GLOBAL CLIMATE OBSERVING SYSTEM
GCOS

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CCI CMUG Integration 6 meeting

14 - 16 March 2016, LMU, München, Germany

GCOS
GLOBAL CLIMATE OBSERVING SYSTEM

WMO IOC UNEP ICSU International Council for Science

GCOS
GLOBAL CLIMATE OBSERVING SYSTEM

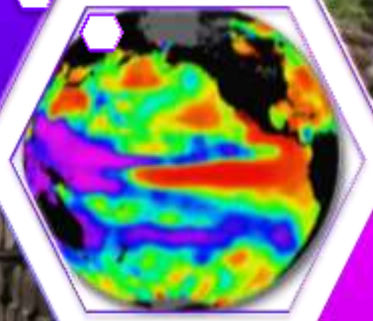
WHY OBSERVATIONS?

Assess impacts of climate variability and change

Model and predict climate system

Support adaptation

Develop climate information services



Detect and determine causes of climate change

Promote sustainable national development

International requirements UNFCCC, CBD, UNCCD, Sendai Framework, Ramsar etc

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Driving the Global Climate Observation Agenda

- GCOS follows a 3 phase approach driven by users

Identify/Review Essential Climate Variables (ECVs) through science panels → Regular review of how these ECV are observed → Develop plans to ensure continuity and improvement of observations

- 2015 Status Report started the 3rd assessment cycle with a new Implementation Plan due in 2016 for UNFCCC COP 22

(1st cycle: 1995-1998)

(2nd cycle: 2003-2004-2010)

(3rd cycle: 2015-2016)

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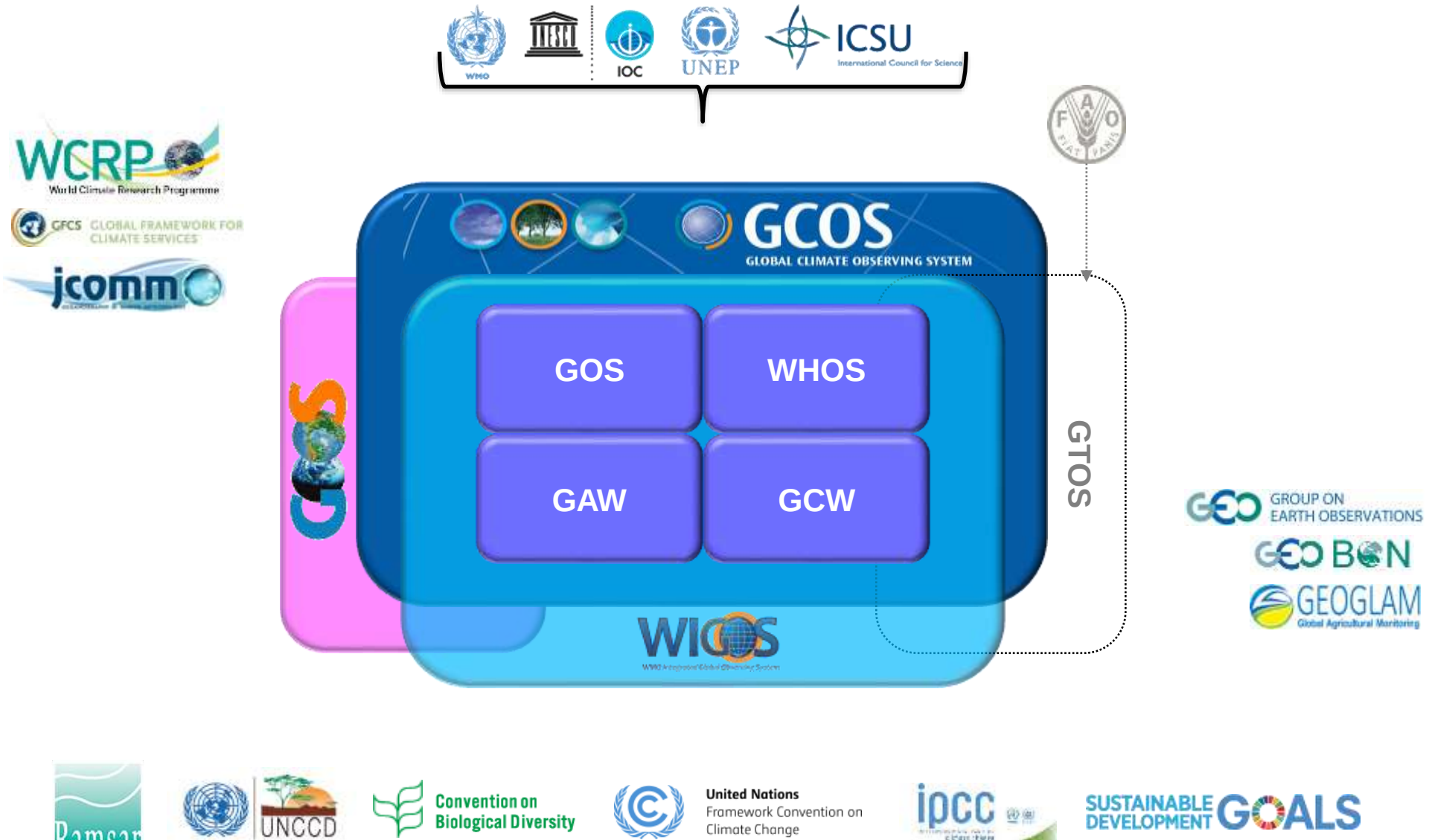

WMO
IOC
UNEP
ICSU
International Council for Science
WCRP
World Climate Research Programme
GFCS GLOBAL FRAMEWORK FOR CLIMATE SERVICES
jcomm
GCOS
GLOBAL CLIMATE OBSERVING SYSTEM
GOS
WHOS
GAW
GCW
GTOS
WIGOS
GEO GROUP ON EARTH OBSERVATIONS
GEO BON
GEOGLAM
Global Agricultural Monitoring
Ramsar
UNCCD
Convention on Biological Diversity
United Nations Framework Convention on Climate Change
ipcc
SUSTAINABLE DEVELOPMENT GOALS

3 SCIENCE PANELS

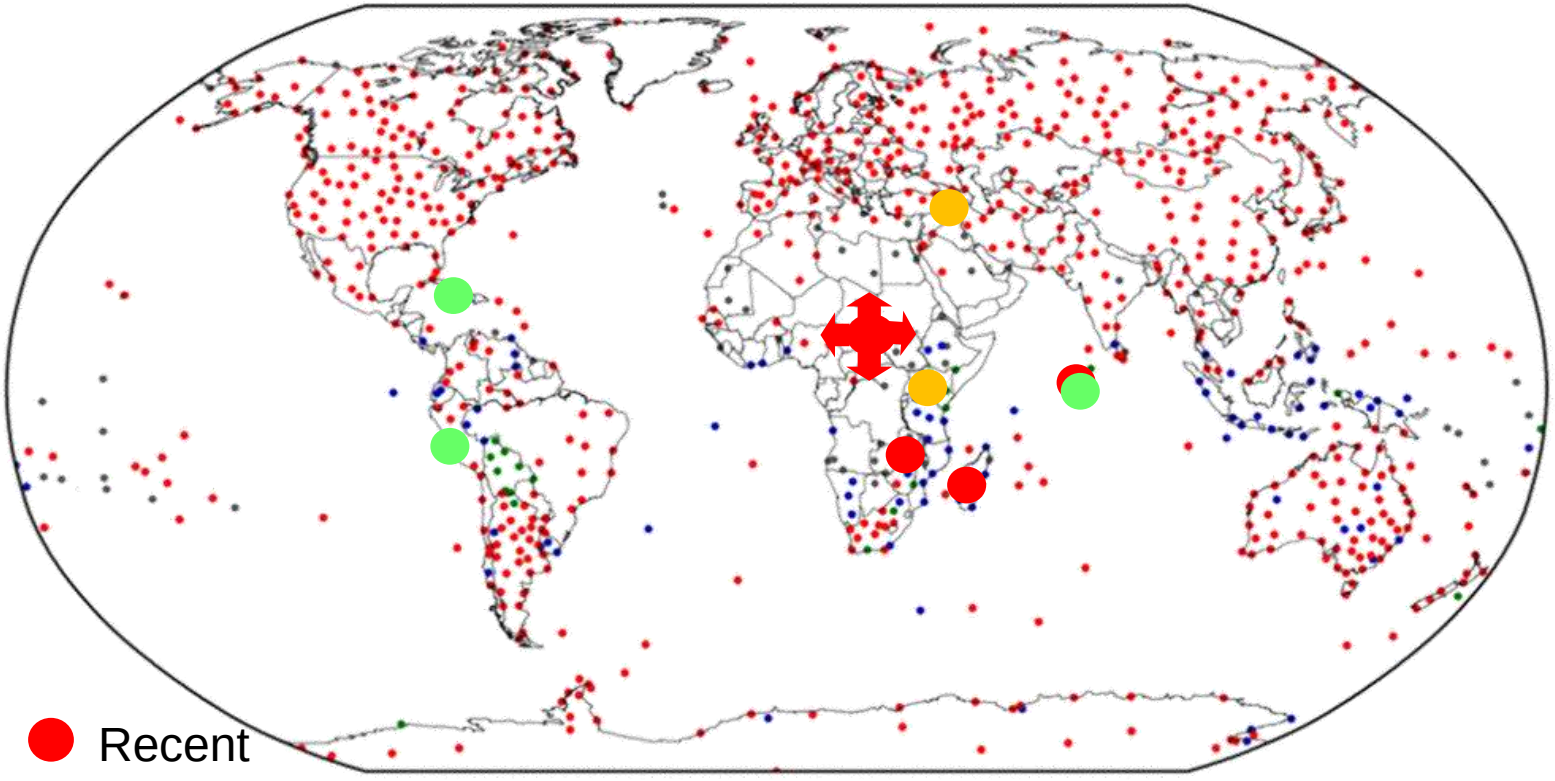
- 3 Science Panels for Atmosphere, Land and Oceans:
  - Capture requirements for users of climate observations.
  - Identify & review Essential Climate Variables (ECV) and their specification
  - Review adequacy of networks to measure & exchange data
  - Give recommendations for the new Implementation Plan
  - Advocating sustained networks, open data access, and future evolution
  - Coordinate with other observing systems

GCOS Cooperation Mechanism (GCM)



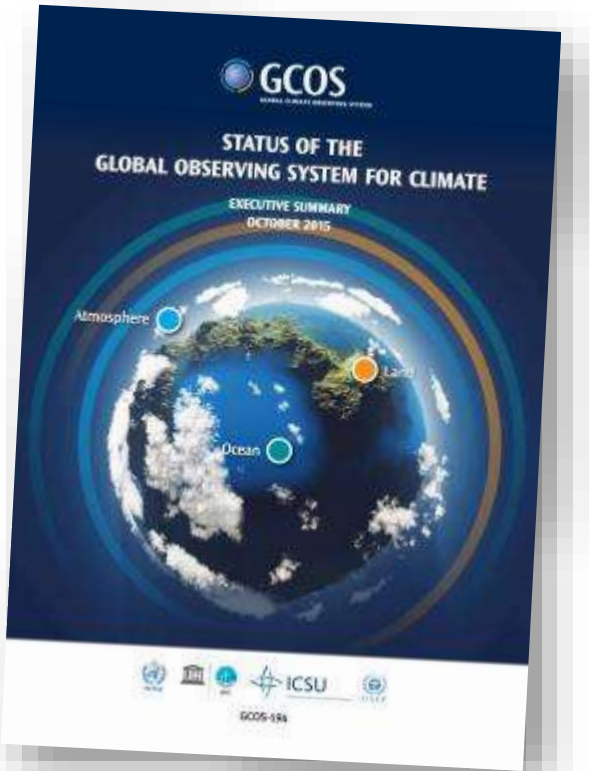


- Capacity Building: e.g. Equipment, comms., training
- Funded through GCM Trust Fund (US$ 3 million in the past decade)



GCOS STATUS REPORT

- GCOS *Status of the Global Observing System for Climate* (GCOS-195) has been published.
- It was submitted to this SBSTA at COP 21 in Paris 2015.
- Describes how well climate is currently being observed, where progress has been made, where progress is lacking or where deterioration has occurred.



- provides a basis for the new GCOS Implementation Plan
- covers matters relevant to the other issues such as biodiversity, desertification, wetlands and sustainable development (SDGs).

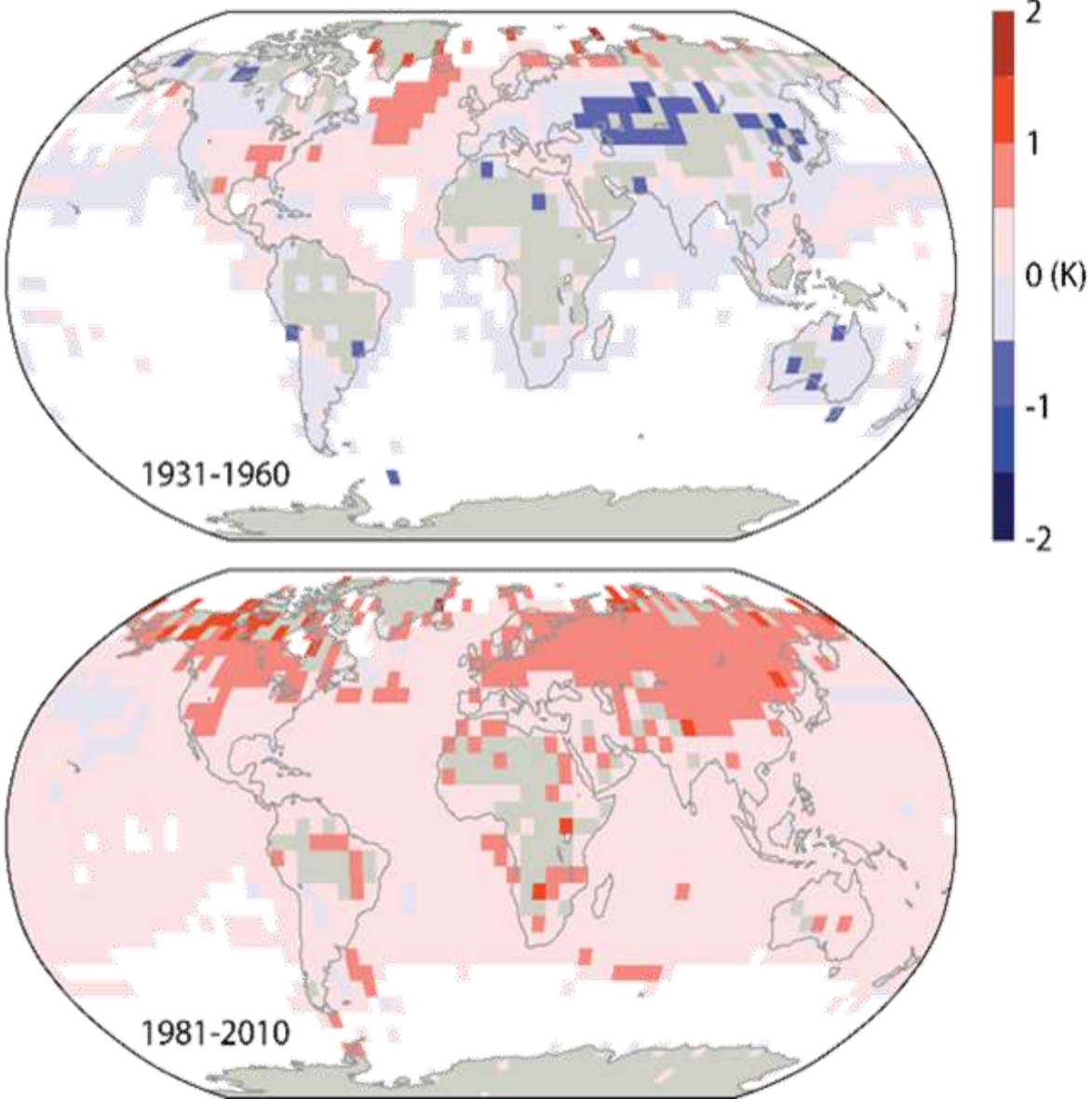
STATUS OF THE GLOBAL CLIMATE OBSERVING SYSTEM

- **Observations of the global climate system are essential** to understand and predict climate variability and change, to provide early warning and plan for extreme events and are an essential input into adaption planning.
- Using global observations, the **IPCC has found that climate change is unequivocal** and extremely likely to be the result of human activities.
- The **global observing system for climate needs to continue** to develop to meet the new challenges posed by planning for **extreme events, early warning systems, and climate change adaption and mitigation**.
- **Regional improvements, especially in Africa**, are needed to fill observational gaps and provide capacity development to ensure their sustainability.
- **Access** to long time-series of data needs to be ensured by **historical data rescue, sustainability of current networks** and **improved operation of data centres**.

OBSERVATIONAL DOMAINS

- **Atmospheric observation** is the best developed due to many decades of meteorological data collection.
  - Networks are relatively dense, with some gaps, with clear observational standards.
  - Largely there is open data exchange and there are international data centres.
- **Ocean observation** has developed quickly, with **international planning and implementation of observational networks**.
  - New technologies enable more and better autonomous data collection.
  - The overall structures are in place for improvement to continue.
- **Terrestrial observations** have traditionally been made on smaller scales, with different standards and methods in different countries.
  - They also have a poor history of open data exchange.
  - **Space-based observation is now providing global coverage of improving quality for a number of variables**.
  - Progress includes global networks for glaciers and permafrost and standards, methods and data-exchange protocols for key hydrological variables.
  - However, an integrated approach to terrestrial observation is still lacking.

SURFACE TEMPERATURE ANOMALIES RELATIVE TO 1961-1990



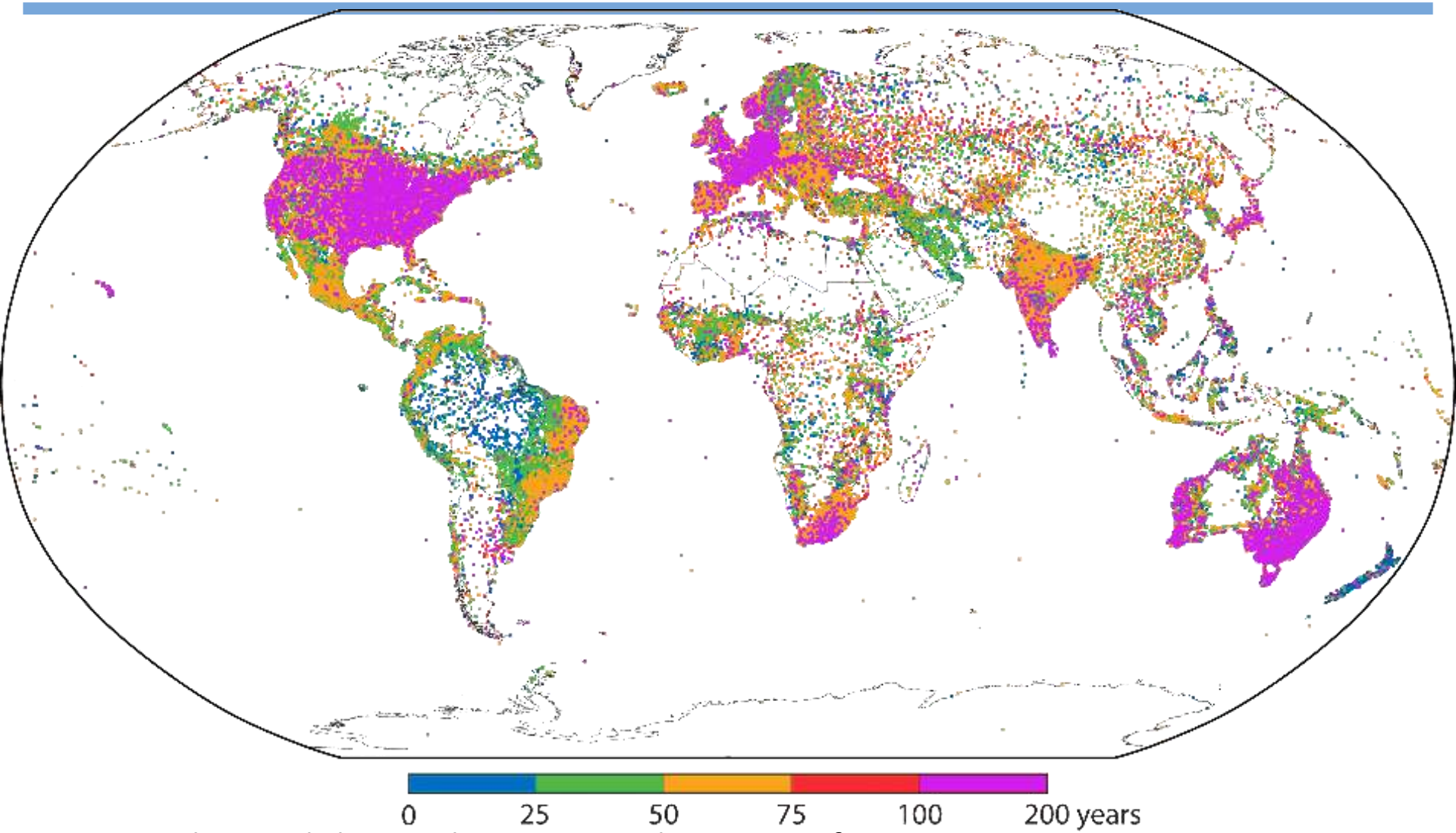
Global surface temperature anomalies from the 1961-1990 mean, based on measured values.

Grey indicates where there is insufficient observed data.

HadCRUT4 (median value from version 4.4.0.0). Values are plotted only where no more than 36 months are missing in the thirty-year period.

SOURCE: Hadley Centre, UK Met Office

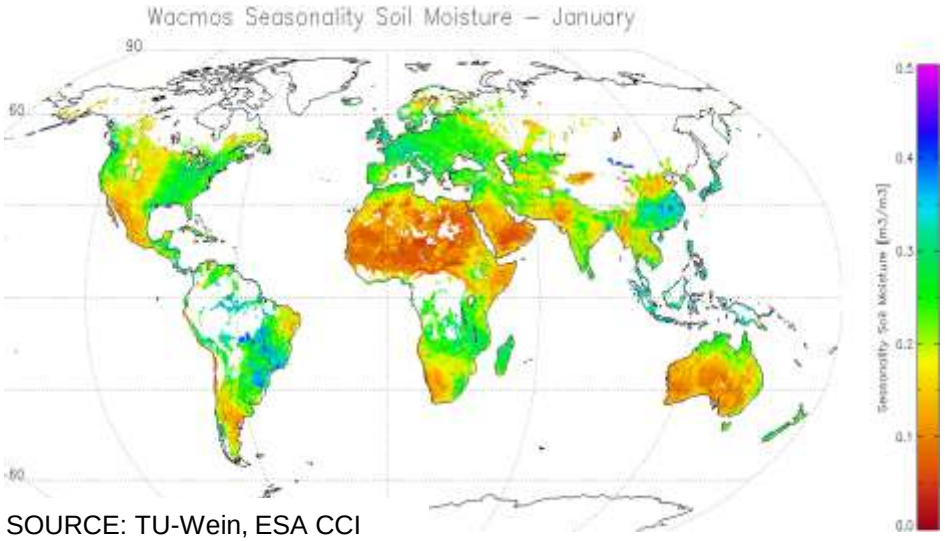
PRECIPITATION RECORDS



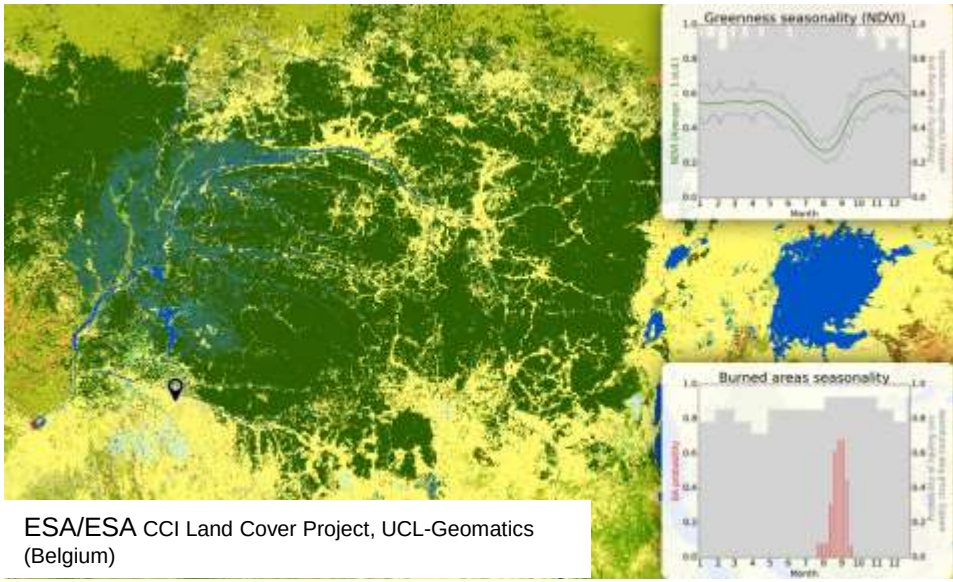
Stations with records longer than 10 years, beginning after 1814

SOURCE: GPCC, DWD

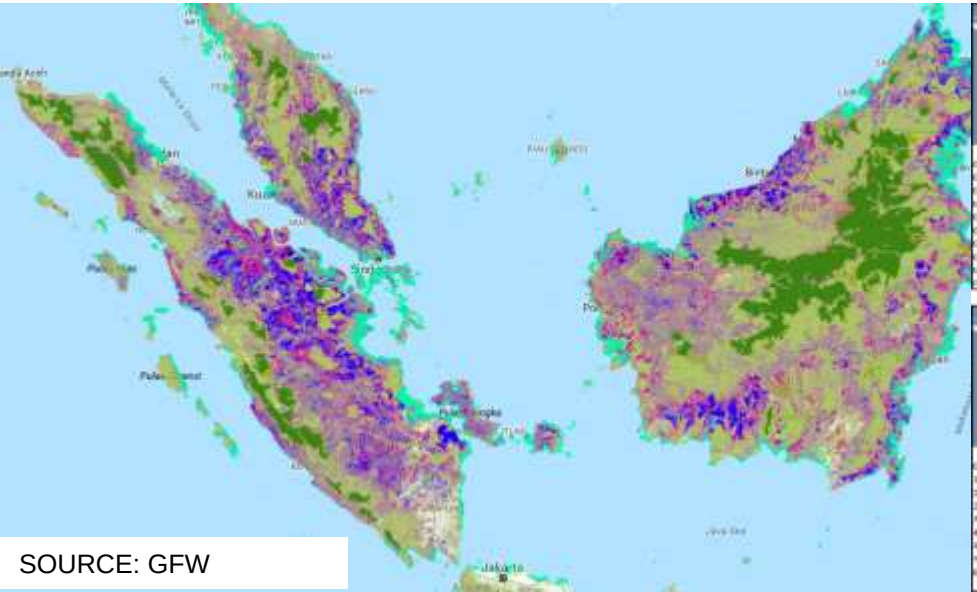
SATELLITES & VEGETATION



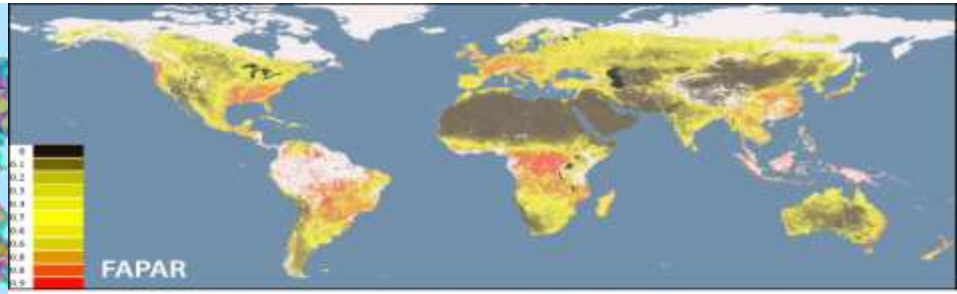
SOURCE: TU-Wein, ESA CCI

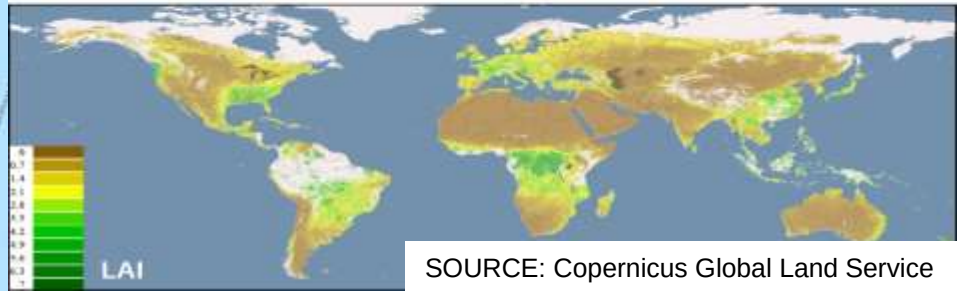


ESA/ESA CCI Land Cover Project, UCL-Geomatics (Belgium)



SOURCE: GFW



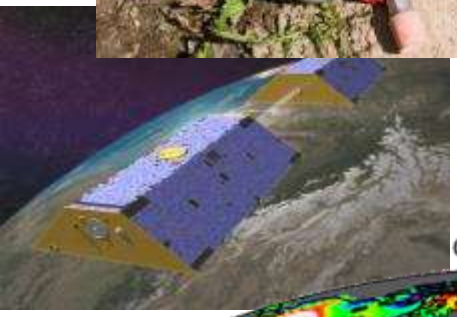


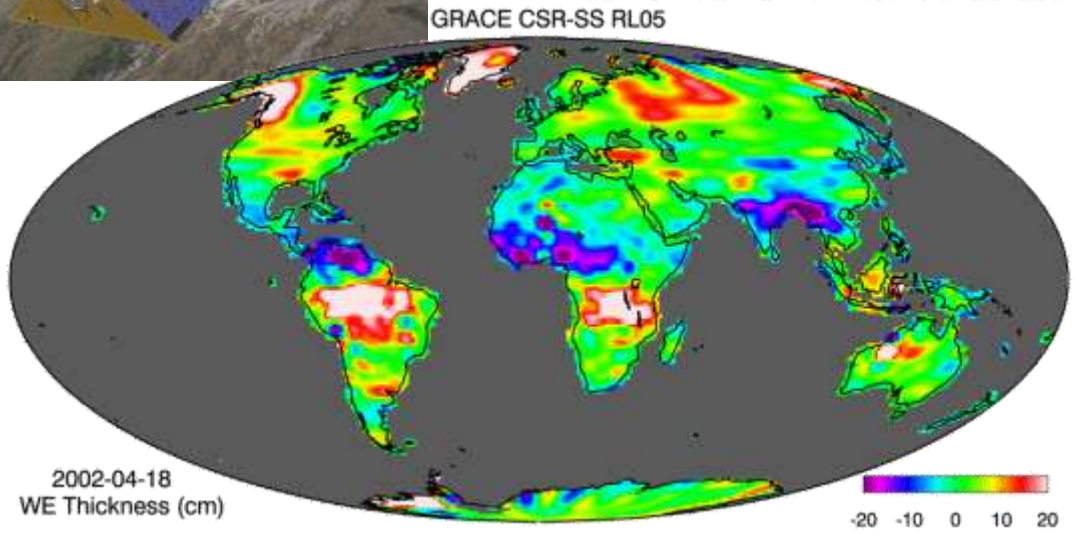
SOURCE: Copernicus Global Land Service

In Situ Monitoring

- In situ monitoring is needed for production of satellite ECVs
- Traditional methods are well established but may be designed for other purposes – forest inventories.
- New methods are being developed to increase accuracy and ease of measurement

GROUNDWATER

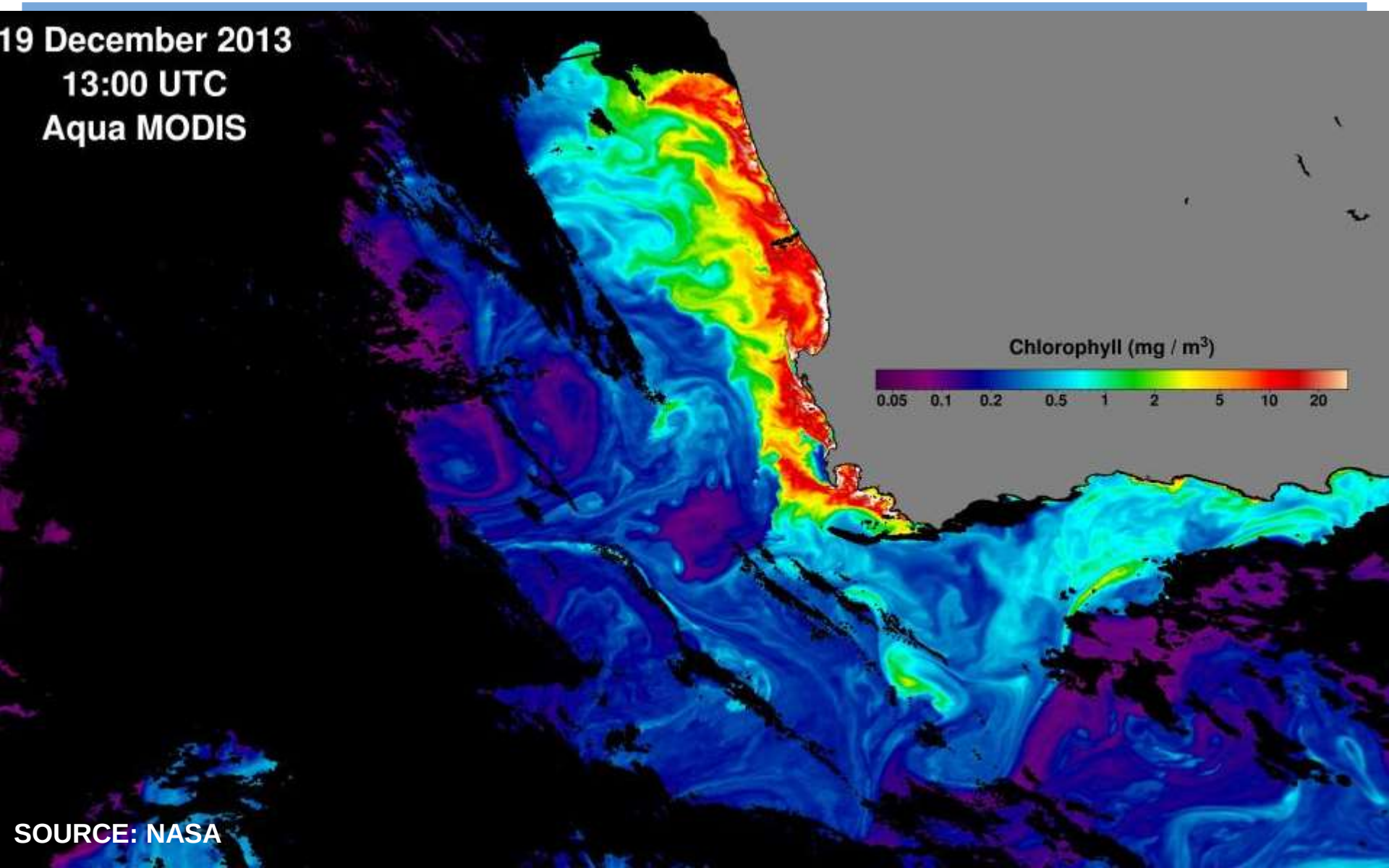




- IPCC notes monitoring is insufficient in Africa
- Ground based data is not widely available
- New satellite-based gravity observations may be useful in the future but need addition information and modelling

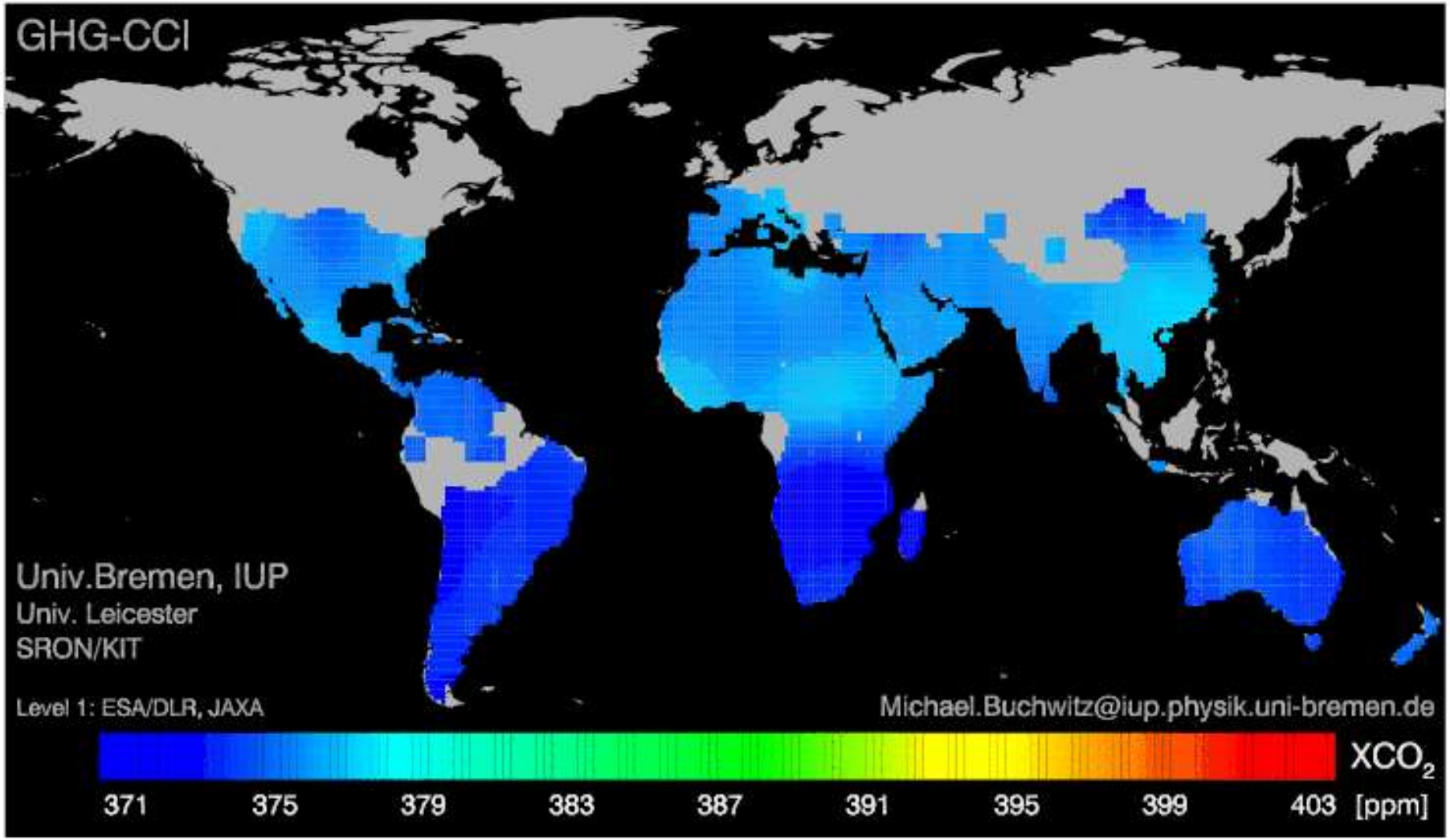
Source: IGRAC, NASA

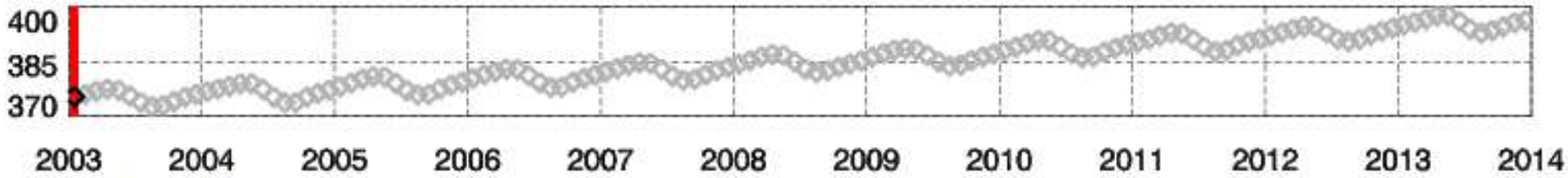
OCEAN COLOUR: CHLOROPHYLL



SOURCE: NASA

Carbon Dioxide SCIAMACHY/ENVISAT+TANSO/GOSAT 2003 Jan





www.esa-ghg-cci.org

2003.04 CRDP#2(BESD,WFMD,OCFP,SRFP)

SERVICES … FIRES: AFIS

ESA/ESA CCI Land Cover Project, UCL-Geomatics (Belgium)

THE IMPLEMENTATION PLAN

- Respond to 2015 Status Report
  - Good progress has supported IPCC and UNFCCC
  - Identifies gaps and deficiencies: regional and in some domains
  - Need to improve data access – discoverability and openness
- Increasing needs arising from Adaptation
- Main focus is on climate - UNFCCC and IPCC needs (Paris Agreement) but also will consider all Rio conventions and SDGs
- Need for ECVs to better describe global cycles:
  - Hydrological, Carbon and Energy

2016 GCOS Implementation Plan

Date	Milestone
2013-2015	Preparatory work in 2013 – 2015 (GCOS panel meetings and three workshops with GFCS/UNFCCC/IPCC; Publication of Status Report)
15 November 2015	Draft Table of Contents submitted to COP21
2-4 February 2016	First Writing Team meeting: Detailed outline & writing assignments
2-4 March 2016	Open GCOS Conference: collect community views
April 2016	GCOS panel meetings finalize their draft chapters
24-26 May 2016	2nd Writing Team meeting: completes draft
June 2016	Limited review (including WMO, Technical Commissions and RAs)
July 2016	Public review (6 weeks)
September 2016	Final version approved by GCOS SC-24
October 2016	Final plan submitted to COP22

UNFCCC NEEDS

UNFCCC	Needs	
Adaptation	Meteorological data e.g. Temp, precipitation, wind, humidity Ecosystem status e.g. Ocean colour, Land cover, soil moisture Coastal zone e.g. Sea level, sea state, topography, subsidence Ocean acidity, Glaciers, Dust, Snow water equivalent…	Also need high resolution local data. Gaps exist in vulnerable areas
Mitigation	Land cover (e.g. forest monitoring to support REDD+) GHG emissions	Many forest monitoring activities exist
Transparency	GHG emissions, Land cover, above ground biomass Atmospheric composition	Validation of emission inventories
Global Stock Taking	GHG emissions, temperature, precipitation Glaciers, Ice Sheets, Sea Ice Land cover/vegetation Ocean heat content, acidity & colour, sea level Atmospheric composition,	Monitoring needs unclear
Public Awareness	Temperature, sea level, ocean heat content, summer arctic sea ice extent, glacier mass balance, snow cover, specific humidity ...	Indicators to be decided:
Capacity Building	GCOS Cooperation Mechanism currently focussed on meteorological data	Extend to terrestrial area?

OTHER RIO CONVENTIONS (DRAFT)

UNFCCC ECV	CBD EBV and/or Trend	UNCCD Progress Indicator
Land cover & change	Ecosystem extent & fragmentation/Ecosystem functional types	Vegetative Land Cover
Soil carbon, land cover change, FAPAR, LAI, Above Ground Biomass, Ocean Colour	Trends in area of degraded ecosystems restored or being restored	Trends in carbon stock above and below ground
Soil carbon, land cover change, FAPAR, LAI, Above Ground Biomass Ocean Colour	Status and trends in extent and condition of habitats that provide carbon storage	Trends in carbon stock above and below ground
Above Ground Biomass, FAPAR, Ocean Colour, Lakes	Phenology – plant growth and differentiation; ocean flow; seasonal surface water dynamics	Land productivity dynamics
FAPAR & Ocean Colour	Net Primary Productivity	
Temperature, SST, Salinity, Acidity, Wind, Fire disturbance	Disturbance Regimes	
Land cover type; biomass	Habitat structure	

To Conclude

- GCOS drives the global climate observation agenda
  - GCOS has a climate observation mandate: but there are clear overlaps with SDGs, CBD, UNFCCC etc. and cooperation is vital
  - GCOS aims to ensure open access to required climate data by a range of users: e.g. adaptation, science, UNFCCC and reporting.
  - GCOS provides practical assistance through the GCM and looks to work with others make this as effective and efficient as possible
- The main task in 2016 is publishing the Implementation Plan
  - Review in July
- Operational satellite-based production of global ECVs is a major development

THANK YOU

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http://gcos.wmo.int

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