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functions through contributions from:

National met services, other national institutions and regional agencies
- to the observing systems, including to baseline and reference atmospheric networks (GSN, GUAN, GRUAN, ...), following GCOS principles and guidelines where possible
- operating monitoring centres, lead centres, data centres, ...
- supporting a Cooperation Mechanism and regional activities for developing capacity
- coordinating their specific national GCOS activities

GCOS bodies:
- the Programme Director and staff at WMO
- the Steering Committee (SC)
- co-sponsored Panels for Atmosphere, Ocean and Land, and their working groups
- also working via representation of these Panels on WOAP and now the WDAC

Secretariats of contributing observing systems and programmes, related technical commissions, space-agency coordinating bodies, expert groups, ...

GSN: GCOS [baseline] Surface Network
GUAN: GCOS [baseline] Upper Air Network
GRUAN: GCOS Reference Upper Air Network
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The architecture for space-based for climate monitoring contributing to the Global Framework for Climate Services in the context of WMO considers the whole chain from observations to decision making.
The objectives of CGMS are formalised within its Charter:

- To provide an international forum for the exchange of technical information on geostationary and polar-orbiting meteorological satellite systems and research & development missions, such as reporting on current meteorological satellite status and future plans, telecommunications matters, operations, intercalibration of sensors, processing algorithms, products and their validation, data transmission formats and future data transmission standards.

- To harmonise meteorological satellite mission parameters (such as orbits, sensors, data formats and downlink frequencies) to the greatest extent possible.

- To encourage complementarity, compatibility and possible mutual back-up in the event of system failure through cooperative mission planning, compatible meteorological data products and services and the coordination of space and data-related activities, thus complementing the work of other international satellite coordinating mechanisms.
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GEWEX Overview

Comparison Data Bases
- Radiation Code Comparison
- AERONET
- Aerosols
- Clouds
- Radiation
- Water Vapour

Global Data Sets
- ISCCP
- I3RC
- CIRG
- LandFLux
- SeaFlux
- GACP
- GPCP
- BSRN
- ISMN
- WGDMA
- Reprocessing Coordination
- GDAP
- In Situ Observations

Data and Assessments
- GDAP
- Global Data Products
- GASS
- GABLS-3
- Vertical Structure & Diabatic Processes of the MJO
- Microphysics

Modelling and Prediction
- GSWP-3
- ALMA
- PILPS
- PILPS
- LUCID
- LoCo
- GLACE-2
- Polar Cloud Project
- Boundary layer Clouds
- Convective and Cloud Processes during TWP-ICE
- GABLS-3
- Vertical Structure & Diabatic Processes of the MJO
- Microphysics

Cross Cutting Projects
- Collaborative Projects
- Regional HydroClimate Projects
- Cross Cutting Projects
- High Elevation
- HAP
- CORDEX
- GLASS Benchmarking

Global Data Sets
- Global Data Products
- Reference Sites/data sets/Observational Networks

Link to external reprocessing coordination such as SCOPE-CM
How to bring as much observational scrutiny as possible to the IPCC process?

How to best utilize the wealth of Earth observations for the IPCC process?

AR5 – initial target
AR6 and other MIPs – long-term targets
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  - GDAP

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## Climate Data Record Maturity Matrix Model (V4.0 from NOAA/NCDC)

<table>
<thead>
<tr>
<th>Maturity</th>
<th>Software Readiness</th>
<th>Metadata</th>
<th>Documentation</th>
<th>Product Validation</th>
<th>Public Access</th>
<th>Utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conceptual development</td>
<td>Little or none</td>
<td>Draft Climate Algorithm Theoretical Basis Document (C-ATBD); paper on algorithm submitted</td>
<td>Little or None</td>
<td>Restricted to a select few</td>
<td>Little or none</td>
</tr>
<tr>
<td>2</td>
<td>Significant code changes expected</td>
<td>Research grade</td>
<td>C-ATBD Version 1+; paper on algorithm reviewed</td>
<td>Minimal</td>
<td>Limited data availability to develop familiarity</td>
<td>Limited or ongoing</td>
</tr>
<tr>
<td>3</td>
<td>Moderate code changes expected</td>
<td>Research grade; Meets int'l standards: ISO or FGDC for collection; netCDF for file</td>
<td>Public C-ATBD; Peer-reviewed publication on algorithm</td>
<td>Uncertainty estimated for select locations/times</td>
<td>Data and source code archived and available; caveats required for use.</td>
<td>Assessments have demonstrated positive value.</td>
</tr>
<tr>
<td>4</td>
<td>Some code changes expected</td>
<td>Exists at file and collection level. Stable. Allows provenance tracking and reproducibility of dataset. Meets international standards for dataset</td>
<td>Public C-ATBD; Draft Operational Algorithm Description (OAD); Peer-reviewed publication on algorithm; paper on product submitted</td>
<td>Uncertainty estimated over widely distributed times/location by multiple investigators; Differences understood.</td>
<td>Data and source code archived and publicly available; uncertainty estimates provided; Known issues public</td>
<td>May be used in applications; assessments demonstrating positive value.</td>
</tr>
<tr>
<td>5</td>
<td>Minimal code changes expected; Stable, portable and reproducible</td>
<td>Complete at file and collection level. Stable. Allows provenance tracking and reproducibility of dataset. Meets international standards for dataset</td>
<td>Public C-ATBD, Review version of OAD, Peer-reviewed publications on algorithm and product</td>
<td>Consistent uncertainties estimated over most environmental conditions by multiple investigators</td>
<td>Record is archived and publicly available with associated uncertainty estimate; Known issues public. Periodically updated</td>
<td>May be used in applications by other investigators; assessments demonstrating positive value</td>
</tr>
<tr>
<td>6</td>
<td>No code changes expected; Stable and reproducible; portable and operationally efficient</td>
<td>Updated and complete at file and collection level. Stable. Allows provenance tracking and reproducibility of dataset. Meets current international standards for dataset</td>
<td>Public C-ATBD and OAD; Multiple peer-reviewed publications on algorithm and product</td>
<td>Observation strategy designed to reveal systematic errors through independent cross-checks, open inspection, and continuous interrogation; quantified errors</td>
<td>Record is publicly available from Long-Term archive; Regularly updated</td>
<td>Used in published applications; may be used by industry; assessments demonstrating positive value</td>
</tr>
</tbody>
</table>

1 & 2 | Research |
3 & 4 | IOC |
5 & 6 | FOC |
Thoughts on climate data product standards

• Use validated, peer-reviewed methods
• Demonstrate long-term consistency
  ▪ Operational products can provide targeted information for real-time users as well as validation for climate products
• Bear a reasonable resemblance to reality and a confidence level in that resemblance to reality
  ▪ data quality/error information provided
• Processing transparent and reproducible
  ▪ Archived in a self-describing format, but distributed in a variety of usable formats (e.g., GIS, KML, GeoTIFF, browse)
  ▪ Source data and processing software available
• Standardized data citation
  ▪ Editors and reviewers need to make it a requirement
  ▪ Make dataset publication on par with journal article publication
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Introduction (II)

Data assimilation combines models and observations and provides:

- Verification facility
- Essential tool for reanalysis and climate monitoring
- Consistent framework for observation impact
- Know-how on quality control, obs error characterisation, etc.

This presentation is a (incomplete) digest of major events over the last year or so:

- THORPEX DAOS (Exeter, June 2011), ECMWF annual seminar (September 2011), WMO data impact workshop (May 2012)
  - WCRP reanalysis conference (May 2012) (see M. Bosilovich)

We will concentrate on:

- Progress in data assimilation methods
- Observation Usage and Impact
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