Progress with the implementation of the Global Framework for Climate Services (GFCS)

Observation for Climate Services

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GCOS sponsored by WMO UNESCO IOC UNEP ICSU International Council for Science

Observation for climate services

Observations are fundamental for climate services

The observations made over past years define climate, how it varies and how it is changing

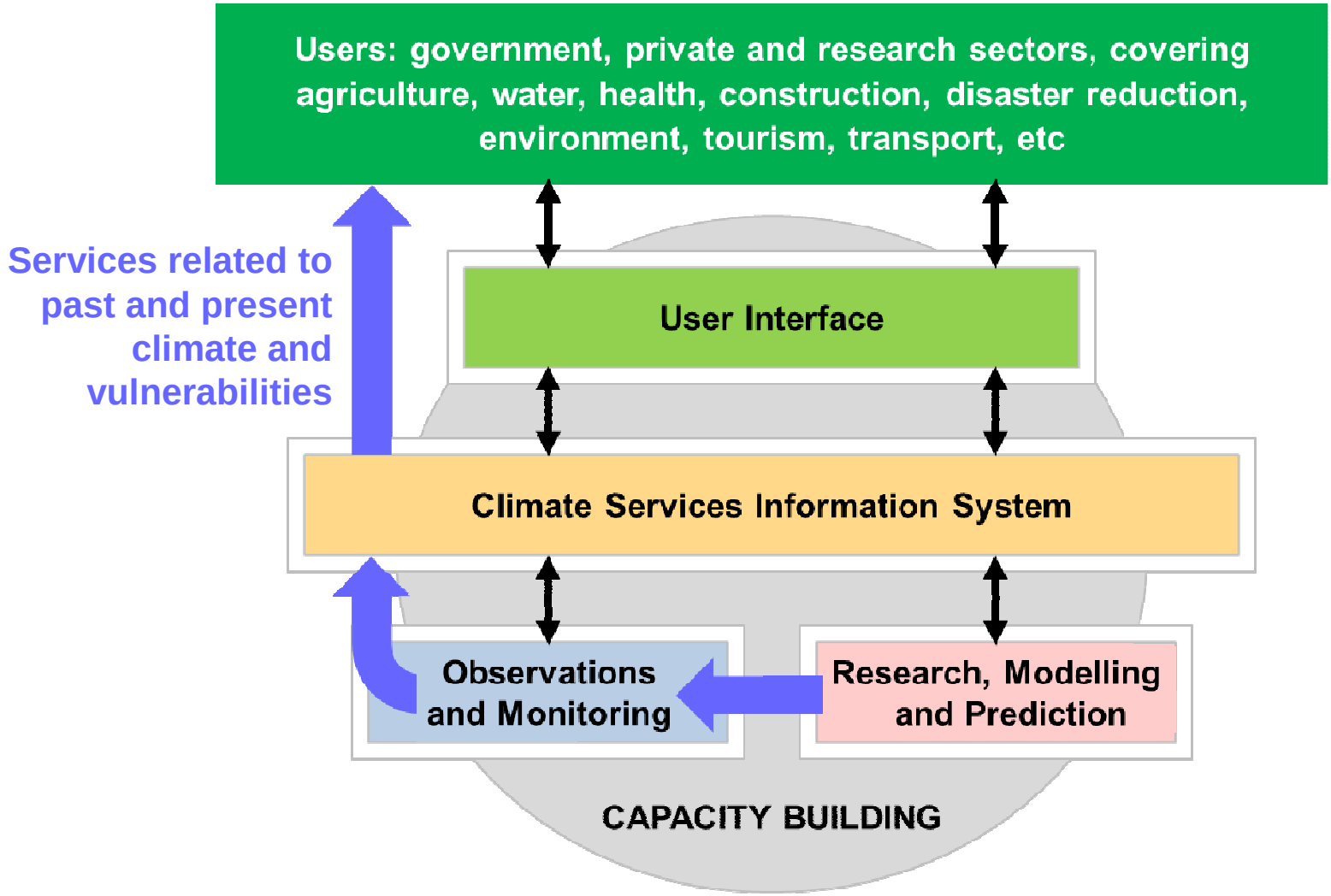
They are also used to

- develop and validate the models used to predict future variations and change
- develop application models linking climatic variations to user-relevant measures such as disease incidence, crop yield and energy demand

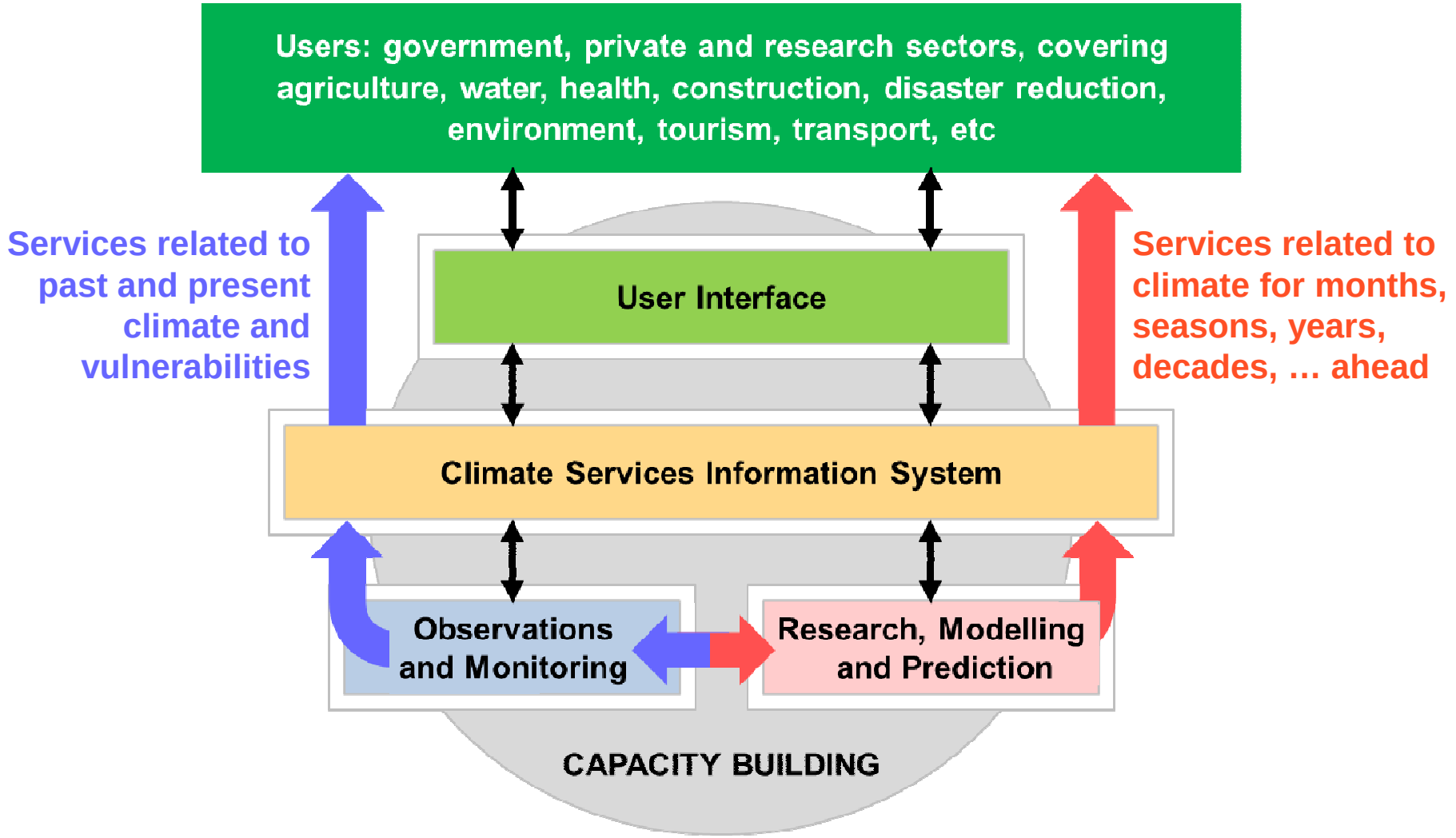
Current observations

- help identify current climate extremes and consequent vulnerabilities
- provide the starting point for forecasts
- enable monitoring of the working of the climate system

Observations for climate services



Observations for climate services



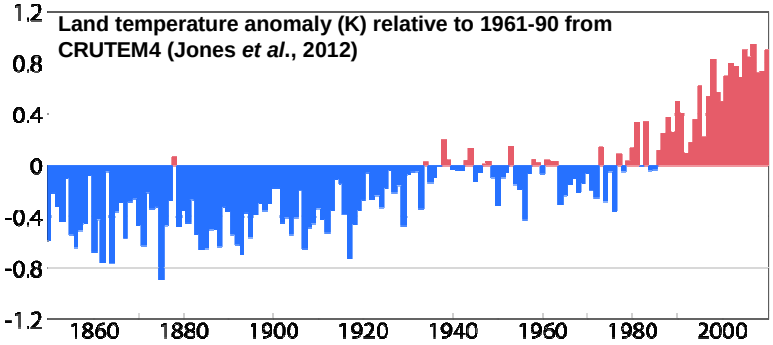
Development of the observing system

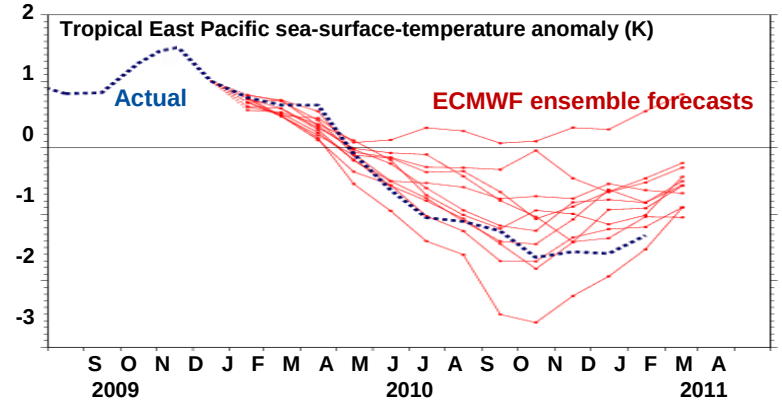
Instrumental record has been built up mainly from the 19th Century for surface weather

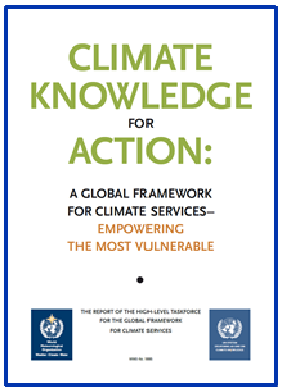
Balloon-based observations were well established by the mid 20th Century

Satellite temperature sounding began on an operational basis in the 1970s

Refinement of space-based and *in situ* observation has continued since then, along with development of capability for data analysis, modelling and prediction







Finding of the High-Level Taskforce for the GFCS:

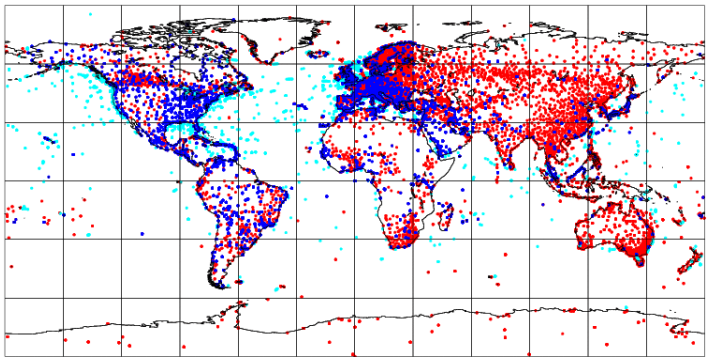
Existing observational capabilities and data exchange already provide a basis for delivery of improved climate services

Improving the atmospheric climate observation network in the developing world is important for improving services for the most vulnerable

Coverage and transmission of weather data is mainly good, but with evident gaps in networks

Lengths of data records held in global centres tend to be shorter for developing countries

Restarting (or starting) observation at key locations is a priority



Locations of 35010 surface weather observations received by ECMWF 0900-1500 UTC 14 November 2011

And needs to be supplemented by:

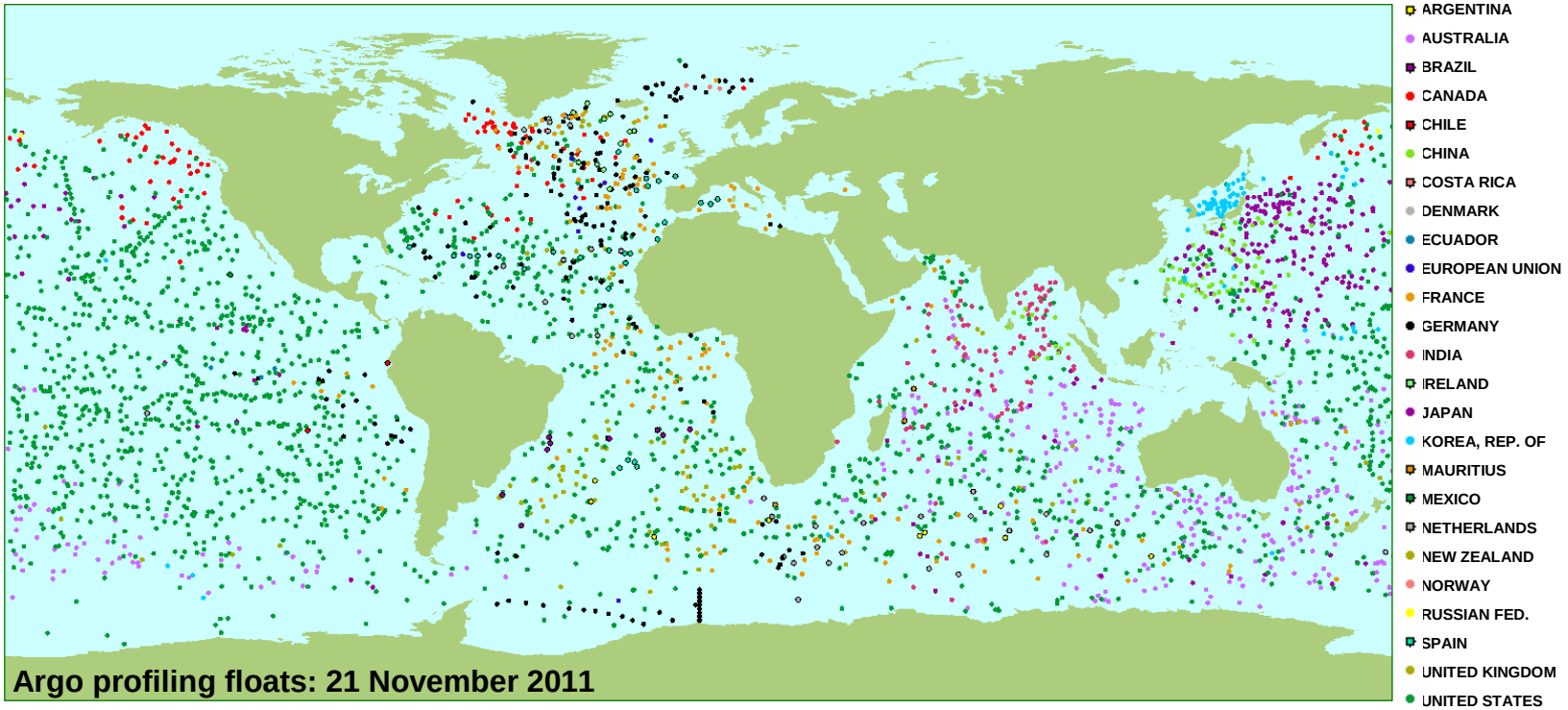
- rescue of past data (imaging paper records, then digitization)
- use of model-based techniques (data assimilation and downscaling) to fill remaining gaps
- use of appropriate national database management systems

Some gaps exist in all countries

- e.g. lack of observations at 50-150m height for siting wind turbines

as does scope for data rescue

Sustain and where necessary enhance established components of the observing system



Floats descend and rise, measuring temperature and salinity in upper 2000m of ocean

Data are key input for ocean analysis and seasonal forecasting of conditions over land

About 800 out of 3400 floats in international network have to be replaced each year

Operation needs sustaining, and perhaps enhancing with floats that descend deeper

Many other types of data are required to support provision of climate services

There is need to enhance observation and/or data exchange for a number of variables, such as:

– precipitation, soil moisture, river flow, lake levels, snow depth, glacial retreat, …

– dust (for health, solar power generation, …)

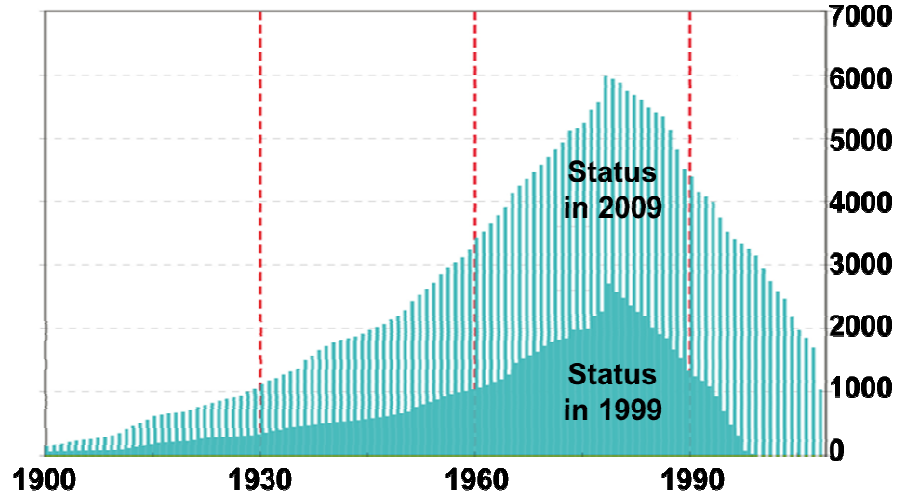
– wild fires (for emissions, public safety)

– marine conditions in coastal zones (including ecosystems)

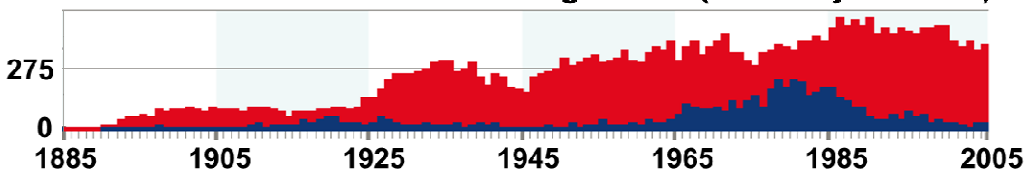
– urban conditions (temperature, humidity, air quality, …)

– trace species (greenhouse gases, other aerosol types, precursor species)

Number of stations providing monthly river discharge data to archive of Global Runoff Data Centre (Koblenz, Germany)



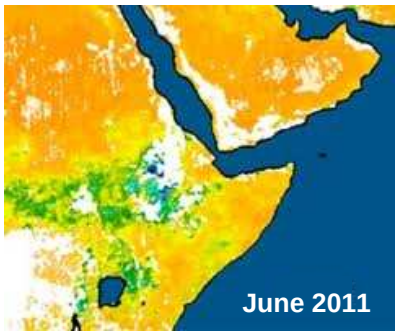
Number of glaciers recorded as retreating (red) or advancing (blue) in the records of the World Glacier Monitoring Service (University of Zürich)

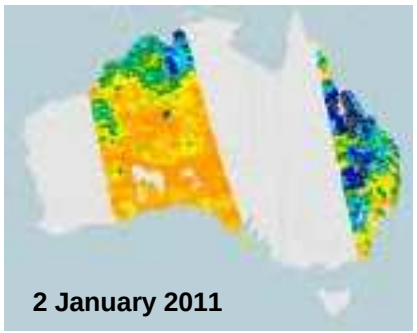


Many other types of data are required to support provision of climate services

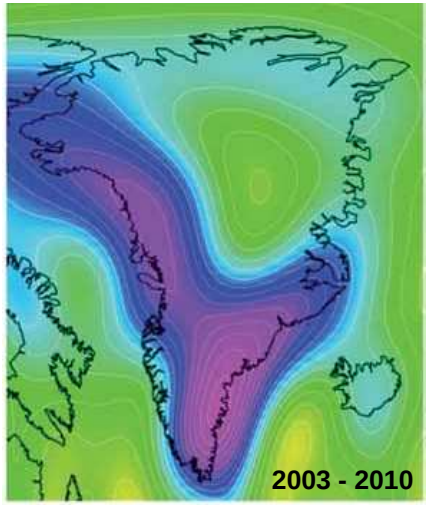
… and need to assess the quantitative value of new measurements from space

−ensuring appropriate transfers from research to operations for long-term monitoring and forecasting

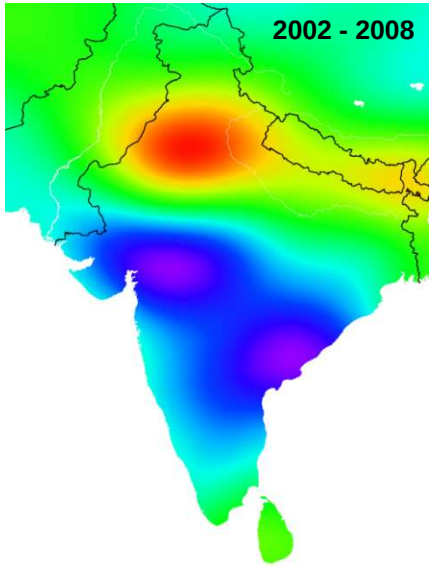




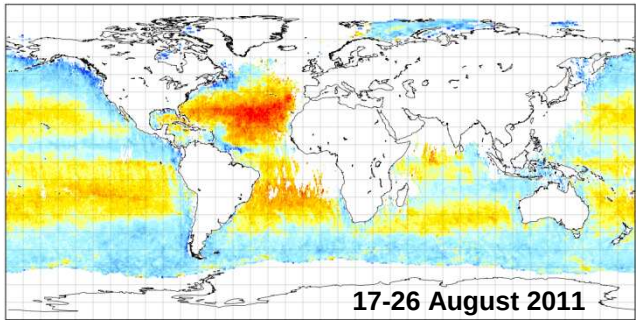
Surface soil moisture from ESA's SMOS mission

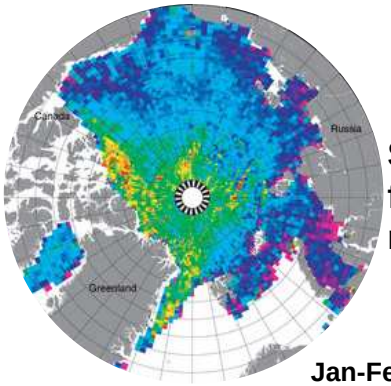


Multi-year change in mass of ice and ground water from NASA's GRACE mission



Sea surface salinity from SMOS

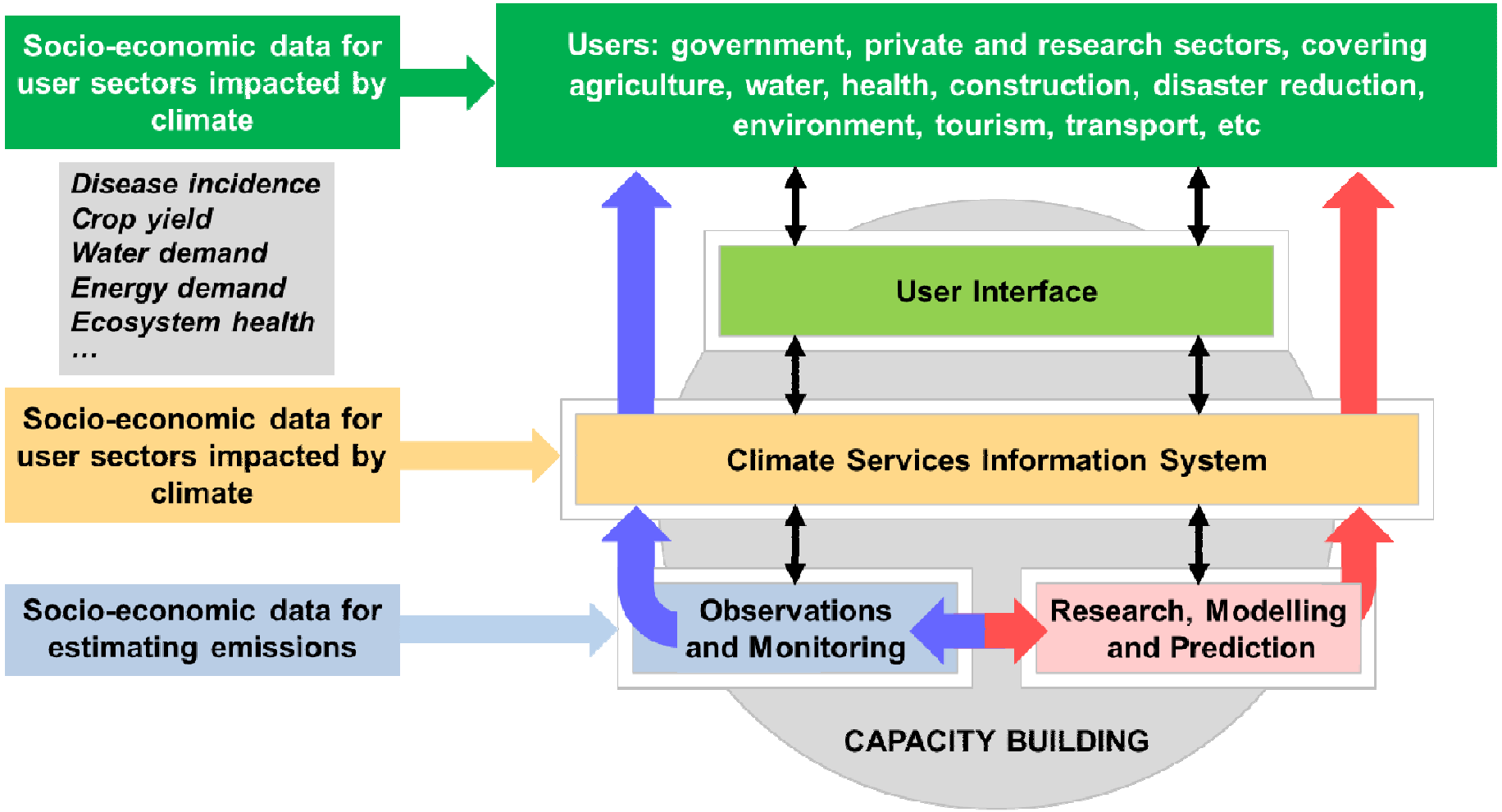




Sea-ice thickness from ESA's CryoSat mission

Jan-Feb 2011

Need for socio-economic data



Concluding remarks

Existing observational capabilities and data exchange already provide a basis for delivery of improved climate services

Good progress is being made in several areas, but not in ensuring a long-term operational basis

- for several important types of *in situ* and space-based observation
- for some of the processing systems

Timeliness and completeness of data release remains an issue

Support for building and sustaining capacity is far from matching needs

- for *in situ* observational networks
- for data management and transmission

Data rescue, modelling and data assimilation can fill gaps in and extend historical observational records