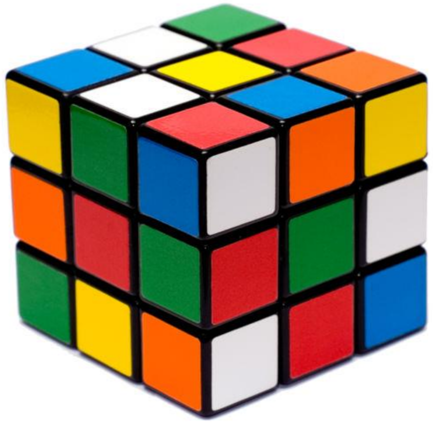
Adrian Simmons

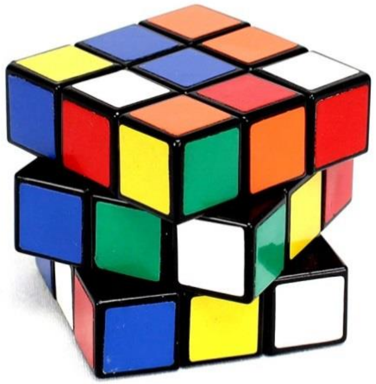
& The Global Climate Observing System GCOS

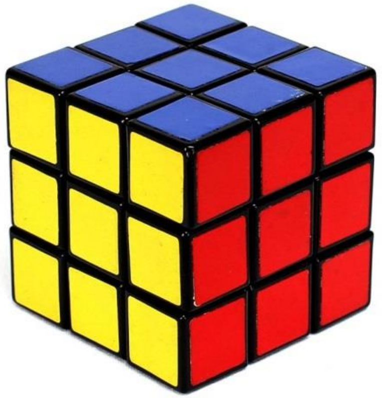
by Carolin Richter, WMO, GCOS, 8 Dec 2017

WMO UNESCO IOC ICSU International Council for Science UNEP

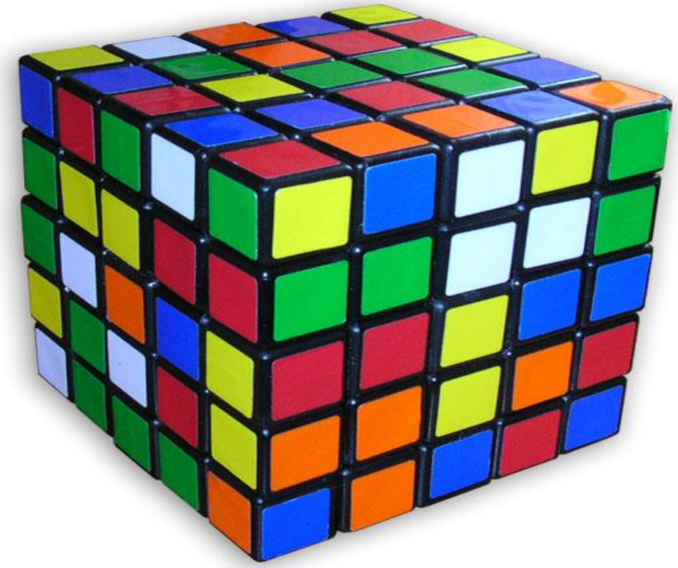
How to compare best the coordination of a Global Observig System for Climate ? Expectations in 2002 - 2006:



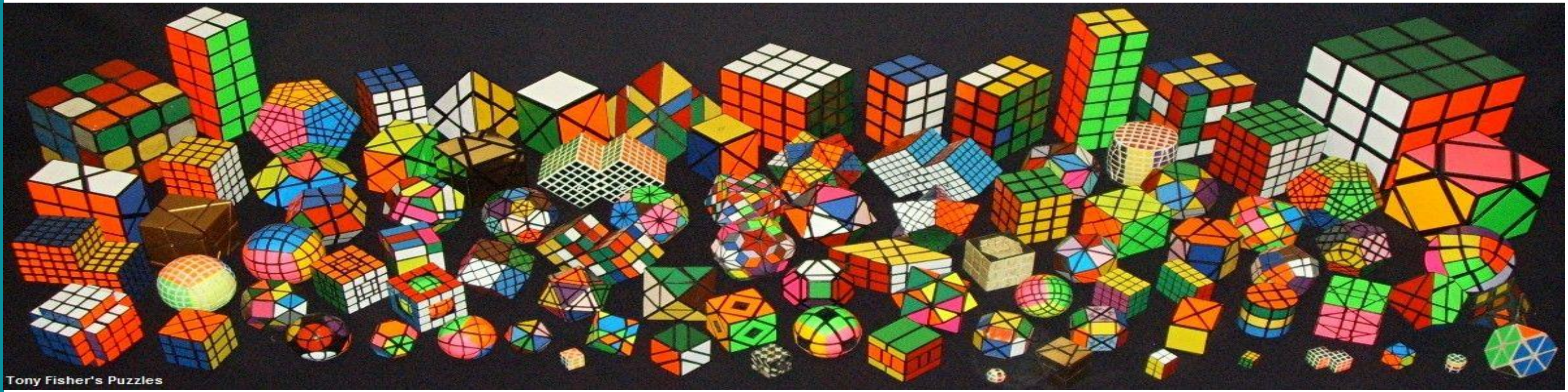




Chairman Atmospheric Observation Panel for Climate 2007 – 2014:



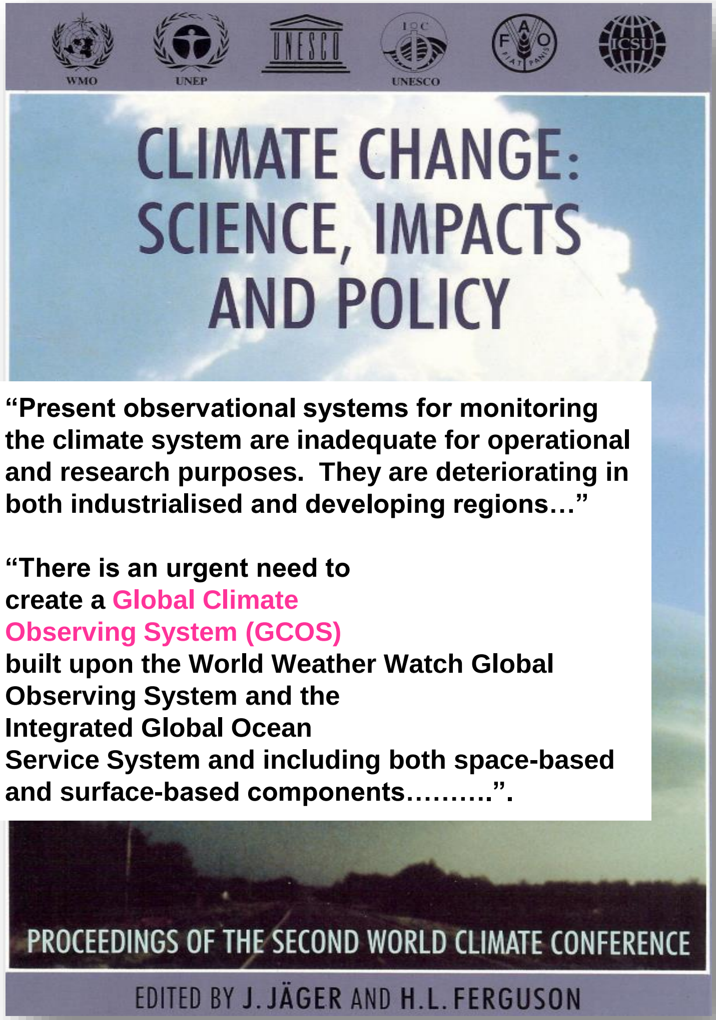
GCOS Steering Committee Chairman 2010 – 2014:



Lead, GCOS Status Report (2015):

Second World Climate Conference (WCC-2) Ministerial Session in 1990

The Secretary-General of WMO, G.O.P. Obasi, addressing the opening of the ministerial sessions of the Second World Climate Conference in the Palais des Nations, Geneva, on 6 November 1990. Behind him (left to right) are the Hon. E. Fenech-Adami, Prime Minister of Malta; the Rt Hon. M. Thatcher, Prime Minister of the United Kingdom; HM King Hussein I of Jordan; Federal Councillor A. Köller, President of the Swiss Confederation; M. Rocard, Prime Minister of France; and the Rt Hon. B. Paeniu, Prime Minister of Tuvalu.



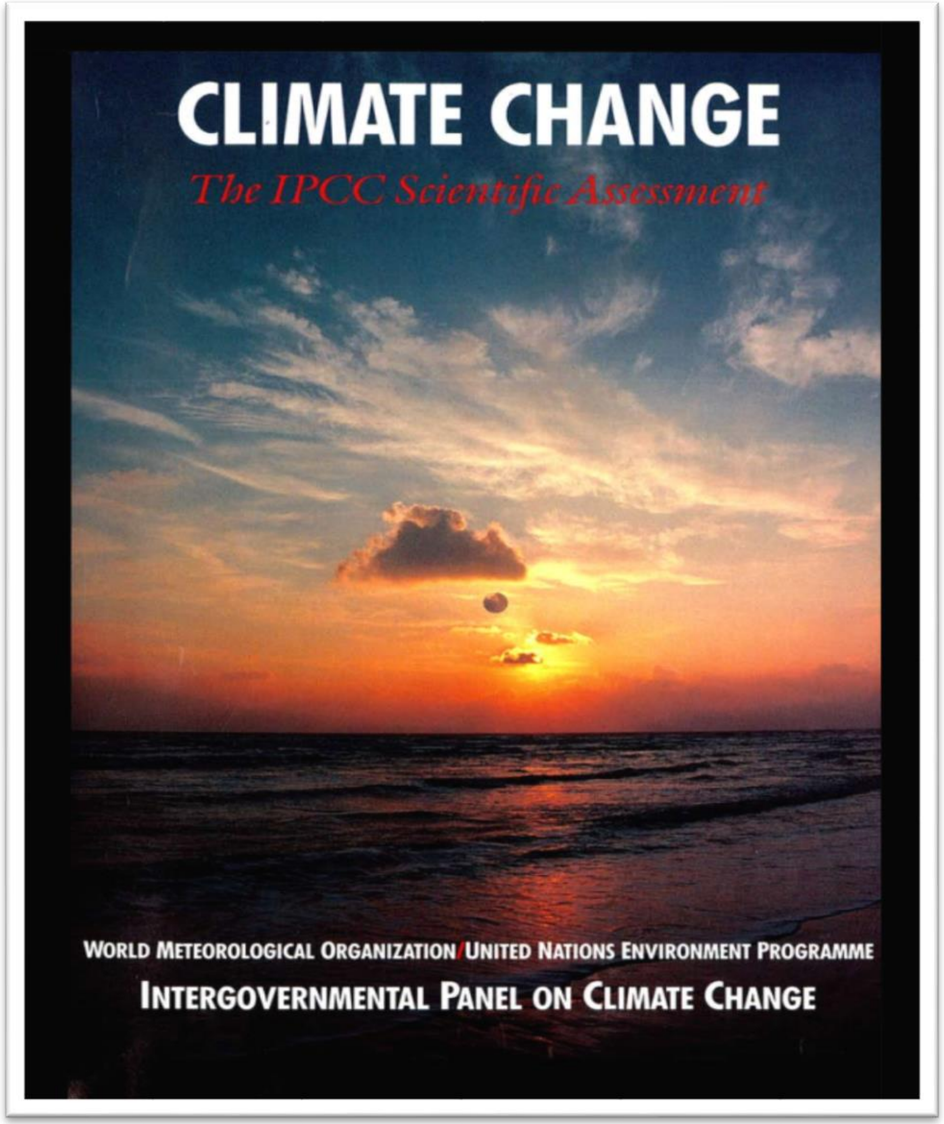
"Present observational systems for monitoring the climate system are inadequate for operational and research purposes. They are deteriorating in both industrialised and developing regions…"

"There is an urgent need to create a Global Climate Observing System (GCOS) built upon the World Weather Watch Global Observing System and the Integrated Global Ocean Service System and including both space-based and surface-based components……….".

IPCC First Assessment Report 1990

IPCC First Assessment Report (1990)

IPCC concluded „that improved predictability of (human induced) climate change would require improved systematic observation of climate related variables on a global basis“



GCOS established April 1992

GCOS
GLOBAL CLIMATE OBSERVING SYSTEM

UNEP

ICSU International Council for Science

IOC

UNESCO

WMO

GCOS established April 1992

The vision of GCOS is that all users have access to the climate observations, data records and information which they require to address pressing climate-related concerns. GCOS users include individuals, national and international organizations, institutions and agencies.

The role of GCOS is to work with partners to ensure the sustained provision of reliable physical, chemical and biological observations and data records for the total climate system – across the atmospheric, oceanic and terrestrial domains, including hydrological and carbon cycles and the cryosphere.

gcos.wmo.int

Rio Conventions - 1992

Article 4.1 (g) Commitments

Article 5 Research and Systematic Observations

Art 4 Art 5 Art 7 Art 8 Art 9 Art 10 Art 11 Art 12 Art 13 Art 14

Art 7 (7c)

Paris Agreement Article 7 (7c): Strengthening scientific knowledge on climate, including research, systemic observation of the climate system and early warning systems.

Article 8:

Loss & Damage: Cooperation and facilitation of EWS, emergency preparedness, slow onset events, …

COP21 • CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

Observations

GCOS
GLOBAL CLIMATE OBSERVING SYSTEM
CEOS
CGMS

Research

WCRP
World Climate Research Programme

Assessment

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO
UNEP

From "observations and science informs policy" to "policy directs scientific focus"

COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

From "observations and science informs policy" to "policy directs scientific focus"

Observations

GCOS
GLOBAL CLIMATE OBSERVING SYSTEM
CEOS
CGMS

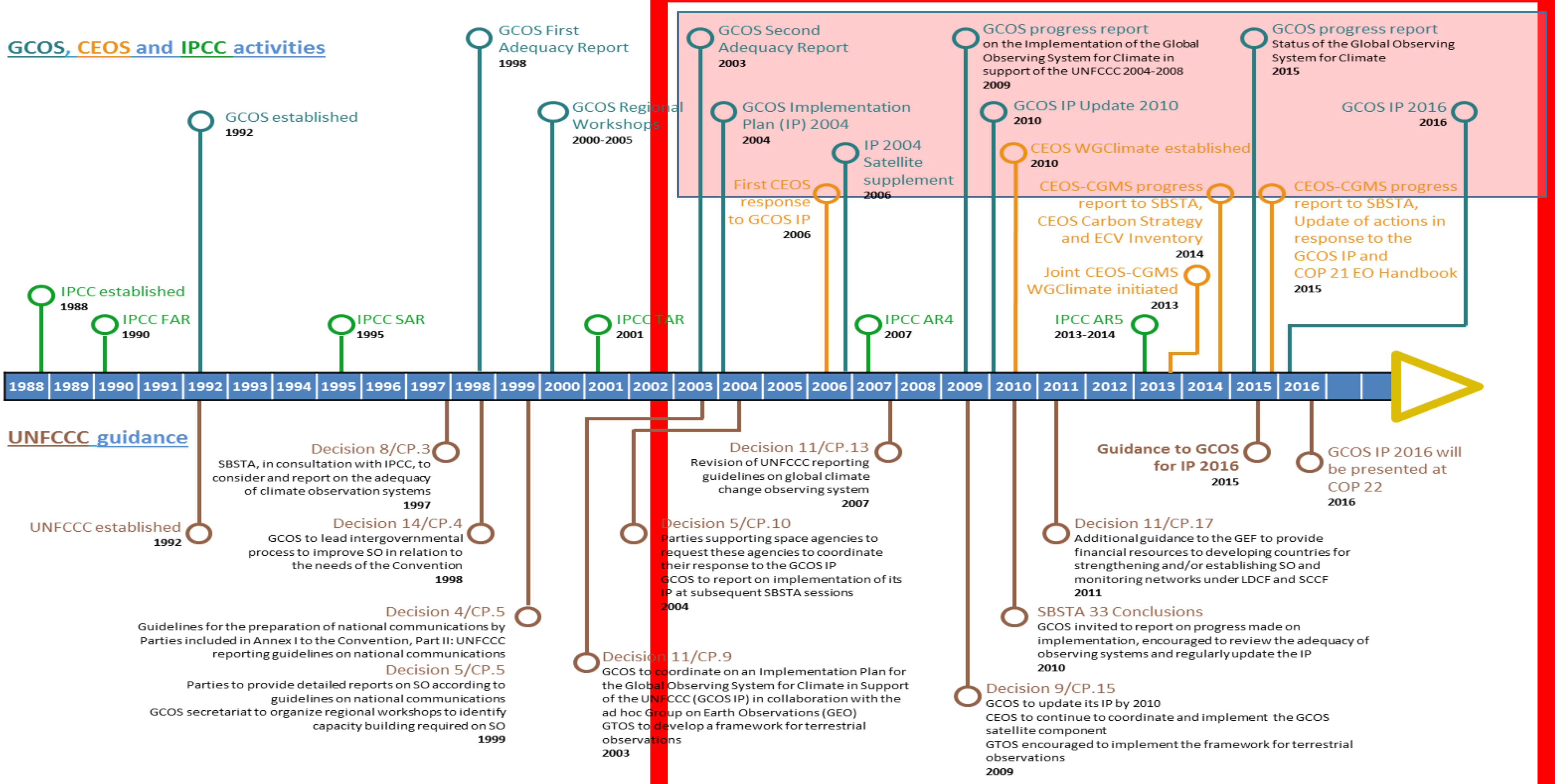
Research

WCRP
World Climate Research Programme

Assessment

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO
UNEP

UNFCCC Conference of the Parties, 2010, Cancun, Mexico
Report to the Subsidiary Body for Scientific and Technological Advice



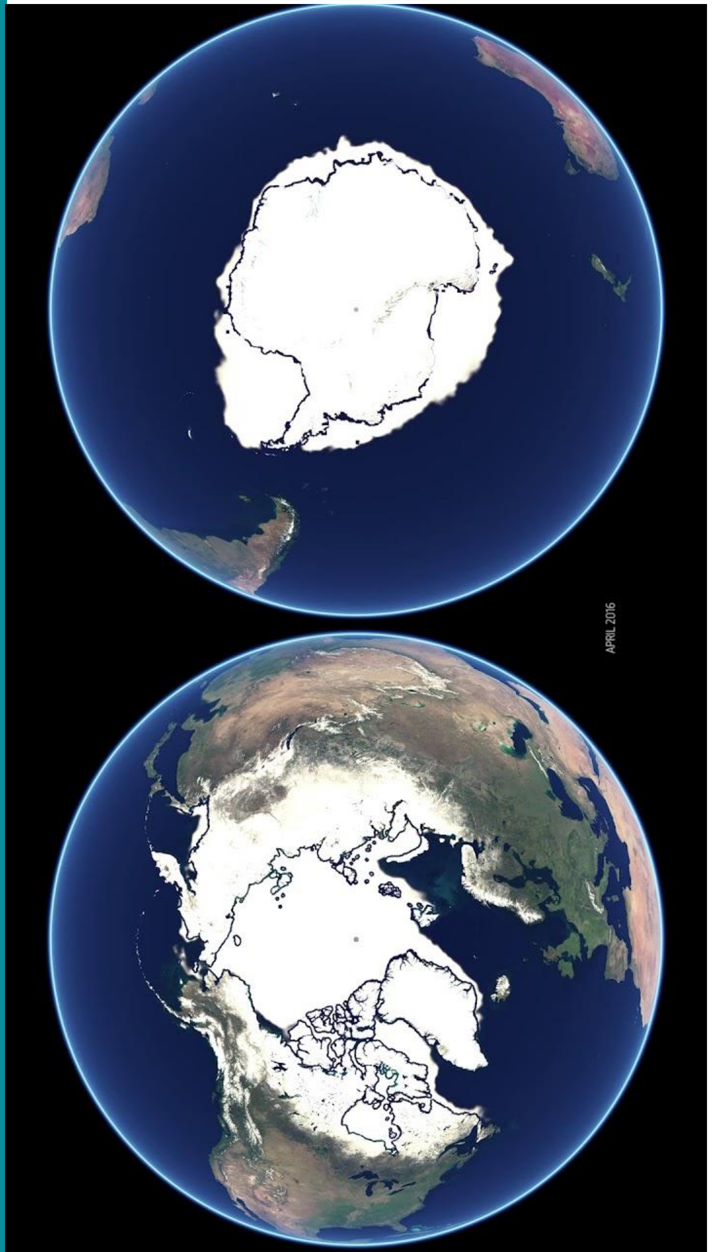
Source: http://unfccc.int/files/science/workstreams/systematic_observation/application/pdf/systematicobservation_2015_1_informationnote.pdf

GCOS Steering Committee Chairmen & Directors Regularly Assessing the Global Observing System for Climate

Adrian Simmons, John Zillman (SC Chairman 2006-2009), Kirk Dawson (SC Chairman 1998-2001)

David Goodrich (Director 2005-2008), Adrian Simmons, Carolin Richter (Director since 2009), Paul Mason (SC Chairman 2002-2005), Alan Thomas (Director 1999-2005)

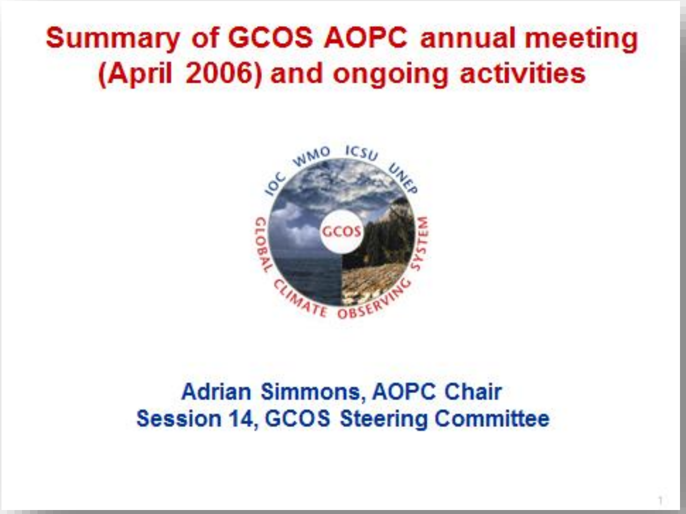
GCOS Satellite Supplement to the Implementation Plan



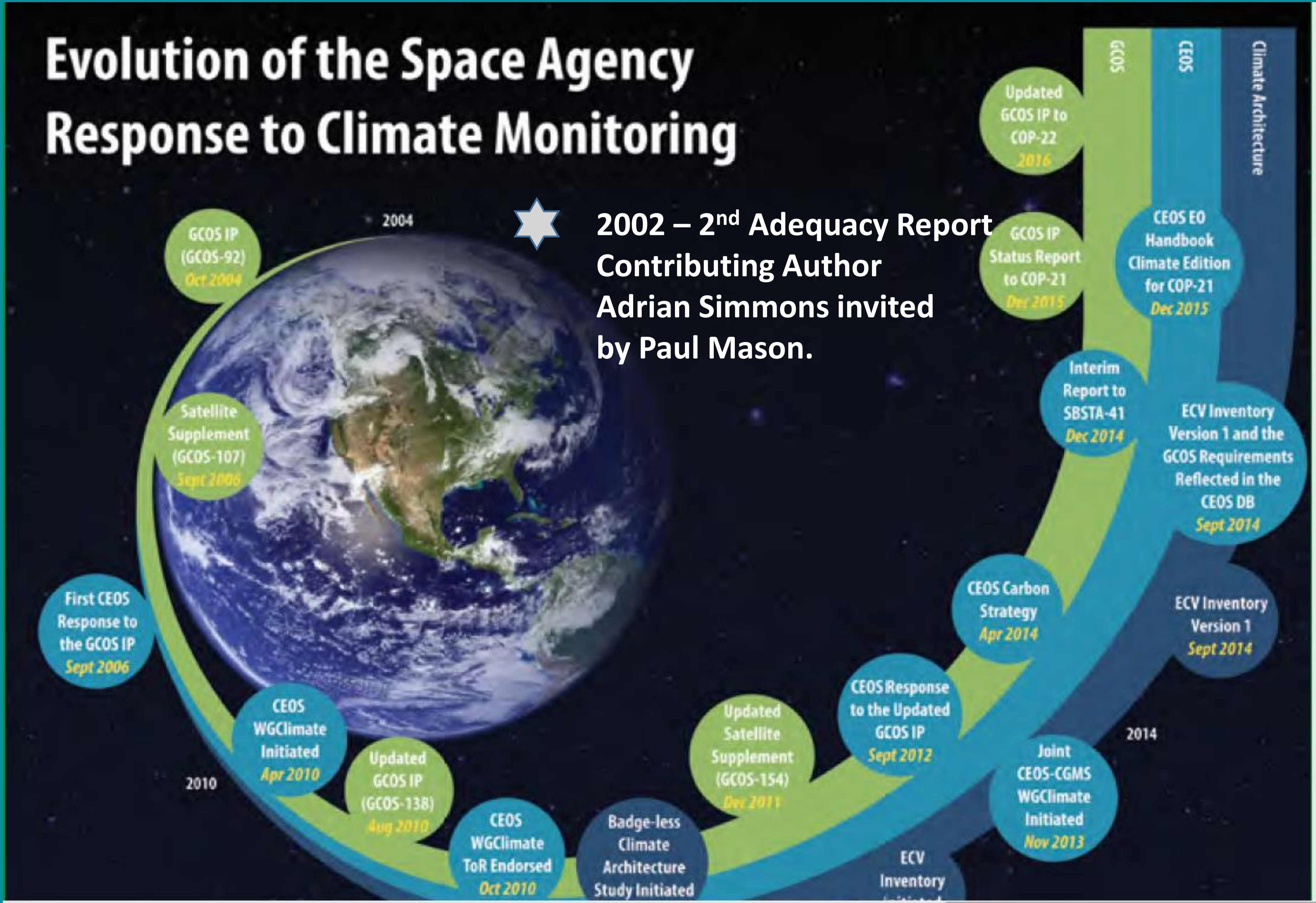
"Space community requires relative clear and stable statement of requirements for climate monitoring."

GCOS Atmospheric Observation Panel for Climate is:

"… drawing conclusions on strategies for monitoring radiation and related atmospheric variables, which are reflected also in Satellite Requirements supplement to the GCOS Implementation Plan noting in particular that current satellite plans do not ensure that the total solar irradiance will be adequately monitored over the coming decades."



Space Agencies respond to GCOS



2002 – 2nd Adequacy Report Contributing Author Adrian Simmons invited by Paul Mason.

Figure 1: Key milestones in the development and planning of the satellite observations required by the UNFCCC – as defined by the Implementation Plan of the GCOS

ECV Inventory Data & Download

WGClimate CEOS CGMS

http://climatemonitoring.info/ecvinventory

WGClimate CEOS CGMS

ID	Domain	ECV	Product	Physical Quantity	Status	Org	From	To
11536	Atmosphere	Earth Radiation Budget	Total Solar Irradiance	Total Solar Irradiance	Current	NOAA NCEI	2003-03-01	2016-12-31
11535	Atmosphere	Earth Radiation Budget	Total Solar Irradiance	Total Solar Irradiance	Current	NOAA NCEI	2003-03-01	2016-12-31
11534	Atmosphere	Earth Radiation Budget	Solar Spectral Irradiance	Solar Spectral Irradiance	Current	NOAA NCEI	2003-03-01	2016-12-31
11533	Atmosphere	Earth Radiation Budget	Solar Spectral Irradiance	Solar Spectral Irradiance	Current	NOAA NCEI	2003-03-01	2016-12-31
11532	Atmosphere	Water Vapour	Total Column Water Vapour	Total Column Water Vapour	Current	NASA	1987-07-01	2016-12-31
11531	Atmosphere	Water Vapour	Total Column Water Vapour	Total Column Water Vapour	Current	NASA	1987-07-01	2016-12-31
11530	Atmosphere	Water Vapour	Total Column Water Vapour	Total Column Water Vapour	Current	NASA	1987-07-01	2016-12-31
						NASA	1987-07-01	2016-12-31
						NASA	1987-07-01	2016-12-31
						NASA	1987-07-01	2016-12-31

showing 1 to 10 of 913 records

DOMAIN	TERRESTRIAL
ECV	*Soil Moisture* Product: Volumetric Soil Moisture ID: T.11.1 Number of items:
TARGET RESOLUTION	horizontal: 50 km vertical: N/A temporal: Daily
TARGET ACCURACY:	0.04 m3/m3
TARGET DECADAL STABILITY::	0.01 m3/m3 /year

Benefits

Improved accuracy of GCMs and soil-vegetation- atmosphere transfer schemes, increased understanding of the feedback between climate and vegetation, gas flux estimation in permafrost regions.

Other Applications

NWP and nowcasting; Hydrological modelling, groundwater management, agricultural management and hazard forecasting, including flood and drought prediction; Epidemiology, though prediction of water-borne diseases.

DOMAIN	TERRESTRIAL
ECV	*Land Surface Temperature* Product: Land-Surface Temperature ID: T.12.1 Number of items: 3
TARGET RESOLUTION	horizontal: 1 km vertical: N/A

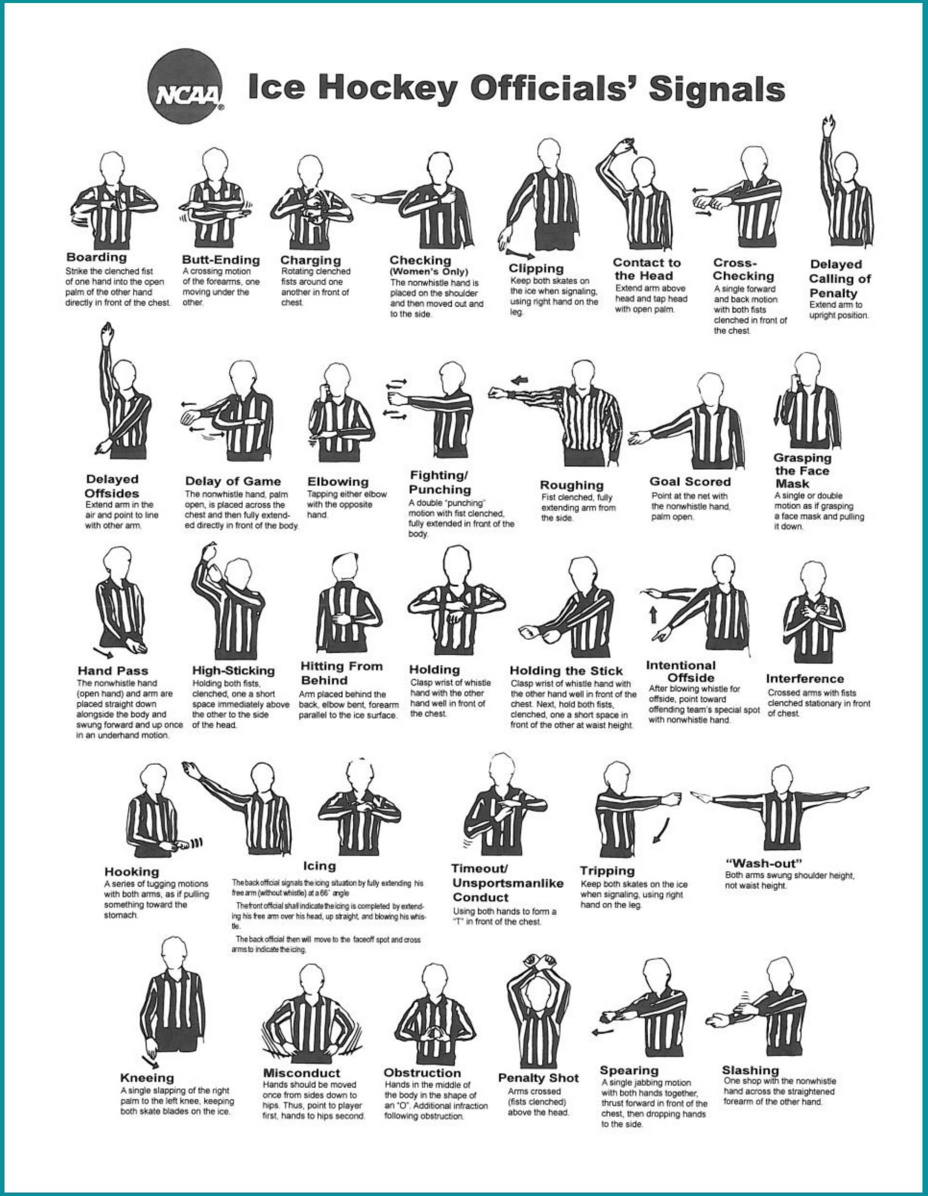
Benefits

Relevance to detailed observations of TOA longwave upwelling radiance; Synergistic with making observations of SST; Relevance to spatial and temporal characterization of freeze-thaw cycles; Land-surface temperature as a driver of vegetation phenology; Response of the land surface to radiative and boundary layer forcing, modulated by hydrological conditions; Early and sensitive indicator of drought conditions.

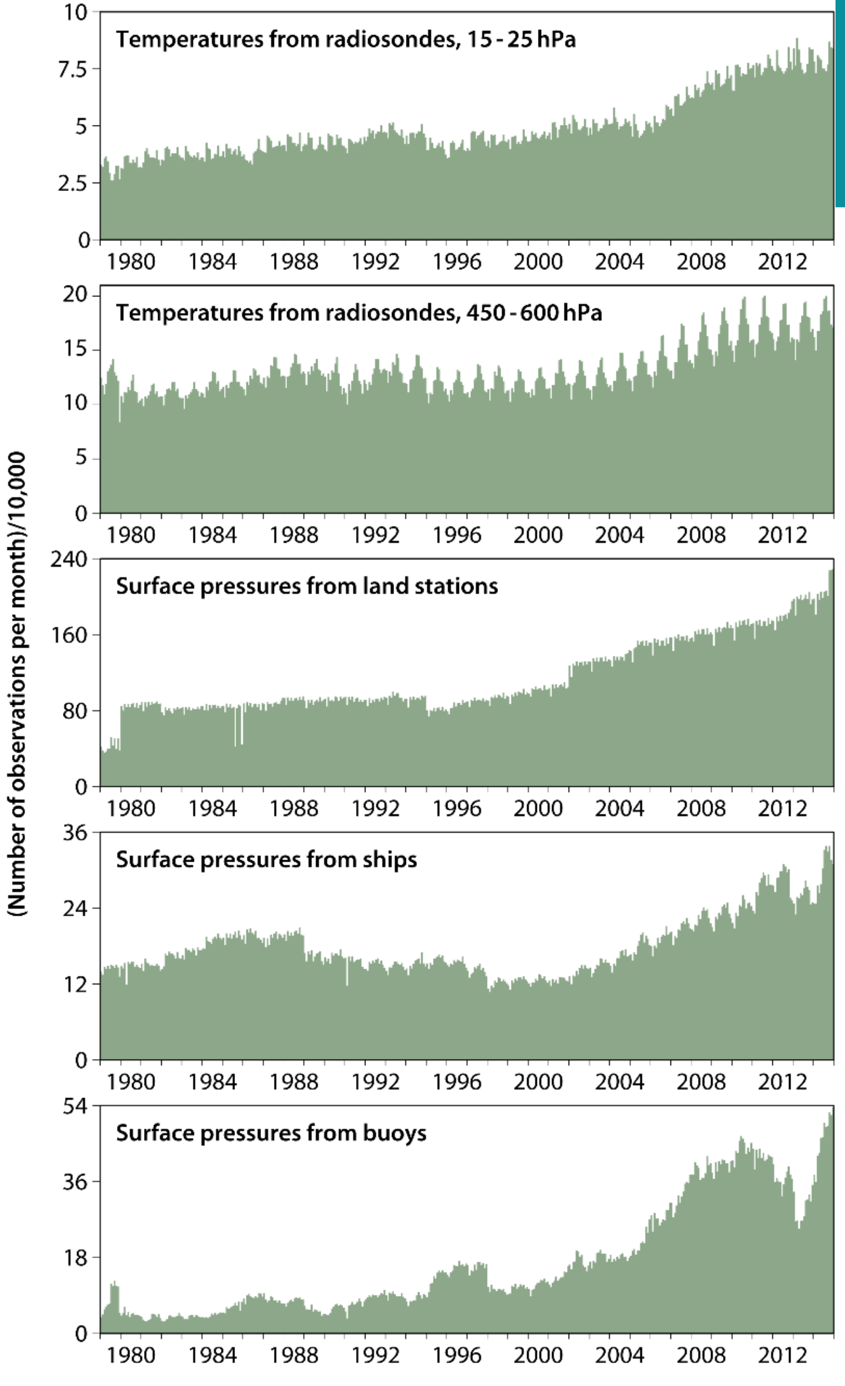
32 ECVs available

WMO UNESCO IOC INTERNATIONAL COUNCIL FOR SCIENCE UN environment

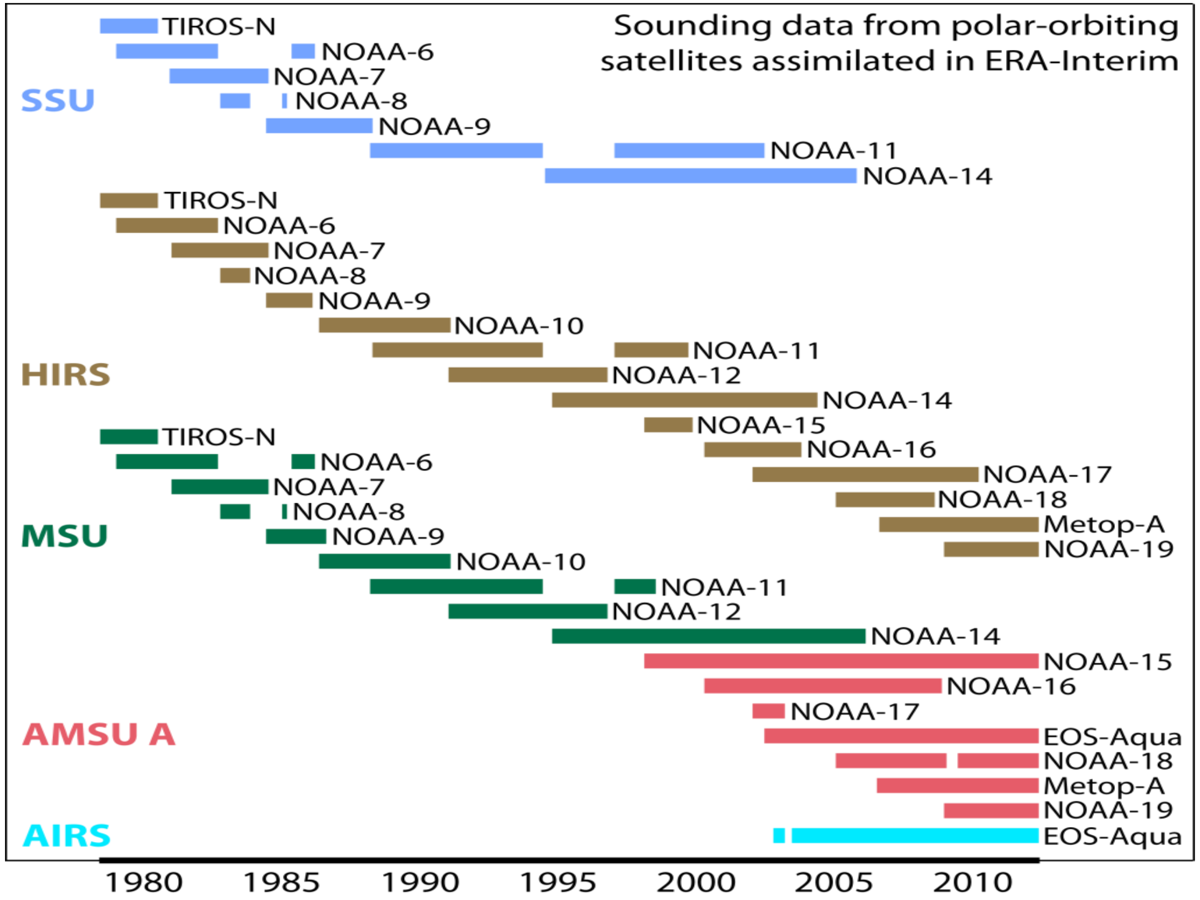
Lead author, Status Report for the Global Climate Observing System, 2015



Evolution of the observing system – Assessment in 2015

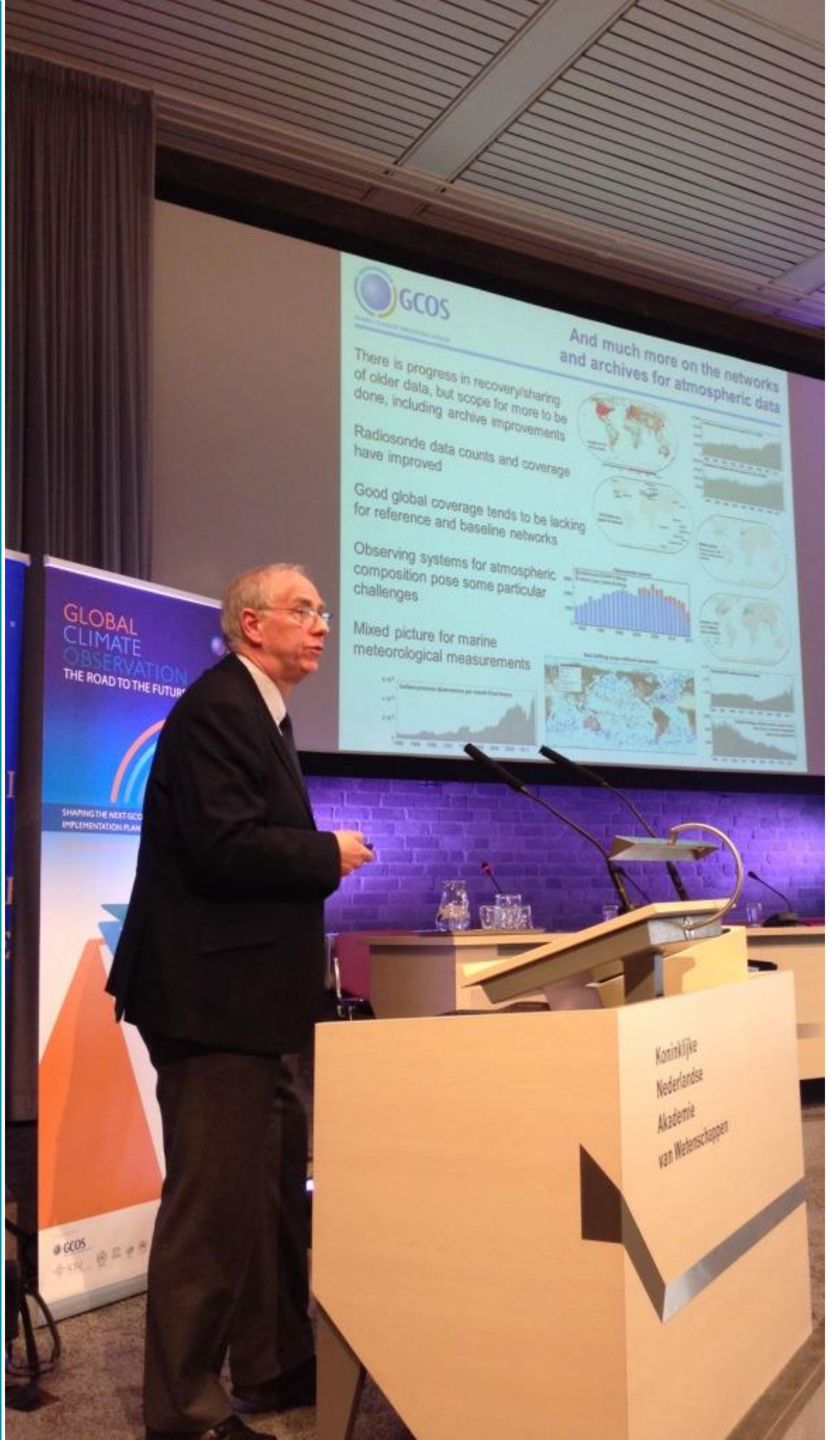


Examples of *in situ* data numbers assimilated by ERA-Interim



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

Source: A. Simmons



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

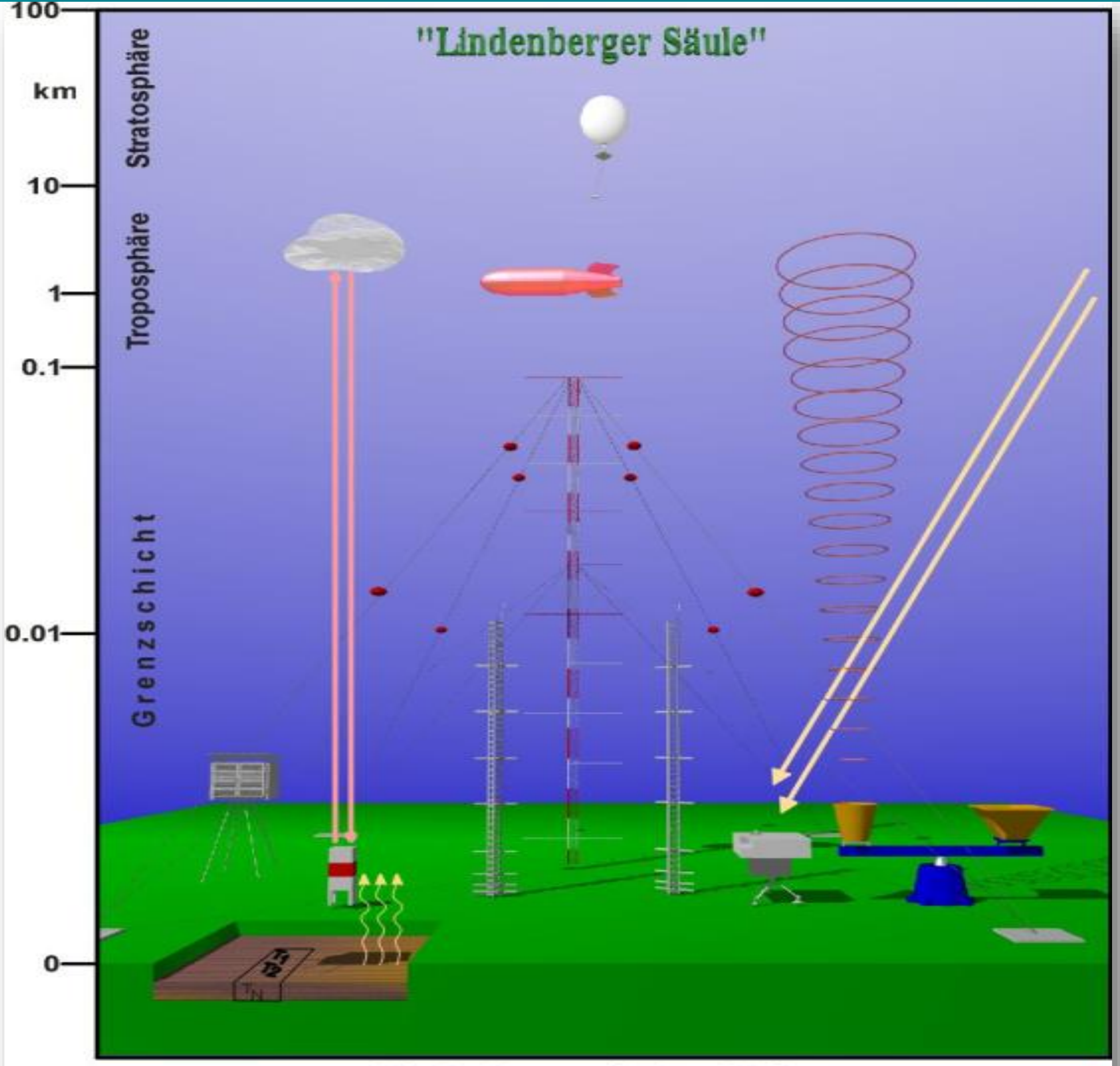
- quantity and quality of data from several *in situ* sources, including radiosondes
- quantity, quality and variety of data from satellites
- recovery and reprocessing of past data, both *in situ* and remotely sensed
- reanalysis, with coupling of atmosphere to ocean and land, and inclusion of chemistry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

and evolving requirements

- e.g. for global, ground-based, soil-moisture data to complement remote sensing and reanalysis

Source:Status Report 2015, A. Simmons

GCOS Reference Upper-Air Network – GRUAN – 2006..2008



Lindenberger Säule - Meßsystem

Reference Networks

Upper air

GRUAN

ECV: Temperature and Humidity

GCOS Reference Upper-Air Network

Radiosonde launch at Ny-Ålesund, Norway

- **Provide reference data to constrain and calibrate from more spatially comprehensive observing system.**
- **Determine trends**
- **Provide appropriate data for studying atmospheric processes**

GRUAN will mark its 10th year anniversary in April 2018, Potsdam

GCOS Surface Reference Network

Reference Network

Improved long-term accuracy, stability and comparability of observations.

ECV: Temperature, precipitation

Surface: Humidity, pressure, radiation budget, wind.

Albedo, land cover, FAPAR, LAI, above ground biomass, soil carbon, land surface temperature

US Climate Reference Network

Moose, WY

Temperature, precipitation, soil moisture and temperature

Cryonet sites from WMO GCW

Quelccaya Ice Cap -

Snow, air temperature, humidity, wind speed and direction, precipitation and downwelling shortwave

Adapting to a changing climate – what observations are needed ?

“Virtually all observations support adaptation.”

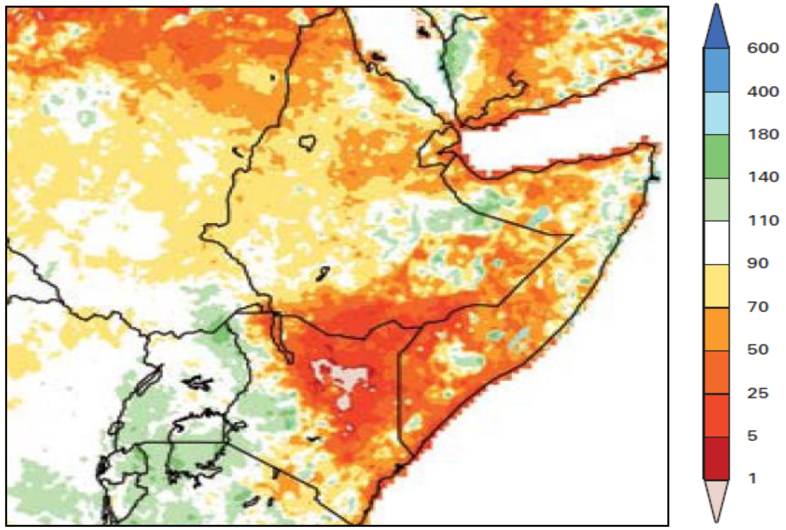
“We must model what we cannot measure (or predict with global systems).”

Adrian Simmons, Workshop on Observations for Adaptation, DWD, Offenbach, Feb 2013

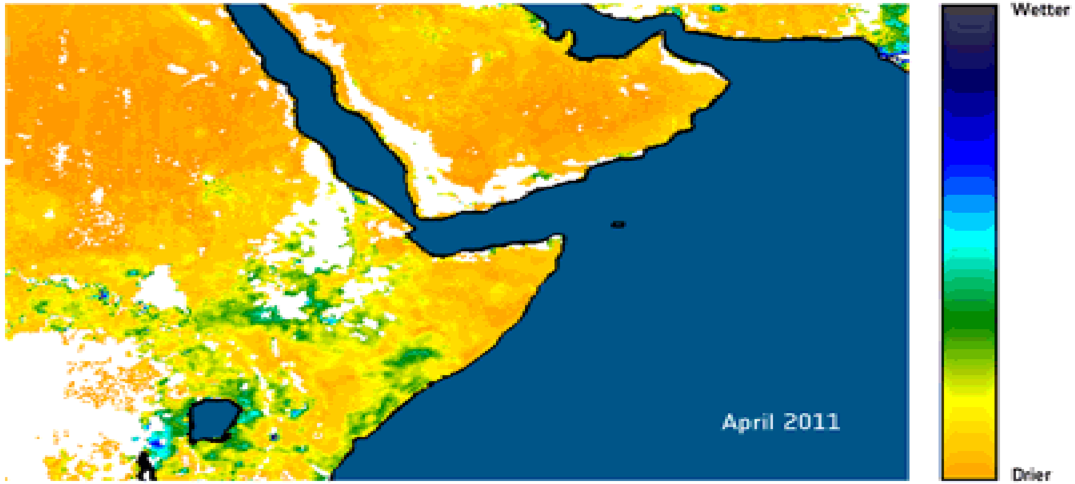
Presentation: “The Global Climate Observing System: Observations and products from global to local”

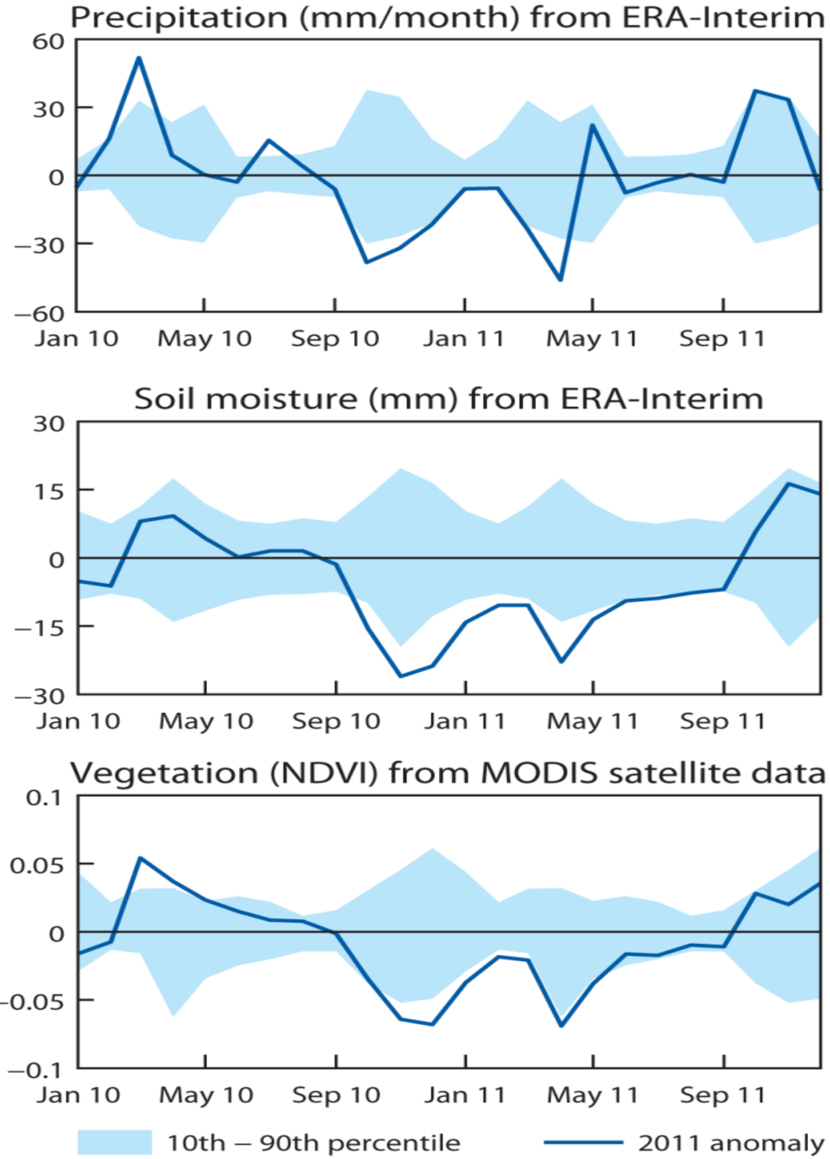
Multiple observation-based indicators of drought in East Africa

Rainfall for Feb – Sep 2011 as a percentage of the 1983–2009 average estimated using blended station and satellite data (*NOAA CPC, reproduced from WMO statement on the status of the global climate in 2011*)



Soil moisture derived from SMOS satellite data from April to mid-July 2011 (*CESBIO/ESA*)





Source: A. Simmons

WMO UNESCO IOC UNEP ICSU International Council for Science

World Climate Conference 3 – and its legacy

World Climate Conference – 3

September 2009

WORLD CLIMATE CONFERENCE-3
Geneva, 31 August – 4 September 2009

CONFERENCE STATEMENT
Summary of the Expert Segment

In the 21st Century, the peoples of the world are facing multi-faceted challenges of climate variability and climate change, which requires wise and well-informed decision-making at every level from households, communities, countries and regions, to international fora, including the UN Framework Convention on Climate Change. Those decisions will require, directly or indirectly, access to the best possible climate science and information and effective application of this information through climate services.

Adrian as Theme Leader «Observations», WCC-3, September 2009:

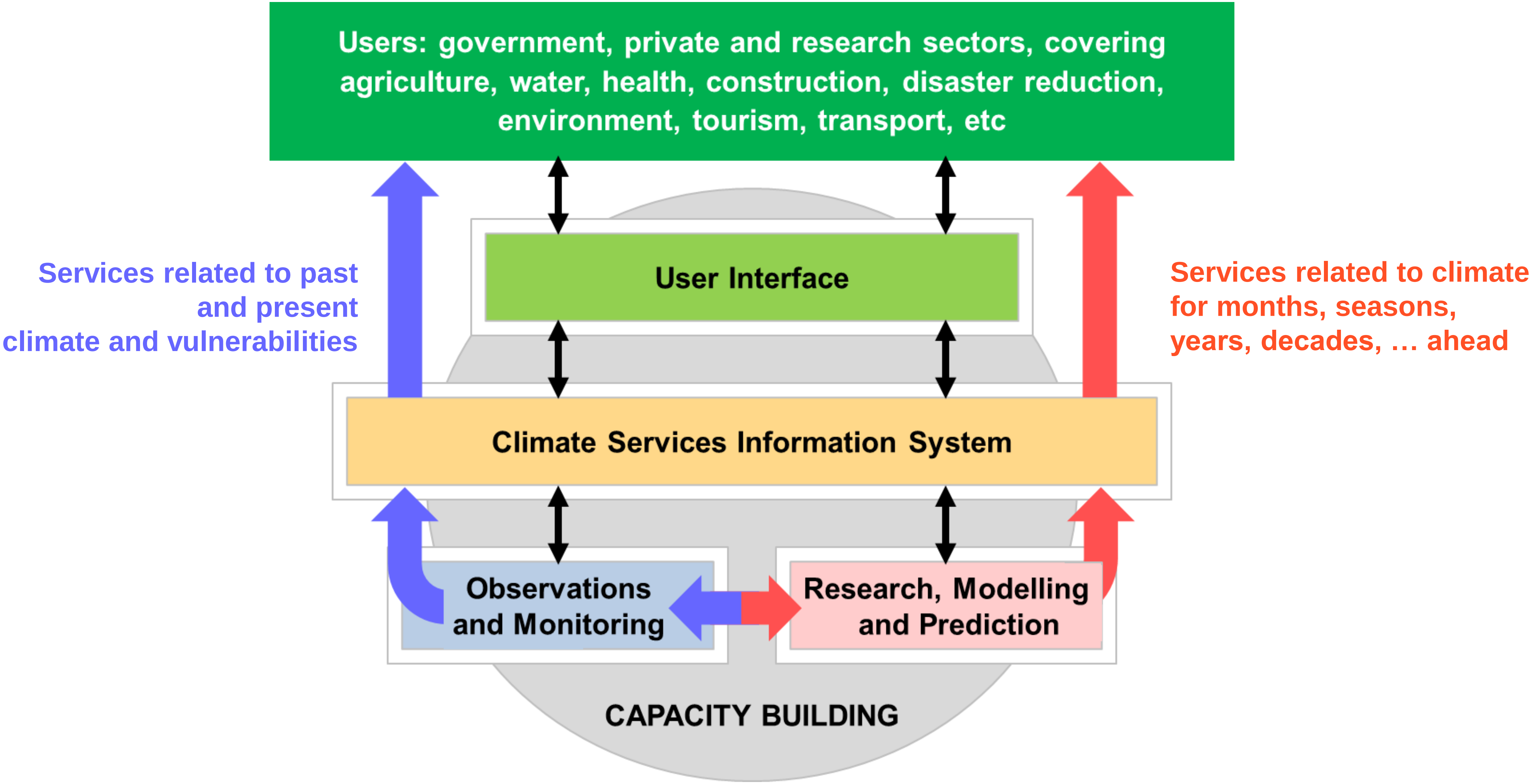
Excerpt Conference Statement: The essential role of climate observations

62. [..]

Observations are needed **to assess social and economic vulnerabilities** and develop the many actions that must be taken to adapt to climate variability and unavoidable change. They must be **recognised as essential public goods** where the value of global availability of data exceeds any economic or strategic value of withholding national data.

63. Full implementation of GCOS is essential for supporting both the **adaptation and the mitigation** objectives of the UNFCCC, and for ensuring that all countries will be able to manage their response to climate variations and change through the 21st Century.

Observations for climate services



(Prof. A. Simmons, GFCS II side event, Cg-XVI, 19 May 2011)

Concept of ECVs published– 2014

THE CONCEPT OF ESSENTIAL CLIMATE VARIABLES IN SUPPORT OF CLIMATE RESEARCH, APPLICATIONS, AND POLICY

BY STEPHAN BOJINSKI, MICHEL VERSTRAETE, THOMAS C. PETERSON, CAROLIN RICHTER, ADRIAN SIMMONS, AND MICHAEL ZEMP

Described is the concept of Essential Climate Variables developed under the Global Climate Observing System for a range of applications, as well as to provide an empirical basis for understanding past, current, and possible future climate variability and change.

Observations are fundamental to advancing scientific understanding of climate (Doherty et al. 2009; Shapiro et al. 2010) and delivering the vetted, timely, and purposeful climate information needed to support decision making in many sectors. Observations and monitoring are key elements of the emerging Global Framework for Climate Services (WMO 2011a) and more generally support climate research, the assessment of climate change, and the development of policy responses (Fig. 1). For these purposes, observational datasets in general need to be traceable to quality standards, be readily interpretable and freely available, and cover sufficiently long periods: for example, the 30 years traditionally used for calculating climate normals (WMO 2011b). Transparency in the generation of climate datasets is

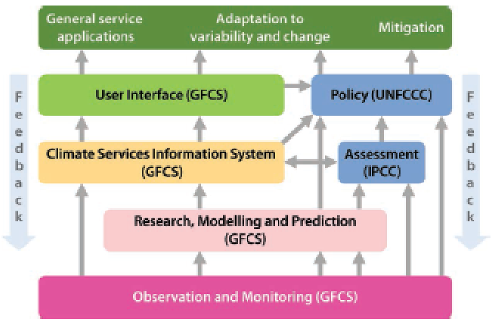


FIG. 1. The role of observation within the Global Framework for Climate Services (GFCS) and in support of research; the assessment of climate change, in particular as undertaken by the IPCC; and the development and implementation of policy responses, in particular under the UNFCCC. Gray arrows denote the main directions of flow of climate data and derived information. Feedback for system improvement flows mainly in the opposite direction. The GFCS includes a substantial capacity-development component that underlies all illustrated components. Adapted from WMO (2009, 2011a).

https://doi.org/10.1175/BAMS-D-13-00047.1
Published Online: 30 October 2014

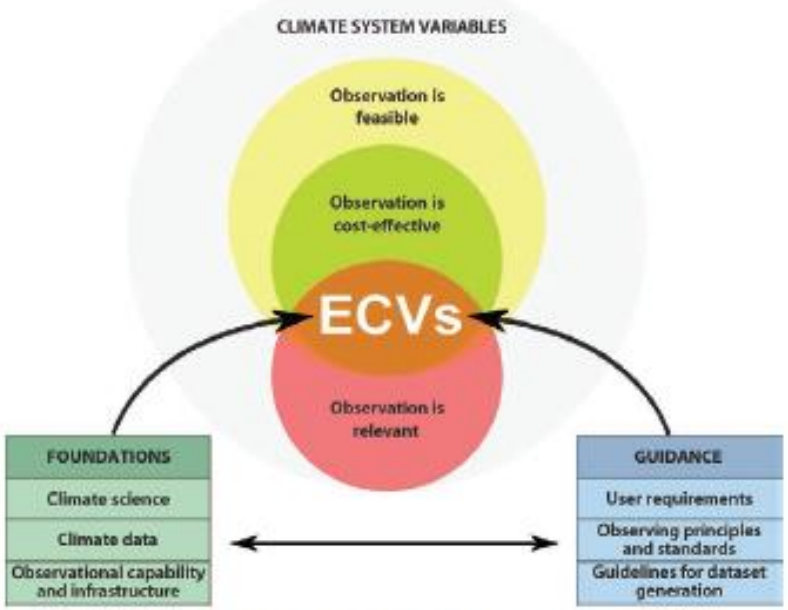


FIG. 2. Schematic of the ECV concept: knowing existing climate-relevant observing capabilities, climate datasets, and the level of scientific understanding of the climate system are the foundations (lower-left box) necessary for selecting the ECVs from a pool of climate system variables. In addition, guidance is needed to make practical use of the ECVs (lower-right box): user requirements capture the data quality needs of science, services, and policy; climate-specific principles guide the operation of observing systems and infrastructure; and guidelines facilitate the transparent generation of ECV data records. The latter address the availability of metadata, provisions for data curation and distribution, and the need for quality assessment and peer review.

Exchanging Arguments

with courtesy of Detlef Frömming

In 2014, GCOS was reviewed by a board appointed by its sponsors, ICSU, WMO, IOC and UNEP. Its overall conclusion was:

"There is no doubt the GCOS Programme should be continued. It is indispensible. If it ceased to exist it would need to be recraated."

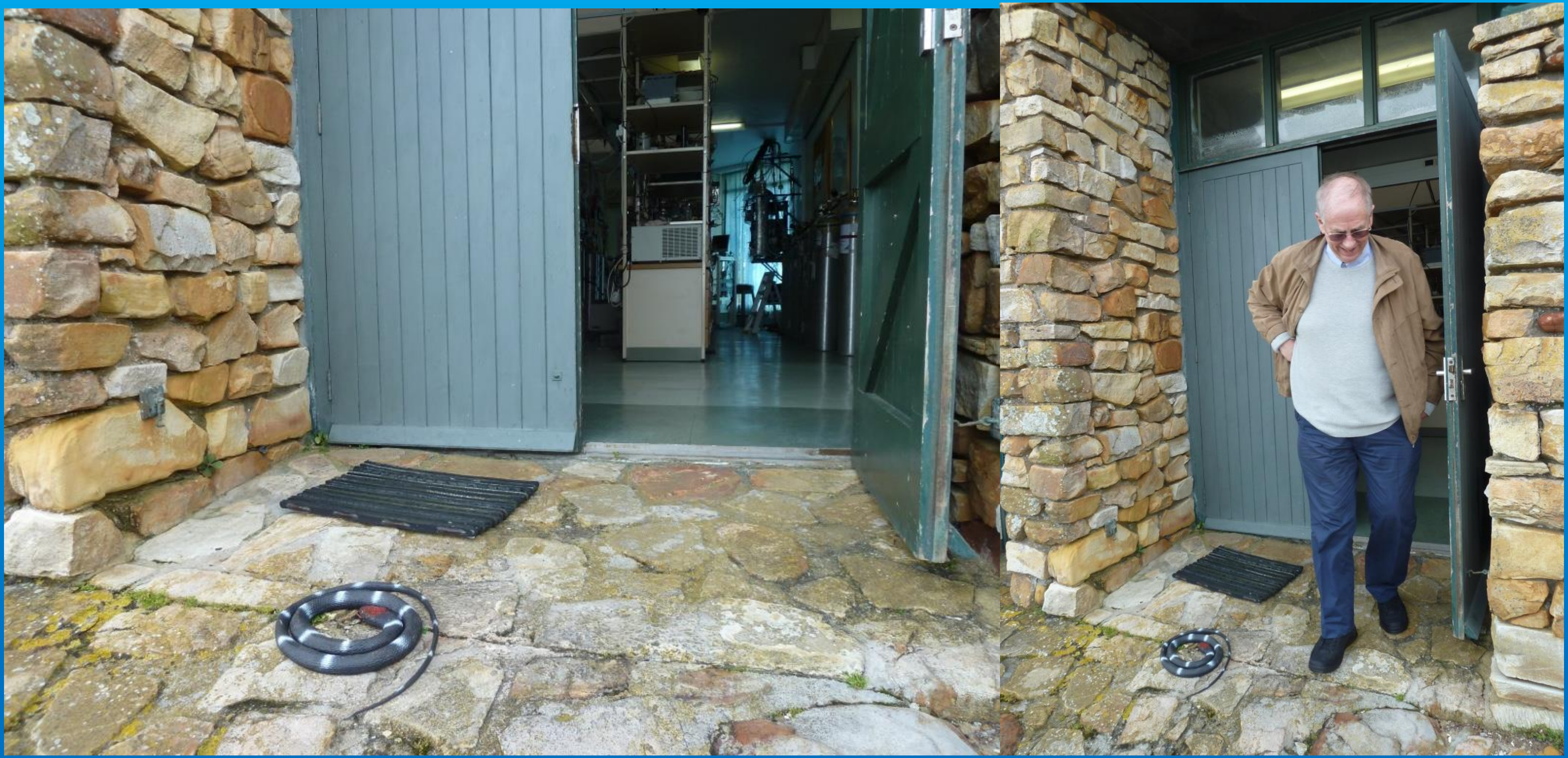
The review made a number of recommendations for improving GCOS.

Improvements are needed to better integrate the sustained observing system and ensure it will meet future requirements.

AOPC Chairman 2007 – 2014 & the new team

Ken Holmlund, EUMETSAT Albert Klein-Tank, KNMI (until 2015)

GCOS Chairmen must be fearless



Visit of the GAW Station, Cape Point, South Africa, 2015 which was well guarded.

GCOS Directors must be fearless
(particular calling Chairmen on Friday afternoons)

Hand-over ceremony from Adrian Simmons to Stephen Briggs at the European Centre for Space Applications and Telecommunications (ECSAT), based at the Harwell Science, Innovation and Business Campus in Oxfordshire, UK, on 3 April 2014.

With deepest gratitude, millions of thanks and fond memories!

SOURCE: ESA

@gcos_un

gcos.wmo.int

UN environment

INTERNATIONAL COUNCIL FOR SCIENCE

IOC

UNESCO

WMO