
WCRP
World Climate Research Programme
39th WCRP JSC
16th – 20th April 2018
WCRP
SPARC
Stratosphere-troposphere
Processes And their Role in Climate

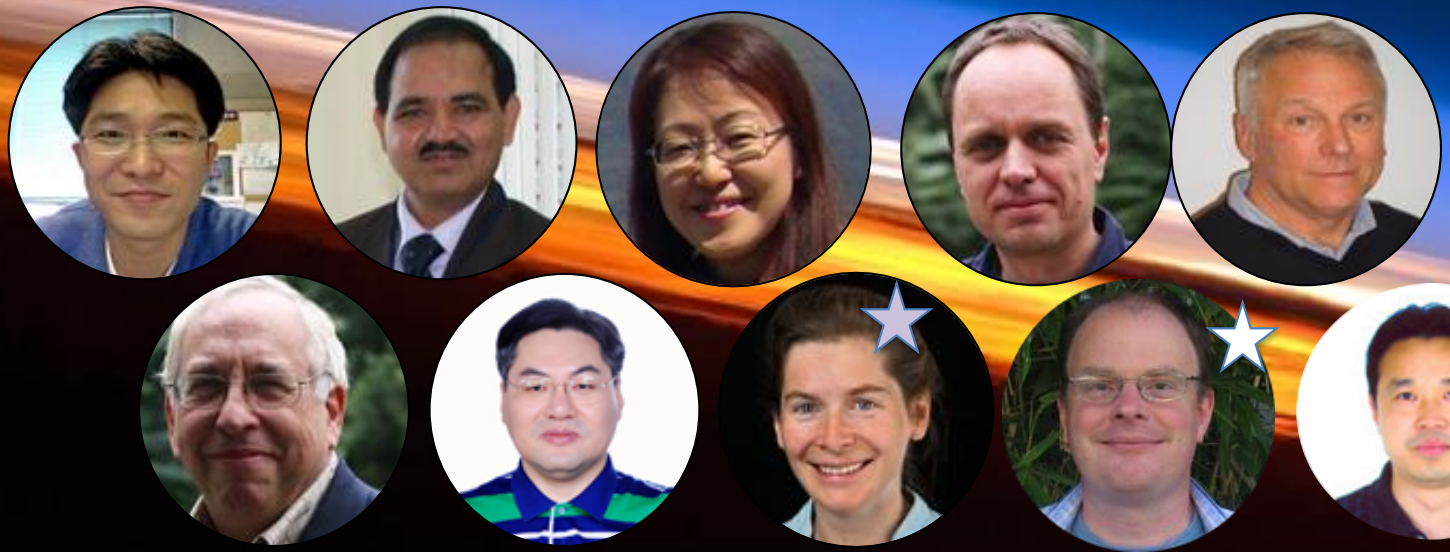
Current SSG

Neil Harris
Co-Chair

Judith Perlwitz
Co-Chair

Boram Lee
WCRP Liaison

The SSG



SPARC
Stratosphere-troposphere Processes And their Role in Climate

> 3000 members worldwide

Highlights

WMO/UNEP Scientific Assessment of Ozone Depletion: 2018

- New insights into the trends and uncertainties in the vertical distribution of ozone have been provided by the SPARC/GAW,/IOC SI2N and LOTUS activities.
- New coupled climate-chemistry model scenario runs, pivotal for understanding future changes in O_3 and UV-B, have been organised in SPARC/IGAC CCMI.
- Reductions in the CCl_4 budget discrepancy, an important political topic, were found in the CTC report which involved academics and industry experts.
- *Early understanding of the anomalous quasi-biennial oscillation in 2016 in QBO-i.*
- *Improved understanding of stratospheric particles in SPARC/ SSiRC & PSC activities - Composition in the Indian monsoon.*
- *Updated knowledge of stratospheric temperature, water vapour and solar influence through ATC, WAVAS II and SOLARIS-HEPPA.*

- *SPARC's work for O3 Assessment – parallels for WCRP post-Paris*

Highlights

Ozone layer:

*How well do we know the trends in the **upper** stratosphere?*

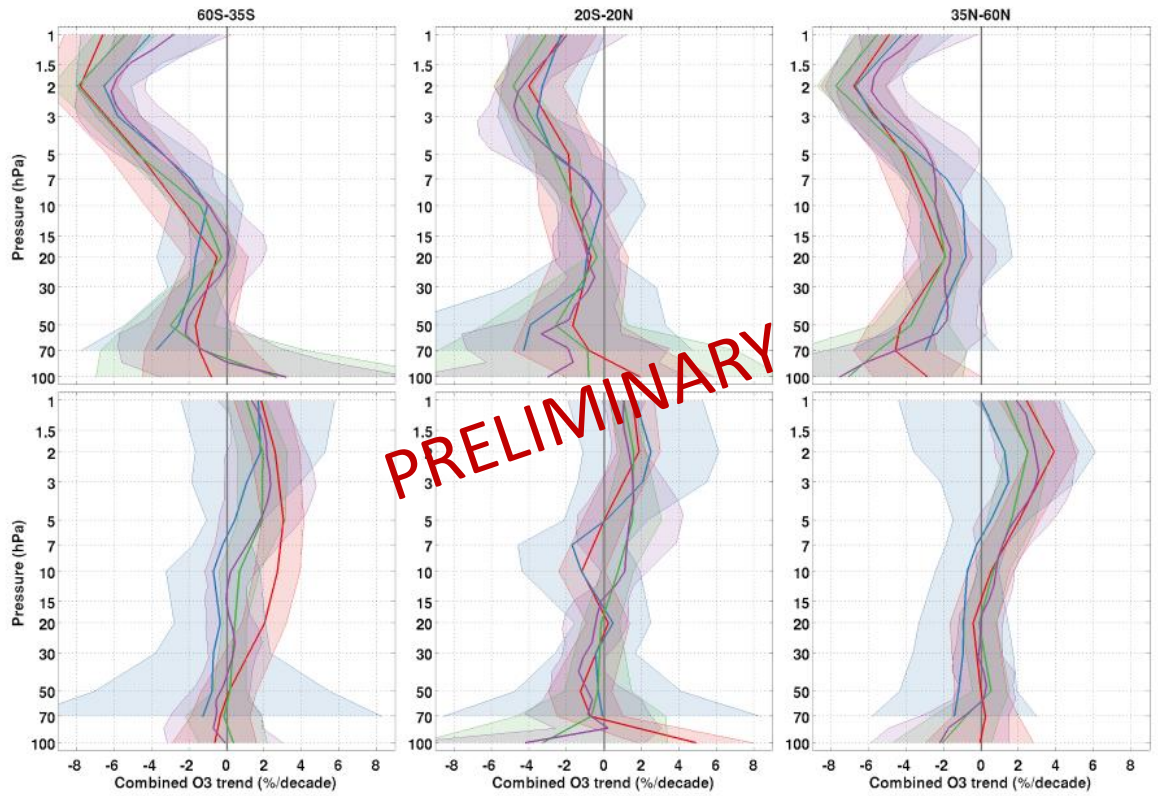


Figure 6.1. *Overview of ozone profile trends from past and recent assessments. Top row are trends before the turnaround of ODS; bottom row are trends since the turnaround. The shaded area represents the 95% confidence interval. Figure S6-1 in Supplement shows the profile trend uncertainties.*

1979-1997
CFCs increasing

1997-2016
CFCs decreasing

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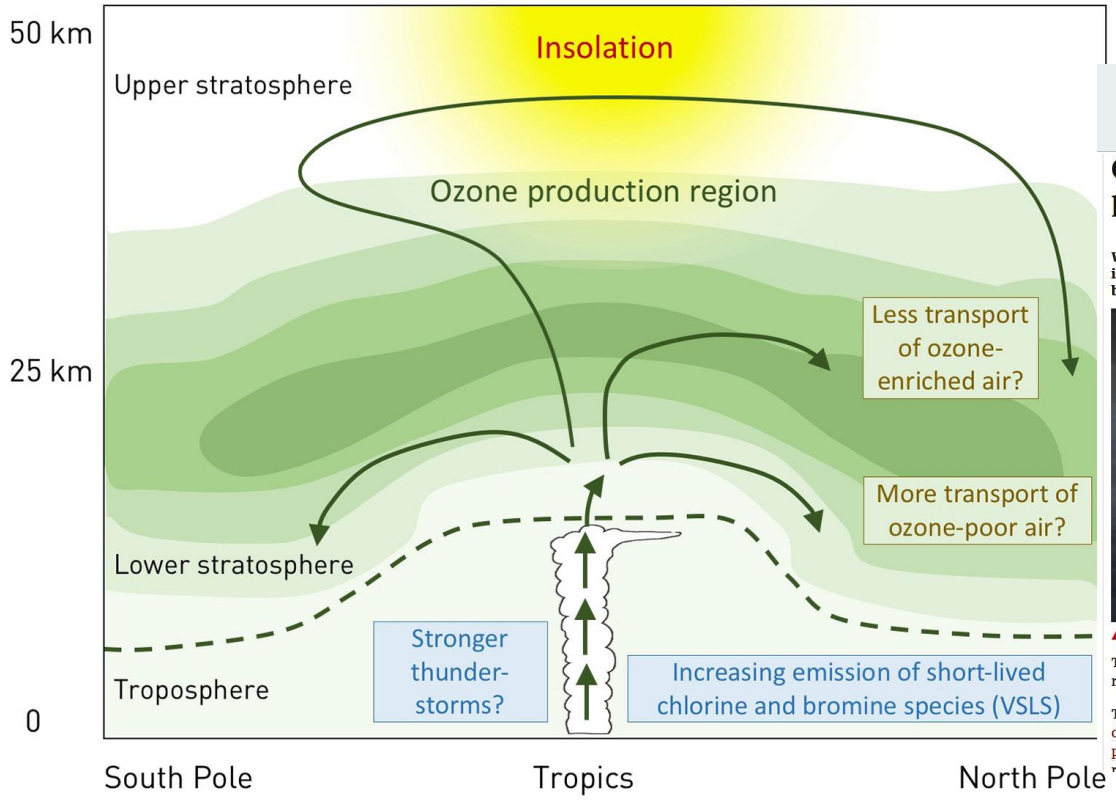
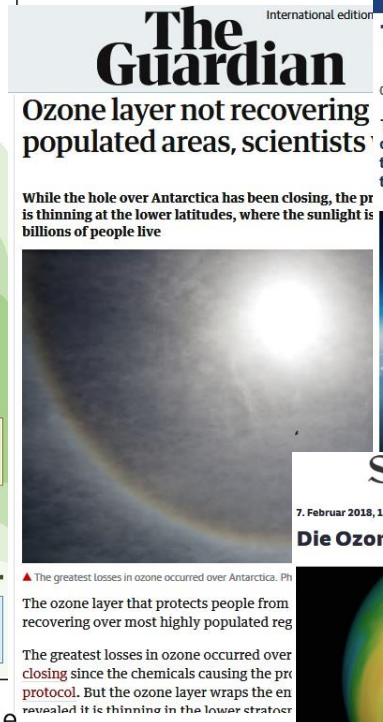
Ozone layer:

*Despite the ban on CFCs, ozone in the **lower** stratosphere has continued to decline at latitudes between 60° S and 60° N.*




The Guardian
International edition
Ozone layer not recovering populated areas, scientists
While the hole over Antarctica has been closing, the pr
is thinning at the lower latitudes, where the sunlight is
billions of people live
The greatest losses in ozone occurred over Antarctica. Ph
The ozone layer that protects people from
recovering over most highly populated reg
The greatest losses in ozone occurred over
closing since the chemicals causing the pr
protocol. But the ozone layer wraps the en
revealed it is thinning in the lower stratosr


ETH zürich
The ozone layer continues to thin
06.02.2018 | Press release
The vital ozone layer has continued to deplete in recent years ov
densely populated mid-latitudes and tropics, while it is recoverin
the poles. This is documented by an international research team
the journal *Atmospheric Chemistry and Physics*.
ozone prote
effective CF


Süddeutsche Zeitung
7. Februar 2018, 18:48 Uhr Atmosphäre
Die Ozonschicht ist so dünn wie noch nie
iation. In t
chlorinat
Das Ozonloch über der Antarktis erholt sich langsam. In anderen Breiten sieht es weniger gut aus. (Foto: dpa)
Das Ozonloch wird zwar kleiner, doch über den Tropen und in mittleren Breiten dünnt die Ozonschicht weiter aus.

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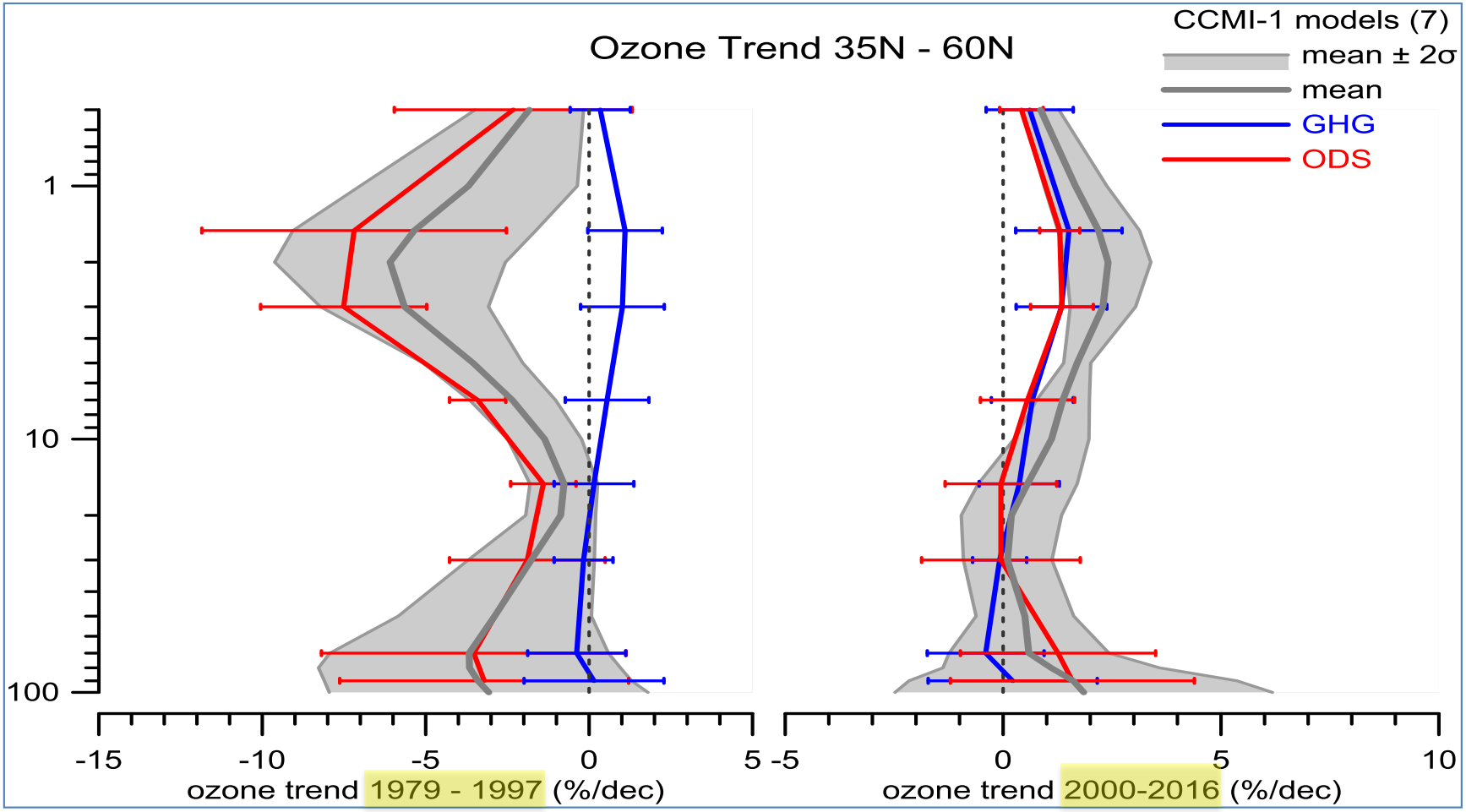
CCMi – coordinated model runs

Full output being used for many studies – ones aspect for WMO 2018 is attributing ozone changes to CFCs and GHGs.

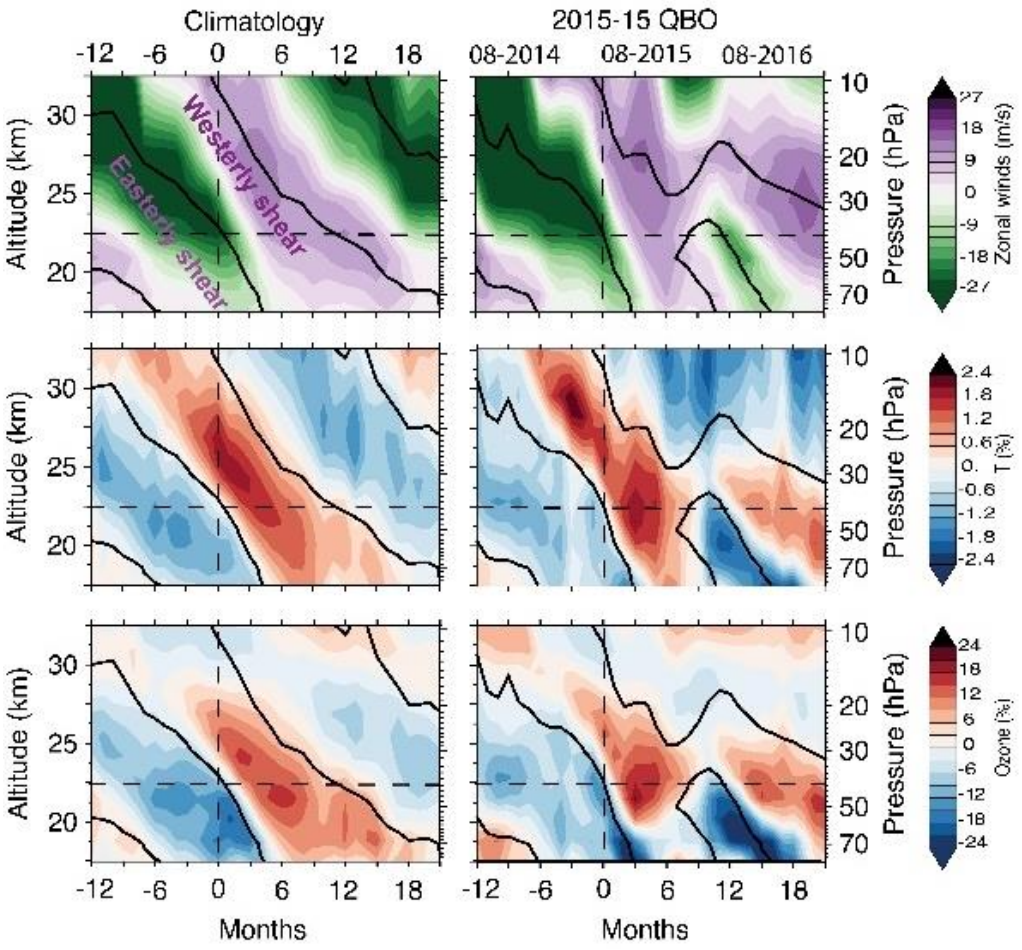


Highlights – QBO anomaly

Understanding the QBO:
The SPARC QBO initiative has already completed 5 completed experiments, using 17 models, creating 25TB of data at CEDA.

A sixth community experiment is underway, investigating the relation between ENSO and QBO.
An updated diagnostics list for QBO-MJO analyses has been created.

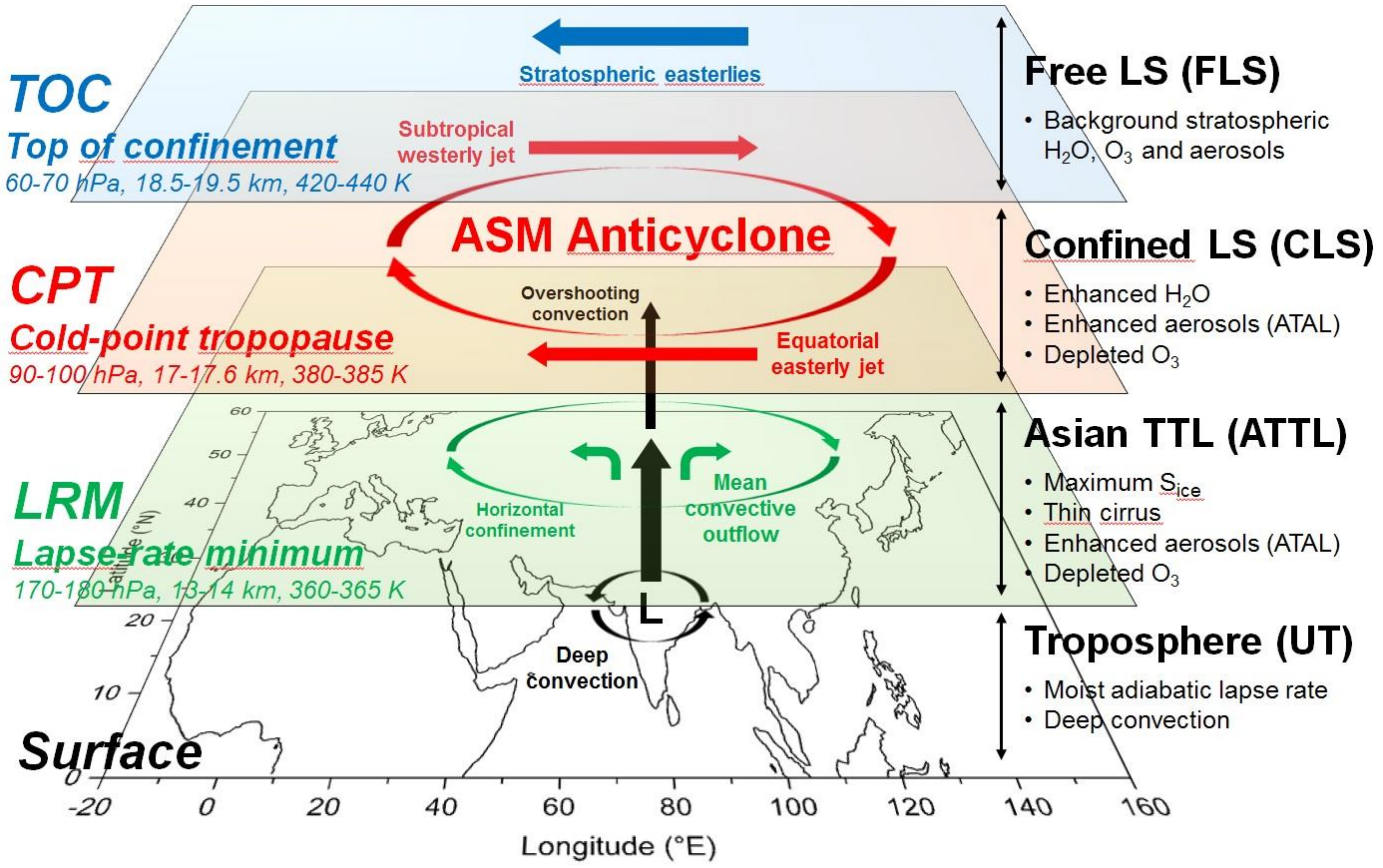
Month 0 = May 2016



Highlights

SPARC / SSiRC & ACAM contributions to StratoClim Campaign 2016-2017

Campaign, based in Katmandu, including Balloon & aircraft measurements to investigate the Asian Monsoon: significantly improved understanding of the Monsoon anticyclone, qualitatively and quantitatively.



Highlights - temperature

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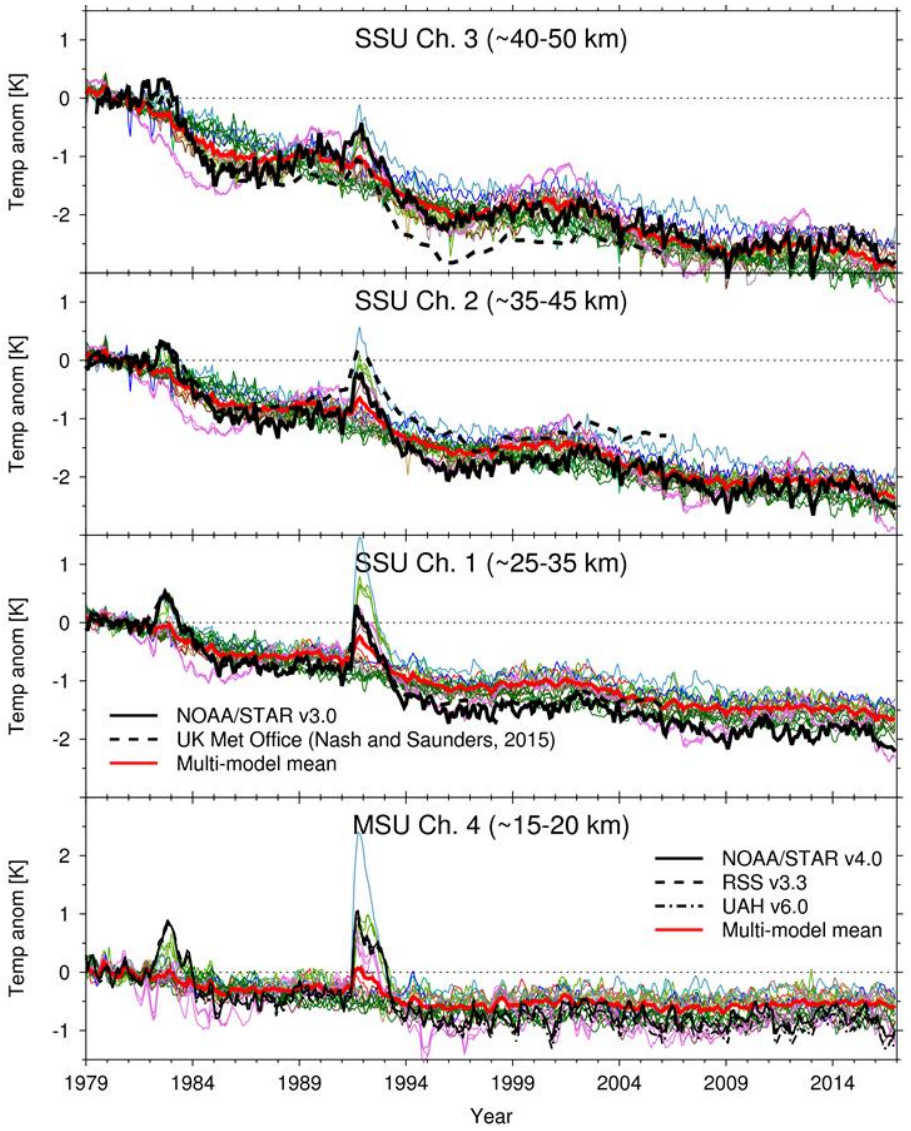
Revisiting the mystery of recent stratospheric temperature trends:

Reprocessed SSU satellite data from Met Office and NOAA/STAR are in better agreement than former data. Greater consistency is seen in stratospheric temperature trends between SSU & AMSU observations and new chemistry-climate (CCMI) models.

The improved agreement comes largely from the recent updates to the SSU records, with the range of modeled trends being comparable to the last generation of chemistry-climate models.



Highlights

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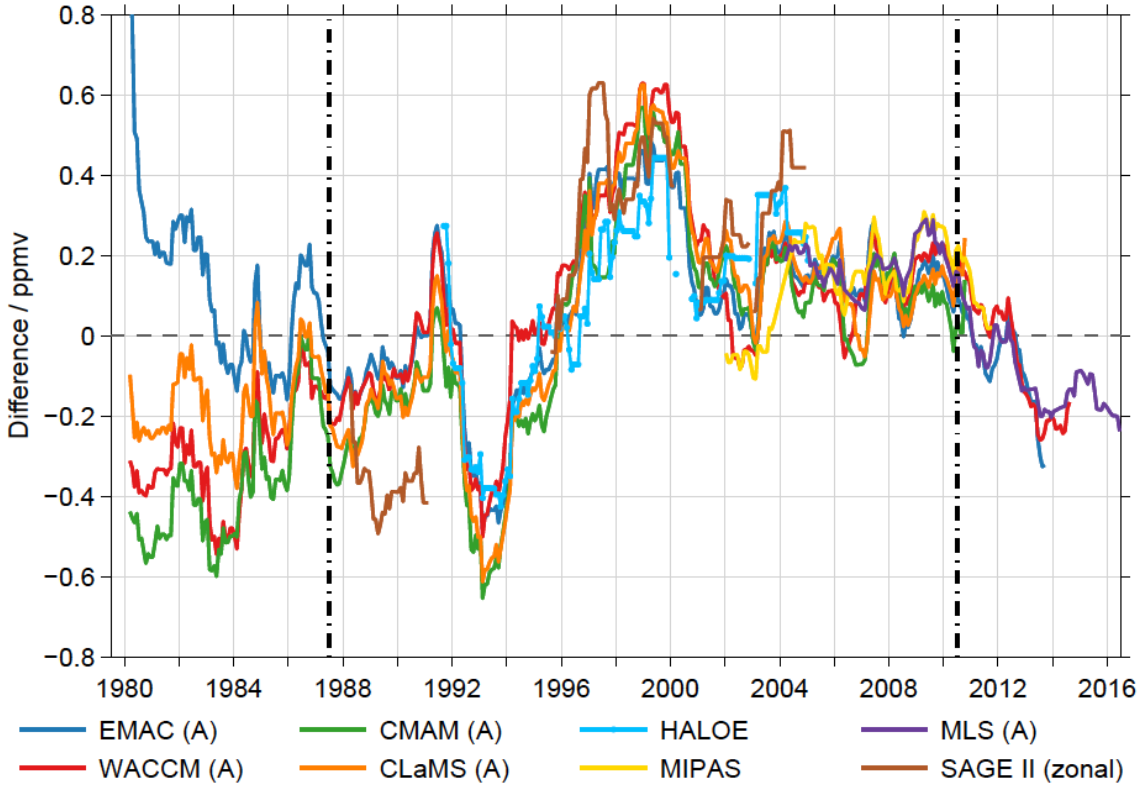
Water vapour in the lower stratosphere

A considerable difference of the temporal evolution of water vapour in the lower stratosphere between the Boulder FPH time series and satellite records and model simulations remains after analysis within WAVAS-II. This cannot be attributed to a non-representativeness of the Boulder location



Lossow et al., ACPD, 2018

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General

- S-RIP activity is providing guidance for next-generation reanalysis systems and for users of current re-analyses.
- Contribution to preparation and, now, analysis of CMIP-6.
- Promotion of collection of high resolution radiosonde data.
- Many others….
- *Engagement in training and international projects.*
- *Successful transition of International Project Office from ETH-Zurich to DLR Oberpfaffenhofen.*

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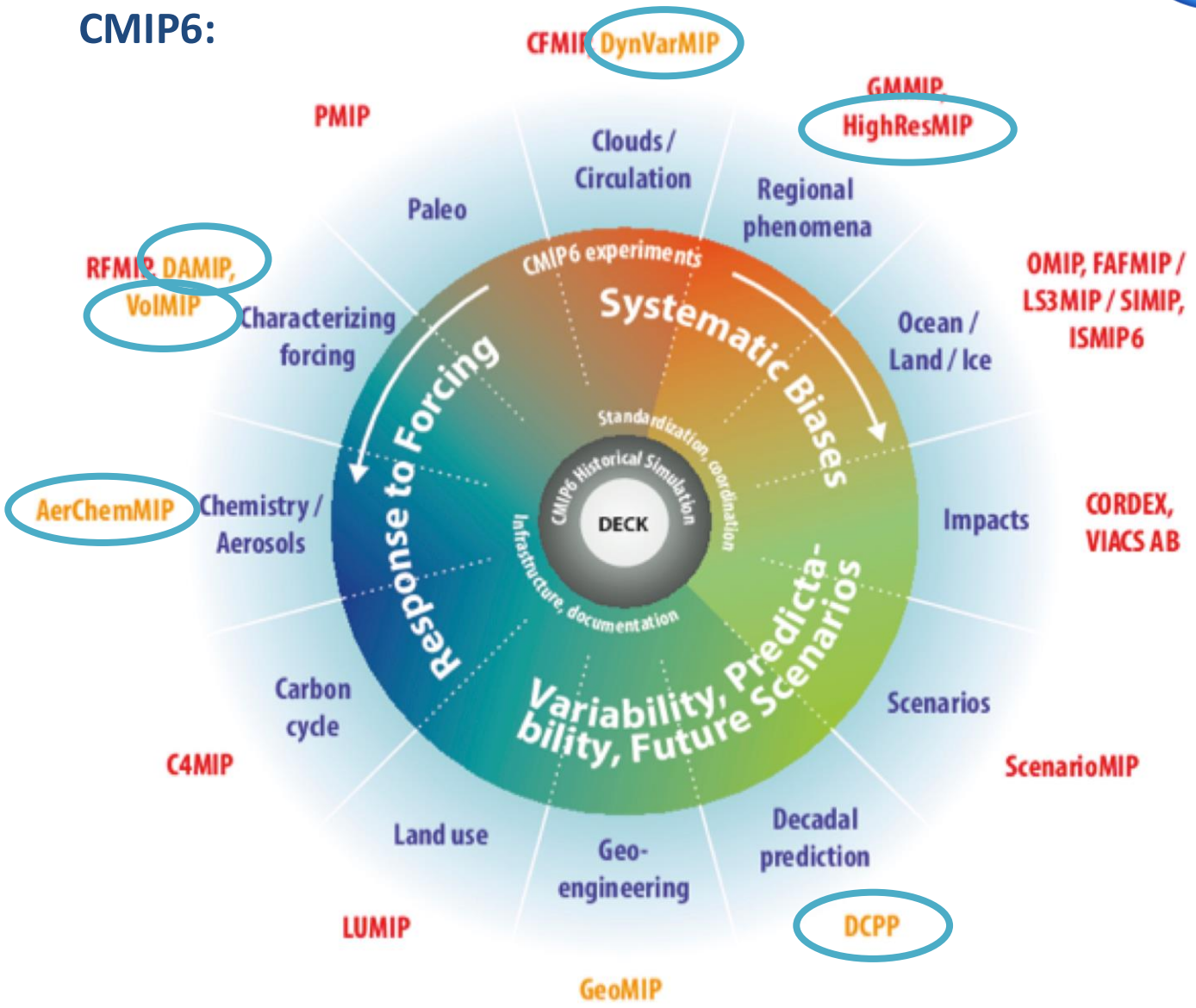
CMIP6:



+ Forcing Datasets:
- Ozone
- Volcanoes
- Solar

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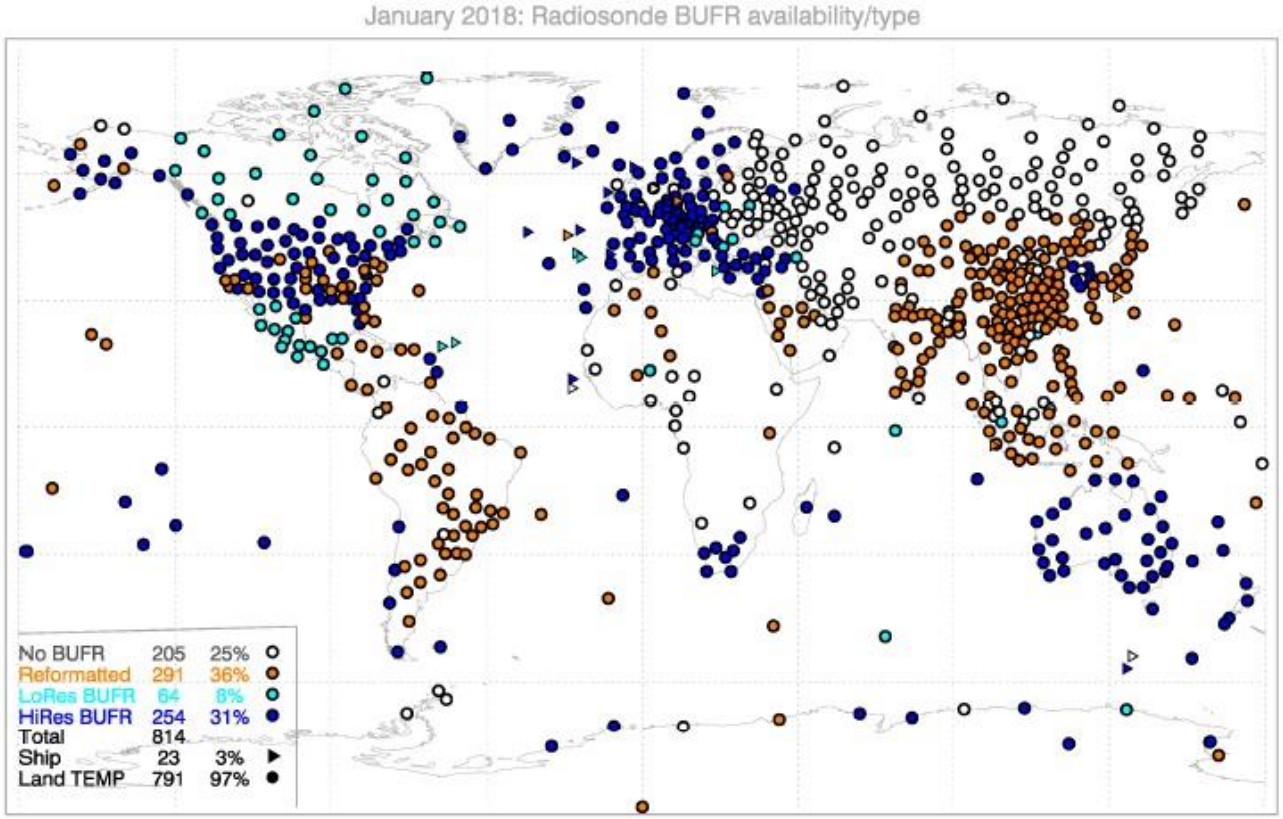
Increase in high vertical-resolution radiosonde data (HVRRD):

SPARC initiatives have encouraged greater greater research availability of global high vertical-resolution radiosonde data (HVRRD). Approximately 30 % of the BUFR data set, covering several years, are HVRRD (defined as over 300 levels reported). The move to increased HVRRD has largely been motivated by desires of the operational centers, and that will likely lead to vastly increased research availability of HVRRD.



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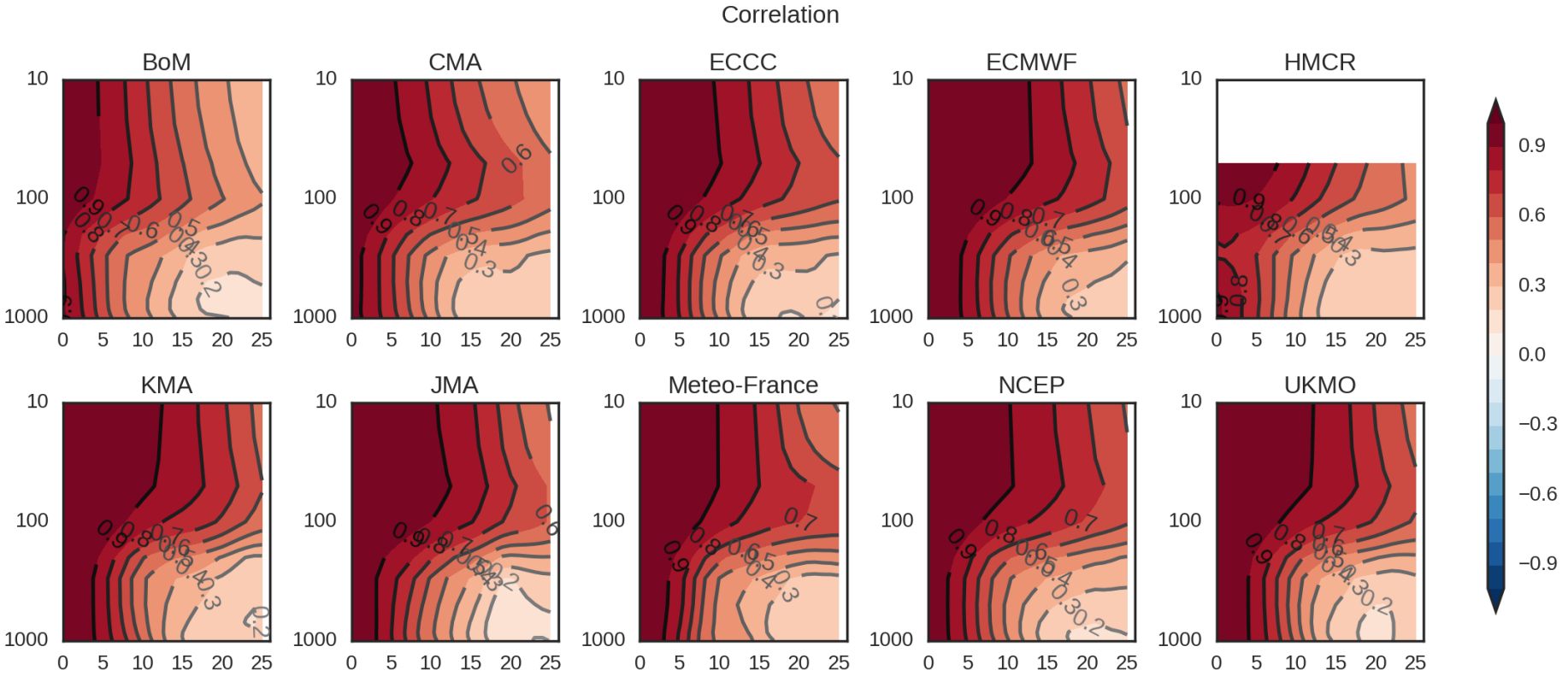
Forecasting skills of S2S models:

A detailed analysis of the skill available from sub-seasonal forecasting systems in the stratosphere and troposphere is underway. In the analysis of the Northern Annular Mode, the model ensembles show significant skill throughout the stratosphere out to 4 weeks and beyond. Tropospheric skill drops below 0.6 by around day 7.



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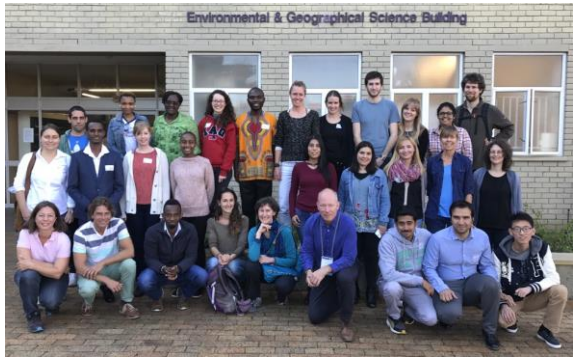
(Co-)organisation of training schools:

2nd ACAM training school: 'Observations and Modeling of Atmospheric Chemistry and Aerosols in the Asian Monsoon'
Guangzhou, China
10-12 June 2017

IUGG training school:
'Stratosphere-Troposphere Interactions'
Cape Town, South Africa
2-5 September 2017



ECR event/Local workshop
'WCRP grand challenges and regional climate change'
Incheon, Rep. of Korea
18-20 October 2017

SPARC General Assembly 2018

1 - 5 October - Kyoto, Japan

SPARC Stratosphere-troposphere Processes And their Role in Climate

SPARC General Assembly 2018 science themes :

- **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**

Coordinated w. Future Earth / IGAC Conference in Takamatsu the preceding week

Joint with Belmont Forum Climate Initiative

Submitted abstracts: 530

Early Career Scientists: > 80

Invited talks by scientists from France, Germany, Israel, Japan, Rep. of Korea, Switzerland, and USA, including Google Loon and Belmont Forum.

Sponsorship money is tight – none from WMO/WCRP

SPARC <-> Strategic Plan

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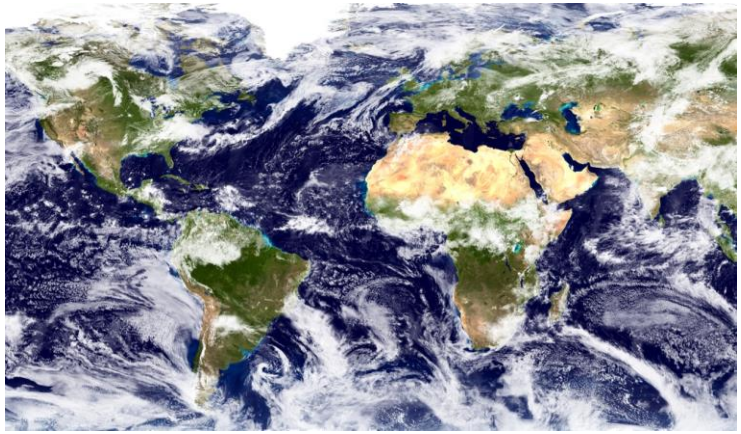

Atmospheric Dynamics + Predictability

How can the impact of weather and climate be reduced?

Chemistry + Climate

How can we limit the future impacts of air quality and climate?

Long-term Records for Climate Understanding

What is happening and how sure are we of that?

Looking ahead

- The major challenge is helping to formulate WCRP's response to its review. *This should open up opportunities for better collaborations both internally (WMO & WCRP) and externally (Belmont Forum, Future Earth and industry).*
- SPARC is valued as an organisation that delivers valuable products, such as question-driven workshops and reports, or coordinated assessments of observational and modelled data sets. *This is a strength that should be built on.*
- It would be good to clarify the structure of the SPARC activities. *One option is to have a panel with the co-chairs of the WMO-UNEP Scientific Assessment of Ozone Depletion and other interested parties (WMO, UNEP) to promote activities on issues which are relevant to future assessments. Each activity would involve appropriate expertise from industry, academia and governments.*
- N.B. A similar approach could be applied to broad initiatives on convection and on atmospheric dynamics which build on activities in various parts of WCRP.
- *Telecons with the co-chairs of the core projects take place periodically and should continue.*

Looking ahead

- SPARC uses its funding to cover travel to workshops and training schools, with priority for early career researchers and researchers from scientifically developing countries.
- In the past few years, opportunities to provide support for deserving scientists have been missed as a result of the low funding level (40 kCHF per year) .
- The situation is now critical as no additional support has been provided by WMO or WCRP for the SPARC General Assembly. This is severely limiting how many scientists can 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.*

Links to new objectives of WCRP

SPARC
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O1. Understanding the climate system

Identify and constrain key processes that critically determine the reservoirs and flows of energy and water – and carbon, aerosols, salt, and other constituents – within and between the components of the Earth System.

O2. Determining predictability on weekly to decadal timescales

Quantify the uncertainties and predictabilities inherent in weekly to decadal time scales of the climate system.

O3. Determining projectability on decadal to centennial timescales

Quantify the sensitivities and emergent constraints inherent in the changing climate system.

O4. Connecting climate science to policy and decision making

Improve the generation and use of decision relevant climate information and knowledge about the evolving Earth system, across space and time scales, to natural variability and climate change.

Old version

Links to new objectives of WCRP

SPARC
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Important issues for SPARC

Do's

- Composition – defining WCRP's role and the relationship with other partners
- Atmospheric dynamics – give it a natural home
- Maintaining WCRP atmospheric communities
- Keep flexible operation
- Keep a role in liaison with the Montreal Protocol process

Don'ts

- Lose what we have
- Become too bureaucratic
- Separate composition and dynamics/transport

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Old version

Future Aims

SPARC
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- compile information on the current state of understanding temperature trends (ATC)
- support of AerChemMIP in evaluations of upcoming simulations (CCMI)
- improve understanding and parametrisation of orographic gravity wave drag (GW)
- publication of LOTUS final report (LOTUS)
- review paper on Polar Stratospheric Clouds (PSC)
- overview paper on the stratospheric role on predictability in the S2S models and work towards providing real-time forecasts of the polar vortex using S2S model output online (SNAP)
- coordinated analysis of the solar signal in CCMI simulations (SOLARIS-HEPPA)
- coordinating a Volcano Response (VolRes) report (SSiRC)
- full review article on the current understanding and our scientific challenges on the subjects of SATIO-TCS
- completion of the S-RIP final report and start of the review process
- assess which discrepancies between two data sets can be attributed to natural variability along with less than perfect collocation of comparison measurements and how to remove discrepancies which cannot be explained by the respective error budgets (TUNER)
- comprehensive assessment of how well we can characterize and quantify trends of key atmospheric quantities in the UTLS across different observation platforms (OCTAV-UTLS)

Thank You!

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