Satellite & In-situ Climate Observations and Products: CPC and CSD Perspectives

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Climate Prediction Center

- CPC does **_much more_** than what the name implies.
- CPC's Mission is to:
  - *Predict, Monitor, Diagnose, Attribute*
- CDRs are a fundamental part of CPC's *Monitoring* efforts.
- CPC collects T and P observations from around the world to generate <u>station</u> and <u>gridded</u> daily and monthly data sets.
- Data sets are quality controlled.
- Used internally for *Diagnostics* and *Attribution*.
- Put on ftp site for external users to pick up.
- CPC works with NWS/Climate Services Division to communicate with the user community and utilizes feedback to provide new products or enhance existing products.

Precipitation and Temperature Data Sets

Data sets are pure station observation, or put onto grids, merged with other satellite and/or model output or pure satellite derived.

- *CAMS* : Climate Anomaly Monitoring System monthly <u>gridded</u> and <u>station precipitation</u> and <u>temperature</u> data.
- *CAMS_OPI* : Gridded merged CAMS-Outgoing longwave radiation <u>Precipitation</u> Index.
- *CLIMAT* : Monthly <u>station</u> <u>precipitation</u> and <u>temperature</u> data .
- *CMORPH* : CPC Morphing technique for the production of global <u>gridded precipitation</u> estimates.
- *CADB* : Daily and monthly <u>station</u> <u>precipitation</u> and <u>temperature</u> data.
- *FEWS-RFE* : <u>Gridded</u> <u>precipitation</u> estimates (RFE and ARC) from CPC/FEWS.
- *GHCN_CAMS* : <u>Gridded</u> land surface air <u>temperature</u> analyzed from combined GHCN and CAMS station data.
- *CMAP* : CPC Merged Analysis of <u>Precipitation</u> (CMAP): Gridded analyses of global precipitation using gauge observations, satellite estimates, and numerical model predictions.
- *UNIFIED* : CPC Unified Rainguage Dataset and Unified Rainguage Analysis.

Other Data Sets

- *OLR* *:* Global gridded <u>o</u>utgoing <u>l</u>ongwave <u>r</u>adiation data using AVHRR. Future product being developed using AIRS & IASI data.

- *Global Monthly Soil Moisture :* Global gridded monthly high resolution <u>soil moisture.</u>

- *SBUV(/2) v8.6 :* merged total and profile ozone data set.

- *Antarctic Ozone Hole Size*: determined from SBUV analysis.

- *UV Index :* UVI forecasts for cities across the US.

- Many derived products from the NCEP GFS, CFSv2, and Reanalyses.

Example of Merged Satellite and In-situ data set: FEWS-RFE

- Run daily at CPC for Africa, southern Asia, Afghanistan area domains
- Final output is minimally biased and greatly improves spatial resolution of information
- Inputs include :
  - IR temperature data from Geostationary (Meteosat) and Polar (AMSU),
  - microwave precip estimates from Polar (SSMI),
  - GTS gauge fields
- Outputs and Archived Data/images:
  - Operational: GTS+GPI+SSM/I+AMSUB
  - Other:
    - GTS+GPI
    - GTS+GPI+SSM/I+AMSUB+GDAS
    - With and without bias removal
  - Archival:
    - All inputs needed for reprocessing
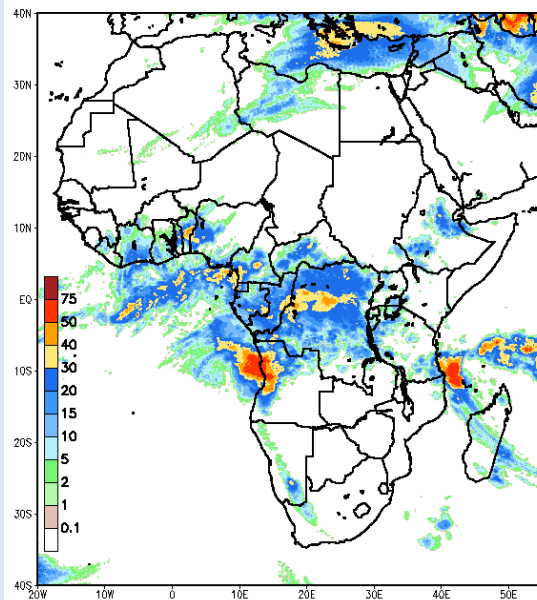   - Some mid-processing outputs
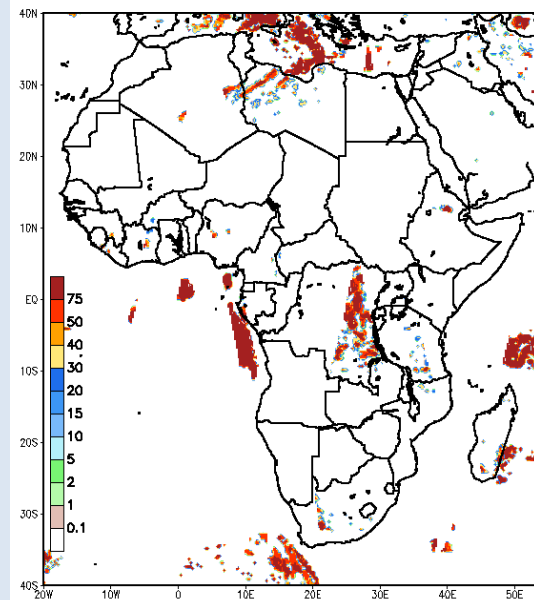
GTS Reported Rainfall
April 3, 2002
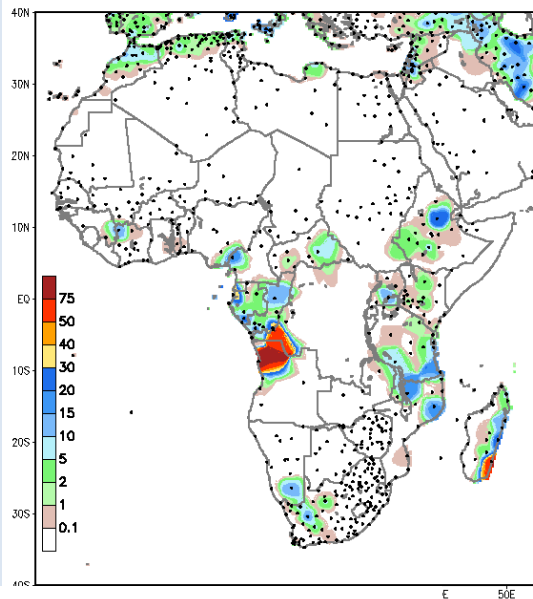
SSM/I Estimated Rainfall
April 3, 2002
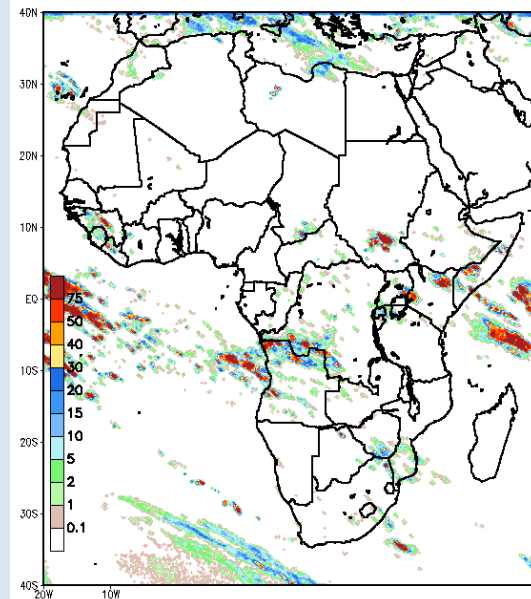
GOES Precipitation Index Estimate (mm)
April 3, 2002

AMSU-B Estimated Rainfall
April 3, 2002

Climate Data Record Program Annual Conference – Asheville, NC - July 31-Aug 2, 2012

Issues – New Products

- New satellite products/data records are always in the planning stages.
- If developers are not able to reprocess the entire data set
  - Either due to lack of funds or computing resources
- Then there will be an issue in developing a Climatology so as to determine Anomalies.

Issues - Data Quality

- Data quality is a major problem in application of climate information: this includes spatial/temporal coverage, missing dates, other discontinuities of various sources (i.e., instrument change, site relocation, etc.) – <u>need for improved synergy with NWS and other partners</u>

- Data QC procedures: lack of <u>information on how the data have been treated, what QC method was used, online guidance on proper data use</u>

  – The most recent example on this issue was erroneous comparison of "old" and "new" climate normals by the NWS field due to lack of information on procedures and inconsistency of data posted/available for applications.

Issues – Data Mining

- Addition of Automated Climate Information System (ACIS) became a significant break-through

- NWS observes, reports, and disseminates data, NCDC archives, and NE RCC develops and manages the tool

- xmACIS – NOAA internal version

- NOWdata – NOAA Online Weather Data – provides limited data access

- <u>Needs</u>:
  - More variety of climate statistics and graphical options
  - Better display, navigation through data set, selection of multiple stations
  - Additions to nine currently available climate variables:
    - wind speed and direction and humidity are probably in the highest demand

Issues – Homogenized Data

- Homogenized data have been validated as a great resource for developing local climate products as well as for application for energy decisions. This data are not <u>widely available, published, distributed</u> among internal and external users

- Homogenized = removal of non-climate changes

- These data are only available on monthly and seasonal scale for temperature and precipitation only – <u>need for other variables</u>

- <u>Daily</u> homogenized data is an urgent need

Question?