The Iowa Environmental Mesonet

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Outline:

- Motivations for our Mesonet
- IEM Component Networks
- 'Super-charging' Networks
- Working with the NWS
- 411 on the KELO WeatherNet
- IEM Applications
- Conclusions / No Questions

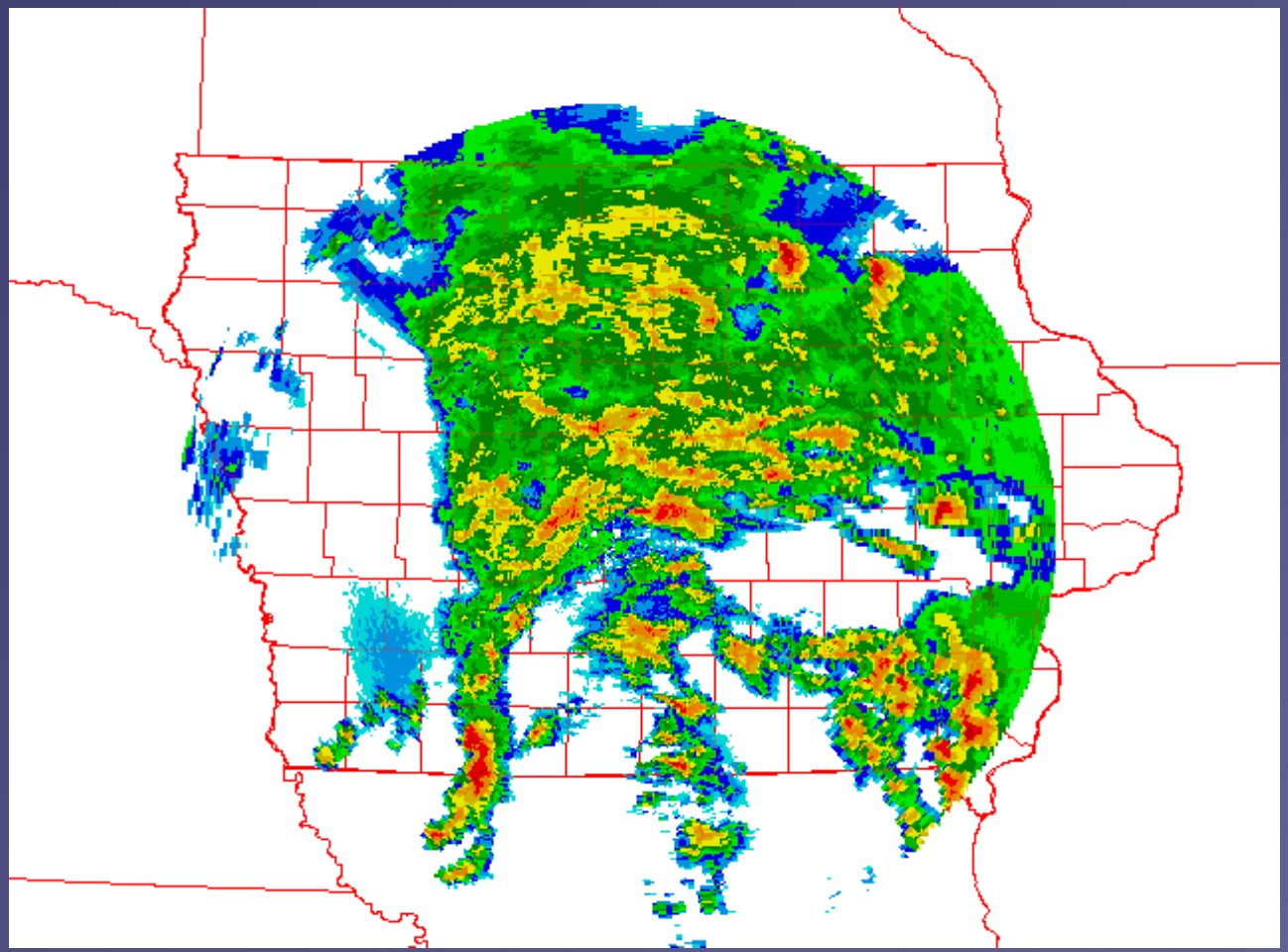
Motivations

- The baseline NWS/FAA ASOS network is not spatially or temporally dense enough to resolve many mesoscale phenomena.
- Building a new observational network is very expensive.
- Building a mesonet of existing networks increases the value, use, and awareness of each member network.

The need for a mesonet

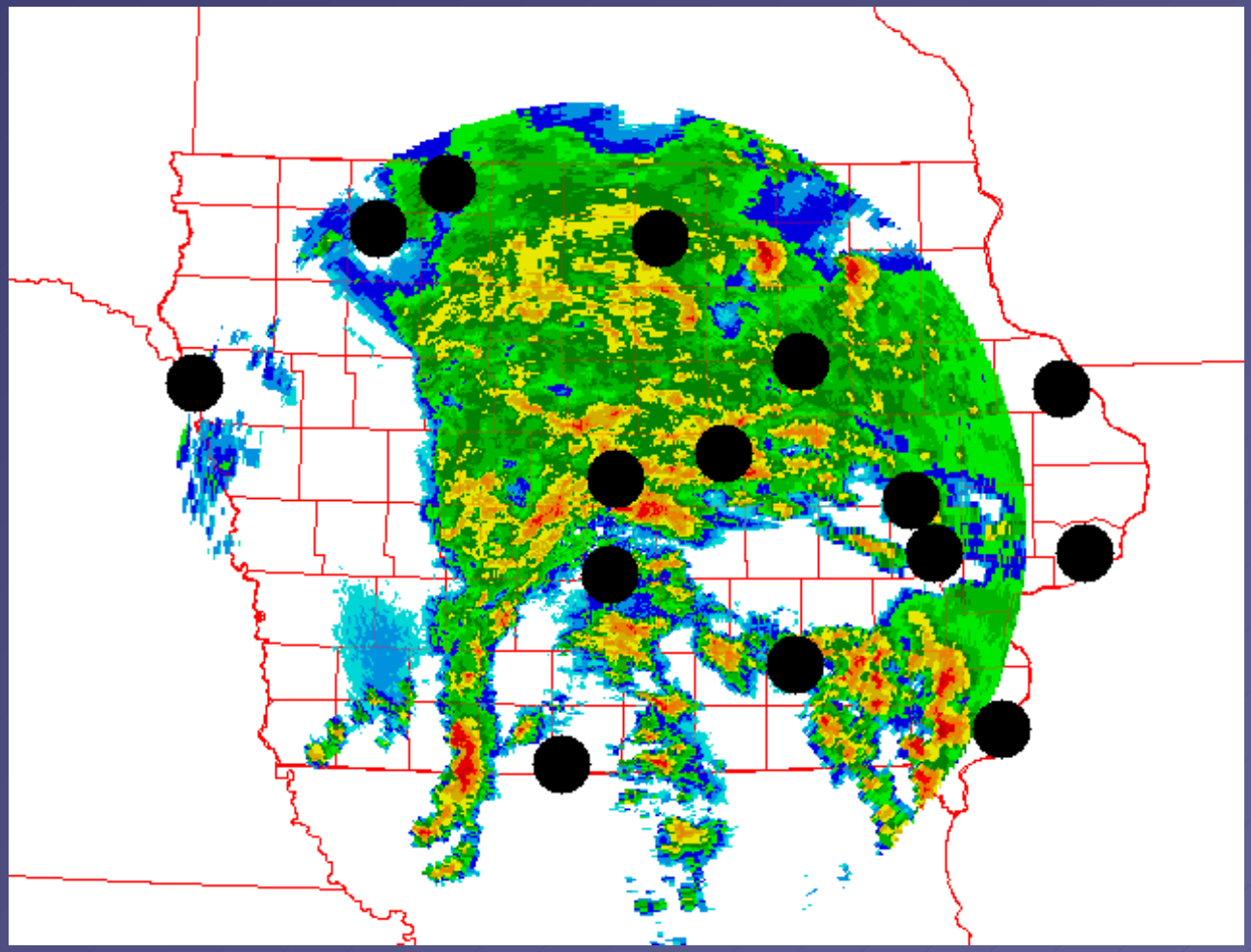
You are a forecaster at the Des Moines WFO. It is 9PM on 8 May 2003. It is dark, so spotters may not be able to help.

What surface observing resources are available to give you situational awareness?



The need for a Mesonet

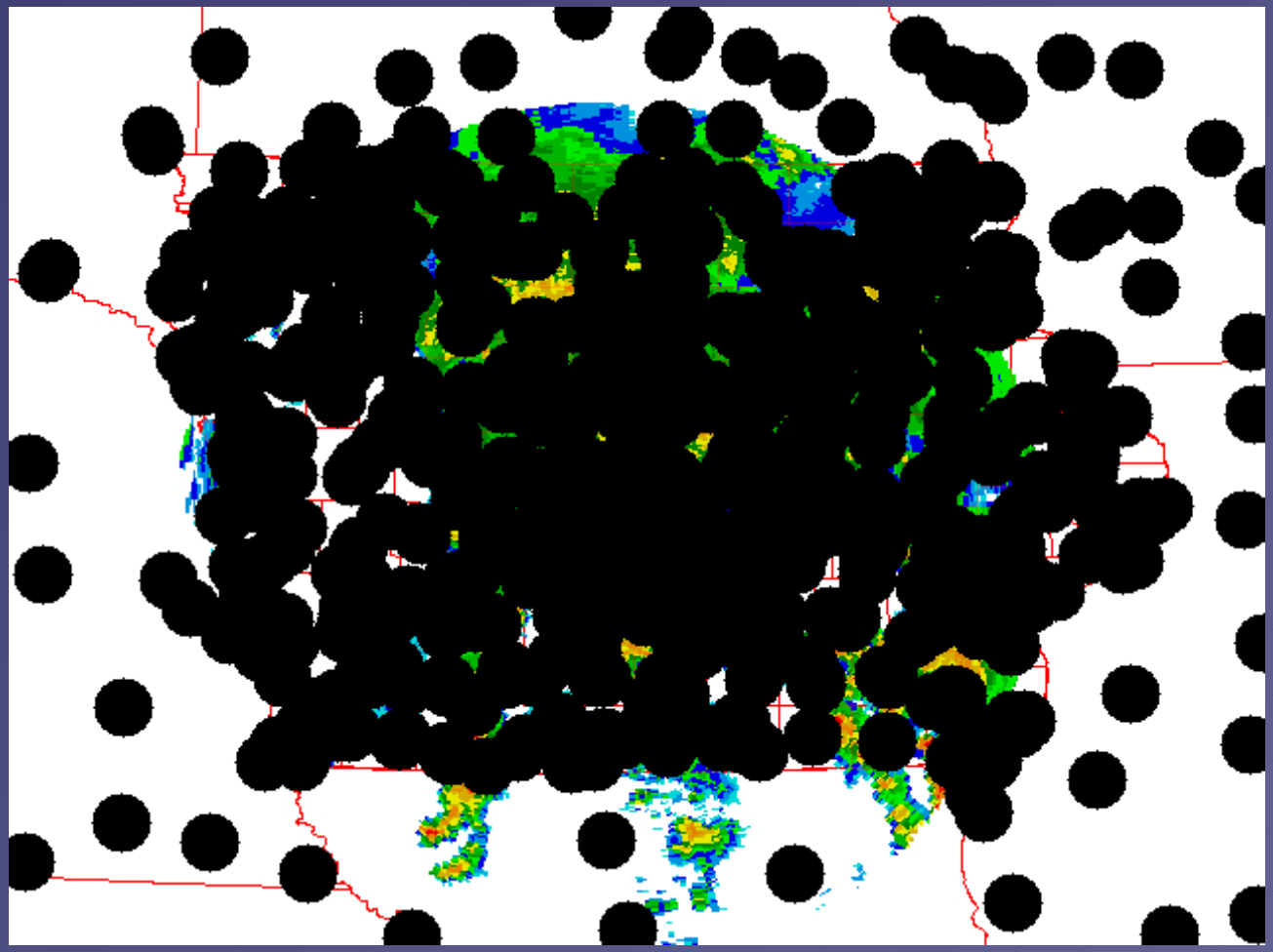
The baseline ASOS network provides you with hourly and some sub-hourly updates. The storm system is moving fast, so issuing timely warnings relies on timely current data.



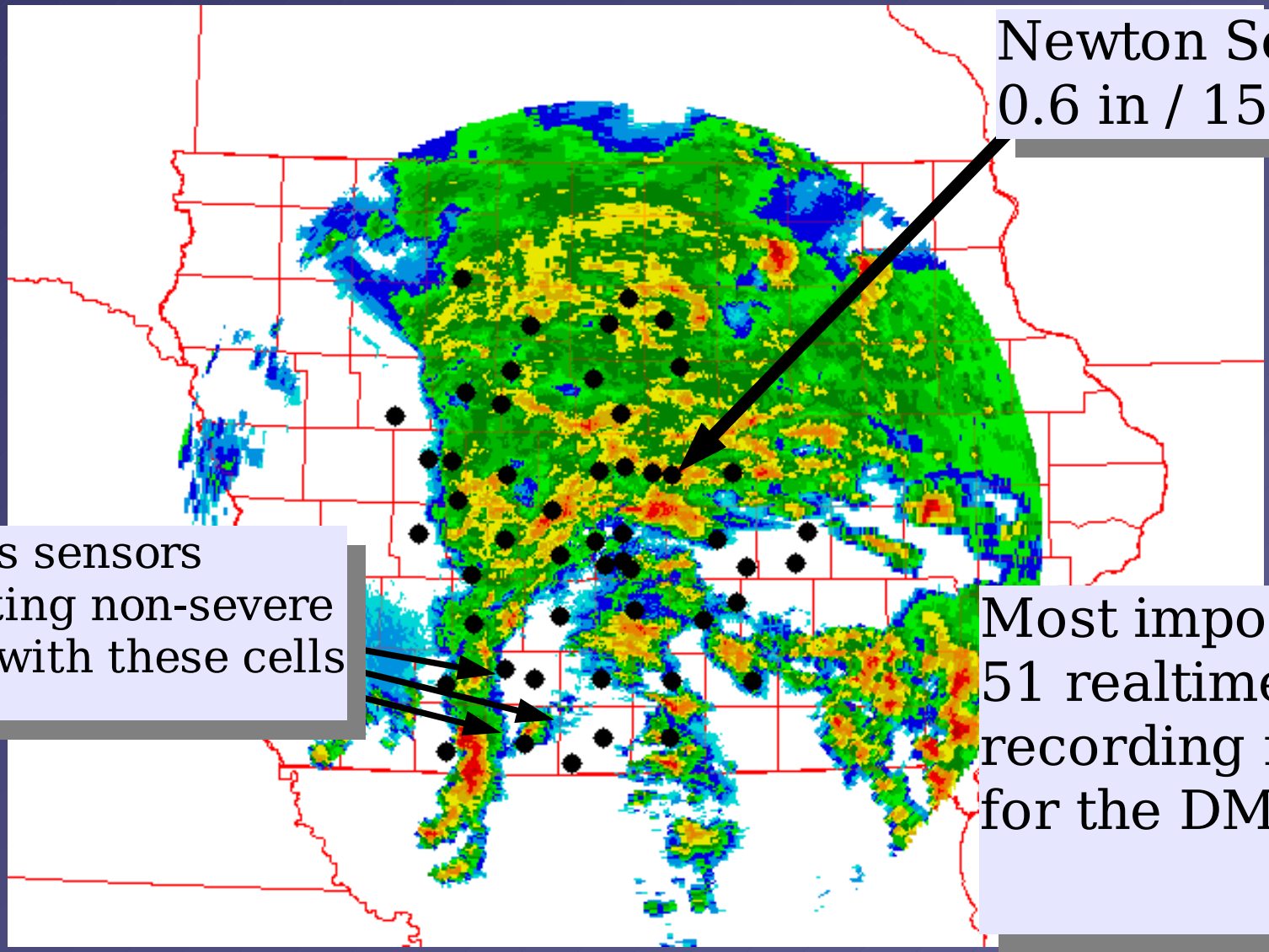
The need for a Mesonet

The Iowa Mesonet collaboration increases your resolution of the near storm environment.

Whoaaa! Dude, where is my RADAR?



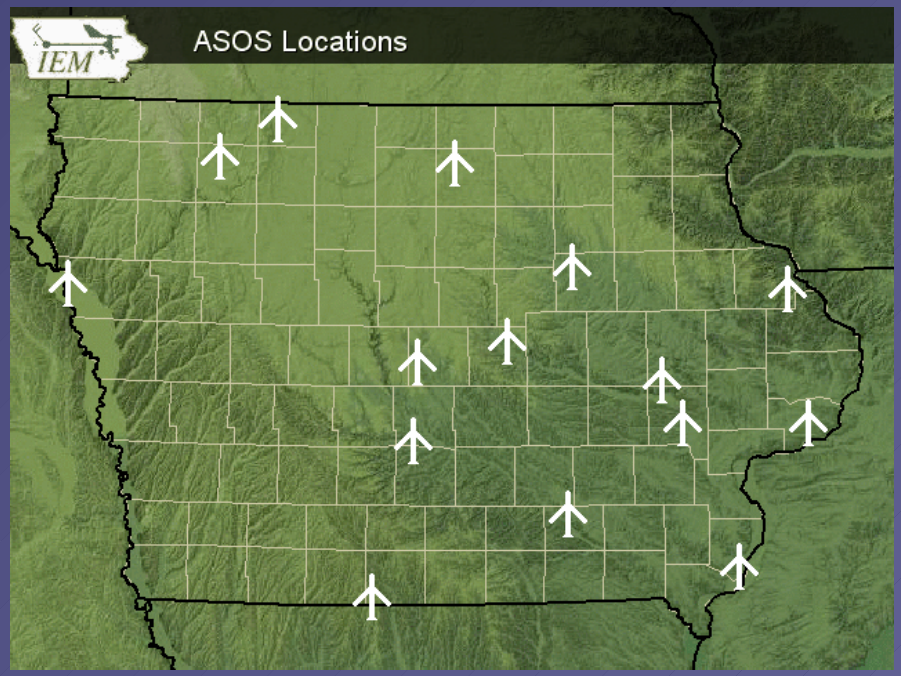
What the Mesonet provided



IEM Component Networks

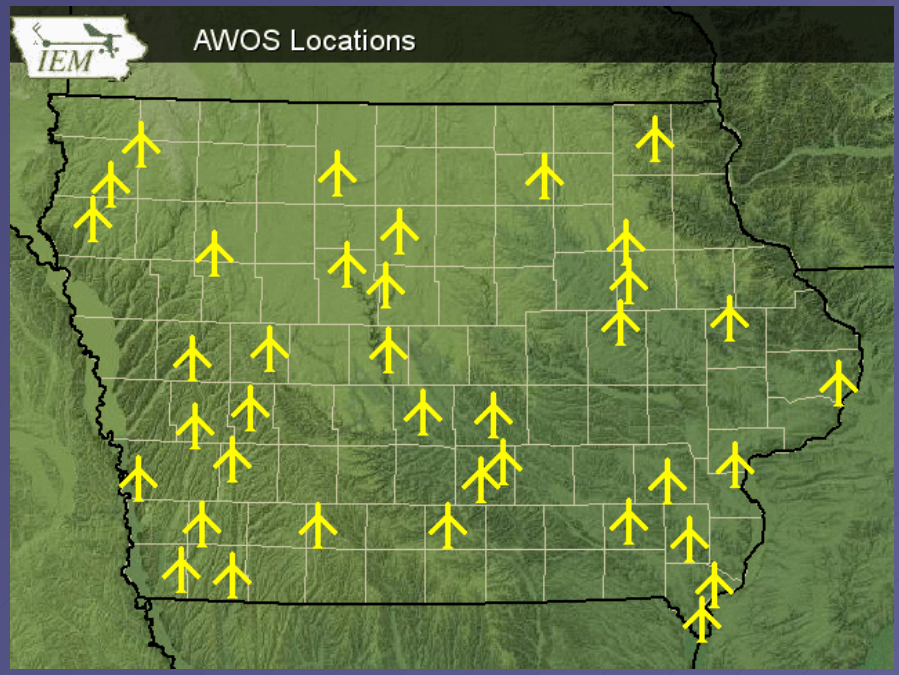
ASOS - Automated Surface Observing System

- Sites
  - 15 +2 (CWI+FOD)
- Location
  - Primary Airports
- Purpose
  - Support aviation



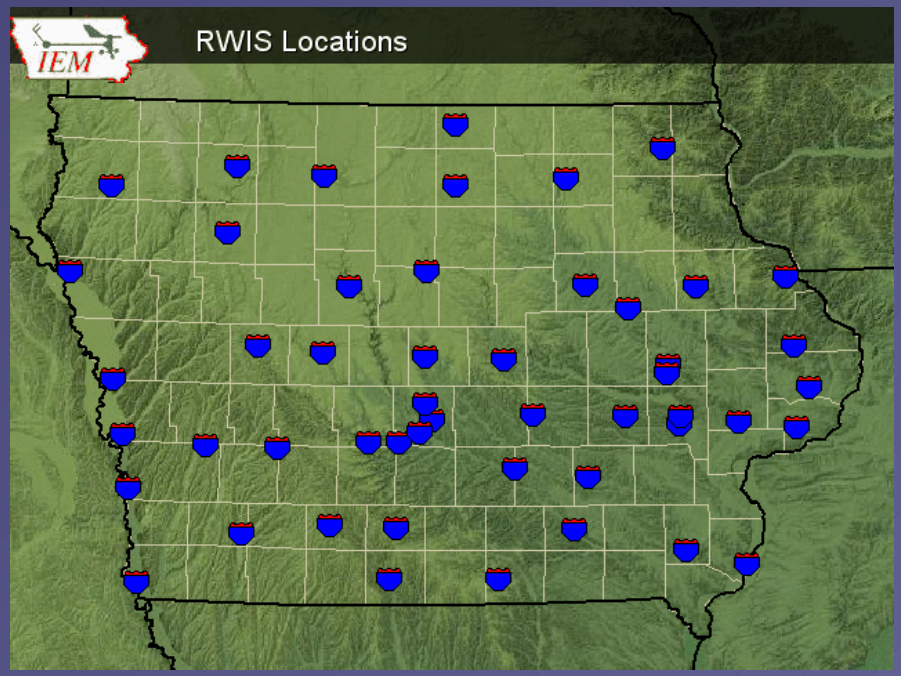
AWOS – Automated Weather Observing System

- Sites
  - 35 +2 (CWI+FOD)
- Location
  - Smaller Airports
- Purpose
  - Support aviation



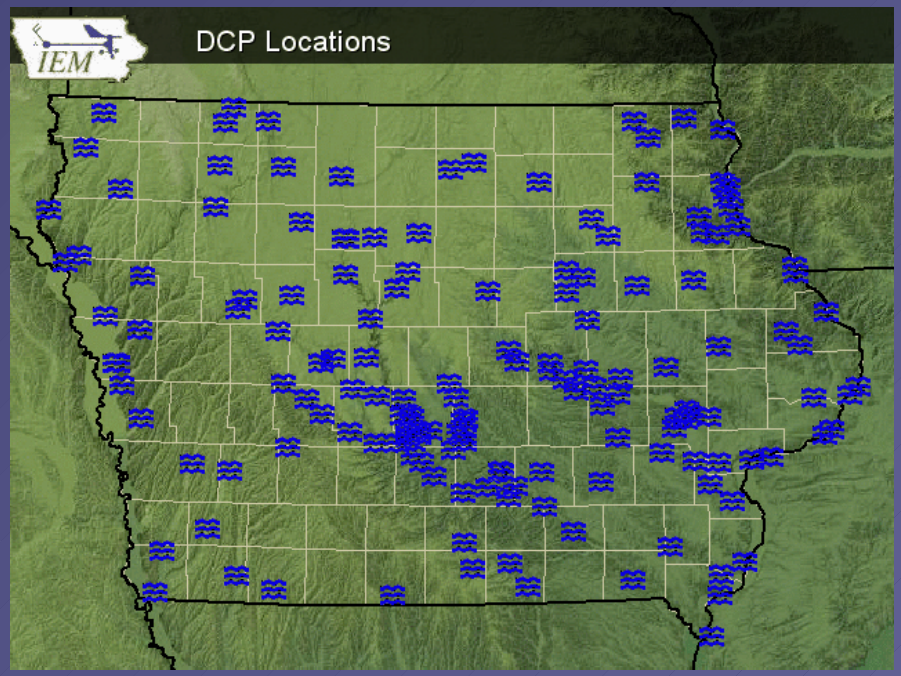
RWIS – Roadway Weather Information System

- Sites
  - 49 Online
- Location
  - Along major roads near bridges
- Purpose
  - Road maintenance support in winter



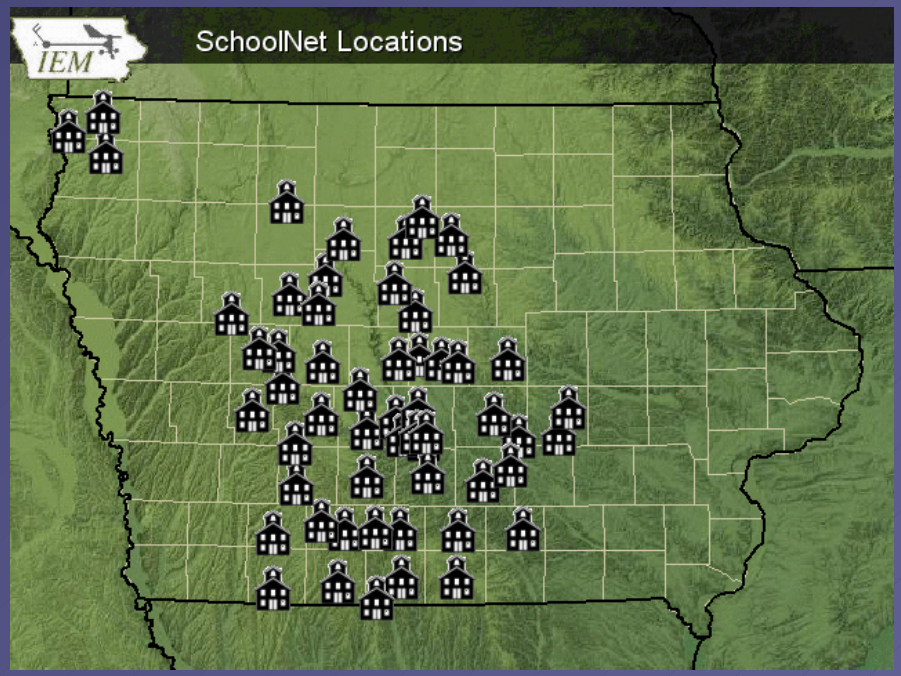
DCP – Data Collection Platforms

- Sites
  - 161
- Location
  - Along rivers
- Purpose
  - Monitor river stages



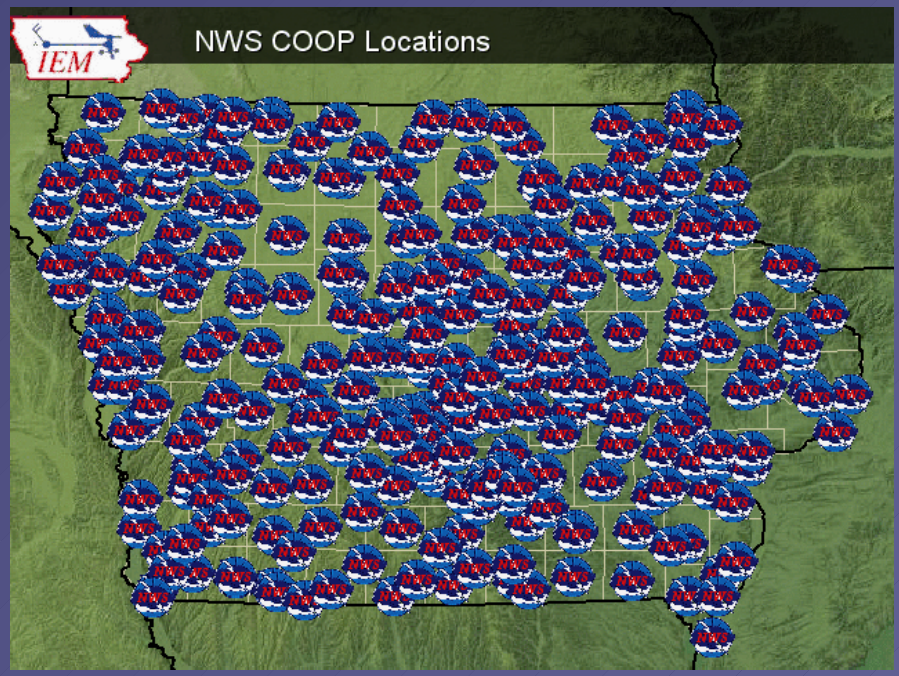
SchoolNet (KCCI-TV & KELO-TV)

- Sites in Iowa
  - 55 (84 total)
- Locations
  - Roofs of schools
- Purpose
  - **Support local science curriculum**



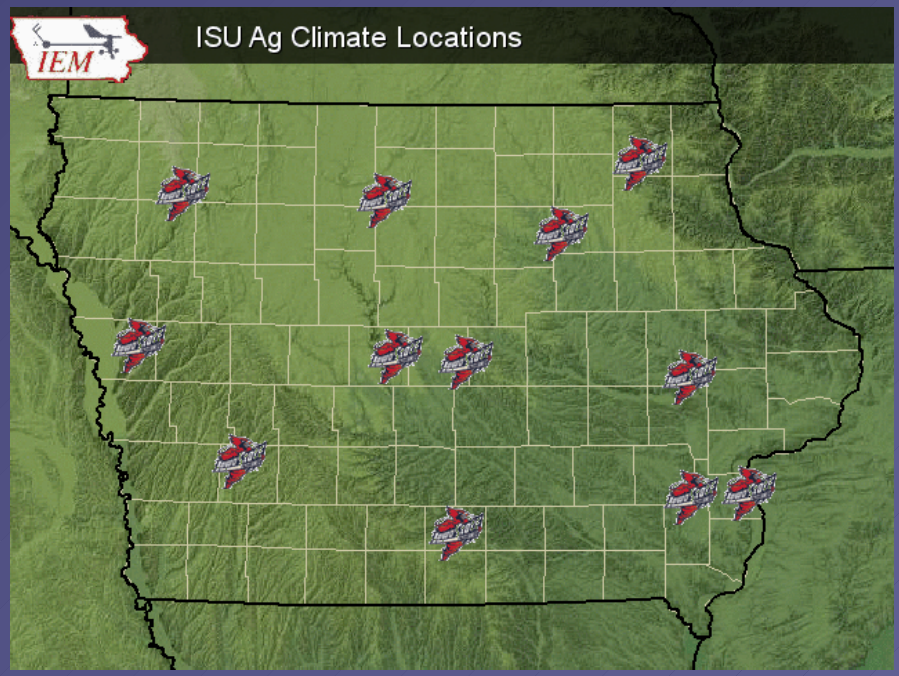
NWS COOP – Cooperative Observing Program

- Sites
  - 145
- Locations
  - Backyards, fields, about anywhere
- Purpose
  - Climate and hydro monitoring



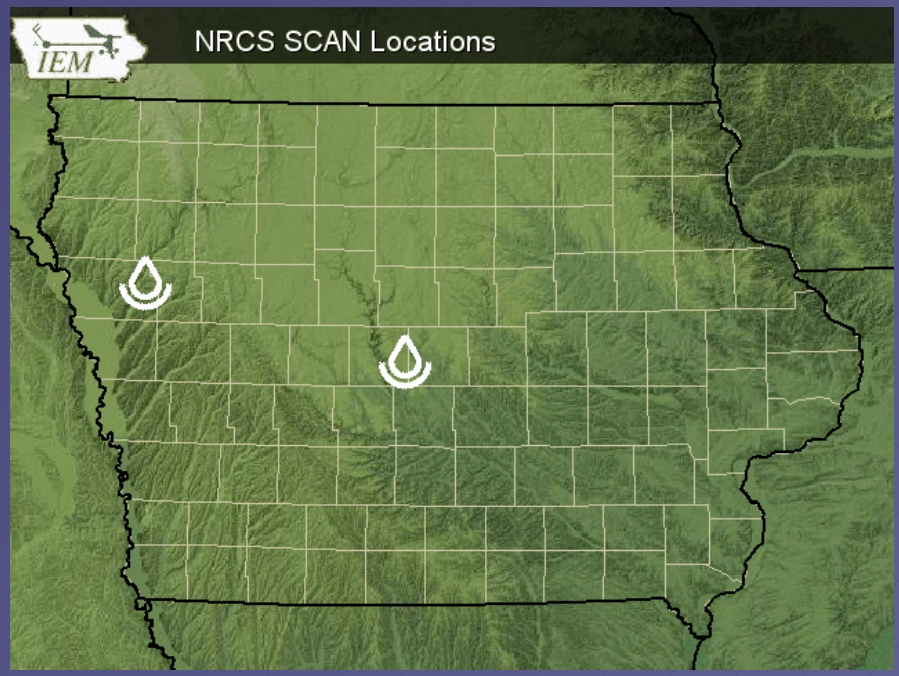
ISU Ag Climate Network

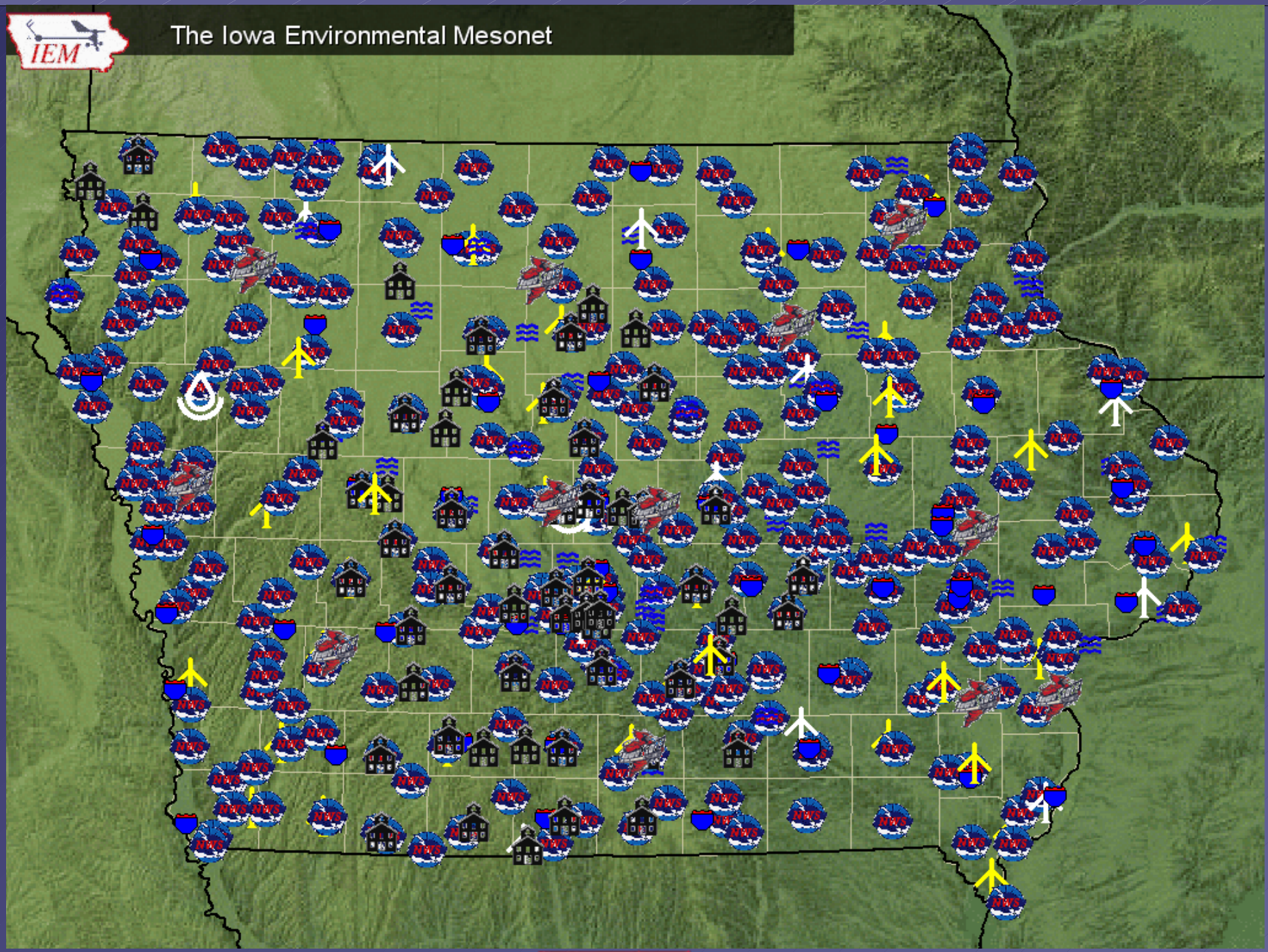
- Sites
  - 12
- Location
  - Open areas near research farms
- Purpose
  - Support Ag activities at the farms



SCAN – Soil Climate Analysis Network

- Sites in Iowa
  - 2
- Location
  - Fields
- Purpose
  - Monitor soil conditions





21 Nov 2003: NWS WFO FSD

IEM

http://mesonet.agron.iastate.edu

Data Processed Daily

Network	# of Sites	Obs/Site/Day	Obs/Day	Obs/Year
ASOS	15	24	360	131,400
AWOS	37	1,440	53,280	19,447,200
IA NWS COOP	145	1	145	52,925
DCP	161	48	7,728	2,820,720
ISU AgClimate	12	24	288	105,120
RWIS	49	144	7,056	2,575,440
SCAN	2	24	48	17,520
IA SchoolNet	55	1,440	79,200	28,908,000
Misc/Other/RAWS	3	24	72	26,280
Non-Iowa SchoolNet	29	1,440	41,760	15,242,400
Non-Iowa ASOS	400	24	9,600	3,504,000
Non-Iowa COOP	1,000	1	1,000	365,000
	1,908		***200,537***	***73,196,005***

Website Access Stats

	Average	Maximum
Visits per day	500	3,500
Hits per day	65,000	750,000
Megabytes transferred per day	800	2,500
Pure Data Downloads / day	50	100

While website stats are nice, the IEM is much more than just another weather data website!

'Super-Charging' Networks

Value Added Processing

- Too many folks just collect data from network X, use data in application Y
- We make major efforts to help the various networks out.
  - Routing their own data back to them
  - Routing other data to them
  - Website application development
  - Archiving services (download, analysis)
  - QUALITY CONTROL!!!

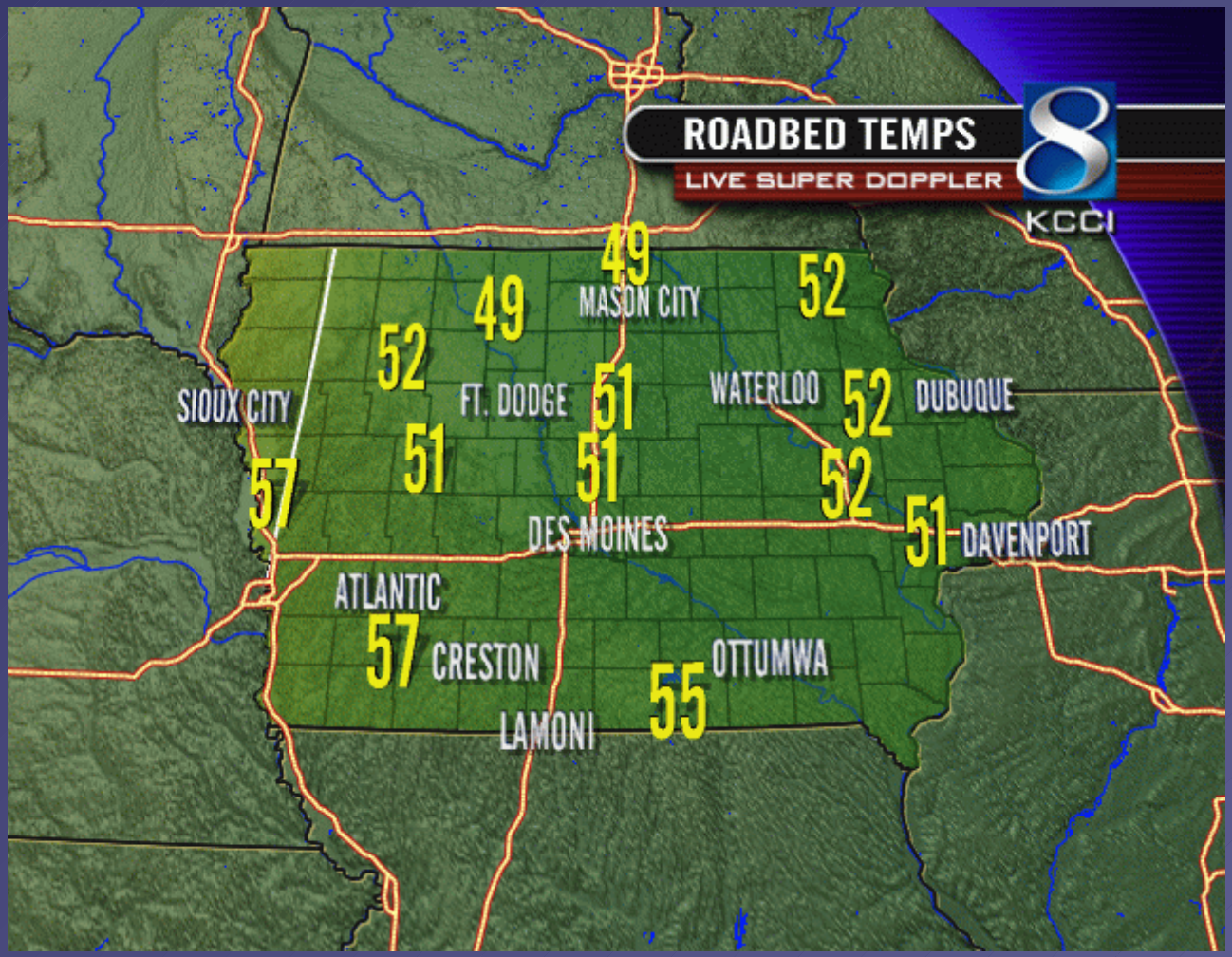
Why work with the networks?

- Network operators are typically lacking
  - IT support
  - An on-staff Meteorologist (a bad thing?)
  - QC expertise
- We give the networks a reason to keep sending us their data.
- We build up their user base to increase the value of their network.

IEM Tracker

- 9,000 trouble tickets have been generated since June 2002.
- All data outages documented.
- Very helpful for the SchoolNets
- Need to make tickets more visible on the website.

IEM Data Partnerships



On-Air Image generated by KCCI-TV showing IaDOT owned Roadway Weather Sensor (RWIS) information.

Working with the NWS

Automated AWIPS Wind Alerts

File Edit Options Version Tools Scripts Products Help

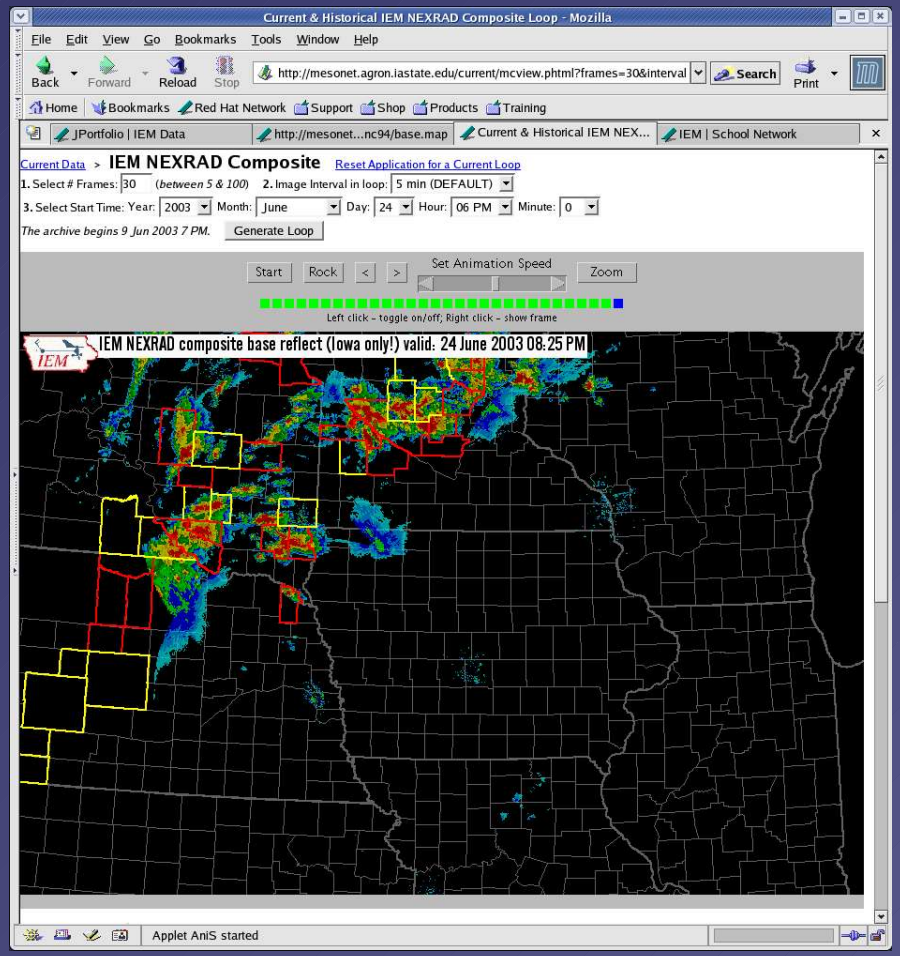
AFOS Browser | Load History | WMO Search | Enter Editor | Accum | Update Obs | Clear

AFOS Cmd: WMO TTAAii CCCC: AWIPS ID:

```
KCCI SNET OB: [06:54]   96 MPH GUST SGLI4 Glidden Ralston _ Glidden
   LATEST OB: [06:54] 65/64 70MPH from NNW  P: 01.25" RR: 00.00"
```

Des Moines NWS Forecasters using an automated wind alert from the SchoolNet. (Craig Cogil & Gary Forester)

Current/Archived RADAR

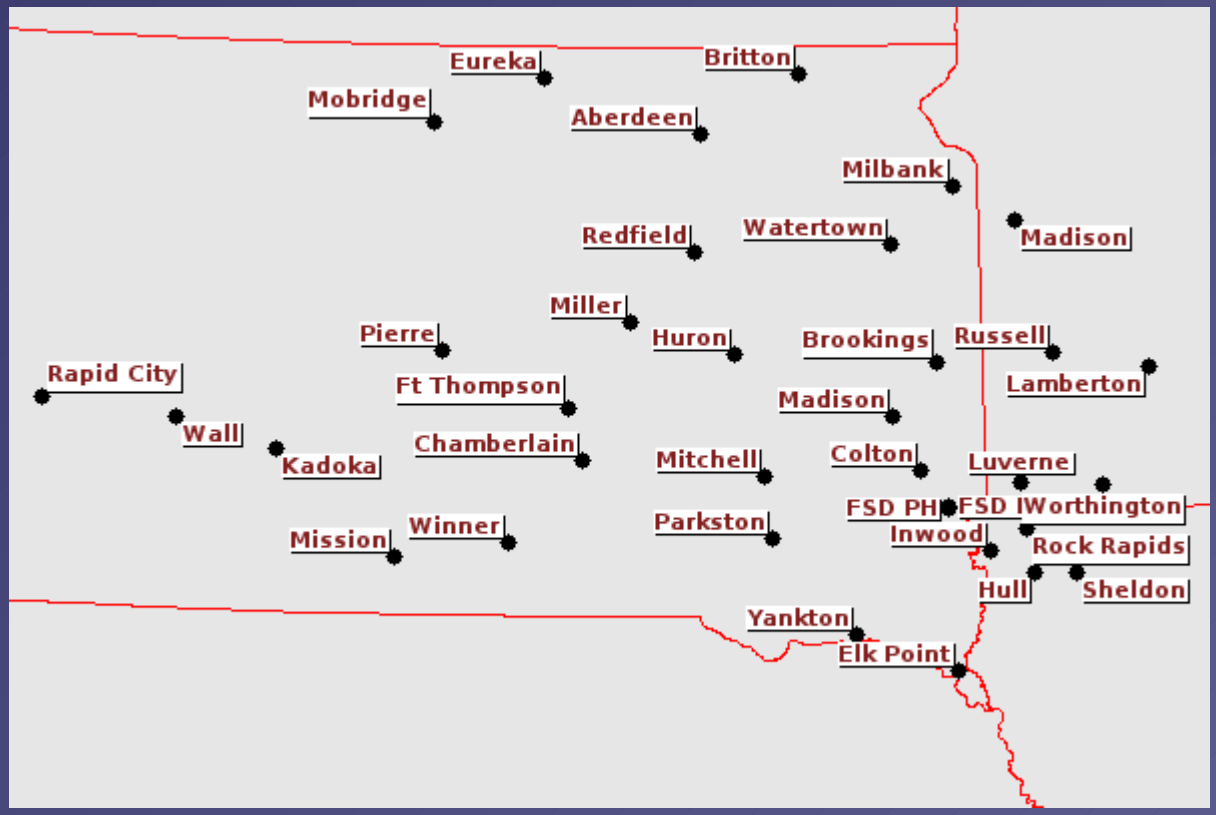


- 5 minute composites since 4 Jun 2003
- DMX displays current loop on their projection system during severe weather
- Useful for building animations for presentations (hint-hint)
- Will backfill archive as requests are made

Formatting Data for AWIPS

- Generate LDAD csv files of RWIS data
- Generate LDAD csv and SHEF encoded of School data
- Wind alerts trigger AWIPS bell
- All routed directly to LDAD via LDM
- FSD currently gets LDADcsv, SHEF, and wind alerts of KELO SchoolNet

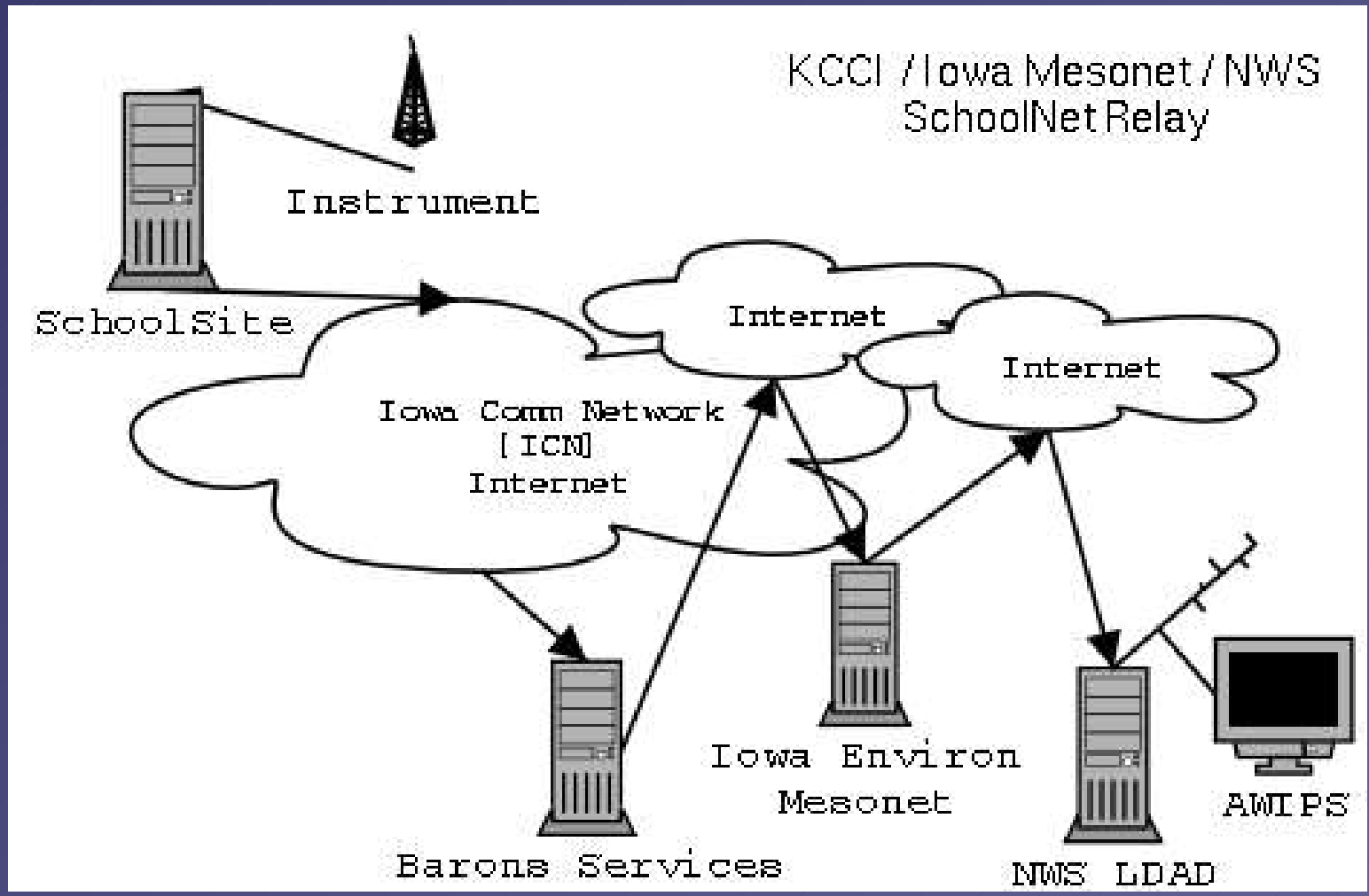
KELO WeatherNet 411



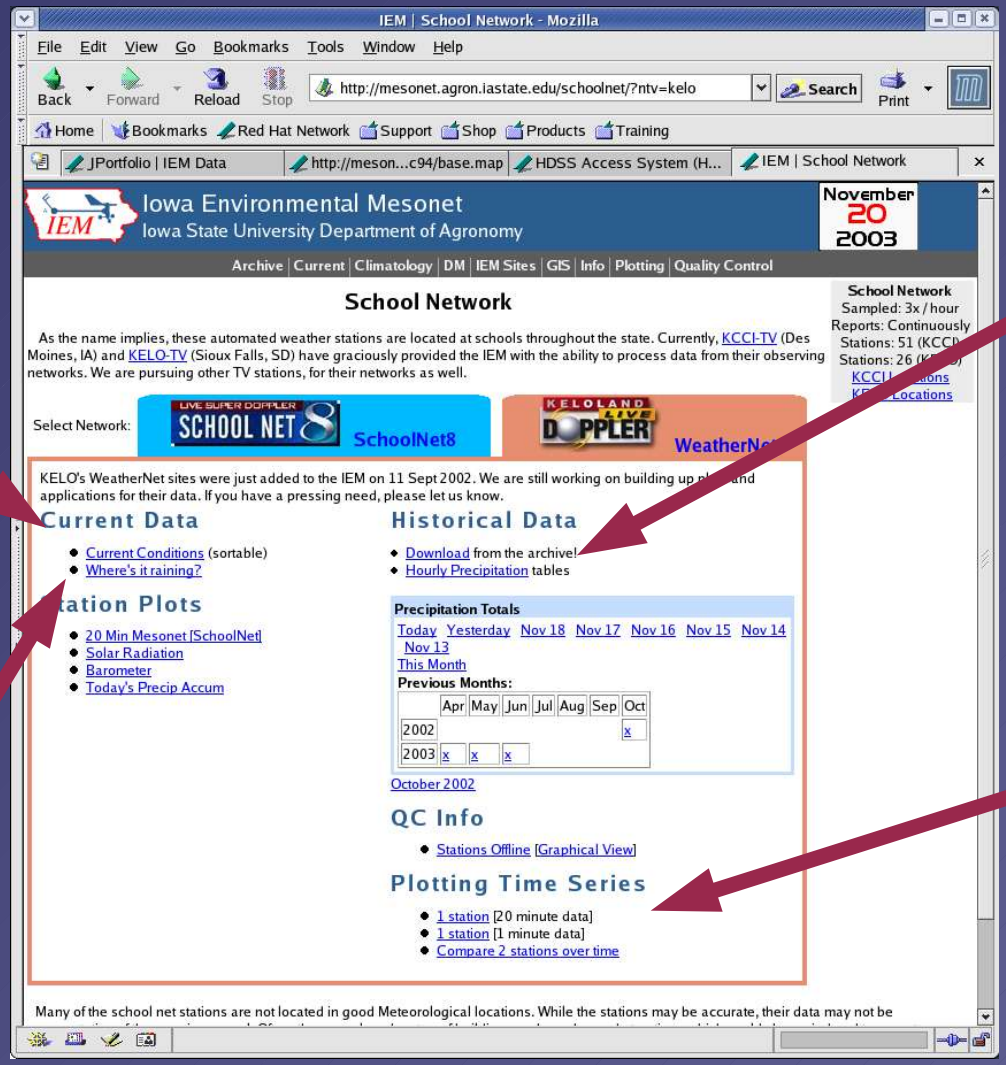
Network Metrics

- 35 sites
- Each site reports: Air Temp, Humidity, Pressure, **Instantaneous** Winds, Rainfall (not heated), Solar Radiation
- Two subnetworks
  - Older Texas Weather Instruments
    - Report every 6-10 seconds
  - Recent addition of Peet Brothers sites
    - Report every minute

Network Topology



Website Functionality



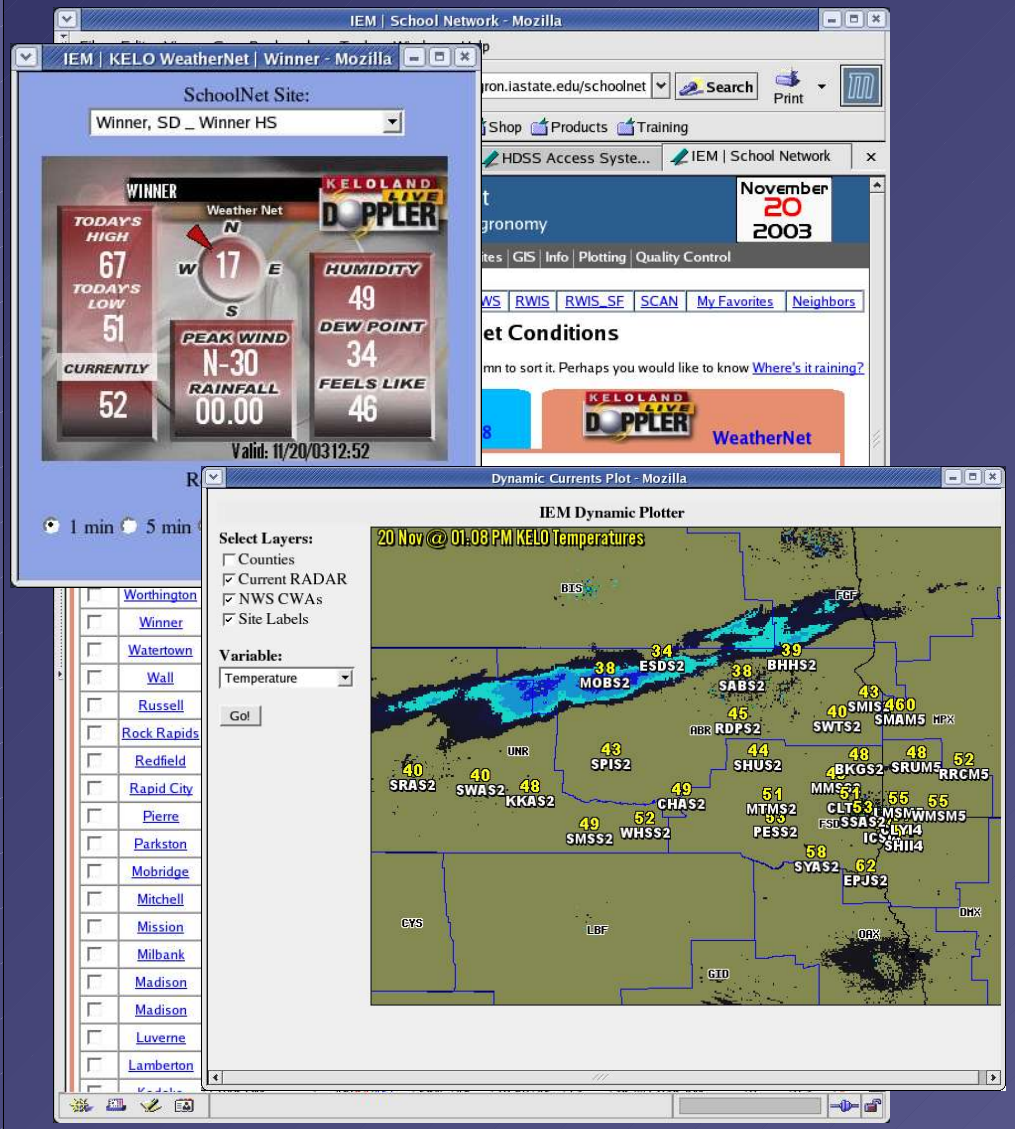
Current Sortables

Where's it raining?

Data Download

1 minute data traces

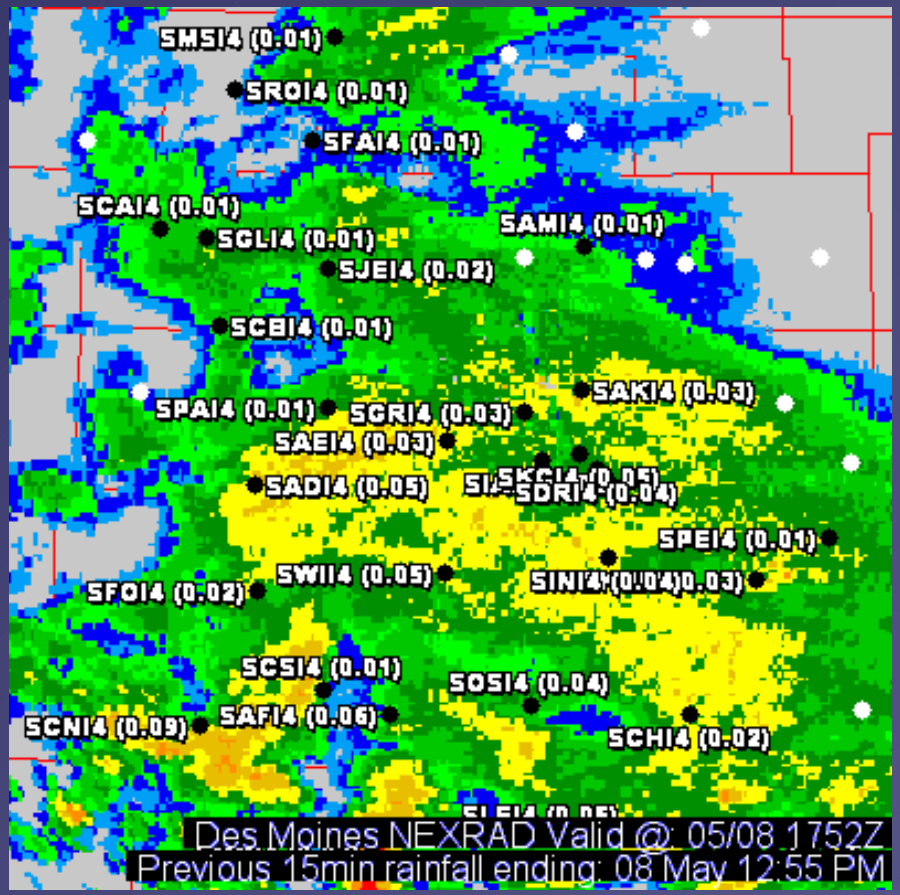
Current Sortables



- Variable sorting
- Dynamically updates
- Add to 'My Favorites' for a custom listing of IEM sites
- Dynamic spatial plots of any variable
- Replicated On-Air display for any single site

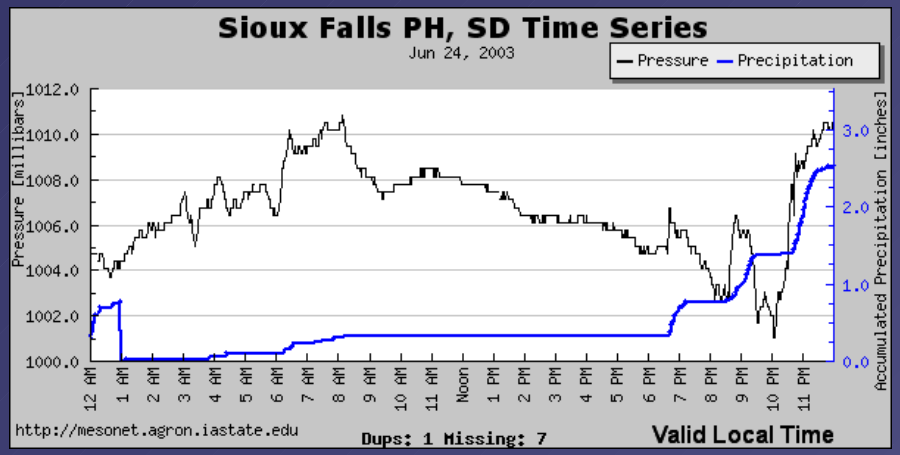
IEM

Where's it raining?

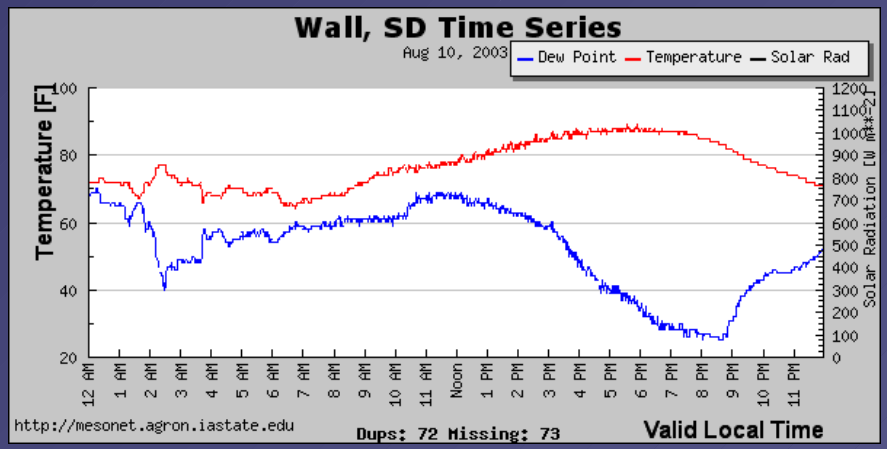


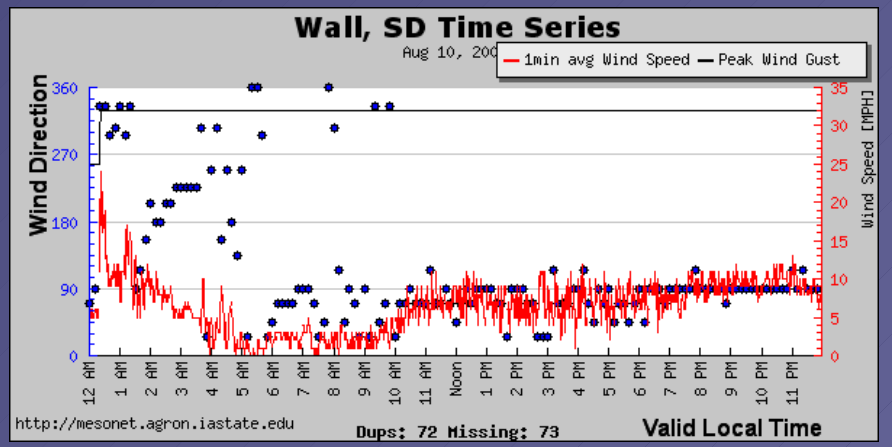
- 'Live' WeatherNet 15 minute rainfall amounts with NEXRAD base reflect
- Applications
  - Virga detection
  - QC sites
  - Flash Flood Guidance
  - Situational Awareness

1 Minute Data Traces



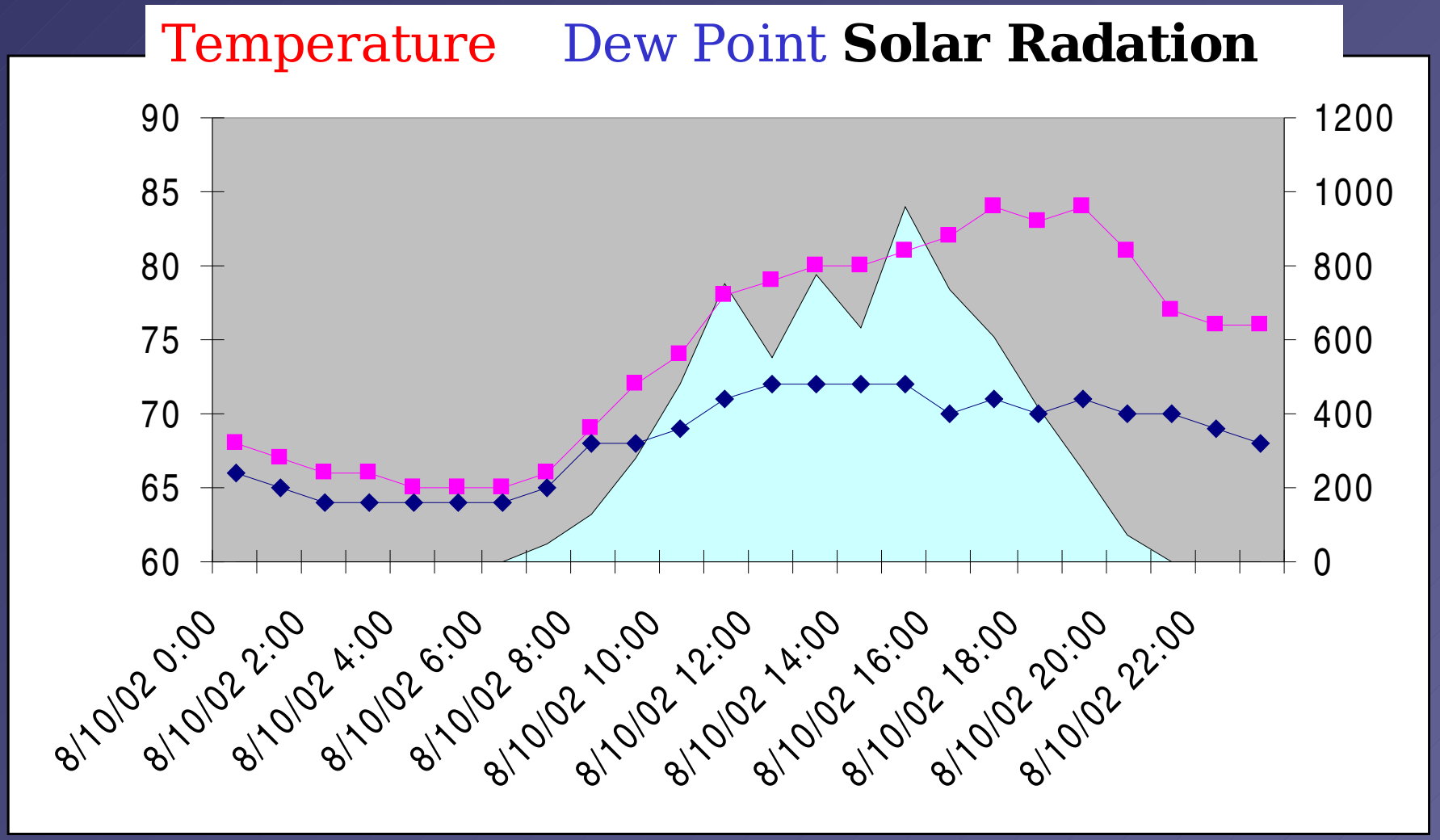
- Dynamically generated with the latest obs or archived data
- So much variability!



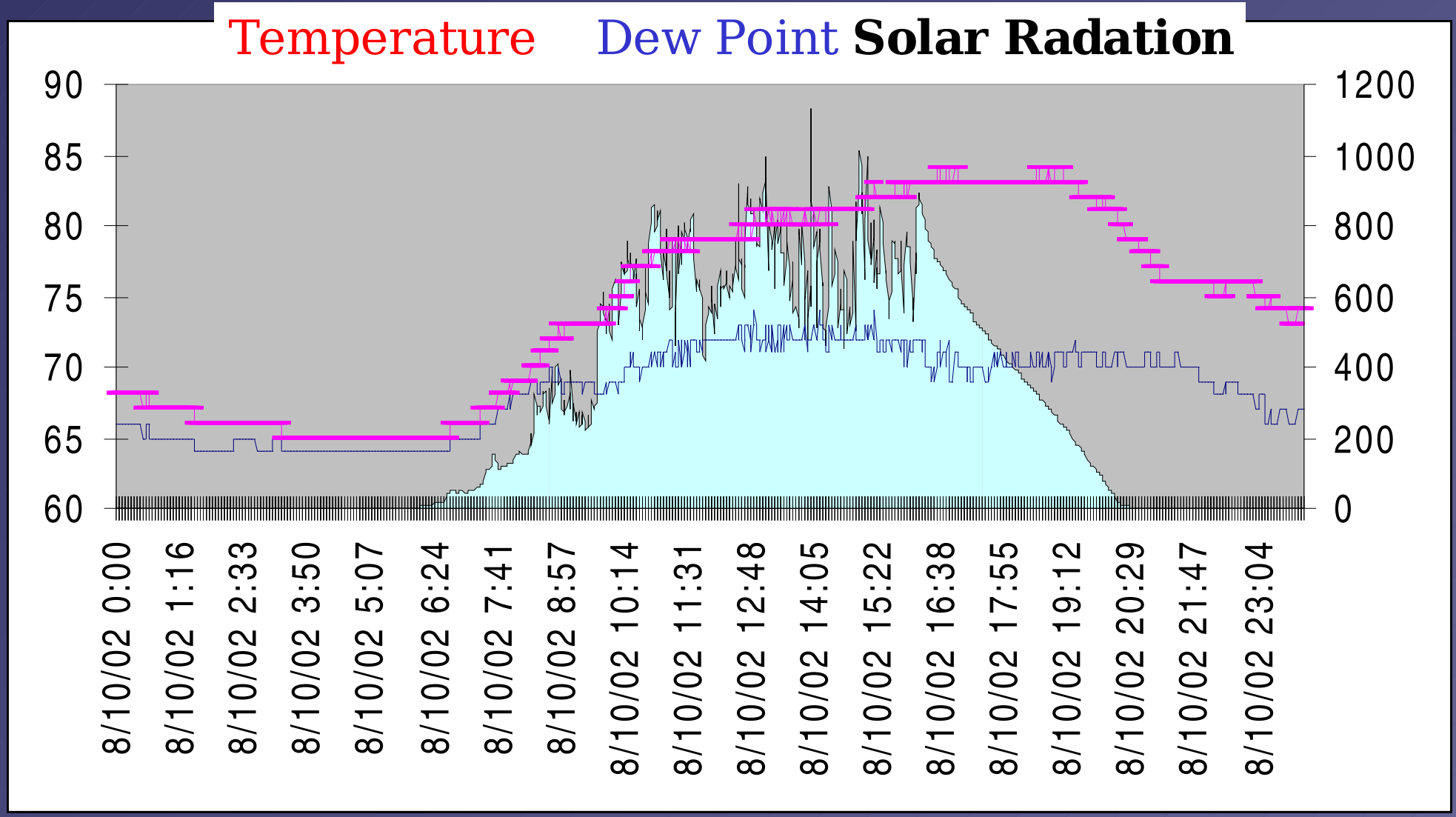


IEM

Hourly data


Temperature
Dew Point
Solar Radation
90
85
80
75
70
65
60
1200
1000
800
600
400
200
0
8/10/02 0:00
8/10/02 2:00
8/10/02 4:00
8/10/02 6:00
8/10/02 8:00
8/10/02 10:00
8/10/02 12:00
8/10/02 14:00
8/10/02 16:00
8/10/02 18:00
8/10/02 20:00
8/10/02 22:00

Minute Data


Temperature
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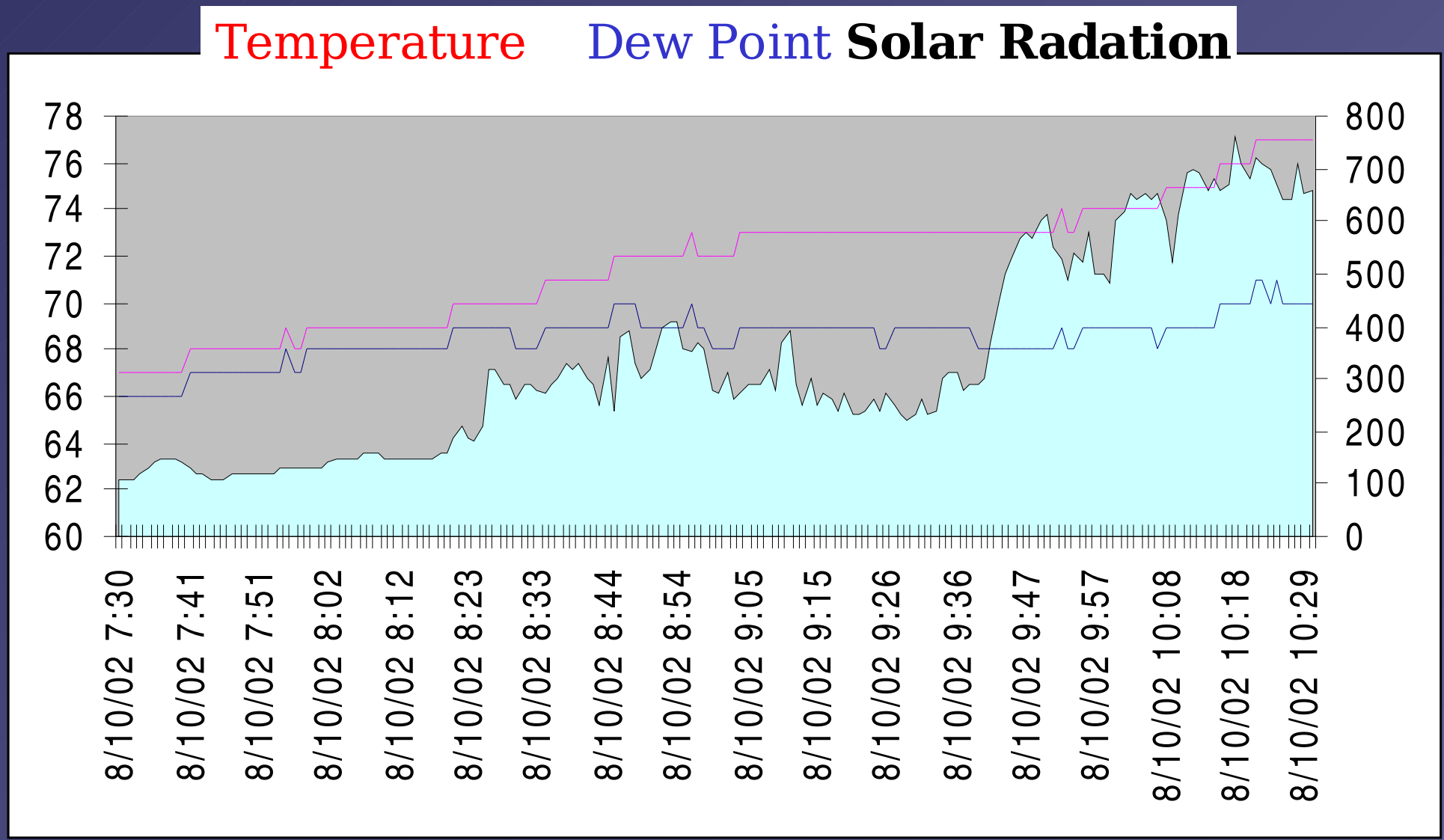
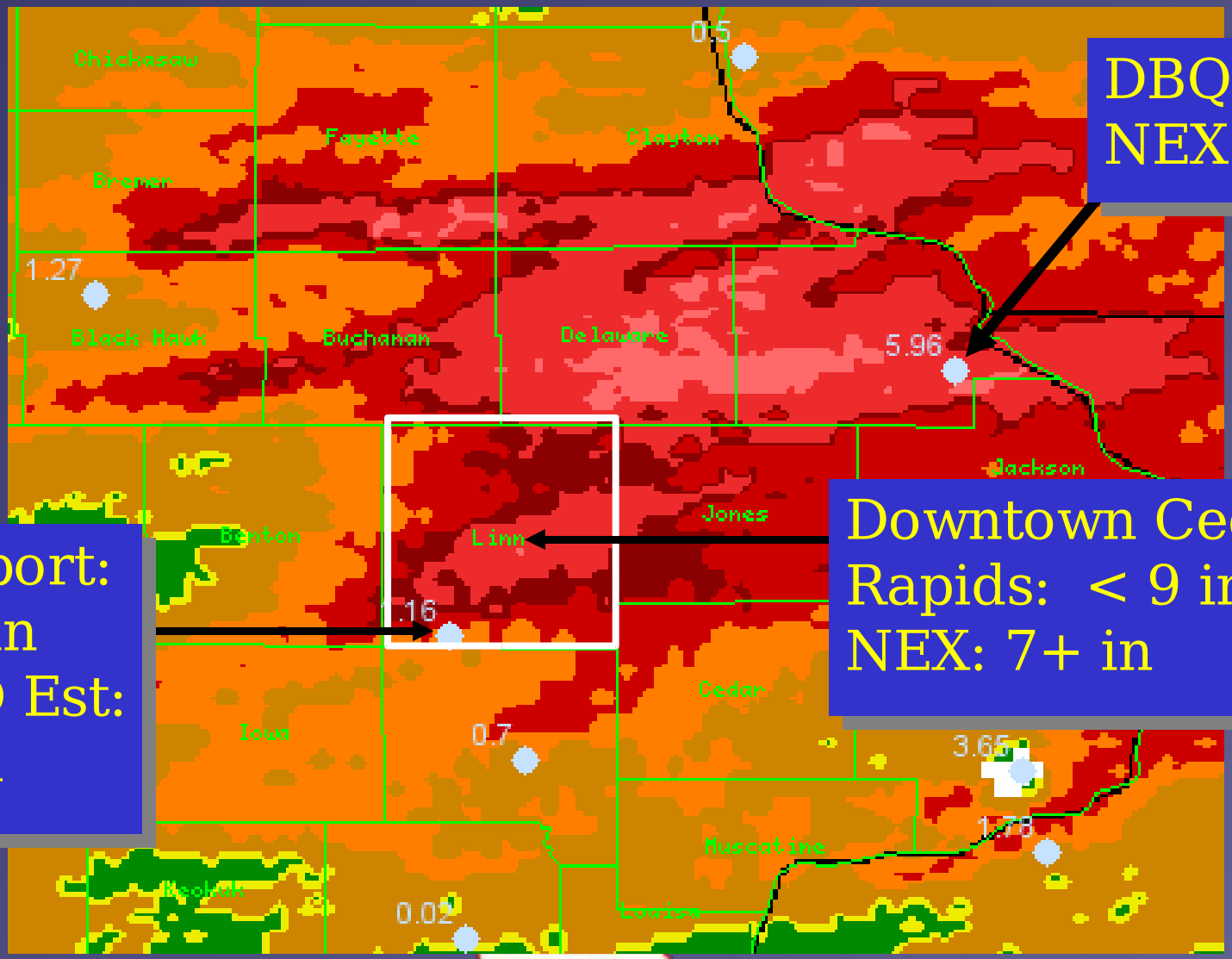
8/10/02 0:00
8/10/02 1:16
8/10/02 2:33
8/10/02 3:50
8/10/02 5:07
8/10/02 6:24
8/10/02 7:41
8/10/02 8:57
8/10/02 10:14
8/10/02 11:31
8/10/02 12:48
8/10/02 14:05
8/10/02 15:22
8/10/02 16:38
8/10/02 17:55
8/10/02 19:12
8/10/02 20:29
8/10/02 21:47
8/10/02 23:04

1 minute data!



IEM GIS Applications

3-4 June 2002 Flooding

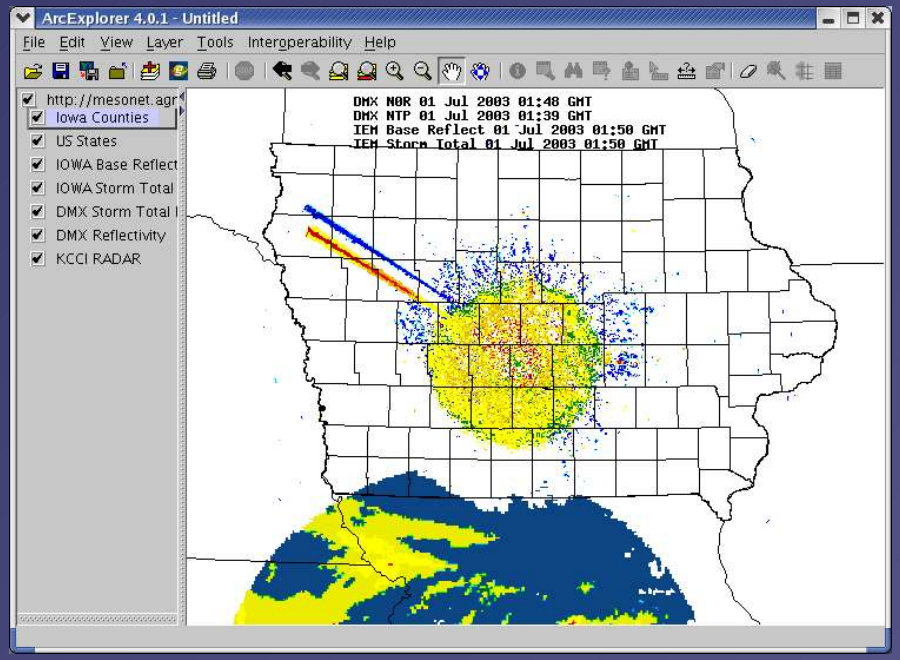


DBQ: 5.96 in
NEX: 7+ in

CID Airport:
1.16 in
NEXRAD Est:
2 in

Downtown Cedar
Rapids: < 9 in
NEX: 7+ in

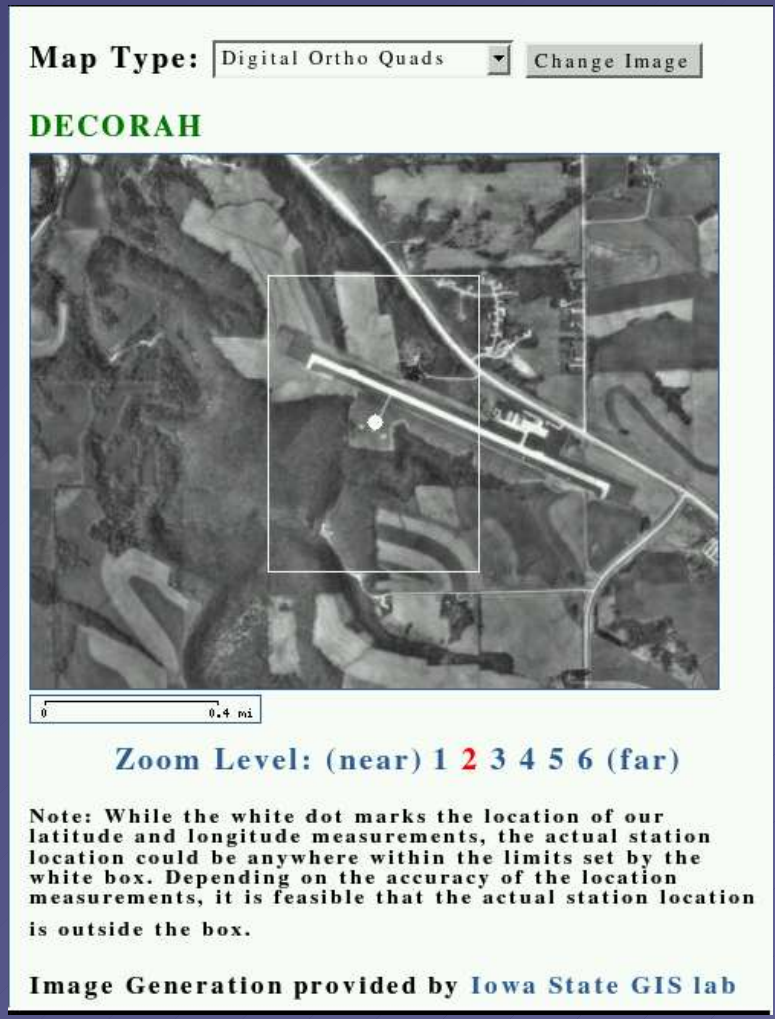
IEM RadView



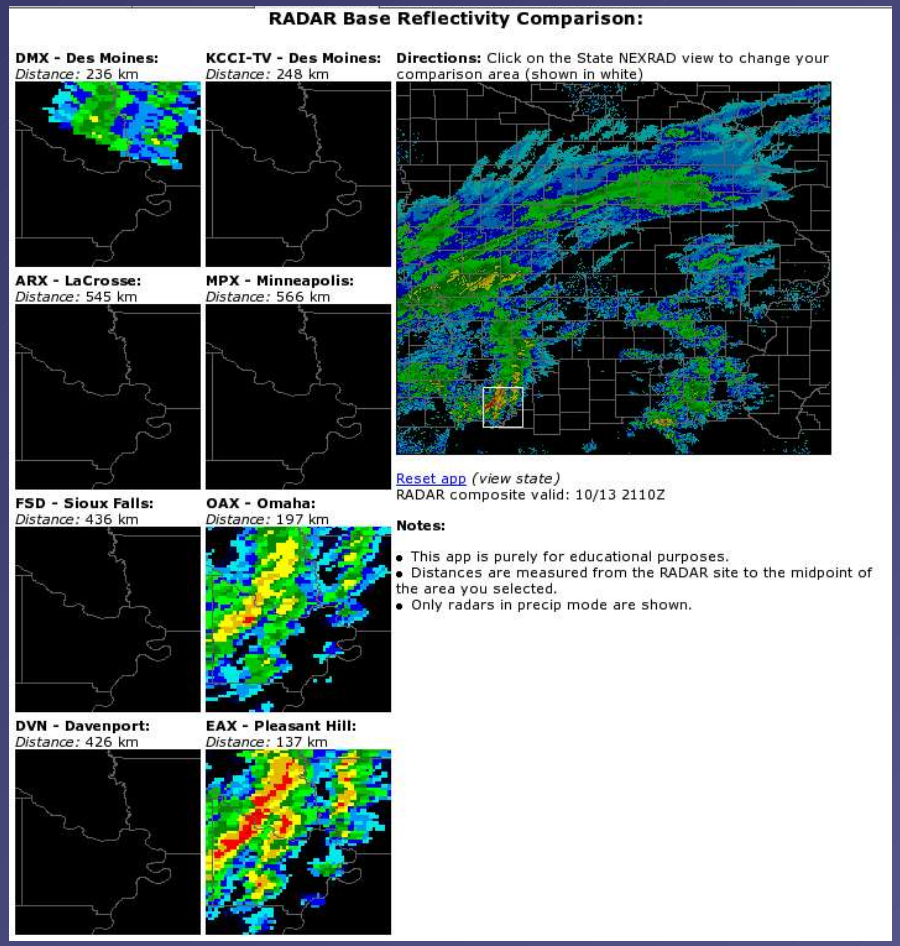
- Effort to provide real-time RADAR data into GIS
- First publicly accessible NEXRAD WMS
- Mapserver HOWTO

OGC Web Services

- Open GIS Consortium (OGC) develops standards for GIS systems to inter-operate
  - Web Map Service (WMS)
  - Web Feature Service (WFS)
- Dynamically bring in Ortho Quads from the ISU GIS Lab
- All generated with Open-Source software and Open GIS standards



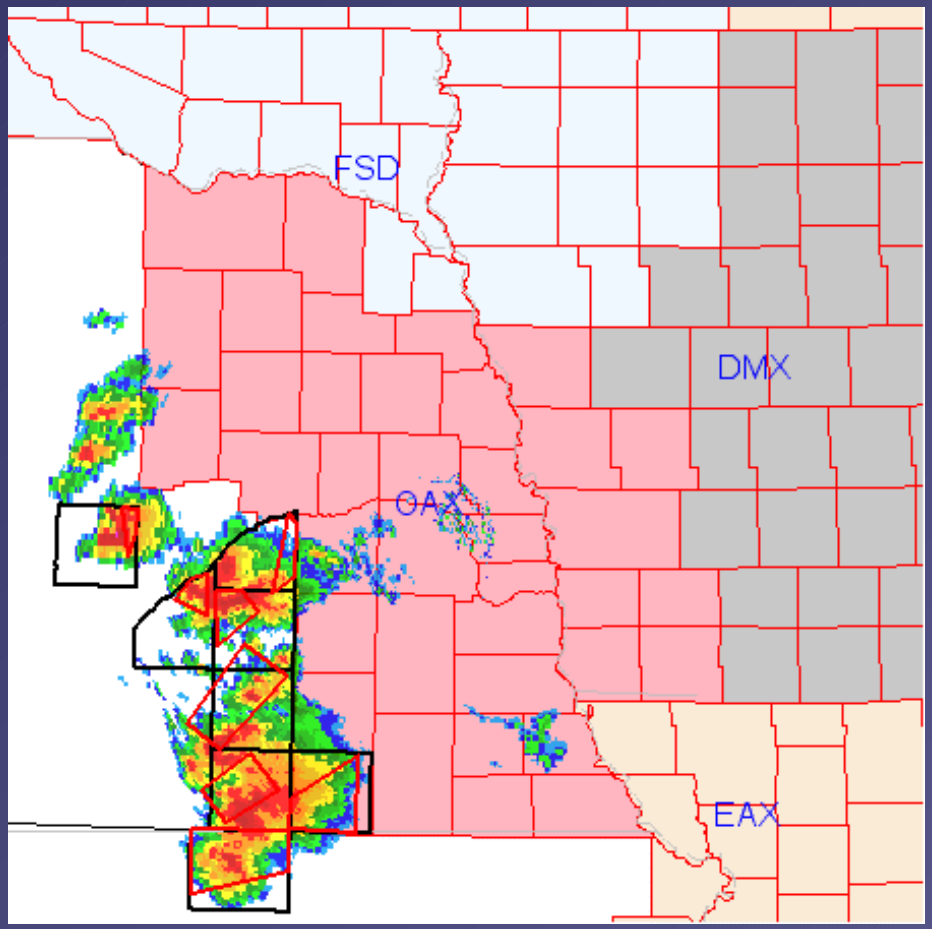
Iowa RADAR comparison



- Compare base reflectivity from the 8 RADARs we collect data from
- More GISish App
  - Click interface
  - Distance calculation
  - KCCI reprojected

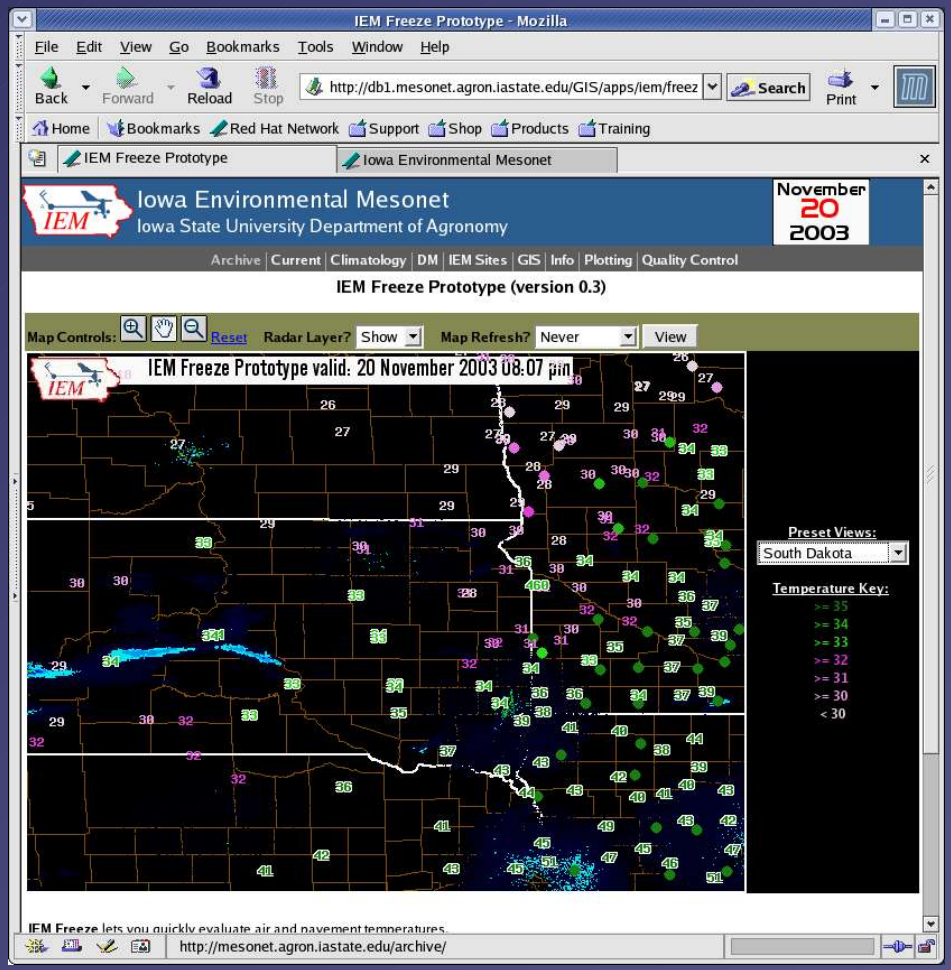
IEM

NWS Warnings + NEXRAD



- Loop GIS layers to produce an interesting animation of warnings and NEXRAD product
- Works nationwide!

IEM Freeze

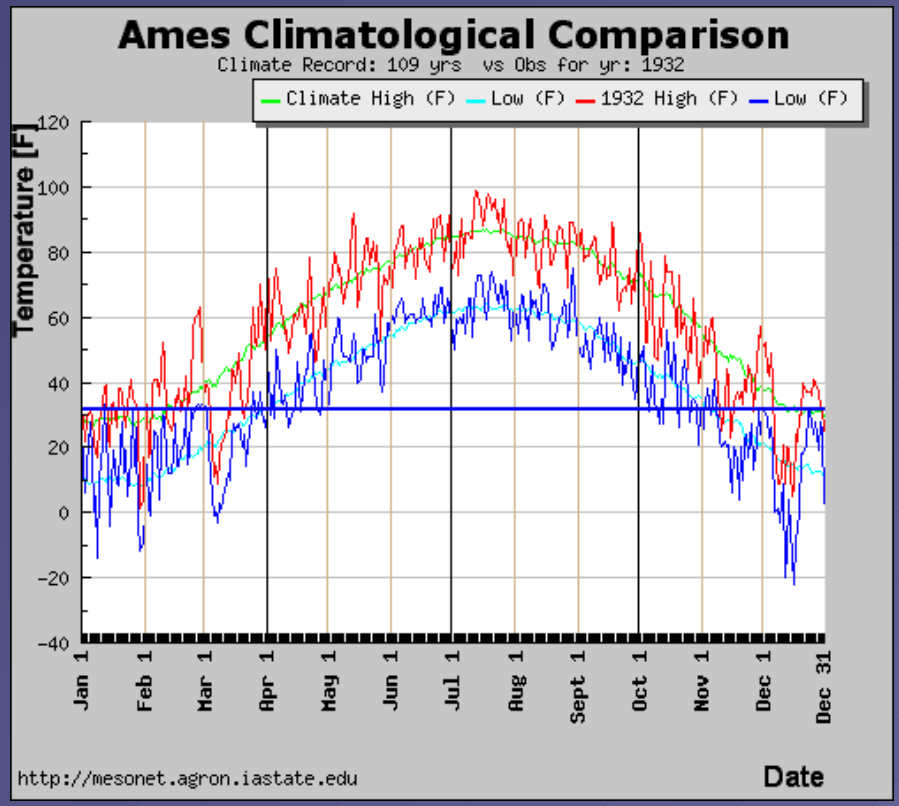


- Combine
  - RWIS pavement temperatures
  - IEM air temperatures
  - RADAR composite
- A GIS interface for custom views
- Feedback needed!

Fun with COOP data

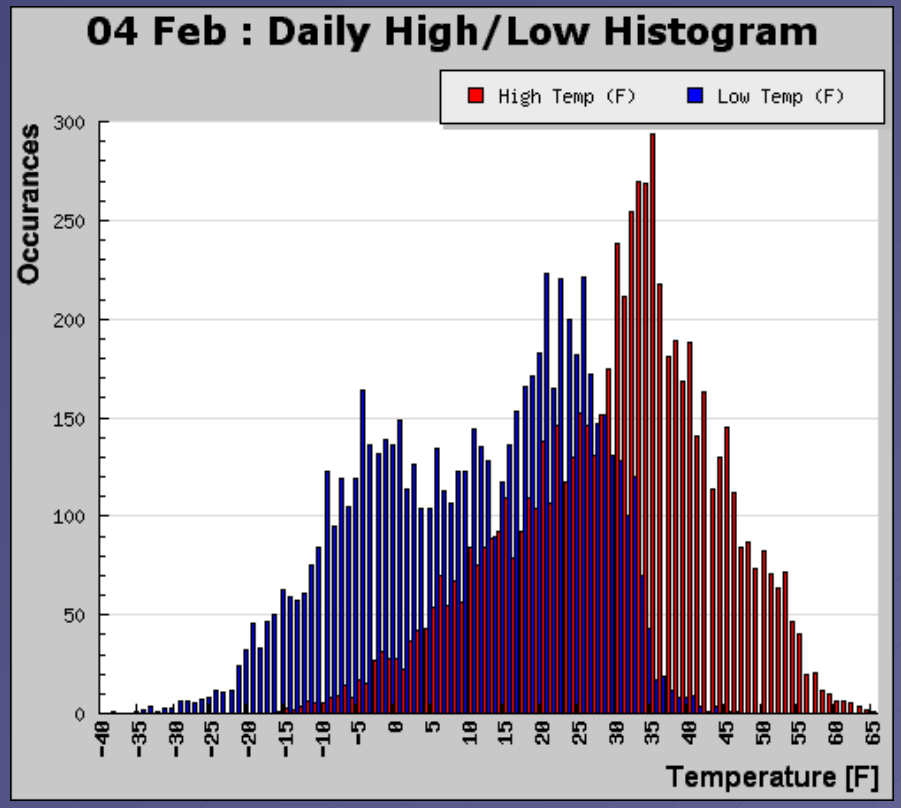
Climatological Differences

- Interactively query the NWS COOP climate database.
- Example, compare daily temperature climatology versus what actually happened that year!



Daily Temperature Spreads

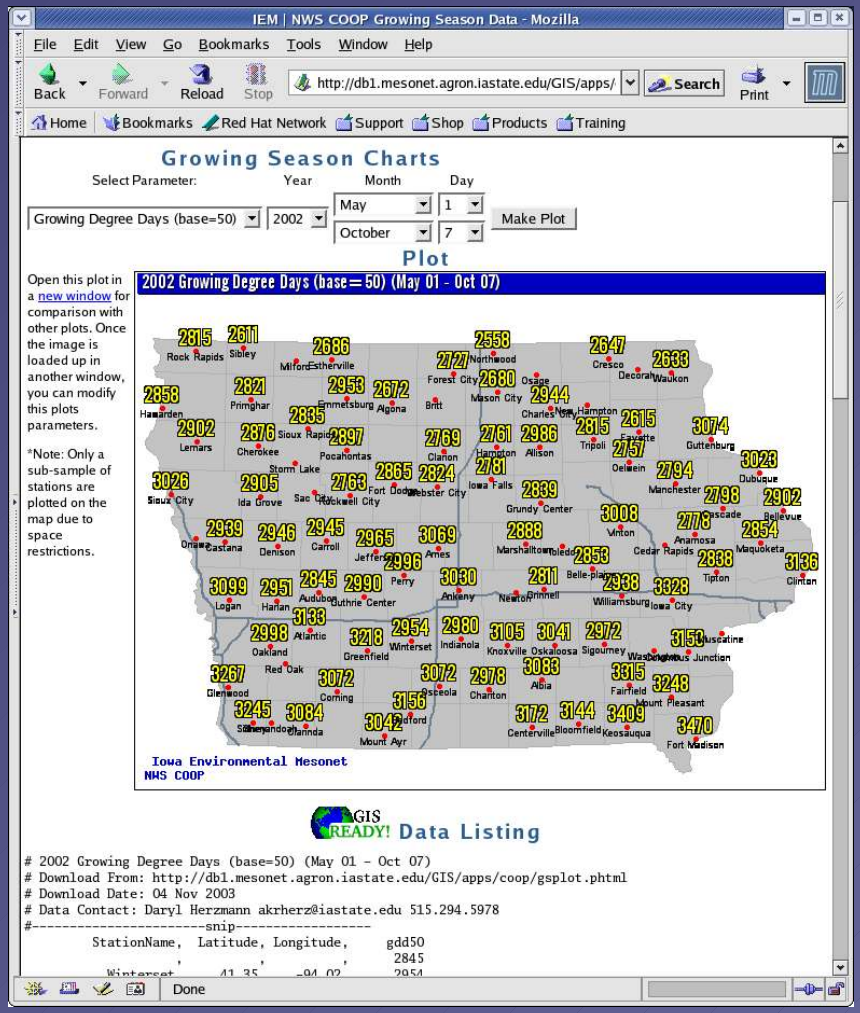
- Accumulate all high / low temperatures for a day and produce a histogram
- Dynamically generated on the website



IEM

Historical GDD data

- Dynamically generate GDD, SDD from the COOP climate archive
- Customized Period
- Dynamically generated output plot.
- GIS Ready dataset presented immediately below



Time for **WEB** demos?

I'm done, questions?

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