Climatological Analysis with GCAT and MetVault

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Climate is the synthesis of the weather in a particular region.
GCAT uses the RTFDDA system (MM5/WRF mesoscale model + assimilation of observations) to build a database of gridded “weather” phenomena over a particular region of earth.

“Weather database” extends over many years (usually 20-40) which are then “combined” to estimate the expected weather and its associated variability and/or uncertainty over a particular region.
GCAT purpose - continued

- GCAT “extends” the climatography from the observation locations (SAMS, RAOB, etc.) to a fine-resolution grid using a dynamically consistent tool (takes into account fine-resolution topography, land, coastline, etc.)

- The generated “weather” and its uncertainty could then be used to drive coupled applications:
  - transport and dispersion; urban dispersion models
  - sound propagation
  - energy generation potential and siting
Possible applications of GCAT at the ranges

• Help locate weather-sensitive installations (air strips, roads, permanent test siting)

• Help decide on time of the year and location for a specific test (how hot/cold, how windy) - apply weather-specific thresholds;

• Possible uses for quality control of observations

• Help locate new observing systems
GCAT procedure

Year 1
- Global analysis
- SFC + RAOBs
- FDDA
- Coupled Applications

Year 2
- Global analysis
- SFC + RAOBs
- FDDA
- Coupled Applications

Year 3
- Global analysis
- SFC + RAOBs
- FDDA
- Coupled Applications

Year N
- Global analysis
- SFC + RAOBs
- FDDA
- Coupled Applications

Statistics:
- Means,
- Standard Deviations,
- Probabilities,
- Extremes
...
GCAT GUI demo...
“GCAT Data Cube”
Model Statistics: ATC, D3, Jan-Feb

Mean T at 00Z  Max T  Min T

ATC Domain 3  ATC Domain 3  ATC Domain 3

T2  Max T  Min T

273.5  274.5  275.5  276.5  277.5  278.5  286  290  260  262  264  266
Model Statistics: ATC, D3, Jan-Feb

Max Wind Speed

Prob. V > 5 m/s

Prob. V > 10 m/s

ATC Domain 3

WSPD

ATC Domain 3

WSPD > 5 m/s

ATC Domain 3

WSPD > 10 m/s
MM5 Wind Climatology at ATC Jan-Feb

ATC Domain 3

Wind field 0600 GMT

Wind field 1800 GMT

0600 GMT

1800 GMT
Coupled models: SCIPUFF

Surface Dosage for Control Member

VX  12/04/2003 08:00 GMT

Probability of Surface Dosage Exceeding a Threshold

VX  12/04/2003 08:00 GMT
MetVault demo...