



Use of Multiple Networks and Special Studies for Meteorological Model Performance Evaluation

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Ad Hoc Meteorological Modeling Group Meeting

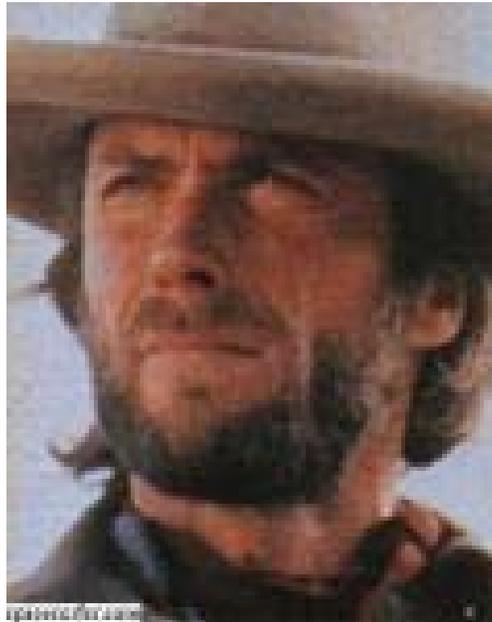
May 27, 2004

Can there be too much data?

- **Mom and Apple Pie:**
 - > Measurements/Observations are crucial for:
 - Model performance evaluation (graphical, statistical)
 - Model nudging (FDDA)
- **So the more the better, right?**
 - > Let's get everything we can find and dump it into a database, Pronto!



- **Whoa, not so fast cowboy...**



- **Wasn't it was Clint Eastwood who said:**
 - > “A man's gotta know his [database's] limitations...”



- **Some issues to consider:**

- > Instrument type/purpose

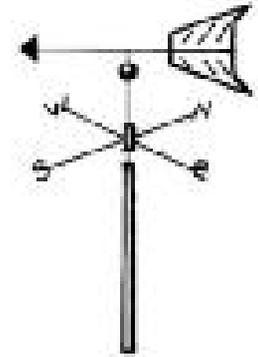
- What is the phenomenon being captured?
- Research-grade or el-cheapo instrumentation?

- > Operator QA/maintenance

- Who's running the sites?
- How often do they inspect site, perform calibration, etc.?

- > Site configuration (usually associated with purpose)

- Location and exposure
- Probe heights
- Reporting frequency (hourly instantaneous vs. average, 24-hr vs. partial day)
- Measurement thresholds





- > Resulting site density
 - What degree of multiple sites per grid spacing?
 - Especially from different networks employing different instruments, protocols, sampling periods, thresholds...
- **Large mixtures of sensors/protocols/reporting formats from different networks can:**
 - > Confound your performance evaluation
 - > Result in nudging to unrepresentative data





Case in Point

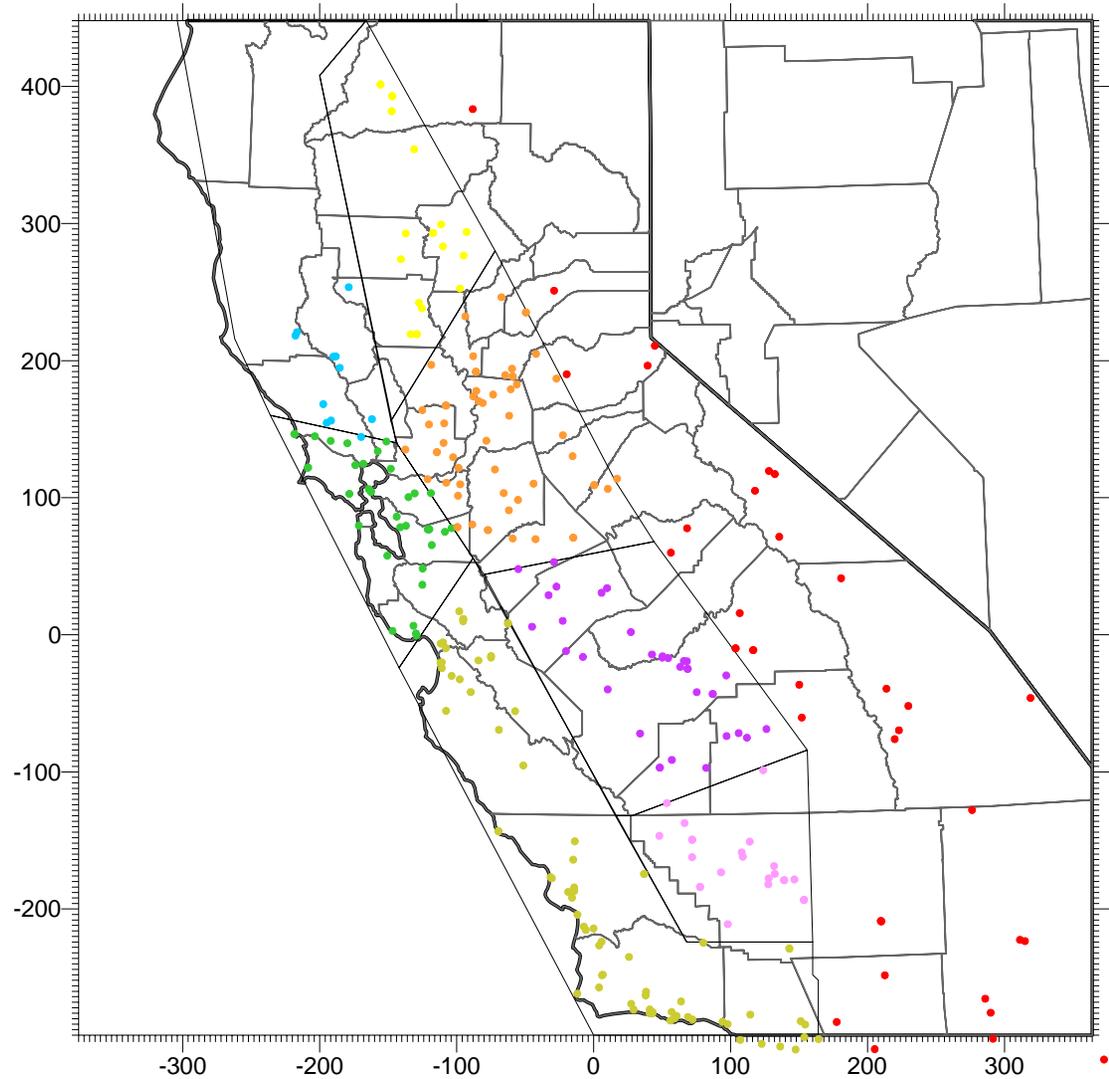


Central California Air Quality Studies - CCOS & CRPAQS
A Multi-Agency Collaboration

- **Modeling being performed for the Central California Ozone Study (CCOS)**
- **CCOS meteorological database includes:**
 - > Special study sites (profilers, sounders, etc.)
 - > District/ARB-run air quality monitoring sites (AIRS)
 - > California Irrigation Management Information System (CIMIS)
 - > Remote Automated Weather Stations (RAWS)
 - > Various independent/industry-run sites (refineries, utilities, etc.)

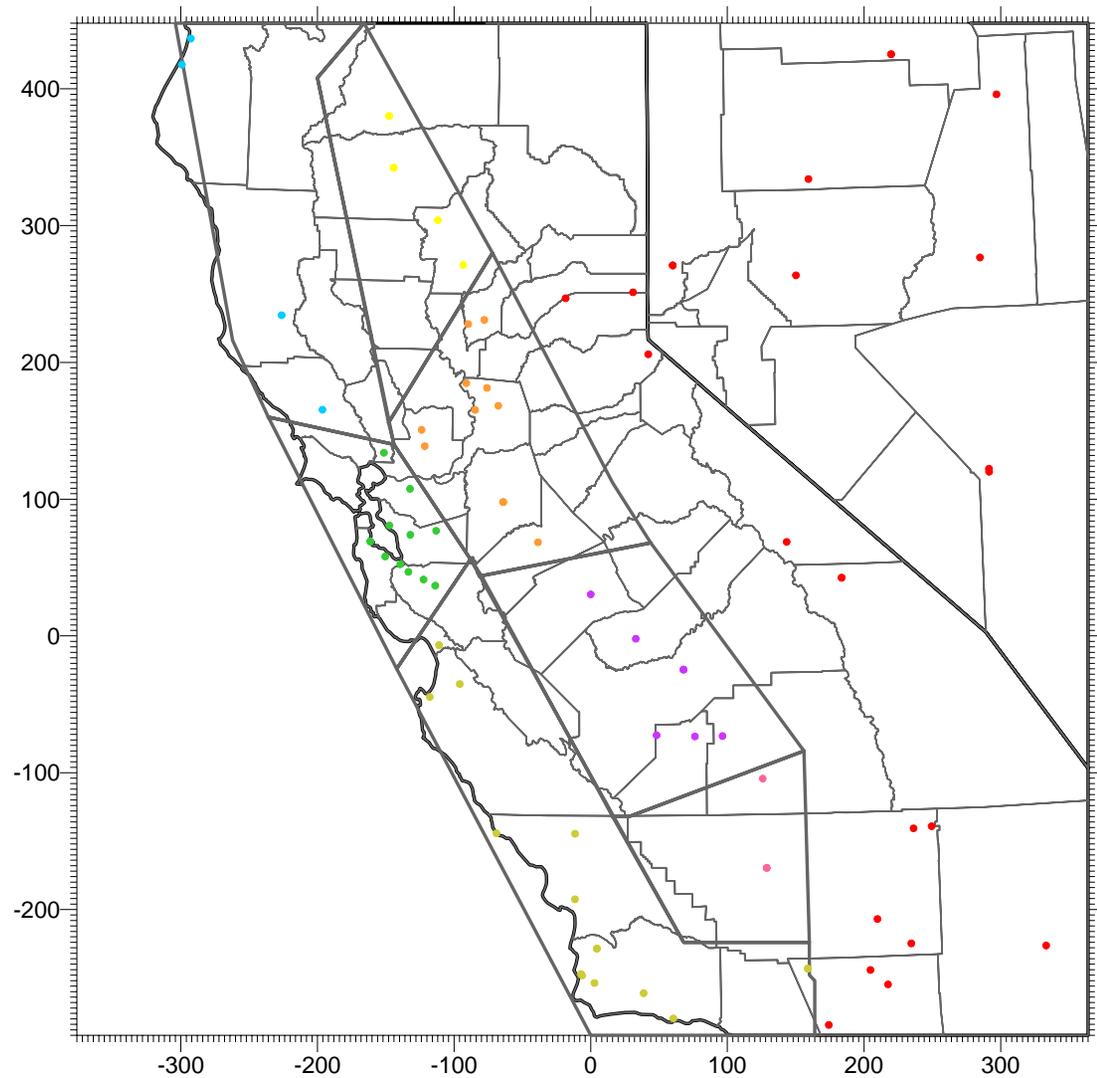


Meteorological sites in
the CCOS Database





We added NWS sites
to the CCOS Database





Characterization of Networks Accessed in CCOS

- **NWS sites**
 - > Considered most consistent source of data for evaluating meteorological models
 - Strict protocols on instrumentation, siting, exposure, probe heights, maintenance/calibration
 - Nearly instantaneous reports top of each hour
 - Relatively low wind thresholds
 - Full set of measurement variables
 - > Coverage over day can be an issue
 - Class I: large airports operating 24-hours/day
 - Class II: smaller airports closed overnight



Characterization of Networks Accessed in CCOS

- **AIRS sites**
 - > Considered acceptable source of data for evaluating meteorological models
 - Strict protocols on instrumentation, probe heights, maintenance/calibration
 - Siting and exposure can be variable (e.g., some sites mounted on buildings, within urban environments, etc)
 - Hourly average, 24-hour operation
 - Relatively low wind thresholds
 - Full set of measurement variables



Characterization of Networks Accessed in CCOS

- **RAWS sites**
 - > Considered questionable source of data for evaluating meteorological models
 - > Rugged instrumentation primarily for fire management:
 - General guidance for siting and exposure
 - Less frequent maintenance/calibration
 - Relatively high wind thresholds
 - Often sited in canyons or on top of ridges
 - Variable probe heights – some sites are “mobile”
 - Hourly average, 24-hour operation
 - Full set of measurement variables

Examples of RAWS sites

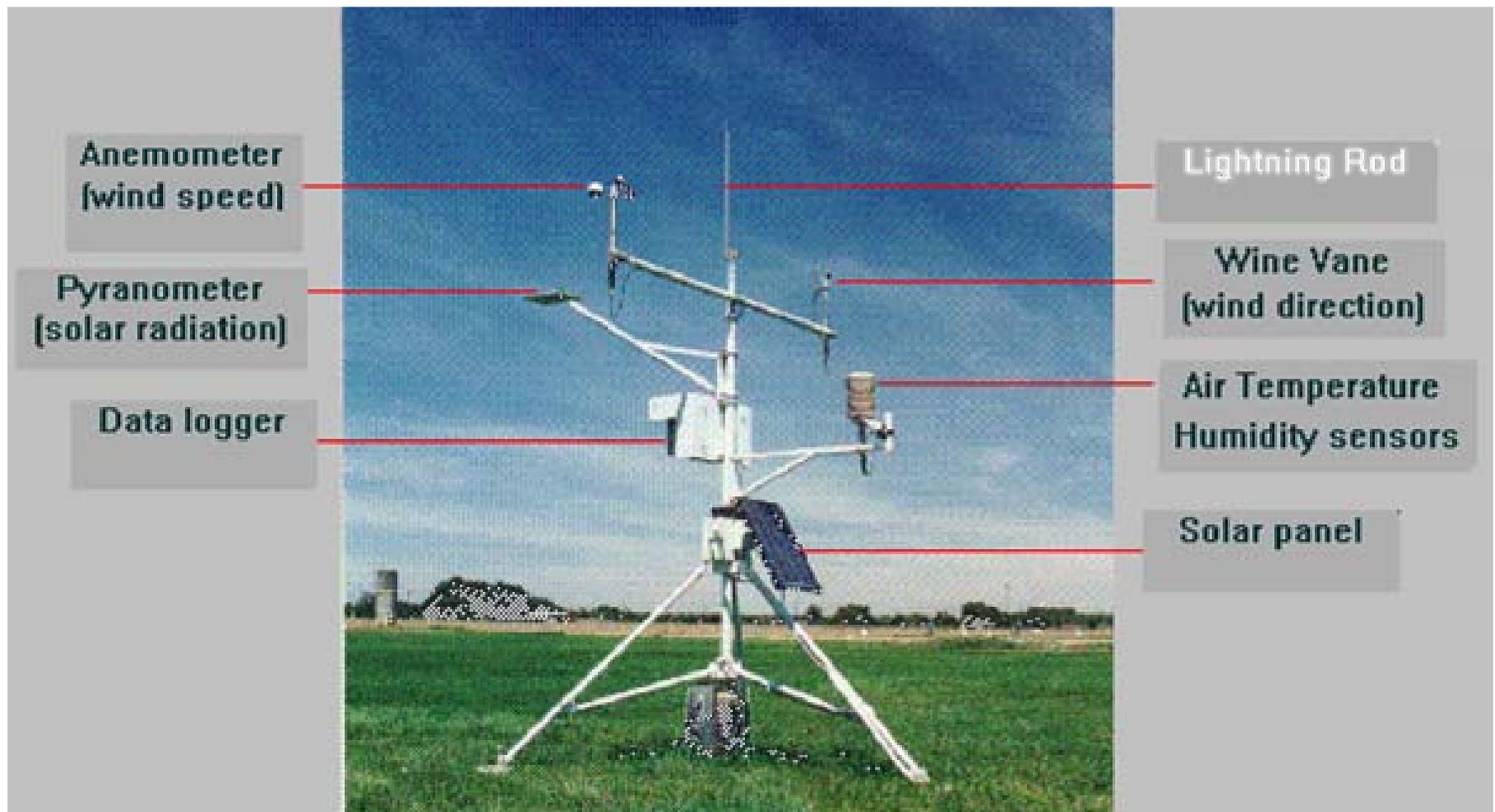




Characterization of Networks Accessed in CCOS

- **CIMIS sites**
 - > Considered questionable source of data for evaluating meteorological models
 - > Primarily for water management:
 - Consistent protocol on instrumentation, siting, exposure, probe heights (2 m tripods)
 - Current information suggests that many sites have not been sufficiently maintained and calibrated over last few years
 - Hourly average, 24-hour operation
 - Full set of measurement variables

CIMIS Instrumentation

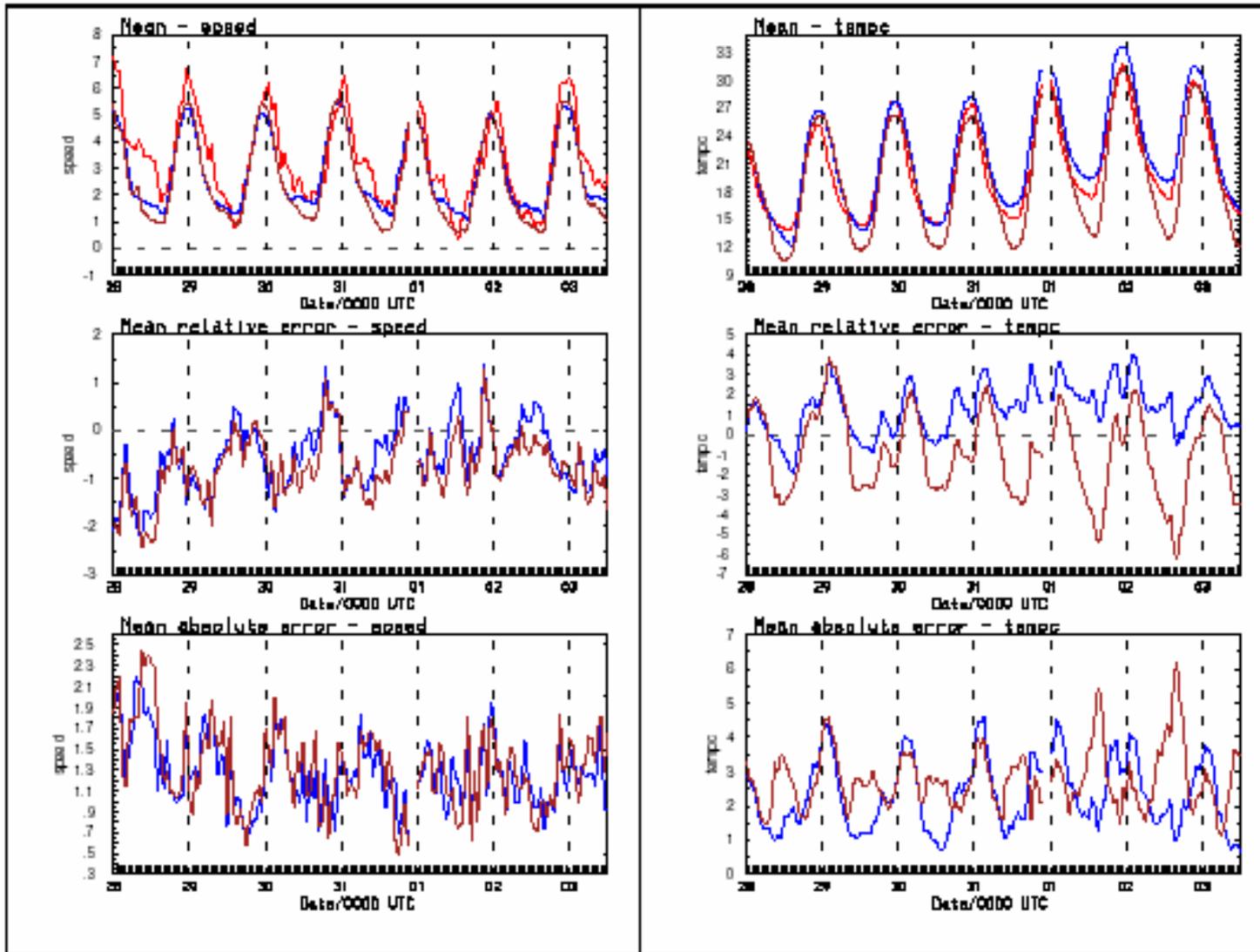




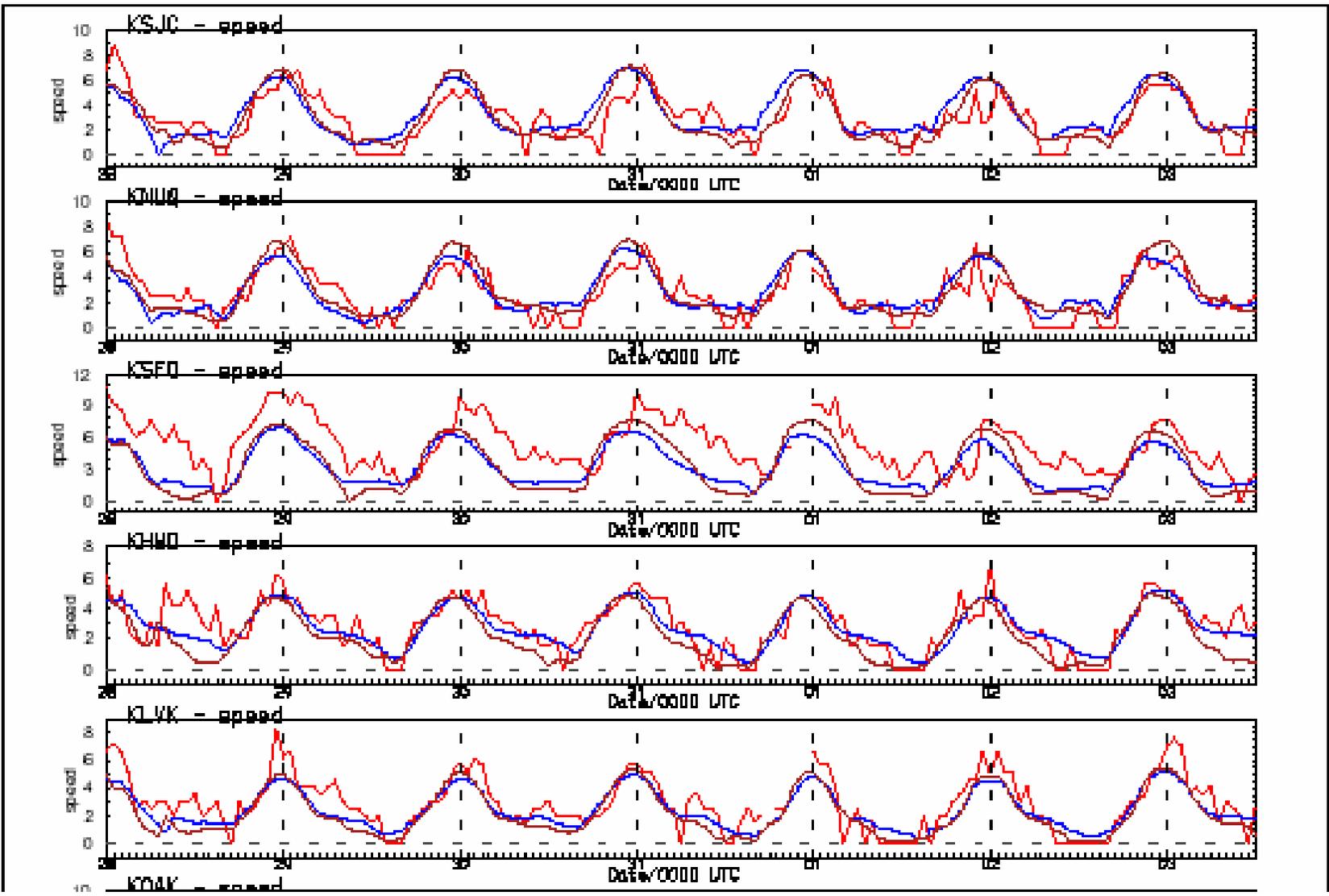
CCOS Meteorological Modeling

- **Various groups have undertaken MM5 modeling**
- **ATMET has undertaken RAMS modeling for an episode in July/August 2000**
 - > Early indications with CCOS dataset suggested RAMS over predicts winds
 - > Evaluated effect of various met networks on model performance evaluation
 - > Sub-regional time series prepared for:
 - All sites averaged together
 - Individual sites
 - NWS sites vs. known 2-m sites

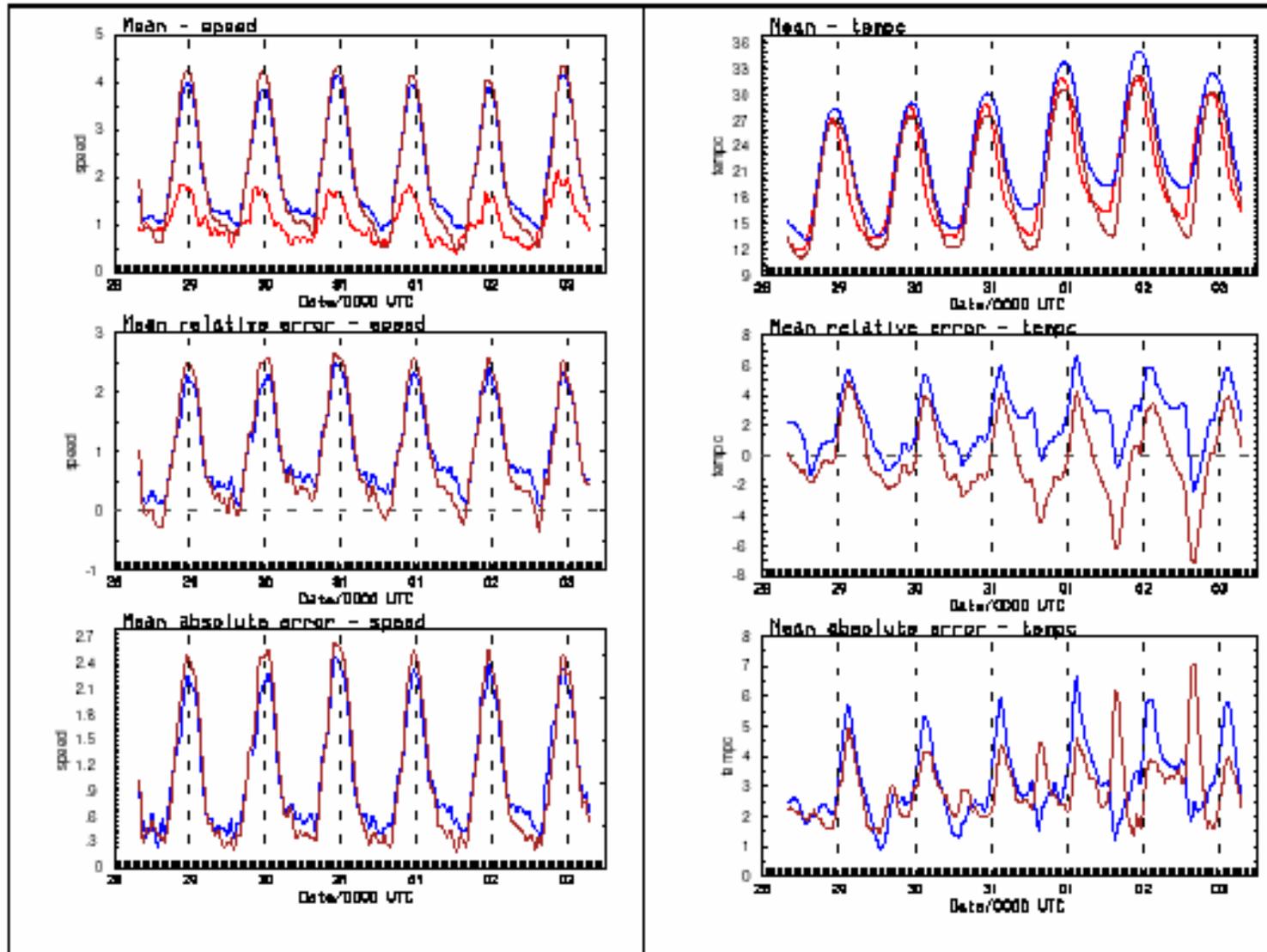
RAMS vs. NWS Data



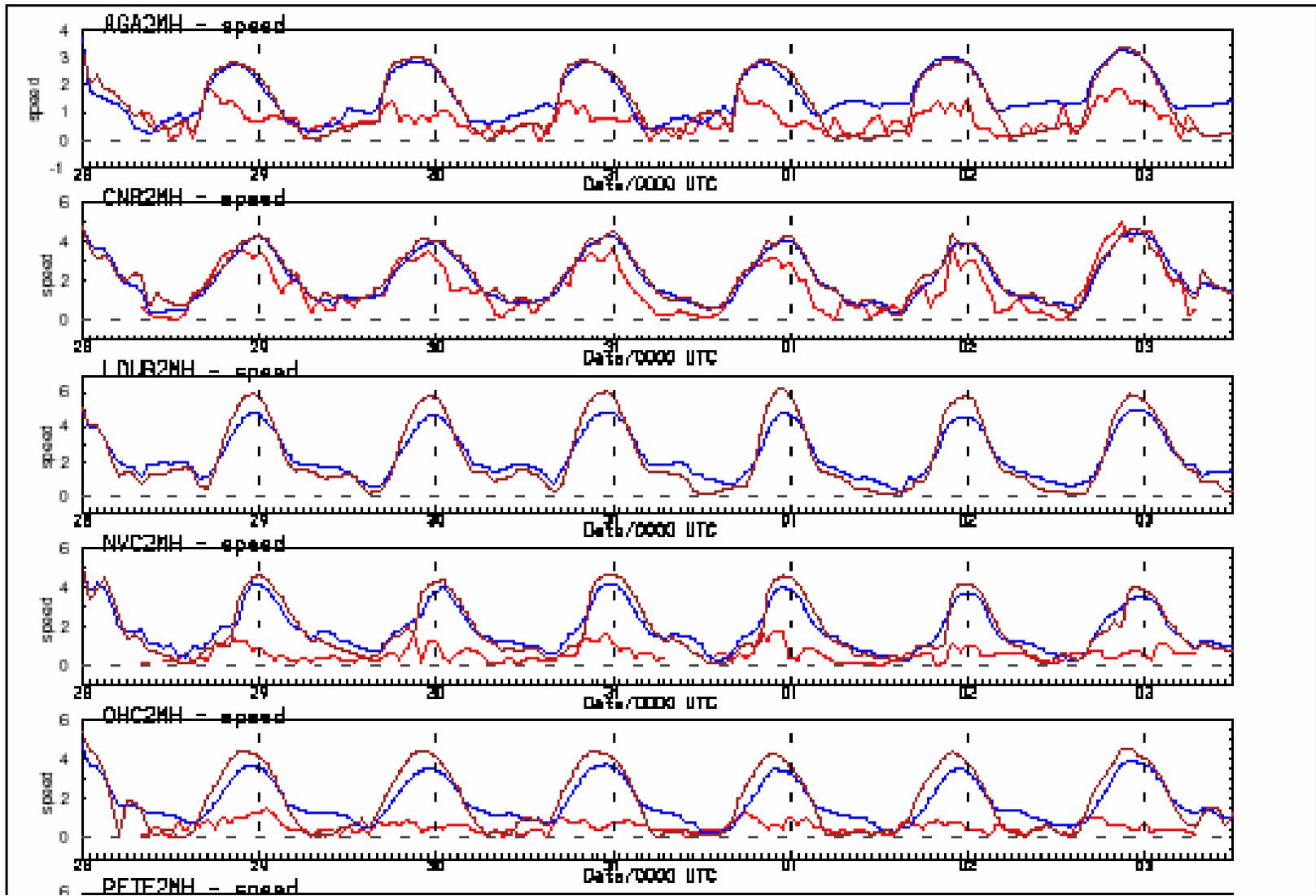
RAMS vs. NWS Data



RAMS vs. 2-m Data



RAMS vs. 2-m Data





Implications



- **Use of all met data in CCOS database can bias the model evaluation**
- **Need to “weed out” those sites that we generally should not compare to met model output**
 - > Remove CIMIS and RAWS
 - > Remove all other known 2-m data
 - > Keep NWS, AIRS, and special CCOS sites



Results



- **Leaves many sites for evaluation**
 - > More faith in data
 - > More directly comparable/consistent to model output
- **Many warm fuzzies, but does not consider:**
 - > Hour-instant vs. hour-average issue
 - > Representativeness of multiple sites per grid spacing



Resulting met site density

