



WCRP: World Climate Research Programme

SPARC: Stratospheric Processes And their Role in Climate

# SPARC Reanalysis/analysis Intercomparison Project (*S-RIP*)

## Introduction and Goals of the Meeting

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# Motivation for S-RIP

- Middle atmosphere/climate community has used reanalysis and analysis data sets
  - to understand atmospheric processes and variability
  - to validate chemistry-climate models (e.g., CCMVal)
  - for trend analyses (potential)
- There are currently **~9** global reanalysis data sets available worldwide
- Different reanalyses give different results for the same diagnostic
- Depending on the diagnostic, the different results may be due to differences either in
  - observational data assimilated
  - assimilation scheme
  - forecast model
  - or any combination of these
- **→ Need to investigate each diagnostic to evaluate RAs**

# Available Global Reanalyses

Product	Centre	Period	Resolution and <b>Lid Height</b> of the Forecast Model	Contact for S-RIP
NCEP-1 (R-1)	NCEP and NCAR	1948-present	T62, L28, <b>3 hPa</b>	W. Ebisuzaki
NCEP-2 (R-2)	NCEP and DOE AMIP-II	1979-present	T62, L28, <b>3 hPa</b>	W. Ebisuzaki
ERA-40	ECMWF	1957-2002	T <sub>L</sub> 159 & N80 reduced Gaussian (125km), L60, <b>0.1 hPa</b>	D. Tan
ERA-Interim	ECMWF	1979-present	T <sub>L</sub> 255 & N128 reduced Gaussian (79km), L60, <b>0.1 hPa</b>	D. Tan
JRA-25/JCDAS	JMA and CRIEPI	1979-present	T106, L40, <b>0.4 hPa</b>	K. Onogi
JRA-55 (*)	JMA	1958-2012	T319, L60, <b>0.1 hPa</b>	K. Onogi
MERRA	NASA	1979-present	(2/3)x(1/2) deg., L72, <b>0.01 hPa</b>	S. Pawson
NCEP-CFSR	NCEP	1979-present	T382 (T574 for post 2010), L64, <b>0.266 hPa</b>	C. Long
NOAA-CIRES 20th Century Reanalysis (20CR_v2)(**)	NOAA/ESRL PSD	1871-2010	T62, L28, <b>2.511hPa</b>	G. Compo & J. S. Whitaker

(\*) JRA-55 will be available later this year  
 (\*\*) 20CR assimilates only surface pressure reports and uses observed monthly sea-surface temperature and sea-ice distributions.

- New reanalysis data sets, within a few years:  [\(see http://reanalyses.org for more details\)](http://reanalyses.org)
  - NCEP-CFSR-Lite, ERA-20C (and ERA-SAT), and JRA-55 family (i.e., JRA-55, JRA-55C, and JRA-55AMIP)
- Some “analysis” data sets:
  - Met Office stratospheric assimilated data, operational analyses by ECMWF, NCEP and JMA, NASA GEOS analyses, US Navy’s NOGAPS-ALPHA, etc.

# S-RIP Goals and Rationale

- Coordinated intercomparison activity should be necessary . . . even if SPARC related diagnostics are only considered
- Consistent interaction between data users and reanalysis providers should be necessary . . . to ensure improvements in future reanalyses
- S-RIP Goals:
  - to create a communication platform between the SPARC community and the reanalysis centers
  - to understand current reanalysis products (and to reasonably interpret their differences)
  - to contribute to future reanalysis improvements in the middle atmosphere region
  - Structure:
    - Preparation team + Scientific Working Group (11 people) + Chapter Co-leads & Contributors & other researchers who actually work on specific diagnostics
    - Scientific WG: (1) suggests the key processes and the relevant diagnostics (i.e., the final report chapters); (2) finds the researchers to lead each chapter and to work on each diagnostic; etc.
    - Chapter Co-leads: Responsible for each chapter (i.e., sciences of that field)
  - S-RIP is an (“emerging”) activity of the SPARC community

# S-RIP Progress to Date

- **June 2011:** Discussion started at 8<sup>th</sup> SPARC Data Assimilation (DA) workshop, Brussels, Belgium (after that, through emails, at meetings, etc.)
- **January 2012:** Proposal article in SPARC Newsletter (by Fujiwara, Polavarapu, and Jackson)
- **February 2012:** S-RIP officially endorsed by the SPARC SSG
- **February 22-24, 2012:** Stratospheric Sudden Warming workshop Kyoto 2012
- **June 11-13, 2012:** 9<sup>th</sup> SPARC DA workshop, New Mexico, USA (there was an S-RIP session)
- **June 25-29, 2012:** SPARC workshop on the Brewer-Dobson circulation, Grindelwald, Switzerland
- **Summer 2012:** Scientific WG was formed

<b>WG members</b>	
Masatomo Fujiwara (co-lead)	Hokkaido Univ., Japan
David Jackson (co-lead)	Met Office, UK
Thomas Birner	Colorado State Univ., USA
Simon Chabrillat	Belgian Institute of Space Aeronomy, Belgium
Sean Davis	NOAA/ESRL, USA
Michaela Hegglin	Univ. Reading, UK
Kirstin Krüger	GEOMAR, Germany
Craig Long	NOAA/NCEP, USA
Gloria Manney	NWRA/New Mexico Tech, USA
Susann Tegtmeier	GEOMAR, Germany
Yulia Zyulyaeva	P.P.Shirshov Institute of Oceanology, Russia

<b>Reanalysis-Centre Contacts for S-RIP</b>	
Wesley Ebisuzaki	NCEP/NCAR, NCEP/DOE
David Tan	ERA-40, ERA-Interim
Kazutoshi Onogi & Yayoi Harada	JRA-25/JCDAS, JRA-55
Steven Pawson	NASA-MERRA
Craig Long	NCEP-CFSR
Gilbert Compo & Jeffrey S. Whitaker	NOAA/CIRES 20CR

**S-RIP Preparation Team:**

M. Fujiwara, S. Polavarapu, D. Jackson, and  
D. Tan (as the RA-centre representative)

# S-RIP: Broad Schedule

- Summer 2012: Scientific WG was formed
  - Discussion in WG on the chapter titles, co-leads, contributors, etc.
  - Two co-leads for most of the planned chapters
- April 2013: S-RIP Planning Meeting at Exeter, UK ←
- 2013-4: 1-2 further dedicated workshops on S-RIP
- ~2015-7: Write a report as a SPARC report
  - Project duration expected to be 3-5 years for the first phase
- Post 2017:
  - additional phases because reanalysis centres envisage a 7-year period between new generations of reanalysis products (we need to establish a continuous evaluation system?)

# S-RIP Report Structure (1/5)

- Based on SPARC experiences, e.g., CCMVal-2, DynVar, (WMO Ozone Assessment), etc.
  - Each chapter is dedicated to a particular field of the SPARC sciences
- Each chapter has co-leads and contributors who are the experts of the field
  - Each chapter is either a review of publications / collection of contributors' works / joint project / combination of these; decided by the co-leads and contributors
  - Ideally, the works cited in the report are from peer-reviewed publications
  - Open to everyone who is interested to contribute; chapter co-leads will be the major contact points
- WG and Prep. Team will make overall arrangements of the project/report



# S-RIP Report Structure (2/5)

- Chapters: Two groups
  - “Basic”: Intro., Description, Climatology and Interannual Variability of Dyn. Var./O<sub>3</sub>-H<sub>2</sub>O
  - “Advanced”: BDC, STC, UTLs/TTL, Polar, QBO, USLM, GW
- Schedule
  - ~2 years for “basic”, 4-5 years for “advanced” ??
  - (“basic” needed for “advanced”; to show some S-RIP products relatively soon)
  - Decided by each chapter’s members (however, if we need >5 years, we had better consider next “phases”)

# S-RIP Report Structure (3/5)

- Chapter 1: **Introduction**
  - Co-leads: David Jackson, Masatomo Fujiwara
  - Contributors: All other WG members
- Chapter 2: **Description of the Reanalysis/analysis Systems**
  - Co-leads: David Tan, Craig Long, Masatomo Fujiwara
  - Contributors: All other reanalysis-center contacts for the S-RIP
- Chapter 3: **Climatology and Interannual Variability of Dynamical Variables**
  - Co-leads: Craig Long, Masatomo Fujiwara
  - Contributors: Sean Davis, all other WG members
- Chapter 4: **Climatology and Interannual Variability of Ozone and Water Vapor**
  - Co-leads: Sean Davis, Michaela Hegglin
  - Contributors: Susann Tegtmeier, Masatomo Fujiwara, all other WG members

# S-RIP Report Structure (4/5)

- Chapter 5: **Brewer-Dobson Circulation**
  - Co-leads: [Thomas Birner](#), [Beatriz Monge-Sanz](#)
  - Contributors: Sean Davis, Simon Chabrillat, Edith Botek, Hella Garny, Harald Boenisch, Gabriele Stiller, Bernard Legras, Howard Roscoe, Darryn Waugh, Thomas Reddmann, Peter Haynes, Kota Okamoto, Kaoru Sato,
- Chapter 6: **Stratosphere-Troposphere Coupling**
  - Co-leads: [Edwin Gerber](#), [Yulia Zyulyaeva](#)
  - Contributors: Kirstin Krueger, Thomas Birner, Simon Chabrillat, Edith Botek, Mark Baldwin, Alexey Karpechko,
- Chapter 7: **Upper Troposphere and Lower Stratosphere**  
(TTL may go to a separate chapter)
  - Co-leads: [Gloria Manney](#), [Cameron Homeyer](#), [Susann Tegtmeier](#), [Kirstin Krueger](#)
  - Contributors: Michaela Hegglin, Sean Davis, Thomas Birner, Simon Chabrillat, Edith Botek, Masatomo Fujiwara,

**NOTE: Chapter order/numbering is tentative.**

# S-RIP Report Structure (5/5)

- Chapter 8: **Polar Processes**
  - Co-leads: [Michelle Santee](#), [Alyn Lambert](#)
  - Contributors: Gloria Manney, Simon Chabrilat, Edith Botek,
- Chapter 9: **Quasi-Biennial Oscillation**
  - Co-leads: [James Anstey](#),
  - Contributors: Yoshio Kawatani, Lesley Gray,
- Chapter 10: **Upper Stratosphere and Lower Mesosphere**
  - Co-leads: [Diane Pendlebury](#), [Lynn Harvey](#)
  - Contributors: Gloria Manney, Peter Hitchcock, Takatoshi Sakazaki,
- Chapter 11: **Gravity Waves**
  - Co-leads: [Nedjeljka Zagar](#),
  - Contributors: Joan Alexander, Manuel Pulido, Ji-Eun Kim, Kaoru Sato,

**NOTE: Chapter order/numbering is tentative.**

# S-RIP Planning Meeting: Purposes

- What we'll do:
  - Finalize the report outline/chapters including chapter lead names and initial list of contributors
  - Define the diagnostics list and observational data for validation
  - Define the general guidelines and protocols
  - Define the timetable of the project
- Outcomes of the meeting include:
  - 2-page S-RIP Implementation Plan
    - This will subsequently be submitted to the SPARC SSG to approve (or not) for the transition of S-RIP from a SPARC “emerging activity” to a fully approved activity
  - SPARC Newsletter article about the meeting

# S-RIP Planning Meeting: Schedule

- 29 April (Mon) (8:30-):
  - Intro. (Chap.1), Reanalysis-centre presentations, Posters & Group Photo, Description (Chap.2), Clim. Int.ann. Var. Dyn. Var. (Chap.3)
- 30 April (Tue) (9:30-):
  - Clim. Int.ann. Var. O<sub>3</sub>/H<sub>2</sub>O (Chap.4), BDC (Chap. 5), STC (Chap. 6), Posters, UTLS/TTL (Chap. 7), Polar (Chap. 8) , Dinner
- 1 May (Wed) (9:00-):
  - QBO (Chap. 9), USLM (Chap. 10), Transport, GW (Chap. 11), Wrap up
- Chapters 2-11: 1 hour for presentation & discussion; two rapporteurs assigned

# Key points for discussion of each chapter

- Diagnostics list
- Observational data for validation
- Your answer to the question: “What will be the scientific approach to reanalysis intercomparison?”
  - Is it descriptive, e.g. "On diagnostic X, reanalysis Y is far from the others"?
  - Is comparison with observations essential or optional?
    - Working assumption: comparison with observations is desirable (and should take into account the observational uncertainties); if omitted then reasons should be given.
  - How much can different chapters vary in their approach?
  - How will the approach evolve over the S-RIP lifetime?
  - Are there approaches that are too ambitious for the initial steps, but should be flagged/planned/developed for later use?
- Ideas on the guidelines (e.g., choice of data sets, choice of periods, peer-reviewed publications only?, etc.)
- Schedule (current idea is ~2 years for Chapters 1-4 and 4~5 years for Chapters 5-)
- Other issues (e.g., data gathering/downloading/archiving issues, organization issues, website, etc.)
- Open issues and next steps

# For the Wrap up Discussion

- Chapter co-leads and rapporteurs prepare **one page slide with short summary/update**; chapter co-leads will present it (max. 2-3 min) at the Wrap-up Discussion
  - Please give it to MF by the end of Tuesday for Chapters 2-6 and by the lunchtime on Wednesday for Chapters 7-11
  - We should also note:
    - cross ref/links among different chapters
    - (reanalysis-center reviews on the results & interpretation of each chapter)
- Other issues include:
  - Website/S-RIP logo
  - **Next conference(s) (purposes, place and date) (any suggestions?)**



# Introduction and Goals of the Meeting

- Motivation for S-RIP
- S-RIP Goals and Rationale
- S-RIP Progress to Date / Broad Schedule
- S-RIP Report Structure
  
- S-RIP Planning Meeting: Purposes, Schedule, Wrap up