GLOBAL CLIMATE OBSERVING SYSTEM

JSC-34
Brasilia, May 2013

GCOS and WCRP

Adrian Simmons
Chair of Steering Committee for GCOS

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sponsored by

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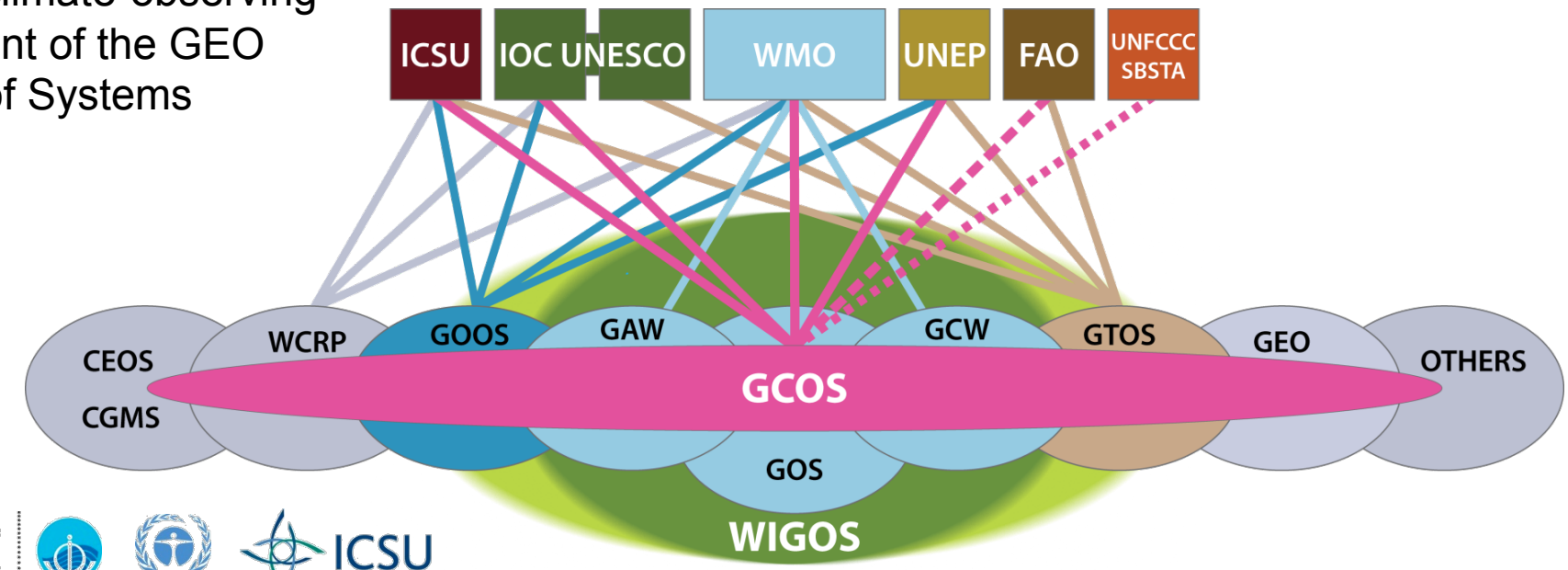
Scope of GCOS

GCOS encompasses the climate components of:

- WMO observing systems (WIGOS: GOS, GAW, GCW, Hydrological OS)
- IOC-led co-sponsored Global Ocean Observing System (GOOS)
- FAO-led co-sponsored Global Terrestrial Observing System (GTOS)
- observational elements of research programmes (WCRP, IGBP, ...)
- other systems contributing climate observations, data management or products

which together form our overall global observing system for climate, and the climate-observing component of the GEO System of Systems



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The GCOS programme

The GCOS programme

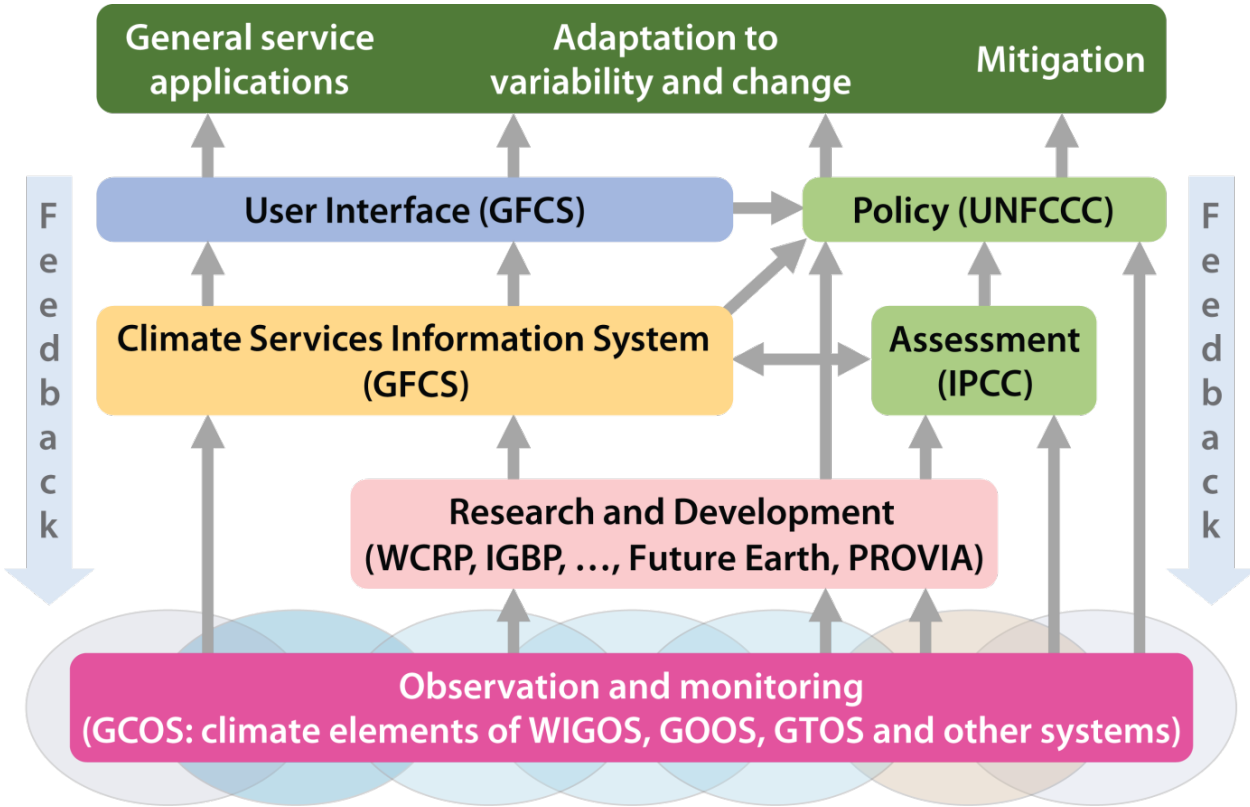
- assesses and communicates requirements for climate observations and products
- advises on and supports implementation; reviews progress
- reports to its sponsors and the UNFCCC

It supports

- assessment
- policy
- research
- services

and is concerned with

- the observations
- data preservation
- generation of data records and products



Adapted from the Third Announcement for WCC-3 and the Report of the High-level Taskforce for the GFCS

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The three domain-based panels, represented on WDAC

Atmospheric Observation Panel for Climate (AOPC)

- sponsored by GCOS and WCRP
- SPARC activities are reported routinely; some GEWEX ones more intermittently
- can achieve change via WMO mechanisms; has governance role for reference network

Ocean Observations Panel for Climate (OOPC)

- sponsored by GCOS, WCRP and GOOS; being re-activated with new ToR
- Eric Lindstrom has handed over to Co-chairs Mark Bourassa and Toshio Suga
- support (from Katy Hill) is now based in the GCOS rather than the GOOS secretariat

Terrestrial Observation Panel for Climate (TOPC)

- sponsored by GCOS, WCRP and GTOS
- Han Dolman has handed over to Koni Steffen as Chair
- secretariat of GTOS is non-functional at FAO; new arrangements are needed

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FAO is lead sponsor of GTOS
Other sponsors are WMO, UNESCO, UNEP and ICSU

The GCOS Steering Committee and WDAC

The GCOS Steering Committee met in September 2012, and supported conclusions on dataset inventories from WDAC-1

GCOS subsequently engaged in CEOS/CGMS/WMO activities and WDAC-2 to advance this

- Jörg and Otis have already reported on the results

The Steering Committee also

- expressed concern at the number of important topics that WDAC had to consider
- asked GCOS panel chairs on the WDAC to work towards ensuring that key items were adequately covered by WDAC or other WCRP activities

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Next round of the assessment cycle

The GCOS programme has started on the process of producing

- a report on progress and adequacy of climate observation scheduled for 2015
- a new “Implementation Plan” scheduled for 2016, which should identify:
  - verifiable, costed actions and potential agents for implementation, as before
  - specific requirements for products
- addressed to sponsors and the UNFCCC

Content will be based on various inputs, including

- Trenberth *et al.* paper on “Challenges of a sustained climate observing system” presented to 2011 WCRP Open Science Conference
- outcome of 2013 SPARC workshop on data requirements
- any other specific statements of requirements or conclusions from assessments produced under WCRP auspices

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Workshop on Observations for Adaption
DWD, 26-28 February 2013

Organised in collaboration with IOC and UNEP

- WCRP was represented by Bruce Hewitson

Identified some specific sectorial needs for observation

Participants stressed

- need for information on data availability, uncertainty and limits of applicability
- need for better access to past and present data
- inadequacy of information (including projections) for decision-support at the local level
- need for further investment in ground-based hydro-meteorological networks

Did not discuss in depth the observations needed to provide reliable forecasts and projections for adaptation

- user dialogue is needed, but can go only so far
- input on requirements has to come also from weather and climate research

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Sponsors' review of GCOS

Sponsors of GCOS have set up a Review Board

- under the chairmanship of Wolfgang Kusch, former head of German Weather Service
- to assess the added value of the GCOS programme, its mandate and ToR
- taking account of developments since the sponsors' 1998 MoU was agreed, including
  - establishment of the GEOSS, GFCS and WIGOS
  - evolution of requirements for observations and products

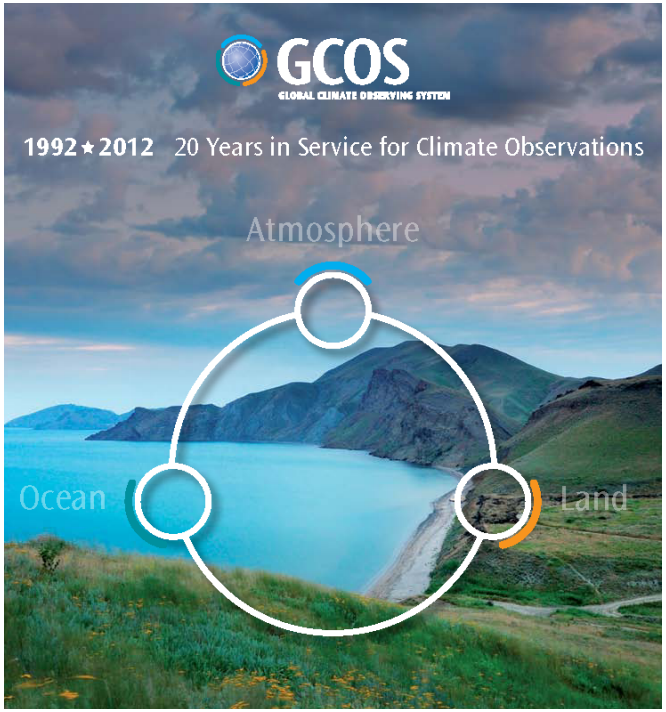
First meeting of Board was 26-27 March 2013

- and received input from WDAC among others

A questionnaire has been developed

- and some interviews will be conducted

Board is expected to report in early 2014



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Evolution of the observing system

Some continuing concerns, including

- deterioration of some *in situ* networks; lack of progress in filling gaps in others
- limited provision for limb sounding and reference measurement from space

but many improvements (that need sustaining) including

- quantity and quality of data from several *in situ* sources, including radiosondes
- quantity, quality and variety of data from satellites
- recovery and reprocessing of past data, both *in situ* and remotely sensed
- reanalysis, with coupling of atmosphere to ocean and land, and inclusion of chemistry
- conventional analysis of instrumental records
- converging temperature information from various observational and model datasets

and evolving requirements

- for global *in situ* soil-moisture data to complement remote sensing and reanalysis
- and more …

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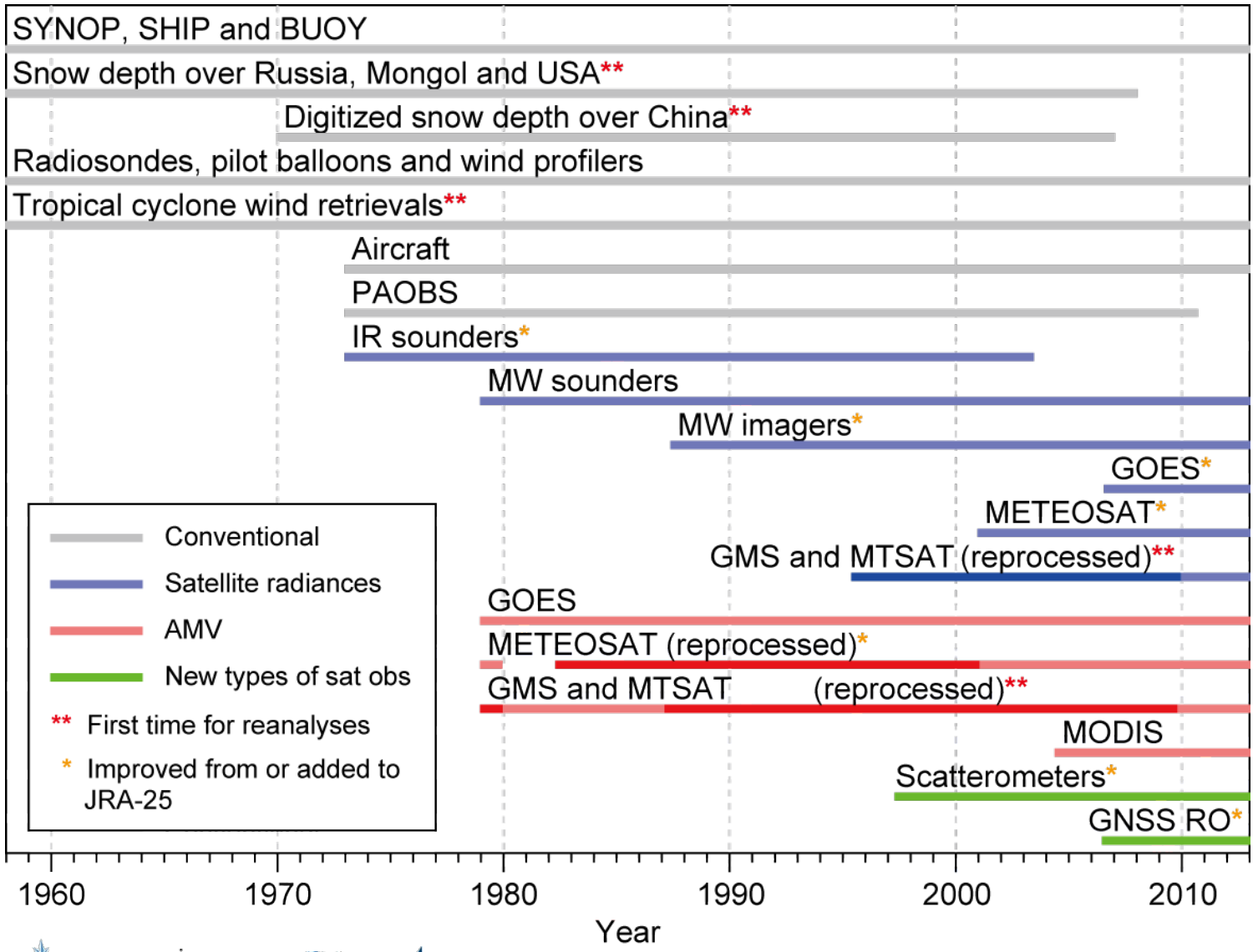
Evolution of the observing system



Types of data assimilated in JMA's new JRA-55 reanalysis

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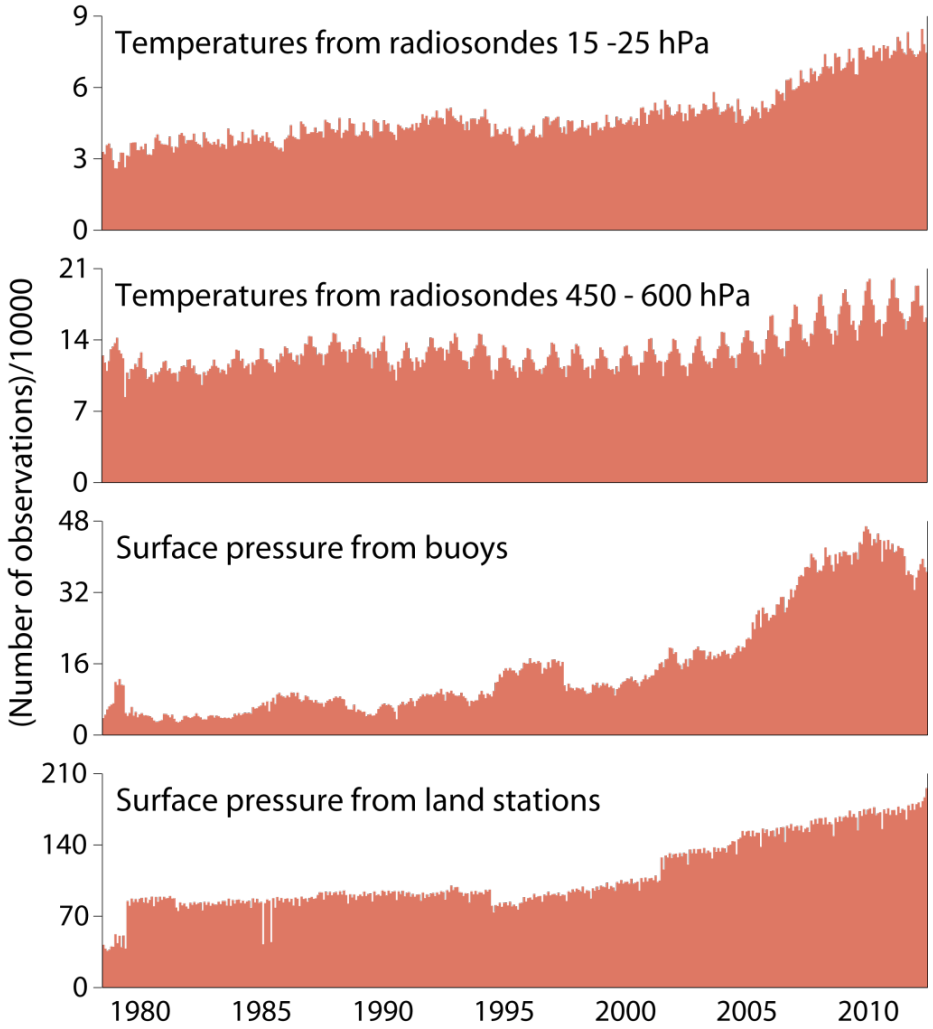
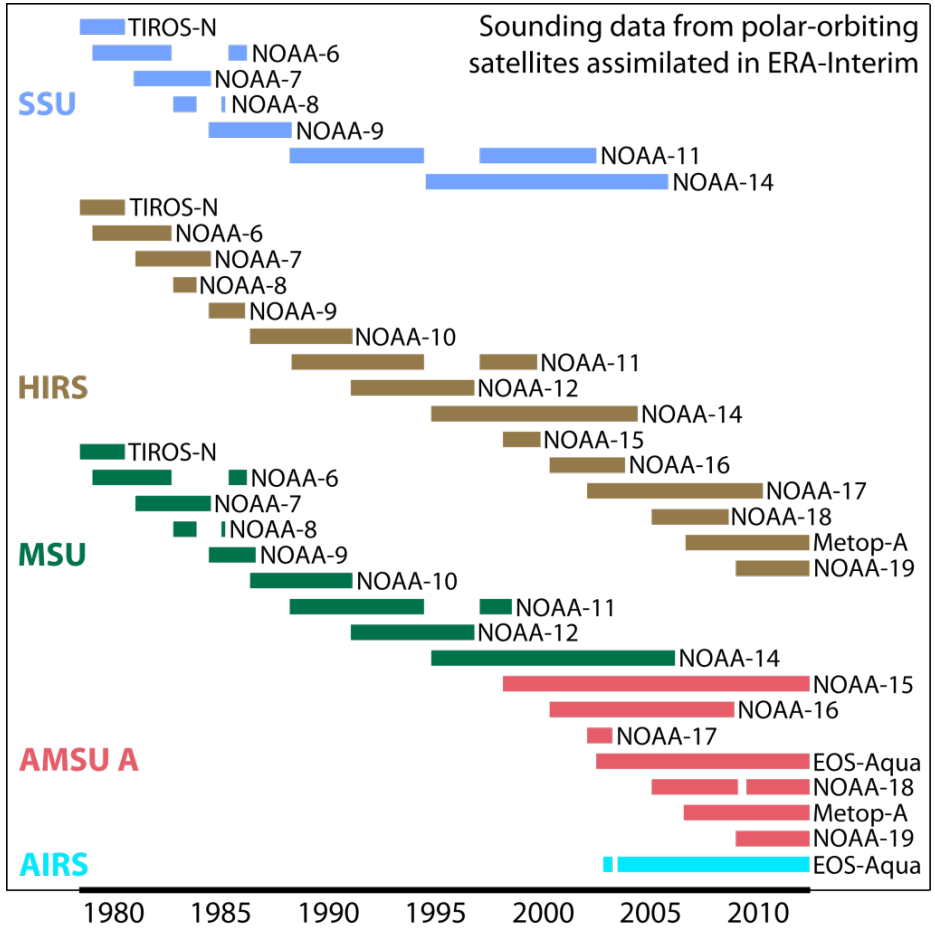
Evolution of the observing system



Examples of *in situ* data assimilated in ERA-Interim



Coverage is for SSU-1, HIRS-2, MSU-4, AMSU-A10, AIRS-40

Data from IASI and NPP could not be used in 2006 version of assimilation system frozen for ERA-Interim. Use of data from Metop-B was not activated in 2012

Data from FY-3 are a candidate for use in future reanalyses

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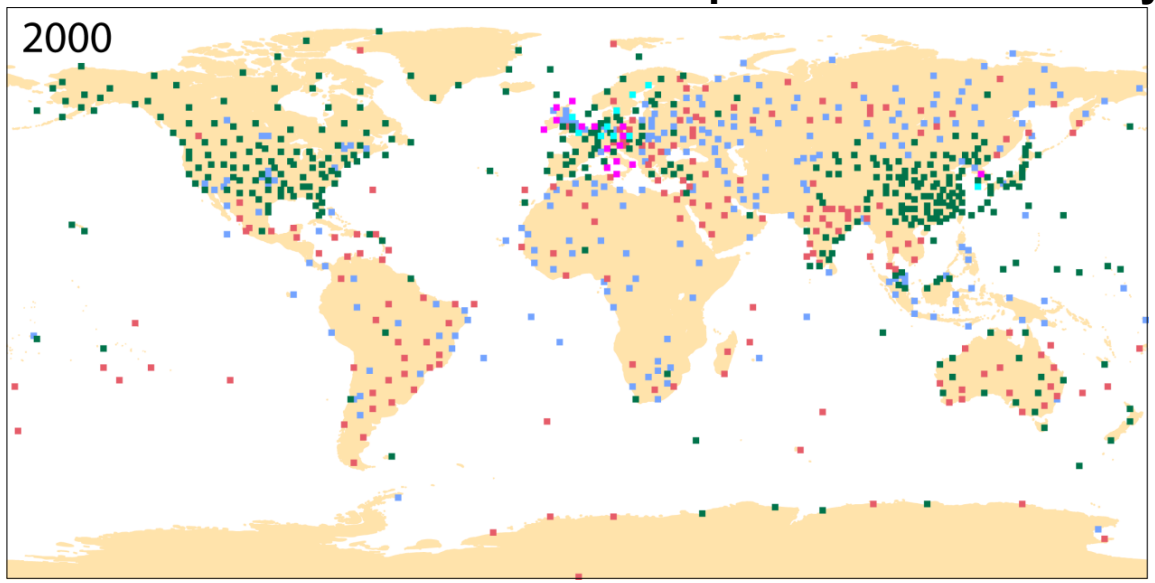
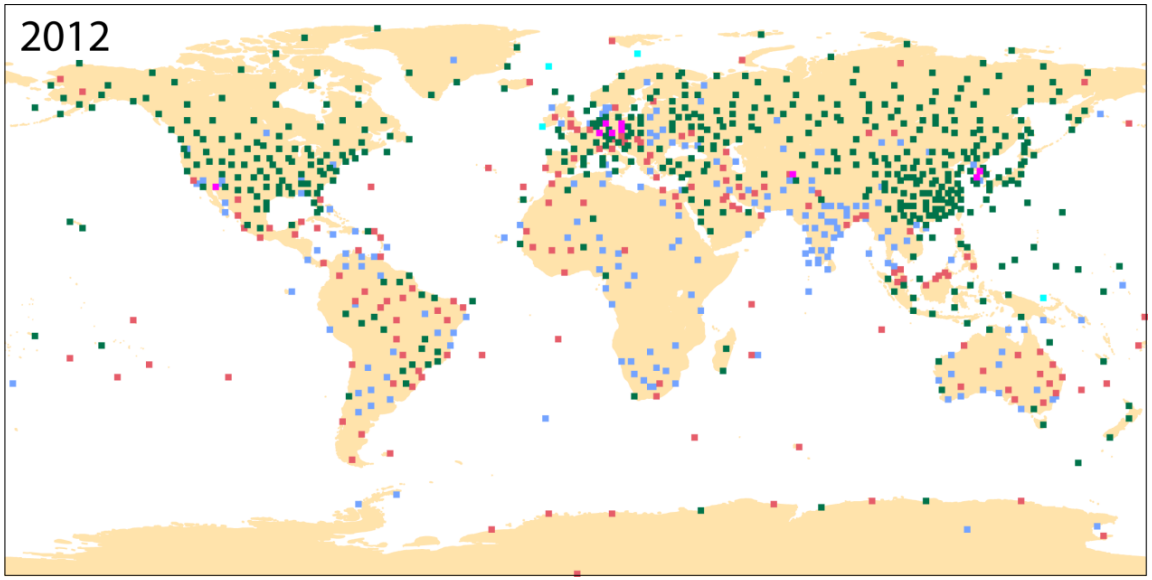
Evolution of the observing system

Annual counts of radiosonde temperatures received by ECMWF for the 500hPa level



1-300 301-600 601-900
901-1200 1201-1500 per 1 °grid box



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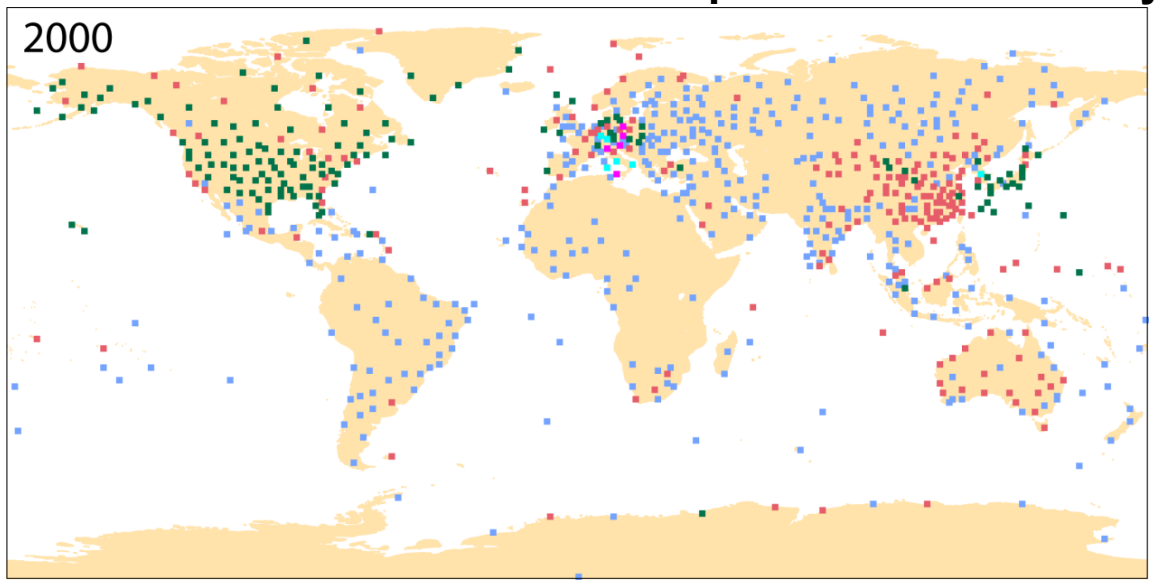
Evolution of the observing system

Annual counts of radiosonde temperatures received by ECMWF for the 20hPa level



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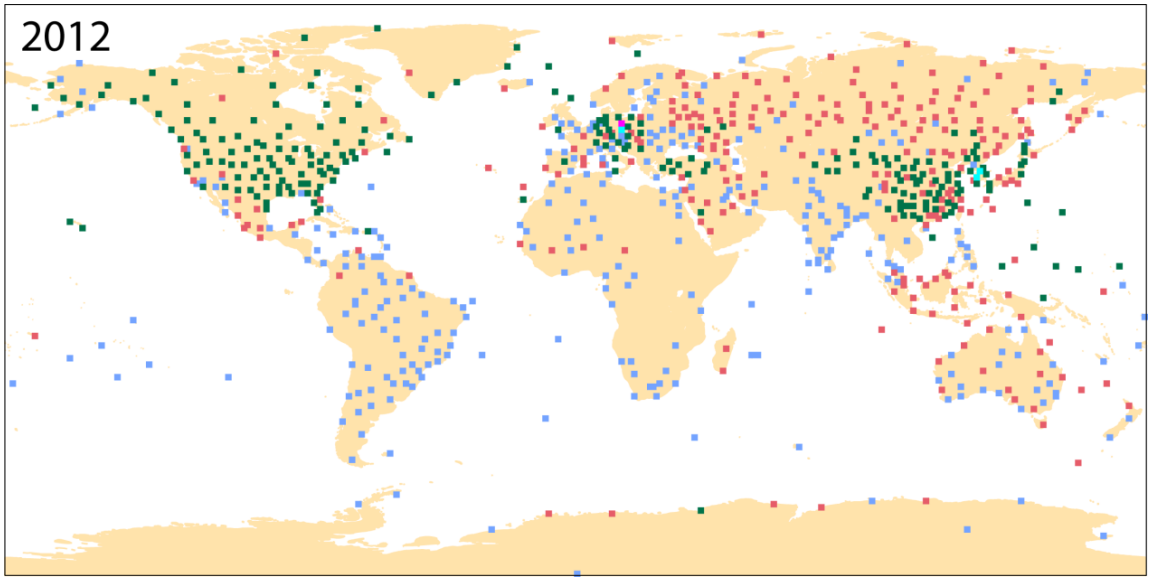

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Improvement of conventional analysis of near-surface observational record

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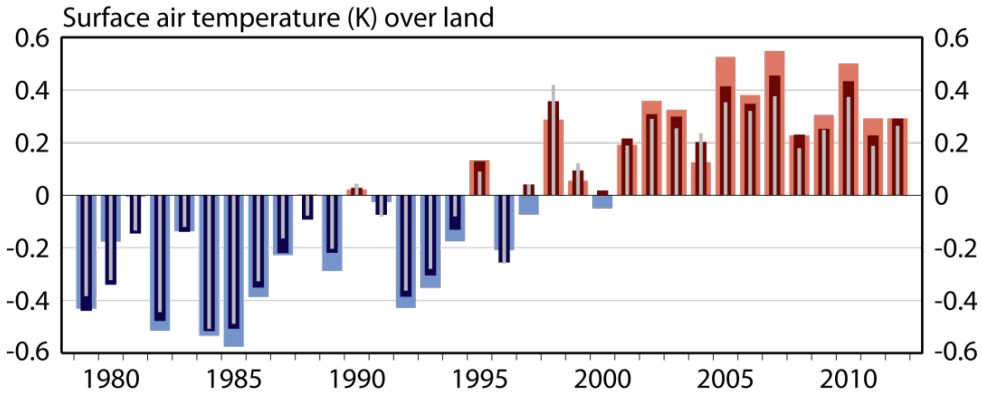
Broad, lighter-coloured bars: ERA-Interim averaged over all land areas (Dee at al., 2011)

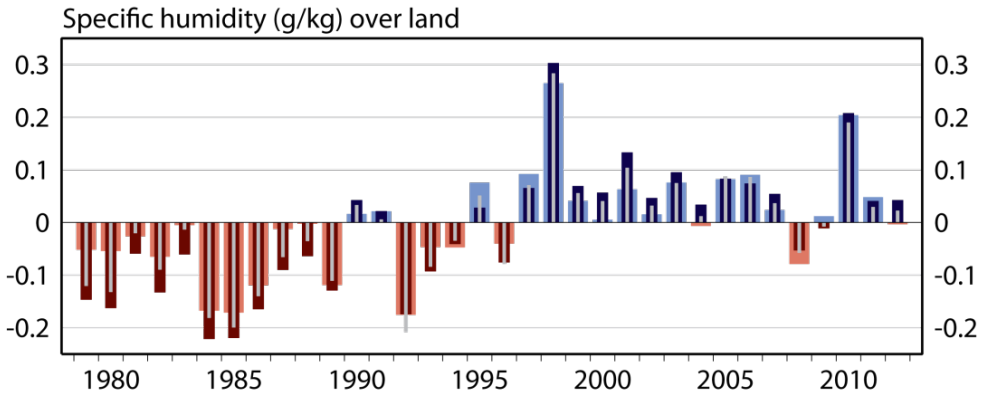
Darker-coloured bars: CRUTEM4 (Jones et al., 2012)

Fine, grey bars: CRUTEM3 (Brohan et al., 2006)



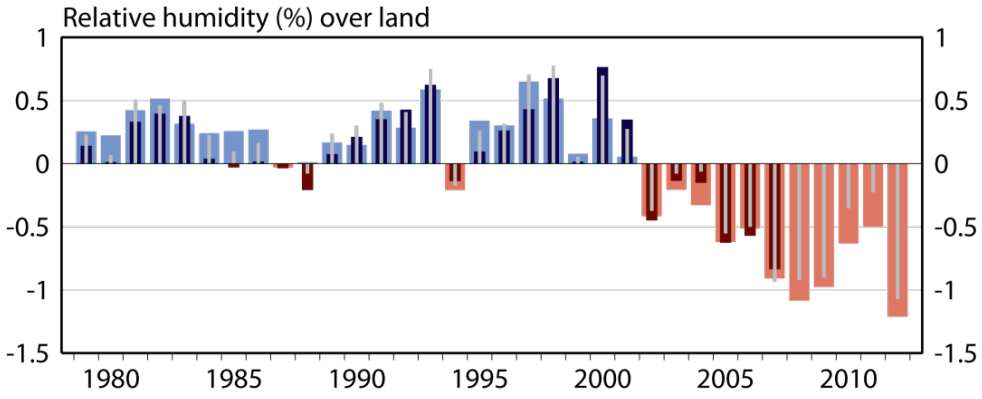
Darker-coloured bars: HadISDH (Willett et al., 2013)

Fine, grey bars: ERA-Interim sampled as HadISDH



Darker-coloured bars: HadCRUH (Willett et al., 2008)

Fine, grey bars: ERA-Interim sampled as HadCRUH



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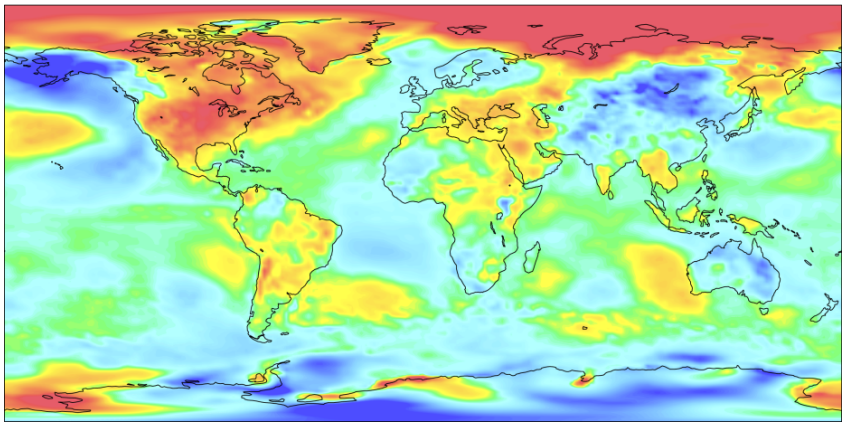
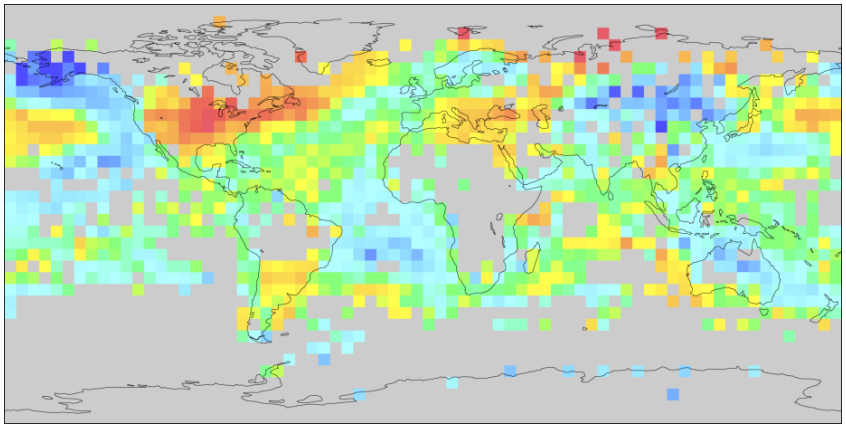
2012 anomalies relative to 1981-2010

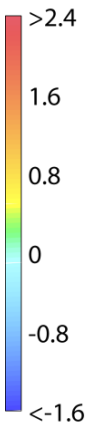
Temperature at two metres (K)



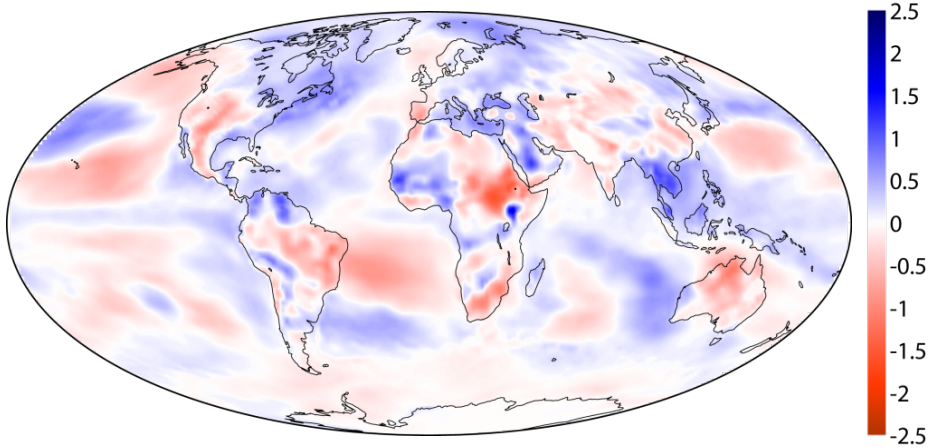
ERA-Interim (Dee et al., 2011)



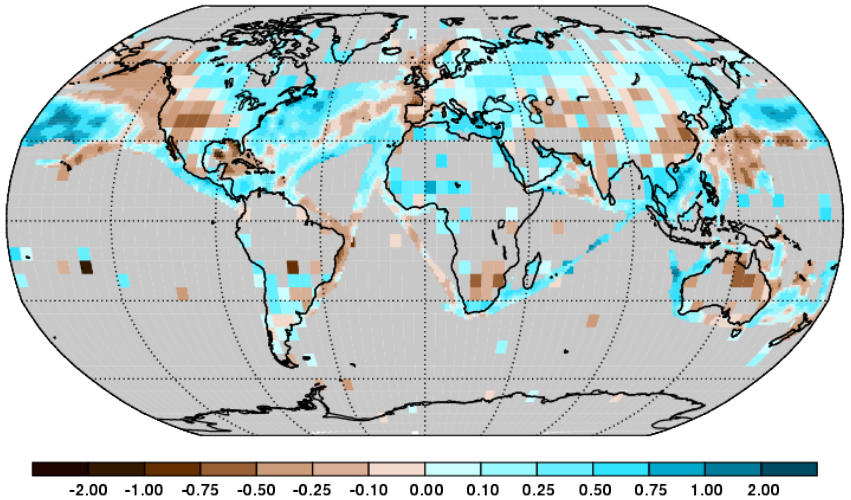
HadCRUT4 (Morice et al., 2012)



Specific humidity at two metres (g/kg)



ERA-Interim (Dee et al., 2011)



HadISDH (Willett et al., 2013)
NOCSv2.0 (Berry and Kent, 2011)

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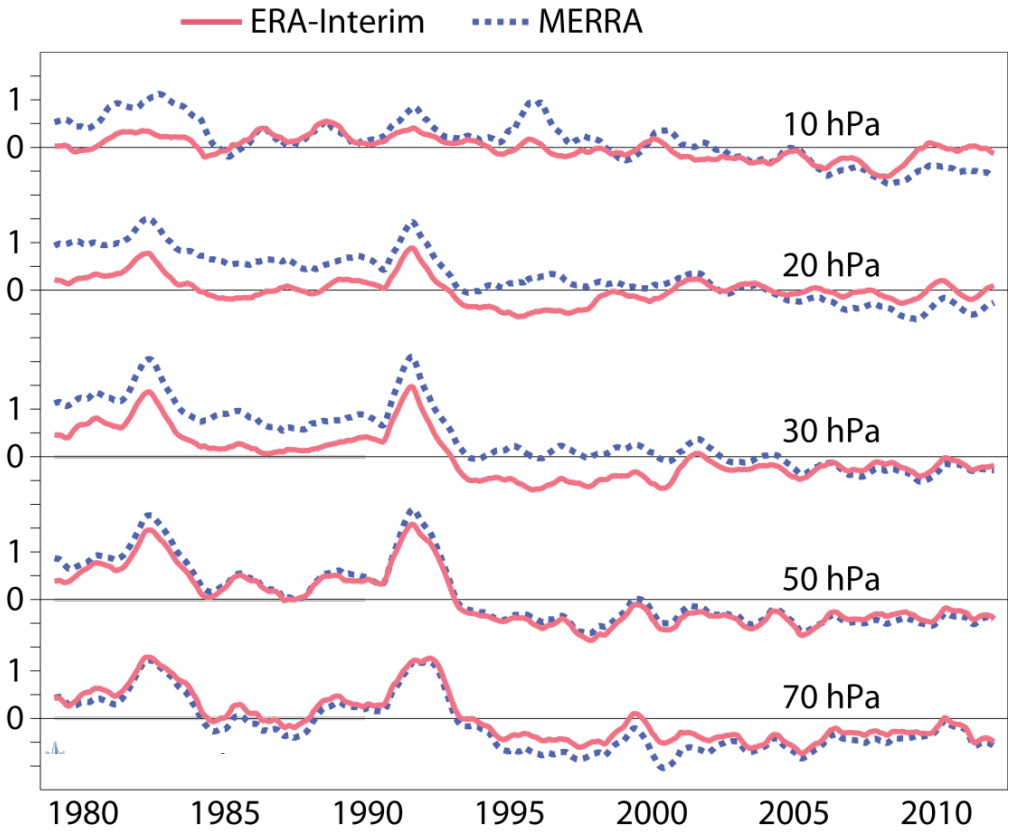
Global-mean temperatures (K) from ERA and MERRA, and SPARC interest in temperature

ERA and MERRA 12m running mean temperatures

Both reanalyses assimilate SSU, MSU, AMSU and HIRS radiances and radiosonde temperatures

Neither shows a 1985-1995 temperature fall consistent with the 2012 version of the SSU record; both favour the older Met Office version



Thompson et al. (2012)
Nature Research Perspective:
The mystery of recent stratospheric temperature trends

Blue: Met Office Grey: CMIP5

Red: Wang et al. (2012)