going SPARC activities (Gravity)
  - Some SPARC activities are ending in 2020 (WAVAS II, PSC, S-RIP)
- Possible WCRP provision of capability
  - Need for long-term data storage for large datasets, preferably with doi
  - On-line communication and work spaces
  - Support for hard-to-involve scientists (ECS from less involved nations)
  - Capability for greener activities (à la GCOS)
- Finding best way to ensure success in capacity building
  - Part of linking to new structure
- Call for expressions of interest to host SPARC General Assembly in 2022; encourage use of innovative meeting concepts to reduce CO_2 footprint and broaden inclusion.

Additional Slides

Progress and achievements

- The 2019/20 Arctic Ozone Hole - not so much an achievement, but a very notable event





Future plans

Tentative theme 1. How will climate change on interannual to centennial timescales?

- Exploiting long-term climate data records for fundamental understanding of short-term climate variability and long-term climate change
- Understanding the uncertainties in observations, reanalyses, and climate models on various time scales.
- Determining climate change effects on weather (including extremes) and regional circulations
- Maintaining observation-modelling interactions – *there is a worry that a new structure might undo progress on this*

Future plans

Tentative theme 2. How can prediction of weather and climate-related extreme events on sub-seasonal to decadal timescales be improved?

- Characterizing dynamical extremes and compound events in the troposphere (e.g. blocking, stalled Rossby waves, others)
- Attributing global and regional climate extremes, and improving their representation in climate models
- Understanding stratospheric biases and uncertainties impacting sub-seasonal to decadal prediction
- Quantifying the tropospheric responses to stratospheric extremes (e.g. sudden warmings and volcanic eruptions) and their sub-seasonal predictability

Future plans

Tentative theme 3. How and why is atmospheric composition changing over time and what are the impacts?

- Understanding the uncertainties of atmospheric composition change from past to future climate.
- Understanding aerosol-cloud interaction in a changing climate
- Monitoring emission change following measures to mitigate climate change
- Exploring space weather impacts on stratosphere and mesosphere composition