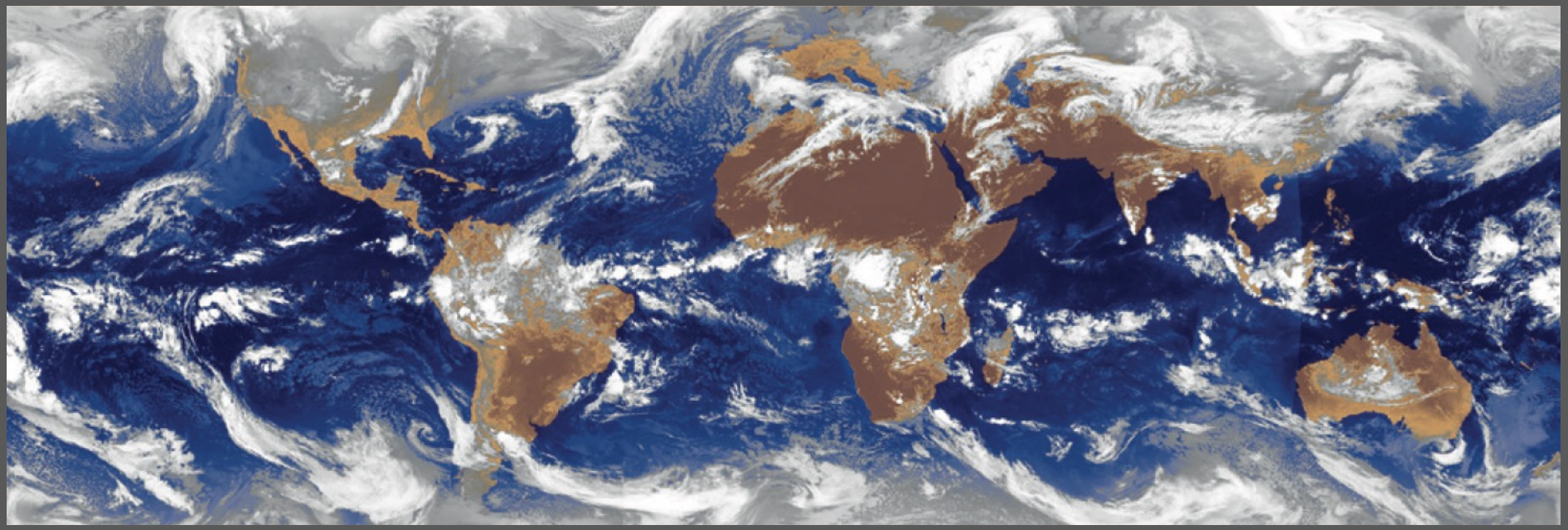
METEOROLOGY

University of Reading

A PERSONAL PERSPECTIVE ON WCRP/SPARC



Ted Shepherd, Grantham Chair of Climate Science

Department of Meteorology, University of Reading

also Jülich Supercomputing Centre, Forschungszentrum Jülich

JÜLICH Forschungszentrum

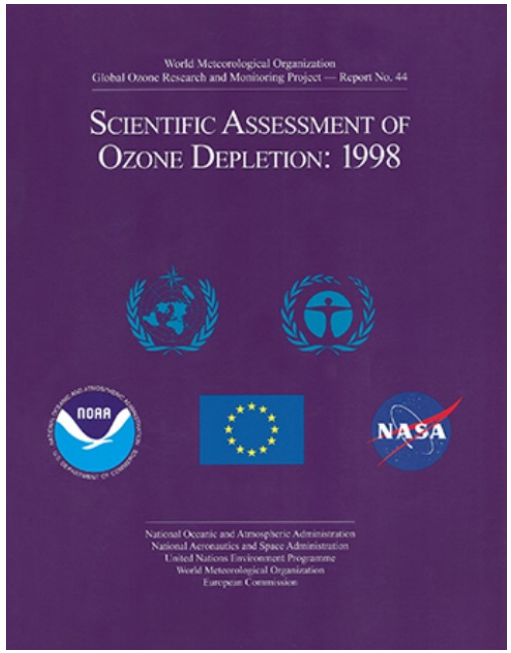
My story

- Canadian; trained and worked in Canada, USA, and UK
- Trained in mathematics, physics, and dynamical meteorology
- Initial research was on theoretical aspects of dynamical meteorology
- Subsequently (30 years ago!) I started working on stratospheric dynamics
- I got involved in SPARC, which was transformative for my career
- 10 years ago I moved (with Michaela) from Canada to the UK, and turned my attention to tropospheric dynamics
  - In a Physics Dept at the University of Toronto, when I taught I would **start from the equations and proceed to the phenomena**
  - In a Meteorology Dept at the University of Reading, when I teach I **start from the phenomena and bring the equations into that discussion**

SPARC: Overall Aim & Modus Operandi (c. 2010)

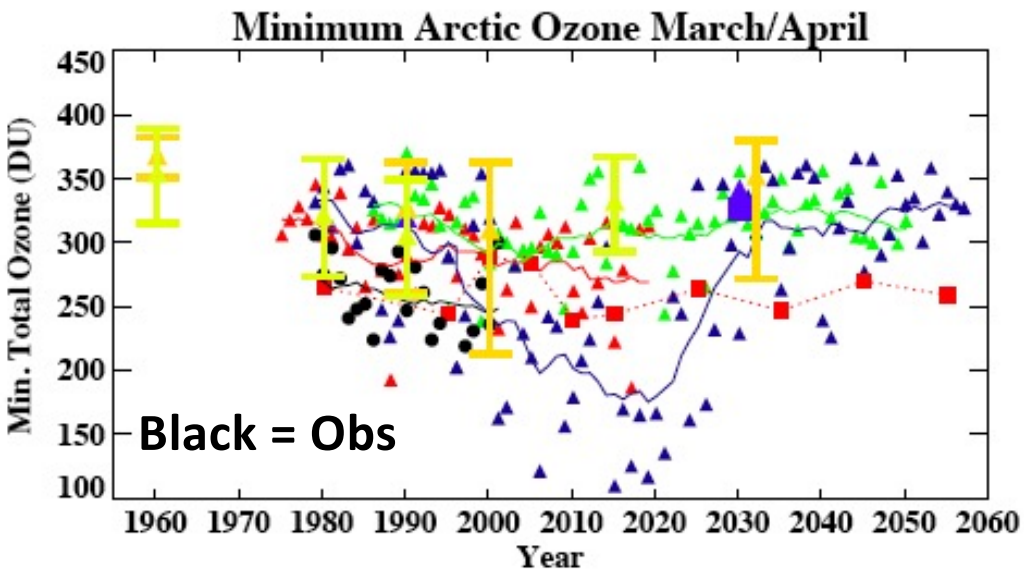
- To bring knowledge of the stratosphere to bear on relevant issues in climate variability and climate prediction
- To identify gaps and define “bite sized” deliverables, bringing in relevant partners, in a well-defined strategic plan for evolution

Major foci: scientific assessments

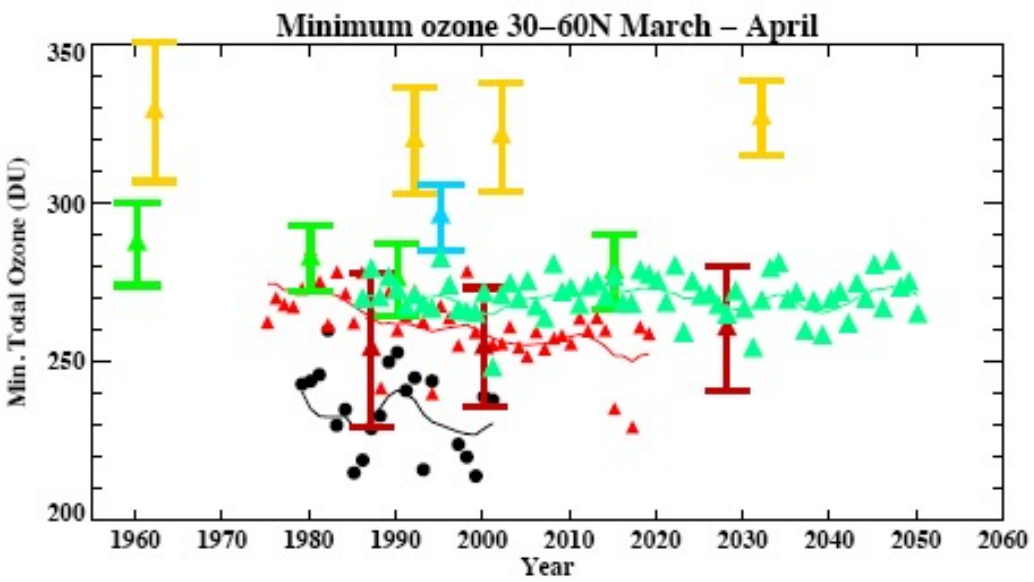


Major mechanism: SPARC Reports

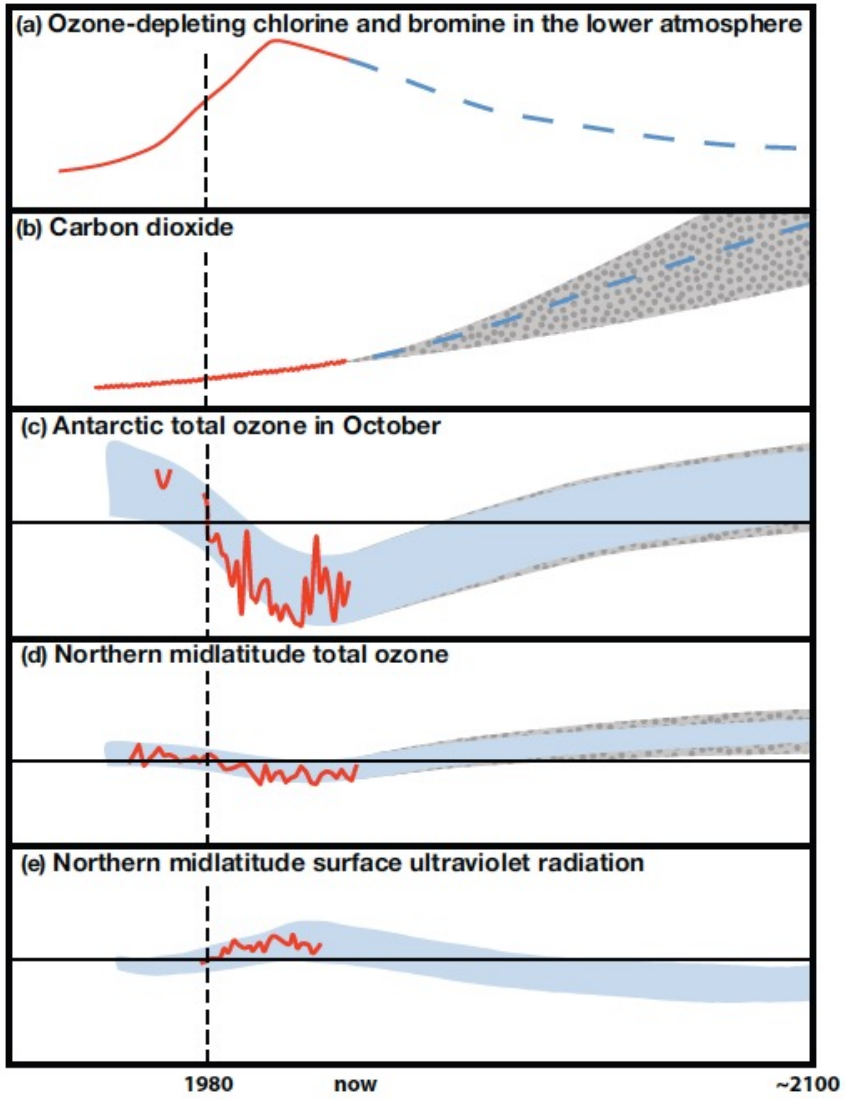
- SPARC Report No. 5 (CCMVal, 2010) responded to the emerging role of chemistry-climate models (CCMs) in the Ozone Assessment
  - For the 2002 Assessment (WMO 2003), the CCMs performed so terribly for midlatitudes that they were not even considered



WMO (2003)



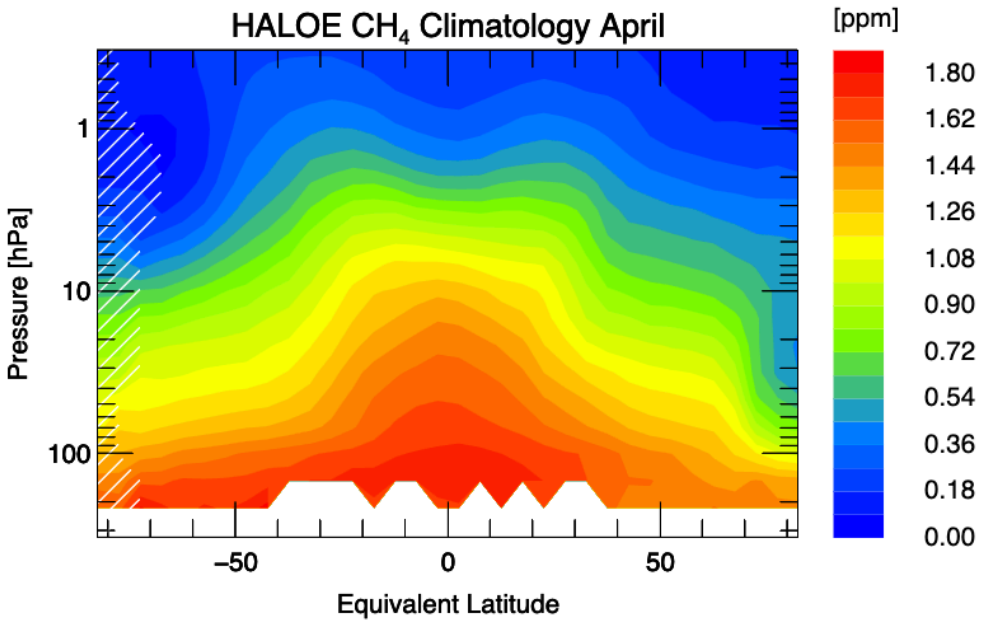
Austin et al. (2003 ACP)



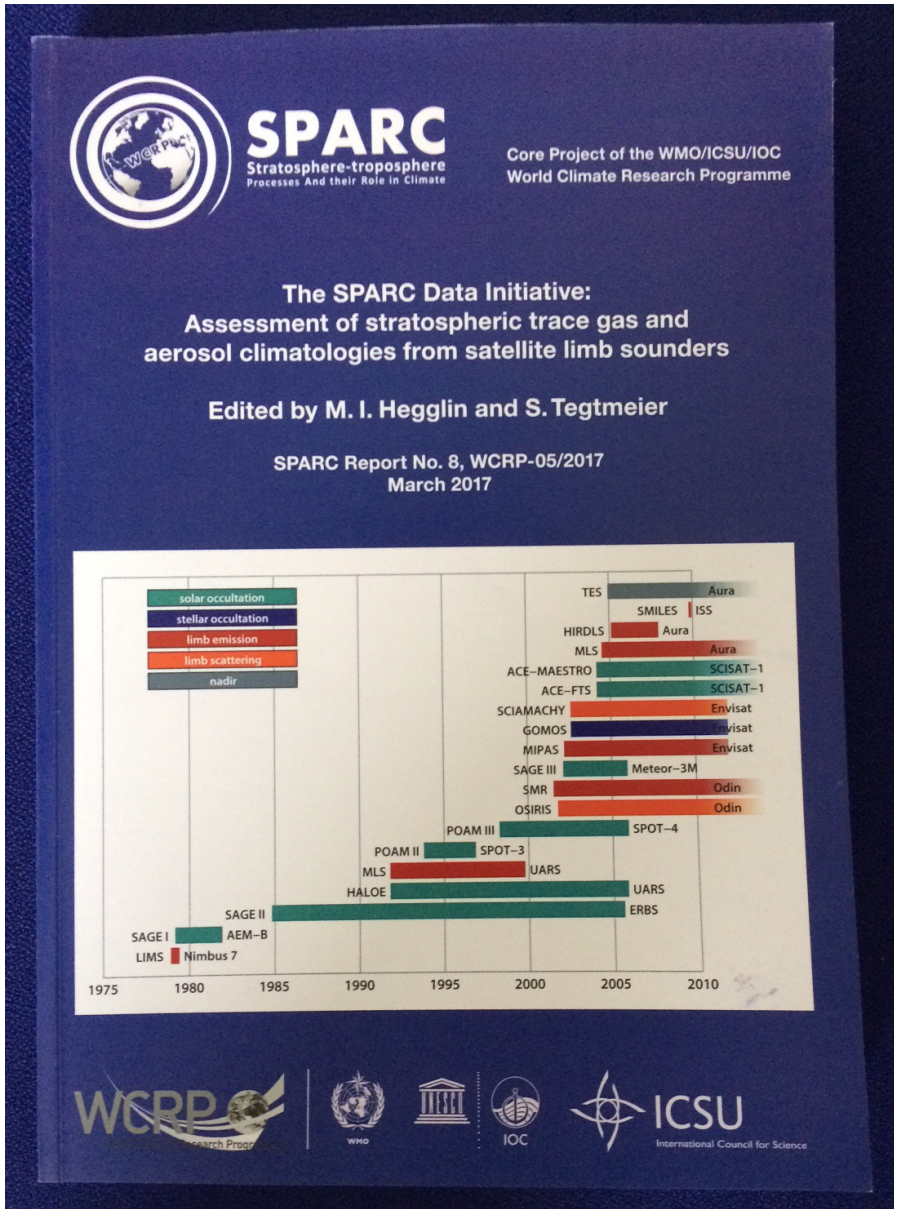
From the Executive Summary of the 2010 Ozone Assessment

- The shaded areas in panels (c)-(e) came from SPARC CCMVal based on statistical analysis of model variability and trends
- Represent uncertainties, not ranges (as in previous Assessments)

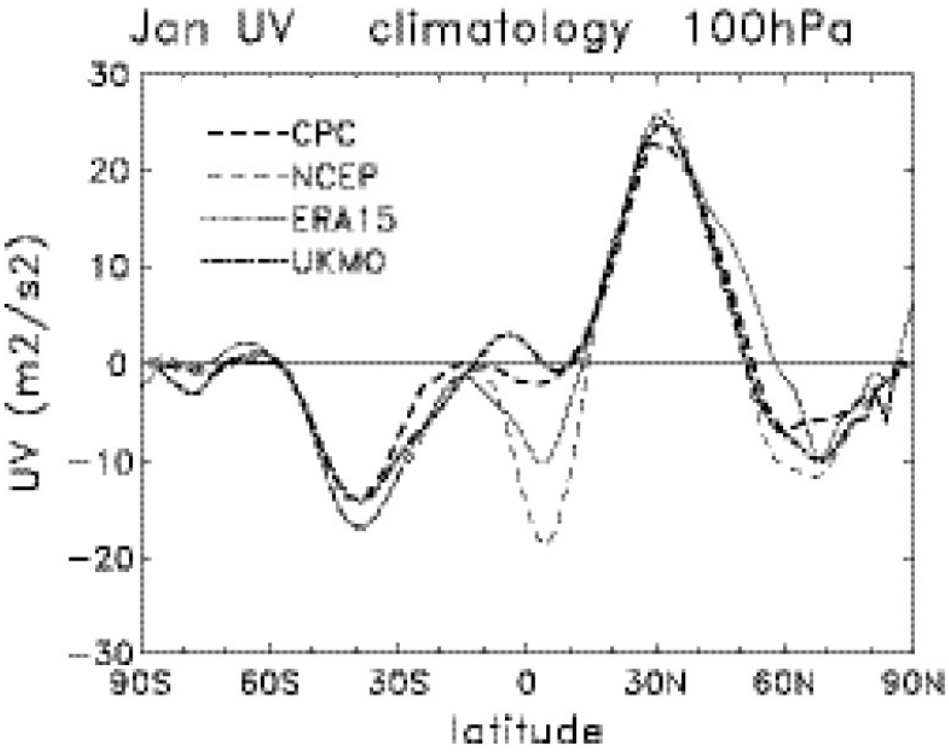
- The tradition continues.....



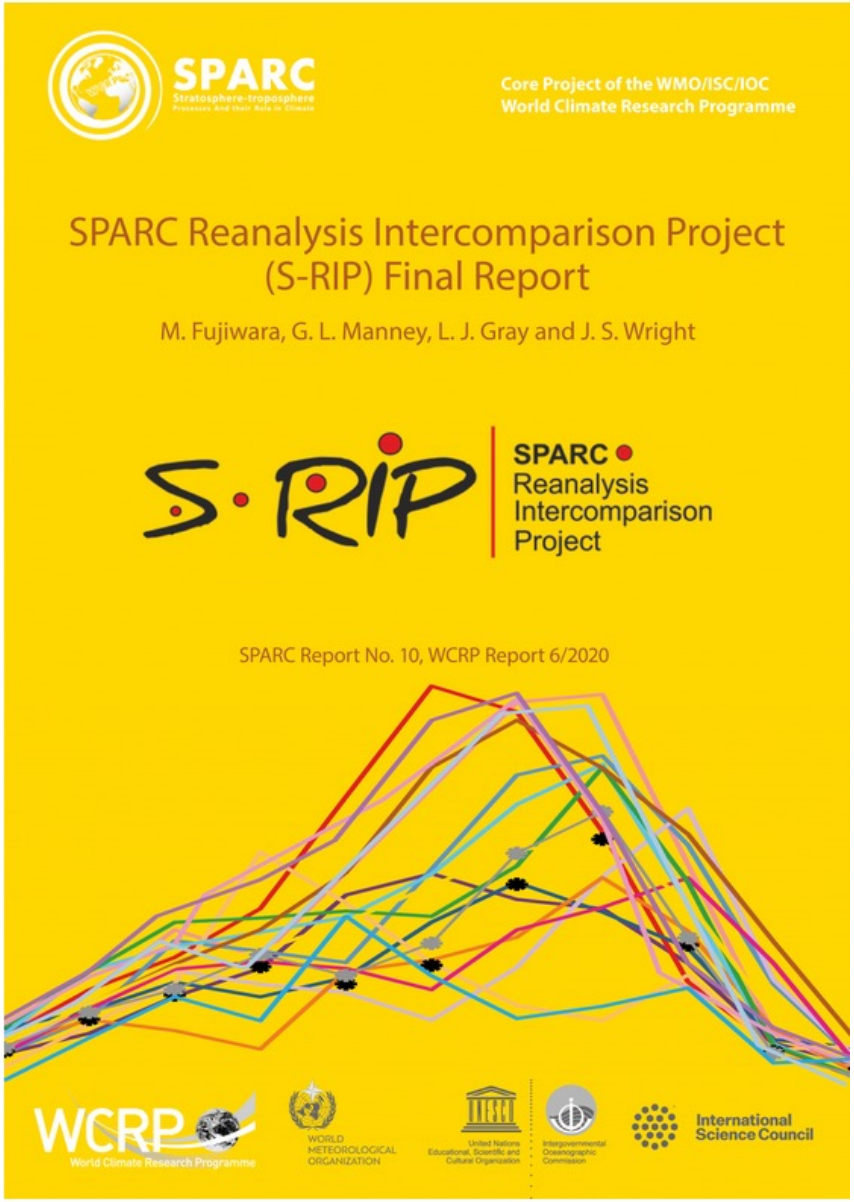
Grooß & Russell (ACP 2005)



- And continues.....



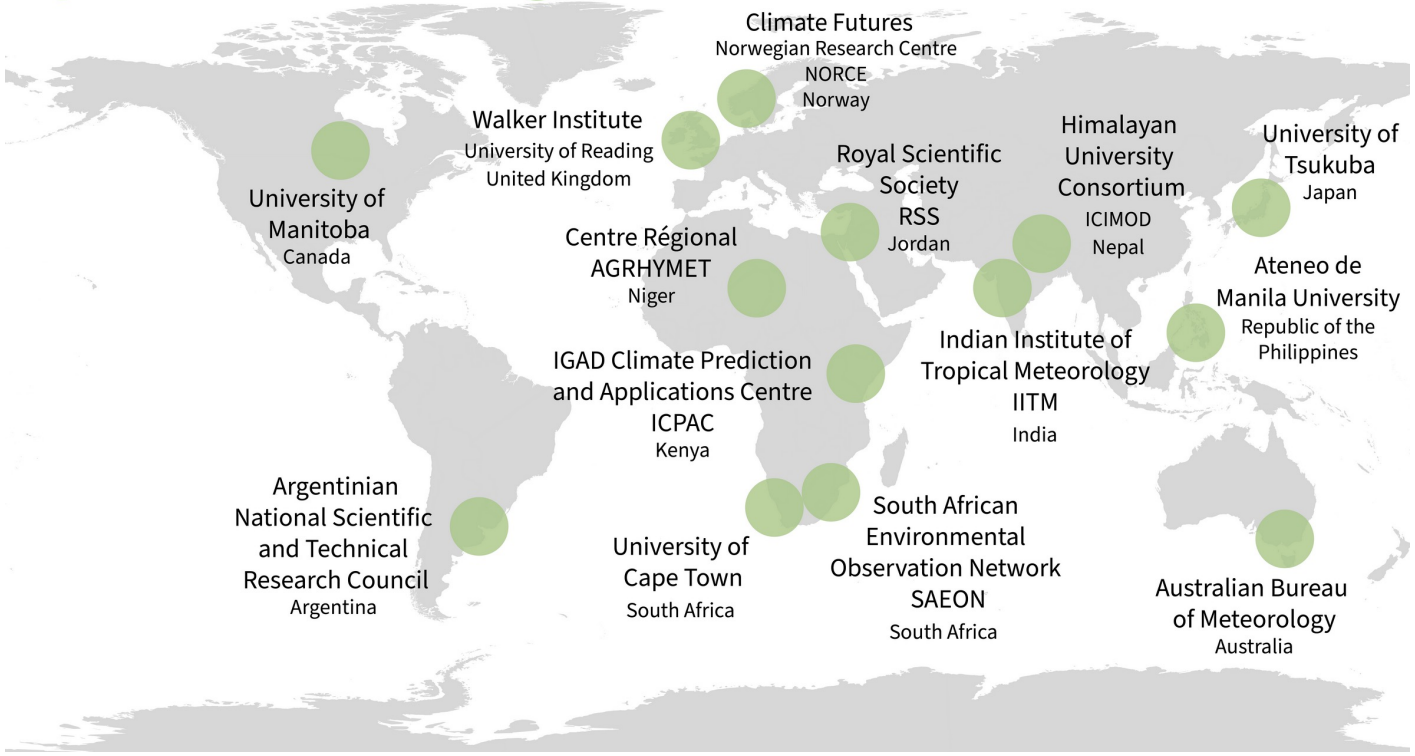
SPARC Report No. 3 (2002)



WMO | INTERNATIONAL COUNCIL FOR SCIENCE | WCRP World Climate Research Programme

My Climate Risk

My Climate Risk Regional Hubs



Co-Chairs: Regina Rodrigues (Brazil) & Ted Shepherd (UK)

Goal: To develop and mainstream a *'bottom-up'* approach to regional climate risk

.... starting from the decision context (and the decision scale)

.... enabling relevant climate information to be brought into that context

.... thereby making climate information meaningful at the local scale

- At the University of Reading, I have been teaching statistics of weather and climate, despite never having had any formal training in statistics!
- This has opened my eyes to **how important it is to bring physical reasoning into statistical practice**

> *"La théorie des probabilités n'est que le bon sens reduit au calcul."* (Pierre-Simon Laplace, 1819)

- ML/AI has the potential to obscure the physical meaning of statistical practice in climate science, but **also the potential to improve it**
  - This is because many of the traditional statistical methods in climate science are "mindless rituals" (Shepherd 2021 Climatic Change)
- **But in order to use the methods well, you need to be fluent in them!**