

Report to WCRP JSC meeting, May 2013

WCRP Polar Climate Predictability Initiative (PCPI)

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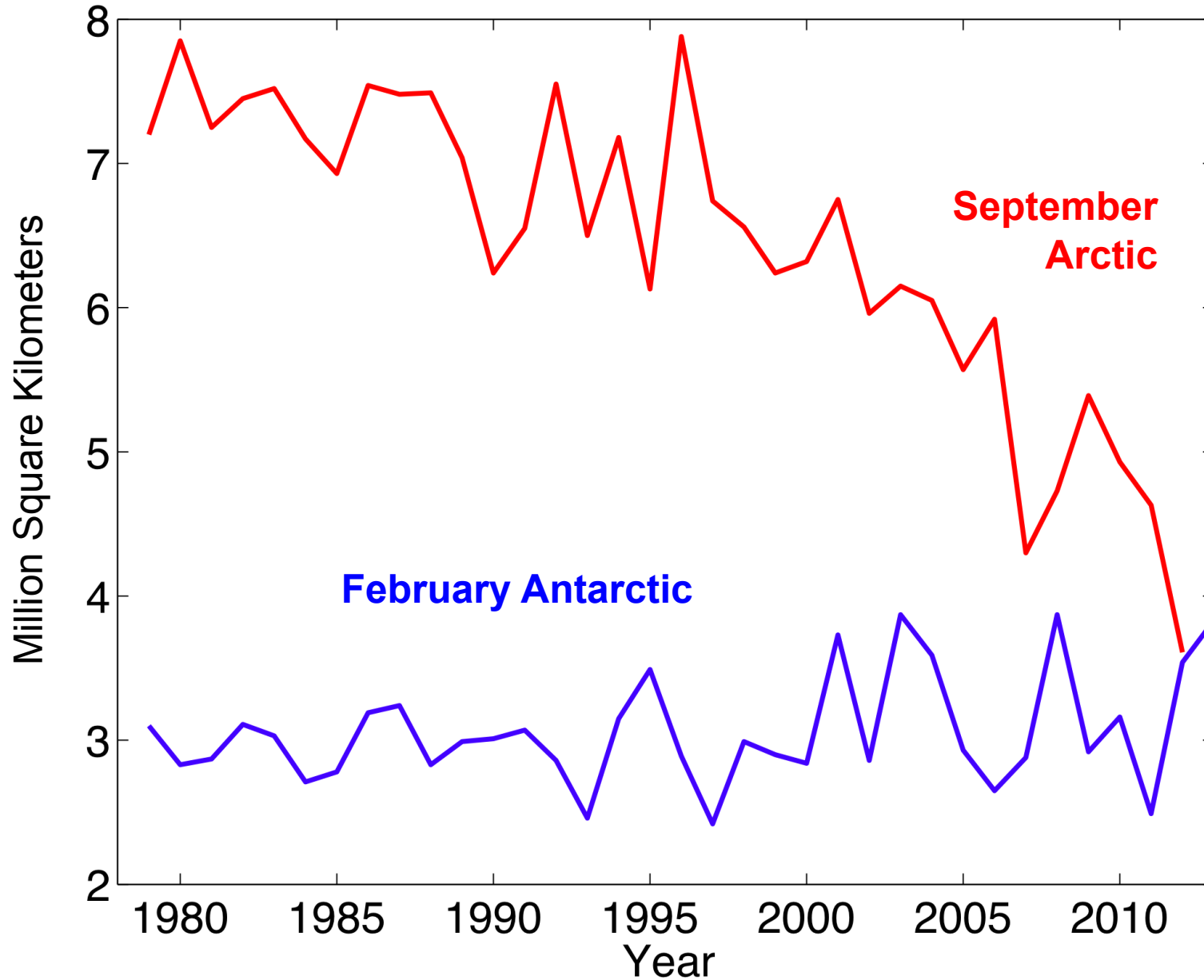
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Ted Shepherd (Department of Meteorology, University
of Reading, UK; representing SPARC)

Scientific Context

- Important and puzzling changes are occurring at the poles
 - Record Arctic sea-ice minimum in Sept 2012
 - Record Antarctic sea-ice *maximum* in Feb 2013
- Agreement between models and observations is not particularly good in polar regions
- Polar regions appear to be important for global climate, not just “canaries in coal mines” (e.g. role of Southern Ocean)
- Polar regions may contain sources of predictability on both seasonal and decadal time scales (subpolar seas, snow cover, sea-ice, stratosphere)
 - Forced component of predictability may dominate over initial condition component in as little as ~5 yr, especially in the Arctic

Annual September or February Sea ice extent 1979-2013



Programmatic Context

- Polar climate predictability cuts across all elements of WCRP; but tends to fall between the cracks
- WCRP Working Groups need process expertise in polar regions to help improve products and strategies
 - WMO Global Producing Centres for Long-range Forecasts
 - Global Framework for Climate Services
- WMO EC-PORS is promoting a Global Integrated Polar Prediction System (GIPPS)
 - WWRP Polar Prediction Project: hours to seasonal
 - WCRP PCPI: seasonal to multi-decadal
 - Will liaise closely, have a common coordination office
 - However the role of PCPI within WCRP is rather different from that of PPP within WWRP

Programmatic context, continued

- There are existing international programs specifically focused on the polar regions: IASC for the Arctic, and SCAR for the Antarctic
 - Need to avoid duplication or competition (or confusion)
 - WCRP brings the global perspective and strength in global modelling
- Within WCRP, the PCPI will constitute a sub-initiative of the “Cryosphere in a Changing Climate” Grand Challenge
 - Specific activities need to be focused, with clear timelines, in areas where WCRP can play a unique role
- The PCPI can be an ‘incubator’ to generate community research efforts that could be adopted, in the longer term, by more permanent components of the WCRP or of partner organizations

Developments since JSC 2012

- Draft implementation plan arising from Toronto workshop (April 2012) widely circulated and then finalized, provided to JSC in November 2012; *identified six proposed initiatives*
 - Discussion at WWRP-PPP Steering Committee meeting in December 2012 identified *three joint initiatives*
- Cecilia Bitz joined Ted Shepherd as PCPI co-lead
- Decision made not to have a formal Steering Committee (too much overhead in terms of time and travel funding)
 - Instead, two champions for each initiative have been identified, to carry it forward
 - Careful thought given to ensure strong connections to related activities within WCRP and with WWRP-PPP

Initiative 1

- Topic: *Improve knowledge and understanding of past polar climate variations (up to 100 years)*
- Co-leads: Sarah Gille (SIO, USA; WCRP JSC) and Julie Jones (U Sheffield, UK)
- Way forward:
 - Bring together research efforts focused on past polar climate variations in order to encourage interdisciplinary interpretation of the fields (not just data gathering)
 - Use the more data-rich recent decades to gain understanding, and then use what data we can to go further back in time
 - Identify initial ‘straw man’ research questions to help identify core areas and the relevant community of researchers
 - Try to use meetings of opportunity and telecons, and avoid extensive travel, but given the disciplinary breadth of the expected participants, will also need dedicated meetings

Initiative 2

- Topic: *Assess reanalyses in polar regions* (joint with PPP)
- Co-leads: Dave Bromwich (OSU, USA; SCAR and WWRP-PPP SSG) and Jim Renwick (Victoria University, New Zealand; WMO EC-PORS and WCRP JSC)
- Way forward:
 - Need to assess reliability and self-consistency of reanalyses in polar regions, given the limited observational constraints
 - Develop metrics reflecting coupling between different components of the climate system (to inform coupled assimilation efforts)
 - Examine analysis increments to identify potential biases in modelled processes

Initiative 3

- Topic: *Improve understanding of polar climate predictability on seasonal to decadal timescales* (joint with PPP)
- Co-leads: John Fyfe (CCCma, Canada) and Ed Hawkins (U Reading, UK; CLIVAR SSG)
- Way forward:
 - Build on existing efforts such as WGSIP CHFP, ARCUS SEARCH, and UK APPOSITE
 - WGSIP has the infrastructure and connections to modelling centres, but needs polar process expertise to interpret results and design new experiments
 - Quantify impact of polar variability on lower latitudes
 - There will be an APPOSITE workshop on seasonal to interannual Arctic predictability some time in the next 12-18 months, which could be tied to a pan-PCPI meeting

Initiative 4

- Topic: *Assess performance of CMIP5 models in polar regions*
- Co-leads: Hugues Goosse (UCL, Belgium) and Jennifer Kay (NCAR, USA)
- Way forward:
 - Move beyond identifying model biases to understand why models behave differently from each other and observations
 - Encourage a process level link between model evaluation and improvement
 - Engage a small group to identify evaluations that exemplify this approach and invite them to a synthesis workshop
 - Write a review paper as an outcome of the workshop
 - Identify best practices and key diagnostics that will lead toward model improvements
 - Eager to see a pan-PCPI meeting in 2014 to explore links between the different initiatives

Initiative 5

- Topic: *Model error* (joint with PPP)
- Co-leads: Markus Jochum (U Copenhagen, Denmark; CLIVAR) and Gunilla Svensson (U Stockholm, Sweden; GEWEX GABLS co-Chair and WWRP-PPP SSG)
- Way forward:
 - Gunilla and Markus have identified half a dozen physical processes important for error growth across timescales
 - Use ECMWF WWRP-PPP workshop in June 2013 for further information-gathering
 - Hold workshop at Bolin Centre in Stockholm in fall/early winter 2013, to develop observational/modelling strategies to improve the representation of these processes (suggest holding jointly with Initiative 2)
 - Expect a number of working groups to feed into plans for observations incl. YOPP, in conjunction with GEWEX GASS

Initiative 6

- Topic: *Improve understanding of how jets and non-zonal circulation couple to the rest of the system in the Southern Hemisphere*
- Co-leads: Gareth Marshall (BAS, UK; CLIVAR) and Marilyn Raphael (UCLA, USA; CliC)
- Way forward:
 - Directly contact potential interested parties
 - Marilyn and Gareth to meet in late June to brainstorm and further flesh out initiative
 - Session proposed for AGU Fall Meeting
 - Suggest holding short workshop (2 days) in conjunction with AGU Fall Meeting, maybe at UCLA
 - Plan to take advantage of meetings of opportunity in 2014
 - Perhaps hold focused workshops leading to review papers, e.g. on Amundsen-Bellinghausen Sea Low

Logistics

- Not much appetite or resources in the community for additional meetings, so the PCPI will coordinate electronically and through meetings of opportunity
 - Will use initiative co-leads to represent the PCPI at other meetings, to ensure effective synergy
- Thinking about possible pan-PCPI workshop in late winter 2014, perhaps in conjunction with PPP SSG meeting
- Project scientist Dr. Diane Pendlebury currently funded by the Canadian Space Agency at University of Toronto (also working on SPARC projects)
 - Will liaise closely with PPP International Coordination Office at AWI-Bremerhaven
 - Has been developing web site; will be hosted by CliC