



WORLD CLIMATE RESEARCH PROGRAMME

42nd Session of the WCRP Joint Scientific Committee (JSC42)

WCRP Core Projects: SPARC

Seok-Woo Son (presenting), Neil Harris, Mareike Heckl

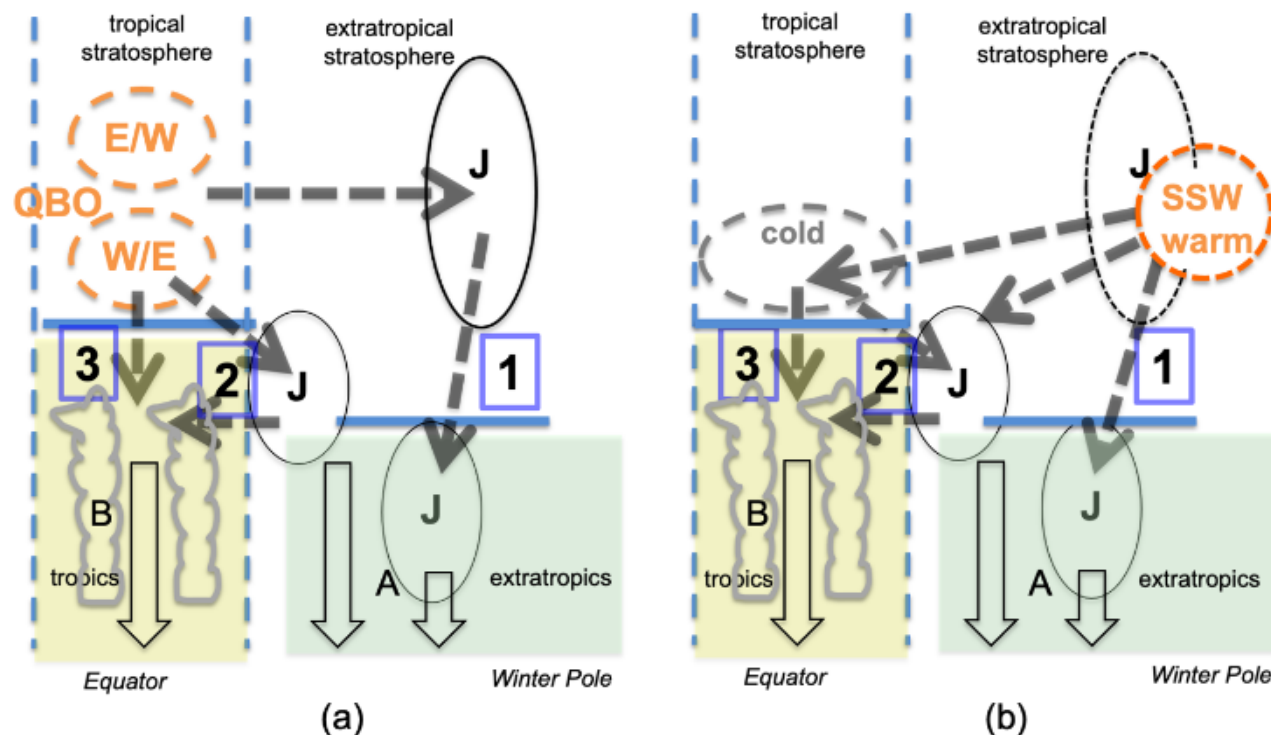


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Science Highlights

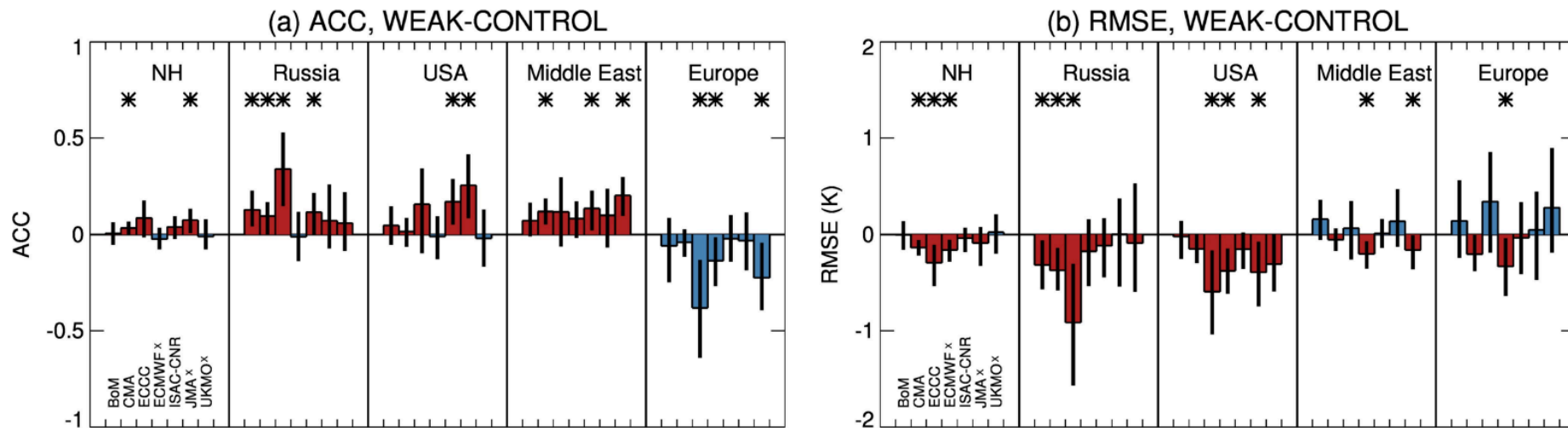
- A series of review papers on **Stratosphere-Troposphere Downward Coupling** in the tropics by SATIO-TCS activity; Quasi-Biennial Oscillation (QBO) signatures in the UTLS, QBO downward coupling, and QBO influence on the MJO.
- A number of DynVar studies on Sudden Stratospheric Warming (SSW), including the review paper and its future changes.
- An extended review paper on polar stratospheric clouds by PSC activity.



Coupling from stratosphere to troposphere for (a) QBO-type (starting in tropical stratosphere) and (b) SSW-type (starting in extratropical stratosphere).
Figure 1 from Hitchman et al. 2021; <https://doi.org/10.2151/jmsj.2021-012>

Science Highlights

- Two **SPARC S2S (SNAP)** community papers: predictability of the stratosphere, and predictability arising from stratosphere-troposphere coupling.
- Two new SNAP community collaborative projects: stratosphere-troposphere coupling biases in S2S prediction systems and Stratospheric Nudging And Predictable Surface Impacts (SNAPSI).

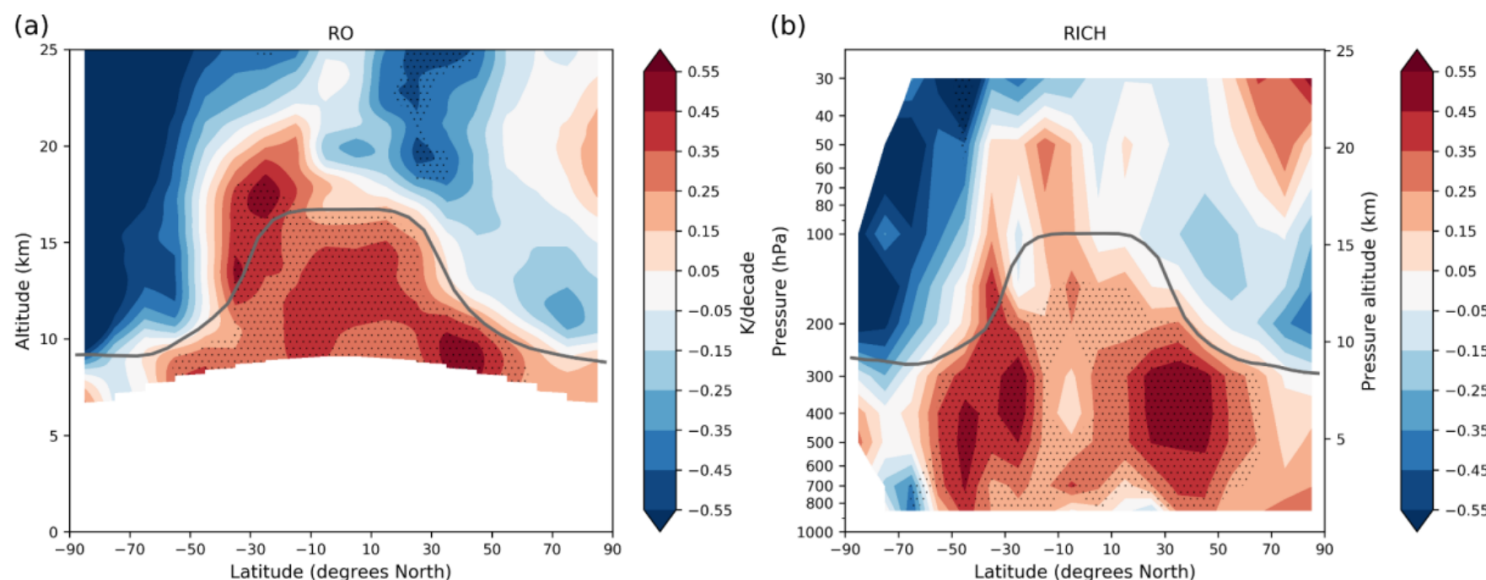


(a) ACC and (b) RMSE for 2-m temperature for the difference between WEAK vortex initializations and Control forecasts. Figure 6 from Domeisen et al., 2019, <https://doi.org/10.1029/2019JD030923>.

Science Highlights

- **Contribution to the 2022 Ozone Assessment:** CCMI has defined a set of simulations with new solar forcing recommendations from SOLARIS-HEPPA activity and additional contributions by LOTUS activity.
- **Contribution to the IPCC AR6:** A community paper examining long-term temperature trend by ATC activity, and a paper examining the consistency and structural uncertainty of GPS RO records.

- New version of the Global Space-based Stratospheric Aerosol Climatology archived at NASA's Atmospheric Sciences Data Center by SSiRC activity.



Altitude versus latitude resolved trends 2002–2018 shown for (a) RO (ROM SAF) and (b) radiosondes (RICH). Trends were computed with multiple regression analysis. Trend values that are significant at the 95% confidence level are indicated with dots:

Steiner et al. 2020; <https://doi.org/10.1175/JCLI-D-19-0998.1>



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Publications

- **SPARC Reanalysis Intercomparison Project (S-RIP) Report** is currently finishing its report of their phase 1 (submitted in 2019; revised during 2020) early-online release is planned in July. → **SPARC Report No. 10**

Chapter 1: Introduction

Chapter 2: Description of the Reanalysis Systems

Chapter 3: Overview of Temperature and Winds

Chapter 4: Overview of Ozone and Water Vapour

Chapter 5: Brewer–Dobson Circulation

Chapter 6: Extratropical Stratosphere–Troposphere Coupling

Chapter 7: Extratropical Upper Troposphere and Lower Stratosphere

Chapter 8: Tropical Tropopause Layer

Chapter 9: Quasi-Biennial Oscillation

Chapter 10: Polar Processes

Chapter 11: Upper Stratosphere and Lower Mesosphere

Chapter 12: Synthesis Summary



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Publications

- **SPARC-related Special Issues:**

1. SPARC Reanalysis Intercomparison Project (S-RIP) special Issue in ACP (> 45 published papers)
2. Chemistry-Climate Modelling Initiative (CCMI) joint special issue in ACP/AMT/ESSD/GMT (>35 published papers)
3. QBO Modelling Intercomparison (QBOi) online collection in QJRMS (6 published papers)
4. Water Vapour Intercomparison II (WAVAS-II) joint special issue in ACP/AMT/ESSD (15 published papers)
5. Towards Unified Error Reporting (TUNER) special issue in AMT (8 published papers)
6. The Exceptional Arctic Stratospheric Polar Vortex in 2019/2020: Causes and Consequences special issue in JGR:Atmosphere/GRL (> 10 published papers)

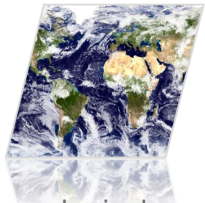


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Future SPARC

Current themes



atmospheric dynamics
& predictability



Chemistry & climate



Long-term records
for process understanding

Evolving ideas

Thematic expertise	Methodologies	Implementation
Atmospheric Circulation <ul style="list-style-type: none"> Rossby wave dynamics Dynamical coupling Feedback mechanisms Understanding variability Extreme events/ compound events Local impacts of climate change Role in predictability 	Observations <ul style="list-style-type: none"> Support for observation missions Long-term record analysis Produce climatologies Data assimilation Uncertainty reporting Identify needs in global observation networks 	Longer-term activities <ul style="list-style-type: none"> Networking-focus (e.g. DynVar) Sustaining long-term assessments of data records or model developments
Atmospheric Composition <ul style="list-style-type: none"> Long-term records Cloud processes Air quality 	Model simulations <ul style="list-style-type: none"> Provide input data sets (e.g. aerosol) Impact studies Model expansion (<i>higher altitudes</i>) Assessment studies (e.g. after extreme events/season) Intercomparison studies Large ensemble studies Consistency checks 	Short-term activities <ul style="list-style-type: none"> On specific topics (e.g. LOTUS) Rapid assessments Workshops (<i>knowledge assessment & connecting communities</i>)
Model assessment <ul style="list-style-type: none"> Consistency checks (btw. Models; time scales; time-variations of parameters,...) Understanding model bias & internal variability Understanding prediction skill (windows of opportunity; signal-to-noise paradox) 	New: Machine learning & Data Science	Scientific exchange & collaboration <ul style="list-style-type: none"> Summer schools & technical training ECS forums Informal community events (e.g. journal clubs) (Online) Seminar series
<p>Those are all connected...</p>		
		SPARC deliverables: <ul style="list-style-type: none"> „Best practice“ guidelines White papers Reviews Assessment Reports/ special issues Set of dynamical analysis tools
		SPARC outreach <ul style="list-style-type: none"> “Regional ambassadors” Advocacy towards funding agencies; mission planning

Issues and Challenges

How you work with the new “Core Projects”?

- SPARC would like to *have representatives* in the new homes’ panels/activities to facilitate collaborations. Many SPARC activities work on related topics, and *collaborations are welcome, including those with ESMO and RifS (and Academy LH).*

How do you plan to work with the “Lighthouse activities”?

- Contribute to the LHAs by *providing input through the SPARC activities’ work.*
- **EPESC**: Monitoring and modelling Earth system change, Integrated attribution and projection, assessment of current and future hazards are addressed by many SPARC activities
- **MCR**: regional climate and climate extremes on S2S time scales (SNAP activity)
- **SLC**: Safe landing pathways, understanding high-risk events, and perturbed carbon cycle (e.g., climate intervention) are already addressed some SPARC activities.
- **DE**: Data assimilation for climate models (SPARC Data Assimilation WG)



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Issues and Challenges

How do you see your community evolving e.g. new activities or activities coming to an end?

- Two current SPARC activities are set to terminate in 2022 (PSCi; WAVAS II).
- New activities will evolve through the new strategy, with *more tropospheric-related topics*. WAVAS II also recommends picking up a few topics they have not been able to examine. The topic of short-lived climate forcers (SLCFs) has been of interest for a while, and might be sparking a new activity. SCLF-related works would *strengthen connections to IGAC and GAW*.
- *Early Career Scientists are encouraged to take on leading roles* in SPARC, e.g. in new community formats such as webinars or journal clubs.



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Upcoming Meeting

SPARC 6th General Assembly: 24-18 October 2022 (± 1 day)

New meeting format: in-person meeting at 3 different hub-locations:

- Asia (First Institute of Oceanography, China *with strong support from the CLIVAR IPO*)
- Europe (ECMWF)
- North America (NASA-NOAA-NCAR)

																									Total Live	Talks	Posters
Day 1																											
Asia/Australasia	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	3	2	1
Europe/Africa	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	6	4	2
N. & S. America	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	3	2	1
Day 2																											
Asia/Australasia	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	6	2	4
Europe/Africa	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	6	3	3
N. & S. America	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	6	3	3
Day 3																											
Asia/Australasia	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	7	4	3
Europe/Africa	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	3	1	2
N. & S. America	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	4	2	2
Day 4																											
Asia/Australasia	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	6	2	4
Europe/Africa	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	7	3	4
N. & S. America	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	8	4	4
Day 5																											
Asia/Australasia	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	5	4	1
Europe/Africa	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	5	3	2
N. & S. America	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	6	3	3



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Others

SPARC Leadership

- Co-chair **Neil Harris** is finishing his last term as a SPARC SSG co-chair.
 - nominating **Amanda Maycock** (Univ. Leeds, UK; Europe/Africa time-zone)
 - nominating current SSG member **Karen Rosenlof** (NOAA, USA; America time-zone)
- SPARC is nominating Sophie Szopa (France) and Wenshou Tian (China) as new SSG members, replacing current two members. In contact with another possible new member: Sarah Osima (Tanzania).

SPARC Office matters

- Supported **Regional Climate Forum in Europe and Western Asia**
- Sabrina Zechlau joining the SPARC IPO@DLR, Germany as *Project Scientist (part-time)*; officially starting in August.
- Mareike Heckl will be on parental leave from 25 July 2021.
- Agreement between WMO and DLR (2021-2023) in the process of being signed.



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