

The Iowa Environmental Mesonet

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Background Info

- 2001 Degree in Meteorology, ISU
- Worked for Iowa State University on the Mesonet since
- I'll get my masters before 2010.
- ARX last but not least to hear my talk
- DMX 2001
- OAX 2002
- FSD 2003
- DVN 2004

Outline:

- . Motivations for our Mesonet
- . IEM Component Networks
- . 'Super-charging' Networks
- . Working with the NWS
- . Iowa AWOS situation
- . IEM Applications
- . Having fun with COOP data
- . Conclusions / No Questions

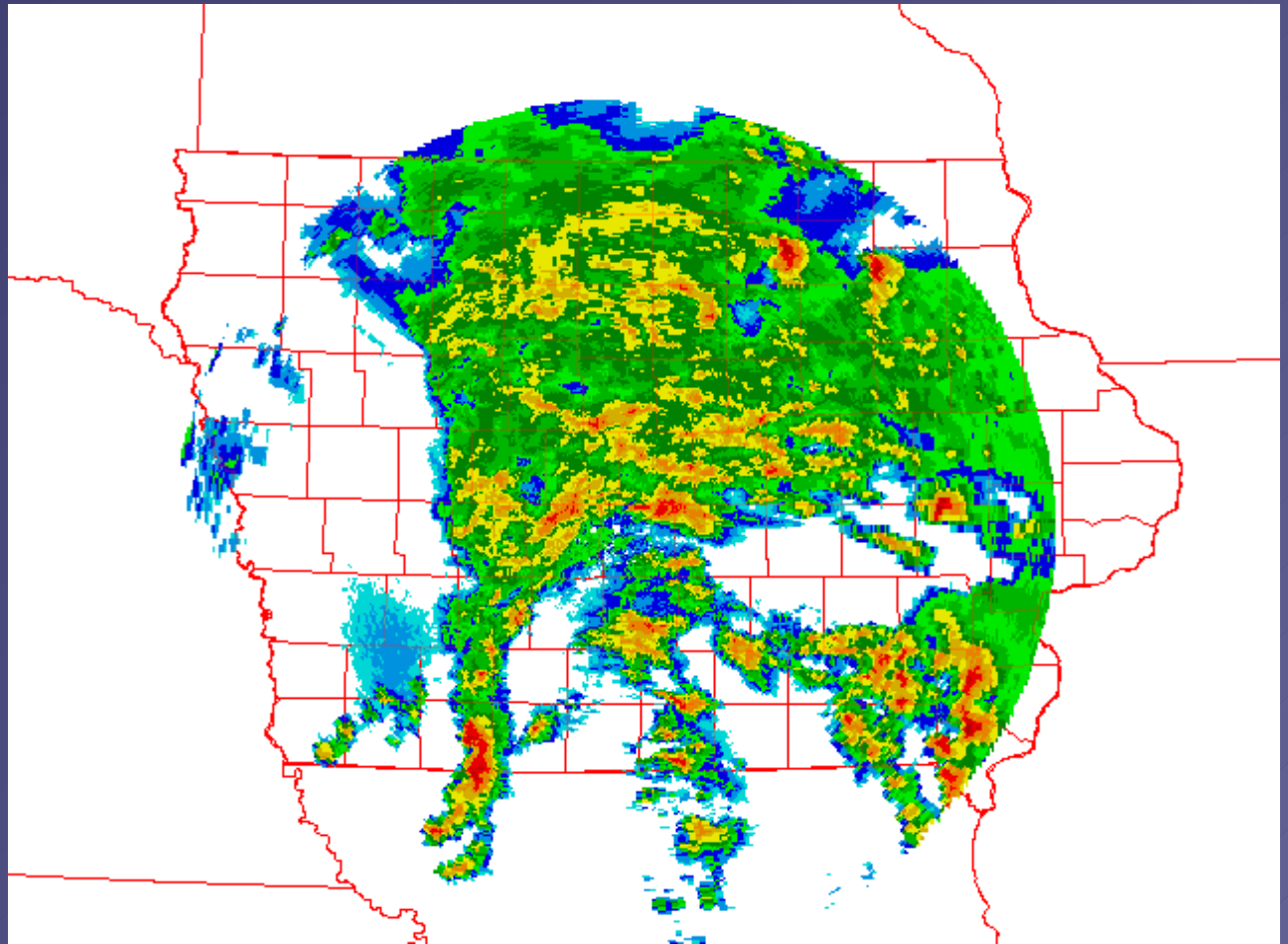
Motivations

- 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

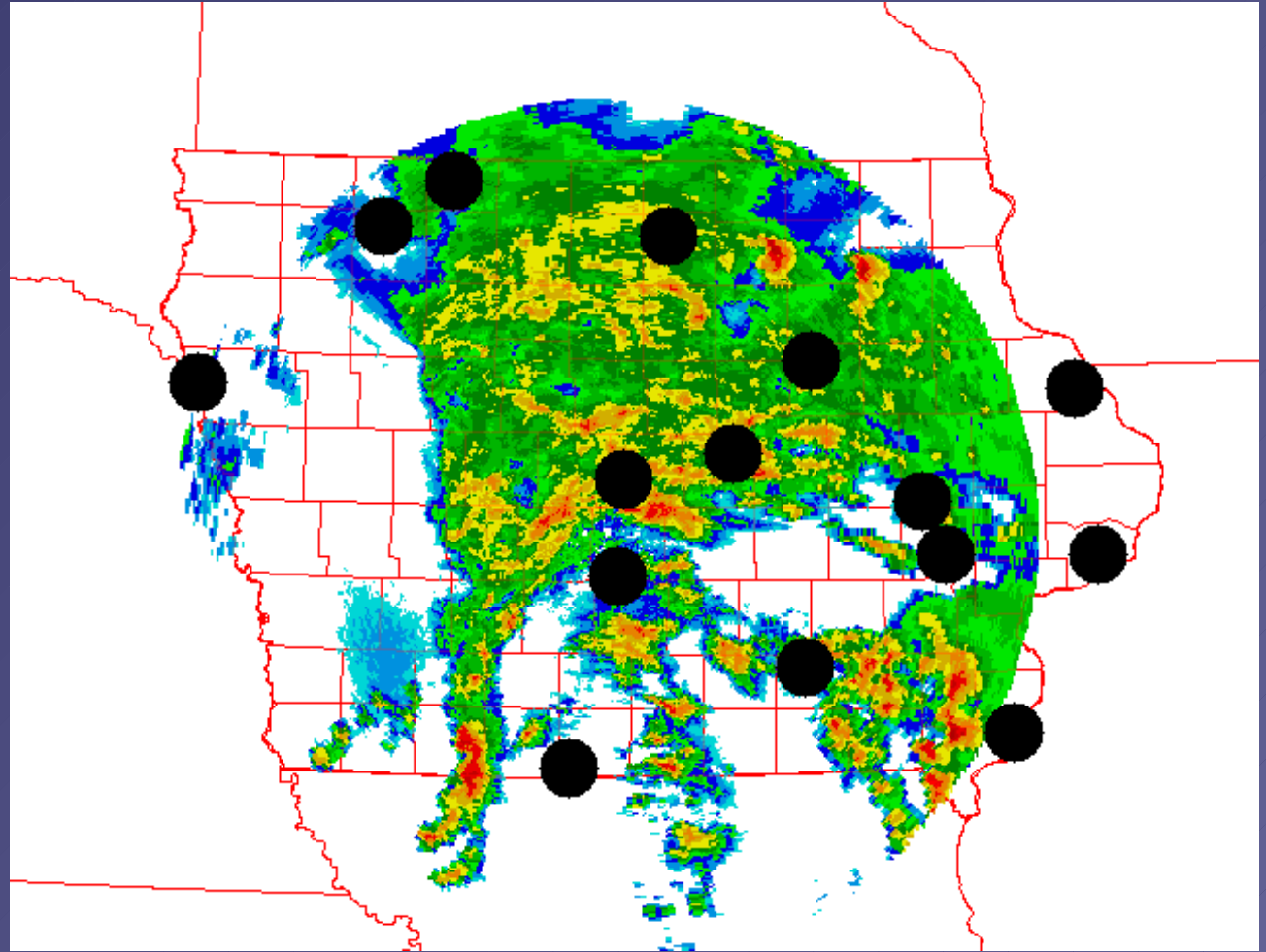
You are a forecaster at the Des Moines WFO. It is 9PM on 8 May 2003. It is dark, so spotters may not be able to help.

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



The need for a Mesonet

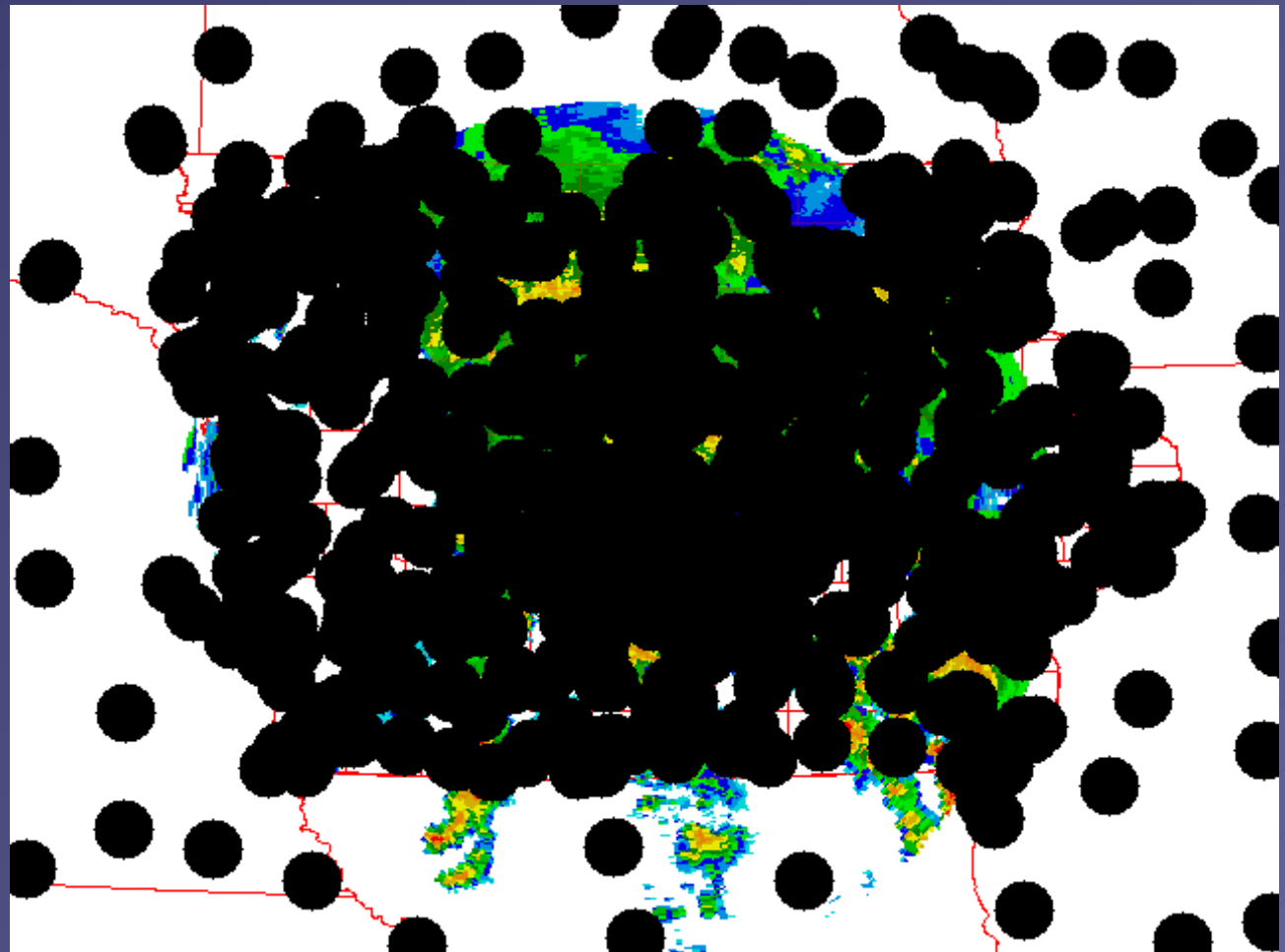
The baseline ASOS network provides you with hourly and some sub-hourly updates. The storm system is moving fast, so issuing timely warnings relies on timely current data.



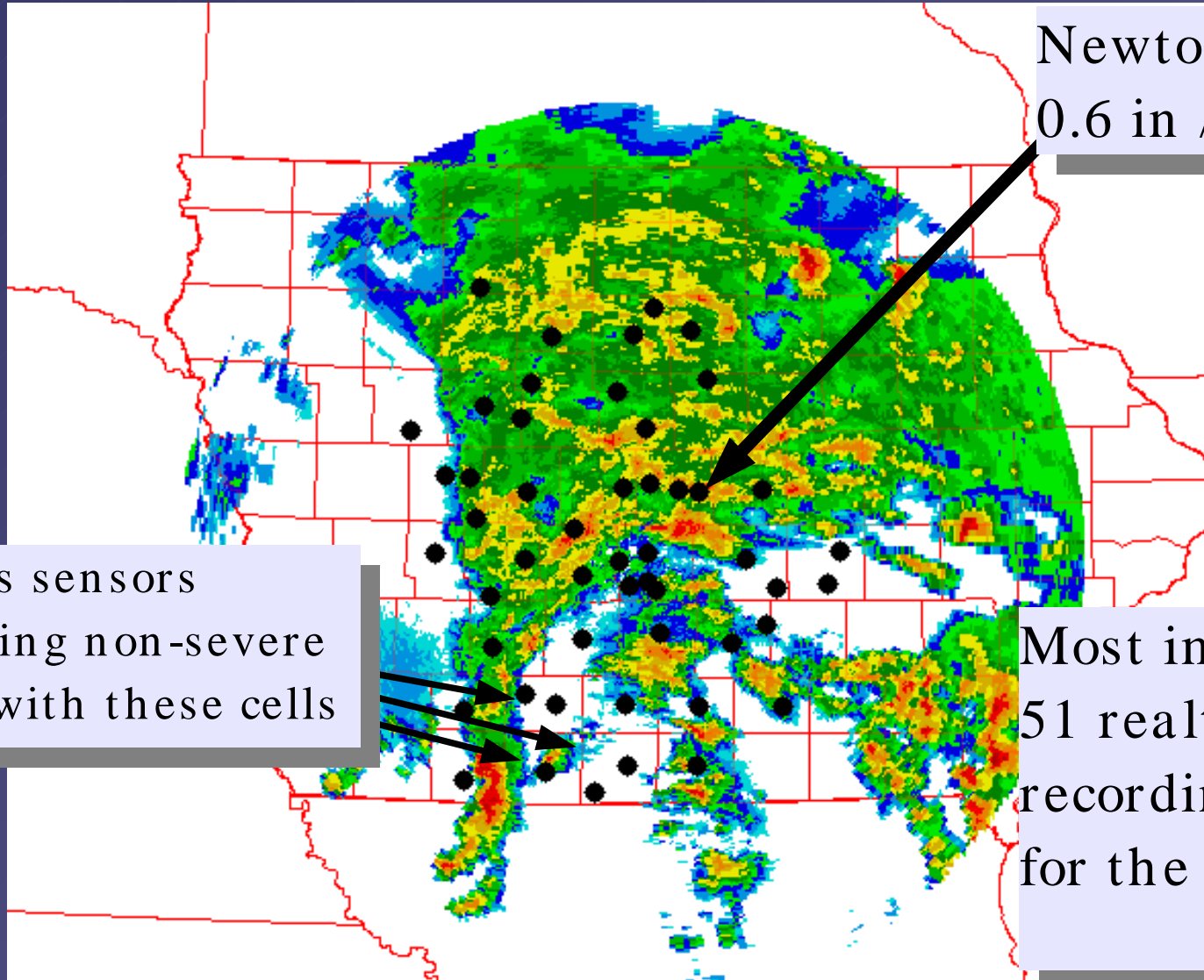
The need for a Mesonet

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

Whoaaa! Dude, where is my RADAR?



What the Mesonet provided



Newton School
0.6 in / 15min

Various sensors
indicating non-severe
winds with these cells

Most importantly,
51 realtime sensors
recording rainfall just
for the DMX CWA.

IEM Component Networks

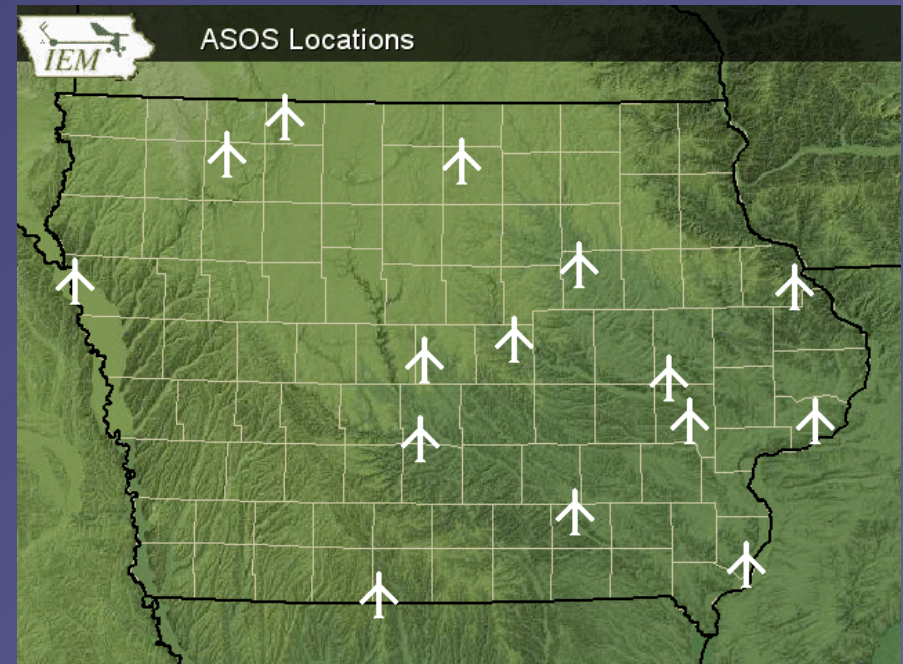
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<http://mesonet.agron.iastate.edu>

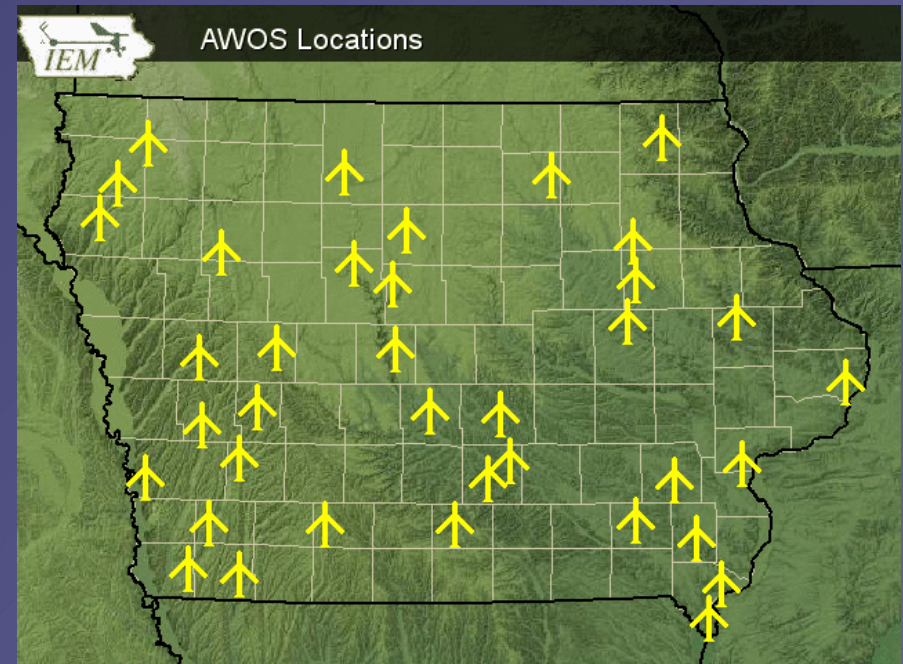
ASOS - Automated Surface Observing System

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



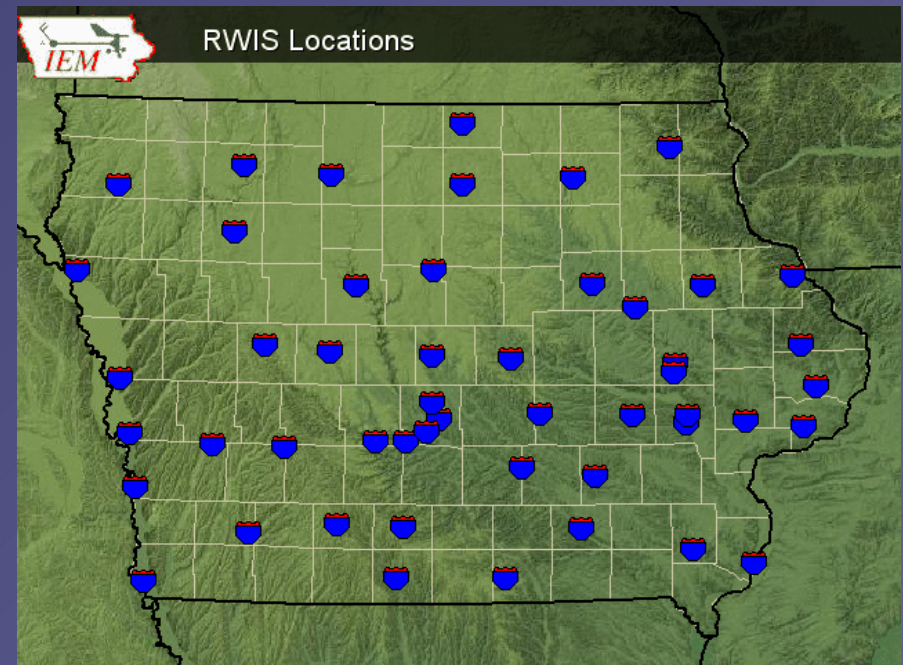
AWOS – Automated Weather Observing System

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



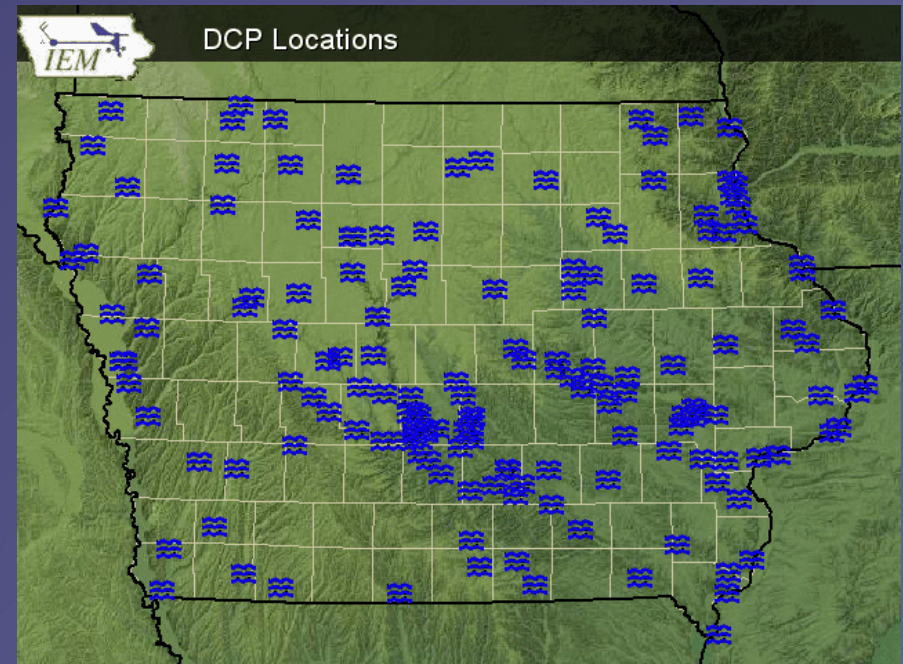
RWIS – Roadway Weather Information System

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



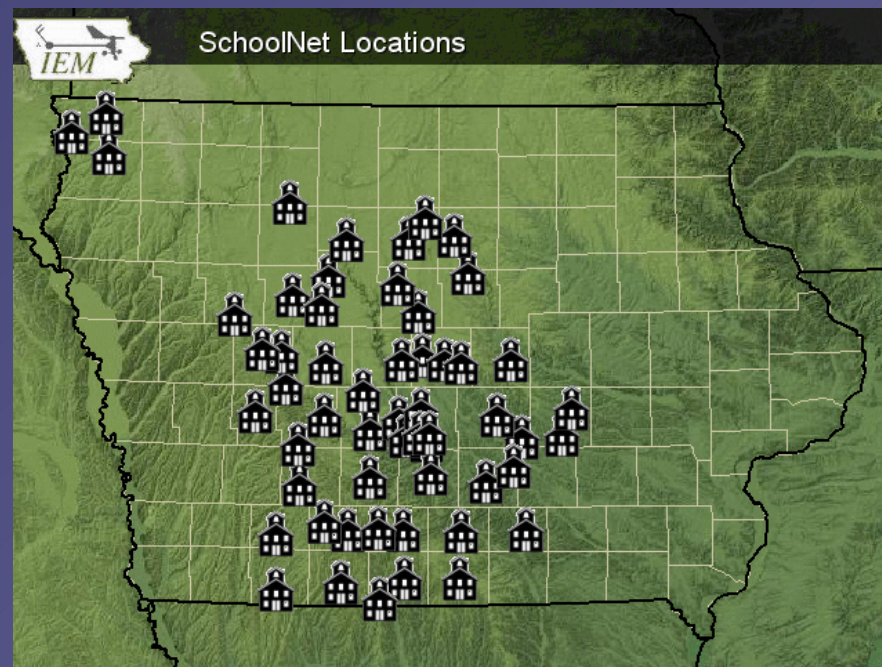
DCP – Data Collection Platforms

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



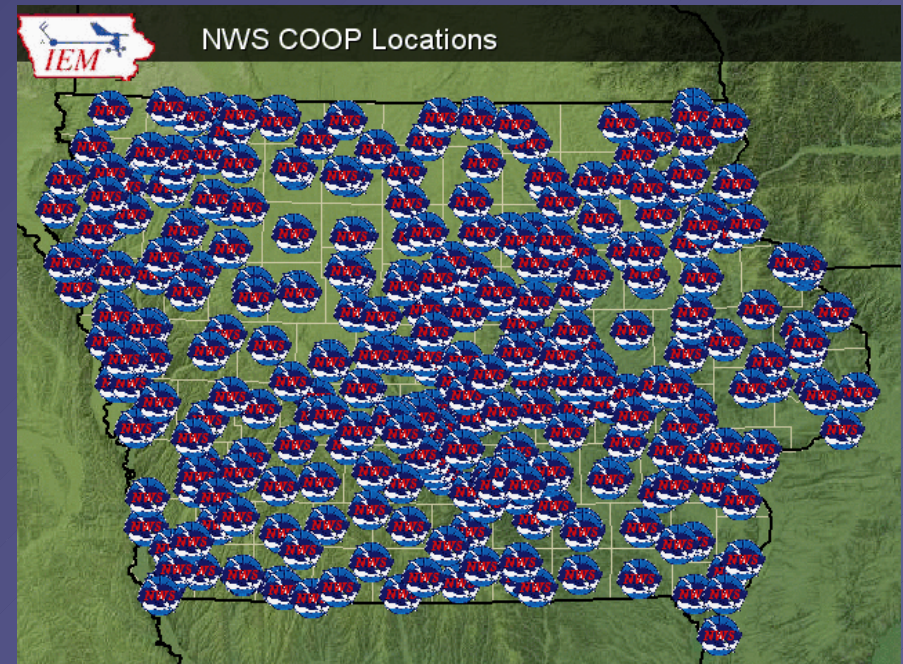
SchoolNet (KCCI-TV & KELO-TV)

- Sites in Iowa
 - 58 (97 total)
- Locations
 - Roofs of schools
- Purpose
 - Support local science curriculum



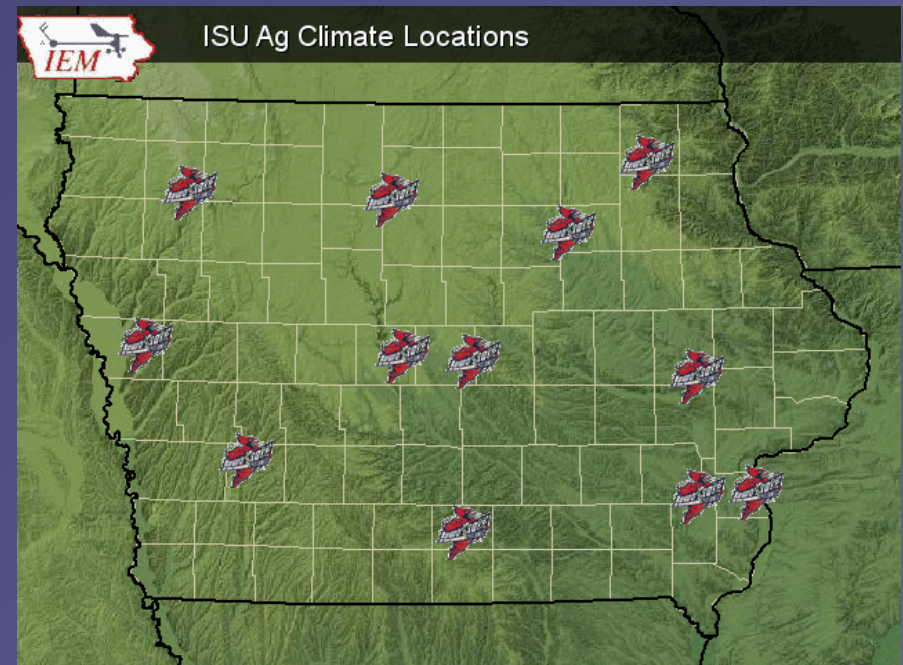
NWS COOP – Cooperative Observing Program

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



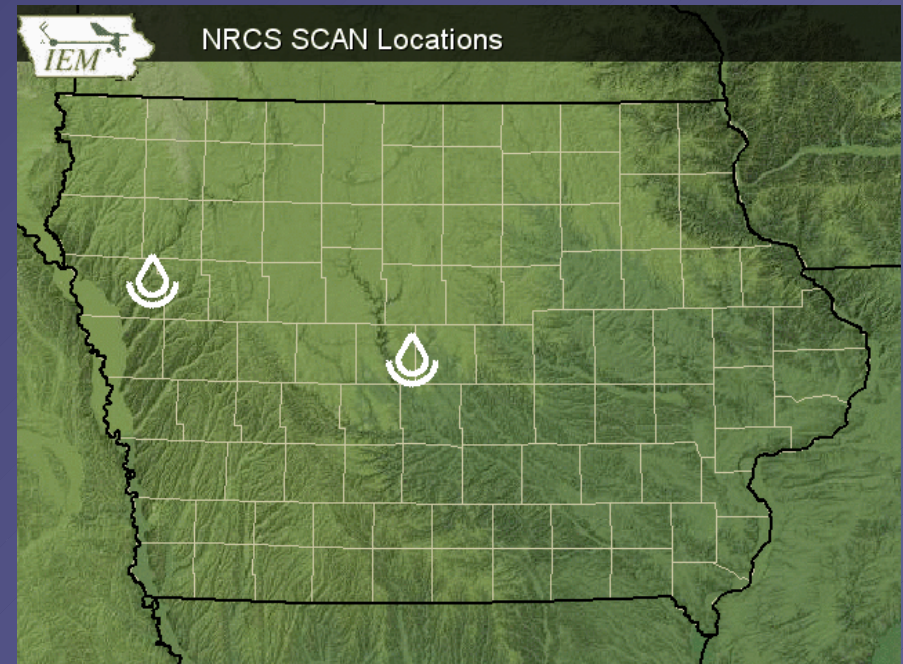
ISU Ag Climate Network

- 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





The Iowa Environmental Mesonet



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<http://mesonet.agron.iastate.edu>

Data Processed Daily

<i>Network</i>	<i># of Sites</i>	<i>Obs/Site/Day</i>	<i>Obs/Day</i>	<i>Obs/Year</i>
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	51	144	7,344	2,680,560
SCAN	2	24	48	17,520
IA SchoolNet	58	1,440	83,520	30,484,800
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
	<u>1,913</u>		<u>205,145</u>	<u>74,877,925</u>



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

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<http://mesonet.agron.iastate.edu>

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?

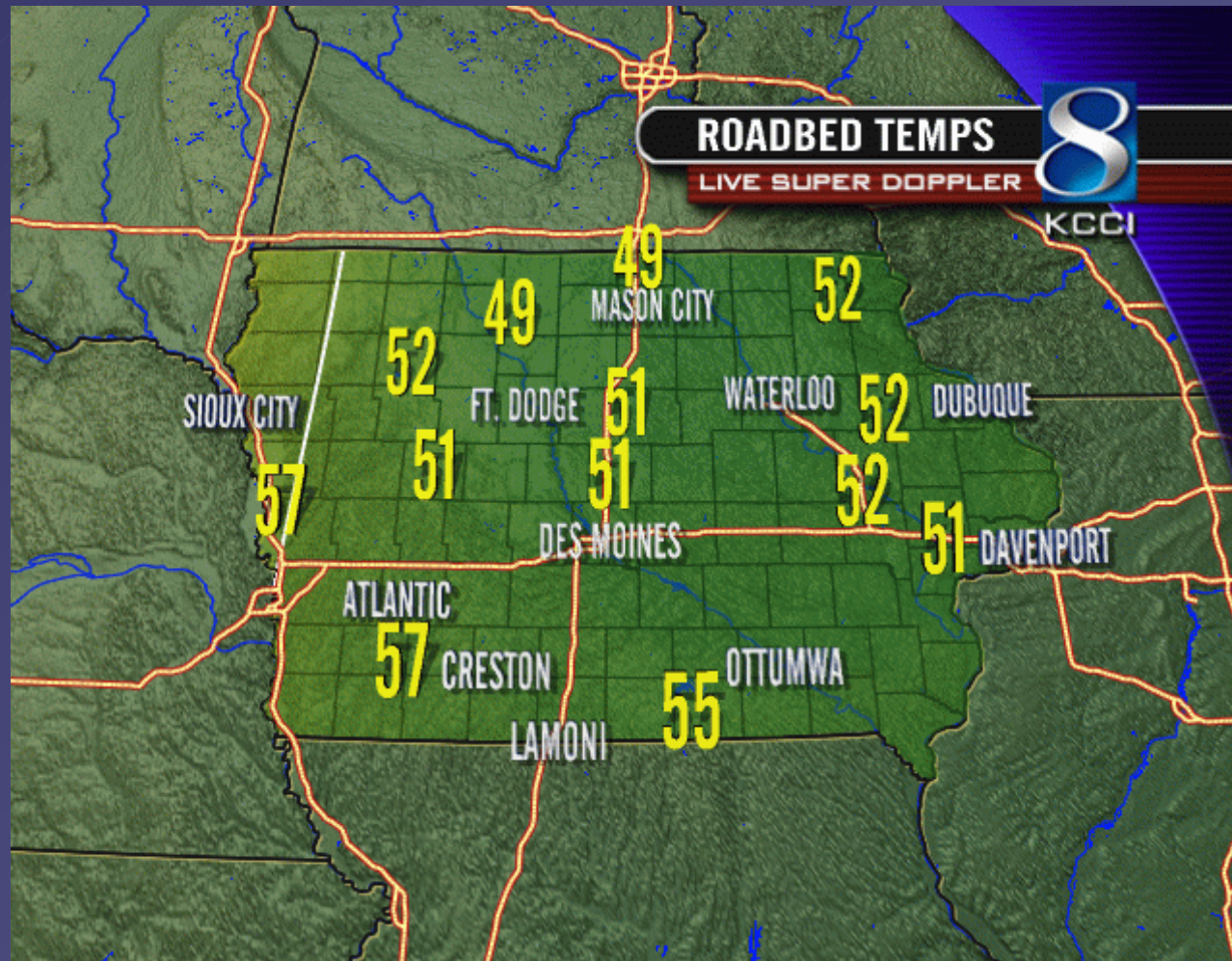
- Network operators are typically lacking
 - IT support
 - An on-staff Meteorologist (a bad thing?)
 - QC expertise
- We give the networks a reason to keep sending us their data.
- We build up their user base to increase the value of their network.

IEM Tracker

- 11,000 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 Tracker

IEM Data Partnerships



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

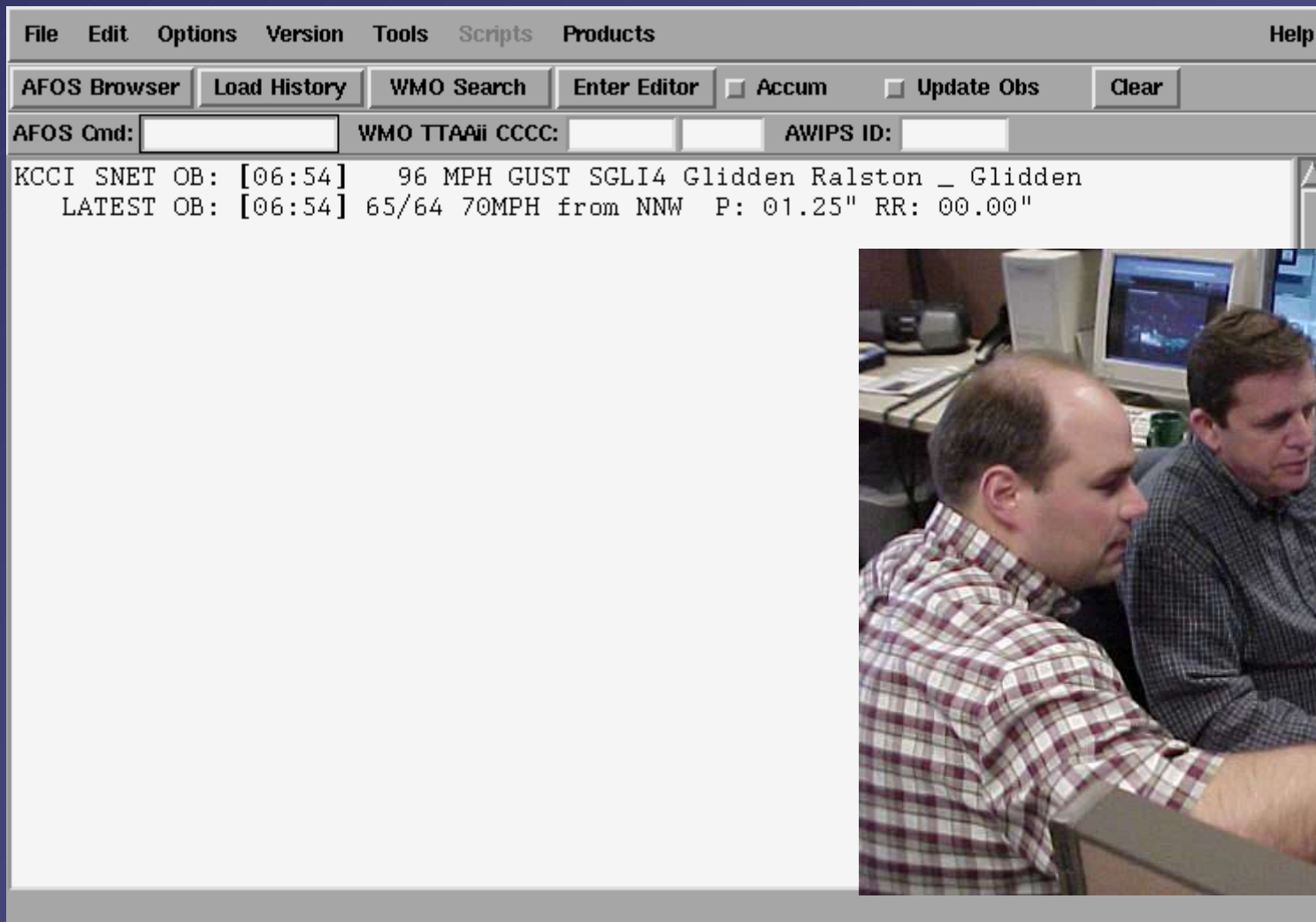
Working with the NWS

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<http://mesonet.agron.iastate.edu>

Automated AWIPS Wind Alerts



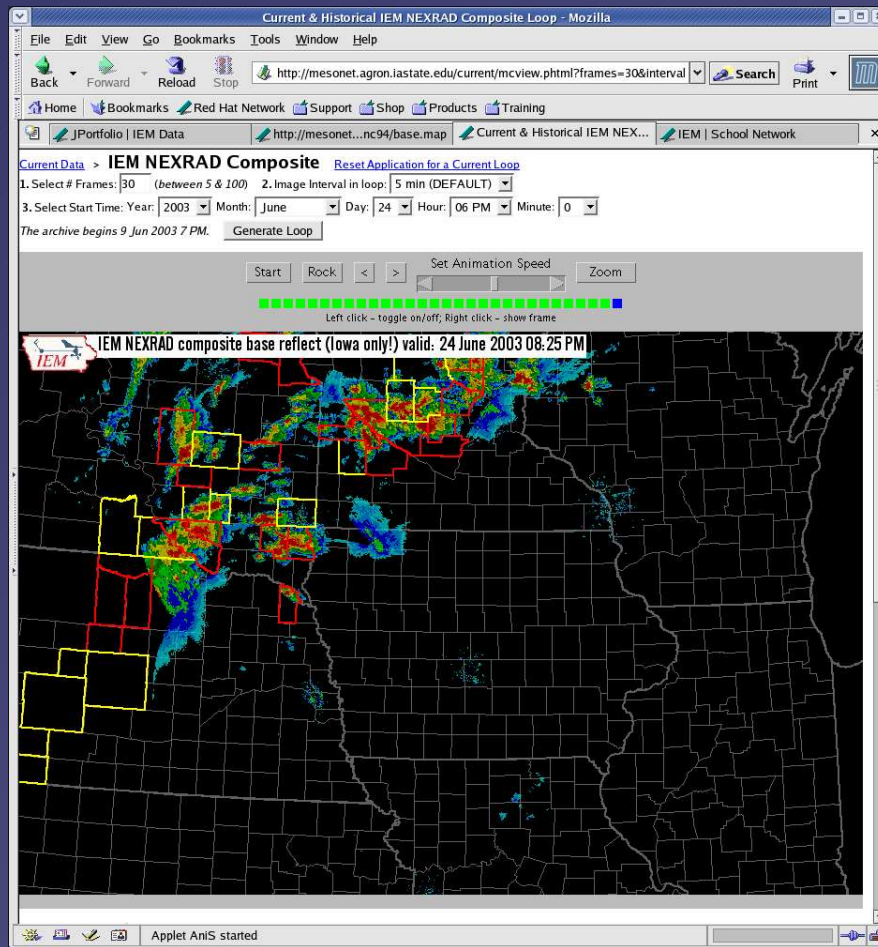
The screenshot shows a software window with a menu bar (File, Edit, Options, Version, Tools, Scripts, Products, Help) and a toolbar with buttons for AFOS Browser, Load History, WMO Search, Enter Editor, Accum, Update Obs, and Clear. Below the toolbar are input fields for AFOS Cmd, WMO TTAai CCCC, and AWIPS ID. The main display area shows the following text:

```
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 1 May 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, DMX, ABR, UDX, OAX(?) all currently feeding on data from the IEM

Iowa AWOS Situation

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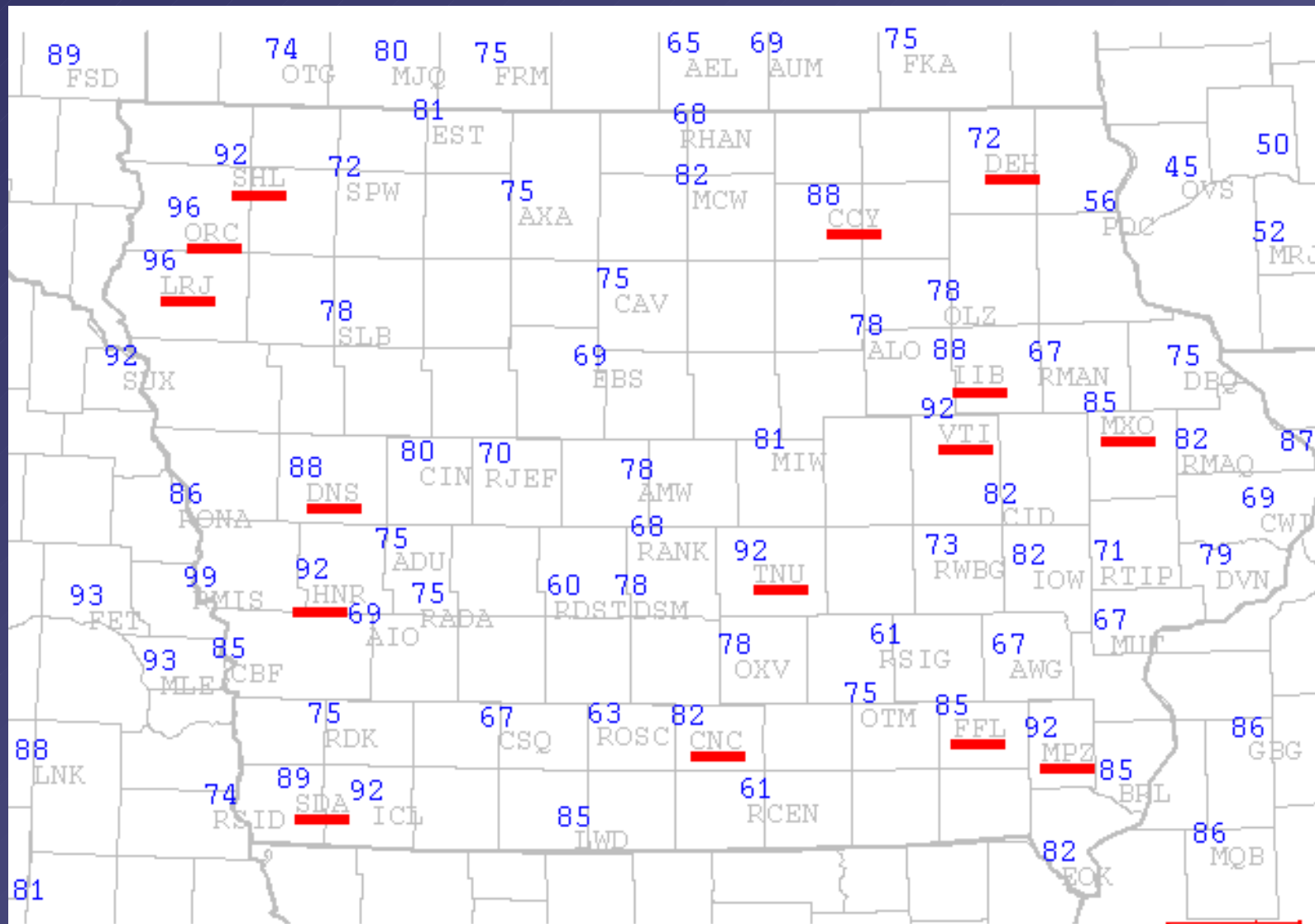
<http://mesonet.agron.iastate.edu>

Background Info

- In the spring of 2002, the state zeroed the AWOS budget and the network was nearly lost.
- Today, the network is operational but producing lots of questionable data.
- The biggest problem is that most centers consider this data as ASOS quality.

Incorrect Calibrations

	Date	Change T	Change Td	Change RH
Denison	10/02/03	2	4	3
Harlan	10/02/03	6	11	8
Orange City	11/06/03	2	10	20
Sheldon	11/06/03	3	7	19
Algona	11/06/03	4	4	0
Newton	12/02/03	0	13	27
Ankeny	12/02/03	0	9	23
LeMars	12/15/03	0	6	19
Fairfield	12/17/03	3	7	12
Fort Madison	12/17/03	-4	4	18
Keokuk	12/17/03	0	3	11



040316/2000 Relative Humidity



“Rule-32” Dew Points

Max Dew Points for 26 Feb 2004

. All Iowa ASOS

- . IOW 30 MIW 30
- . ALO 31 SUX 32
- . SPW 31 LWD 32
- . CID 29 DSM 31
- . MCW 31 EST 31
- . DBQ 28
- . OTM 30
- . DVN 29
- . AMW 30
- . BRL 29

. AWOS > 32

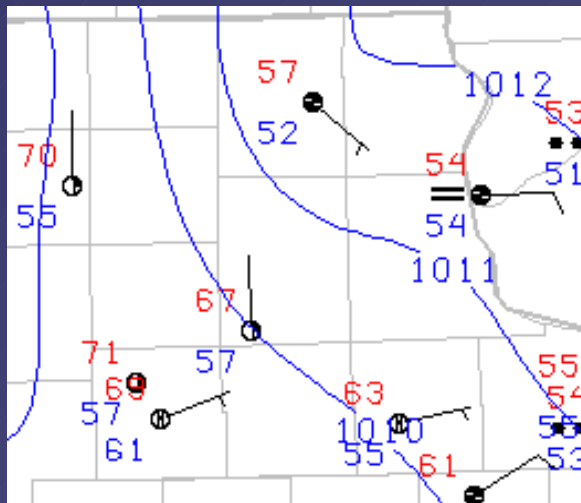
- . ORC 41 SDA 34
- . TNU 39 CCY 34
- . DNS 39 BNW 33
- . MPZ 38 CSQ 33
- . LRJ 37 ADU 33
- . FFL 37 OKV 33 IKV 36 CBF 33
- . SHL 36 CBF 33 HNR 36 IIB 33
- . FSW 35 EOK 33
- . CNC 35 CIN 33
- . CAV 35

Who remembers OLZ in 2003?

- 13 Jun 2003, your office notified the DOT
- 21 Oct 2003, the DOT said the site was okay, since it was within 1 degree of IIB. Which is their data standard. Within 1 degree of the nearest AWOS.
- 23 Oct 2003, site was 'calibrated'.
- How did this happen in the first place?

14 May 2003 19 Z

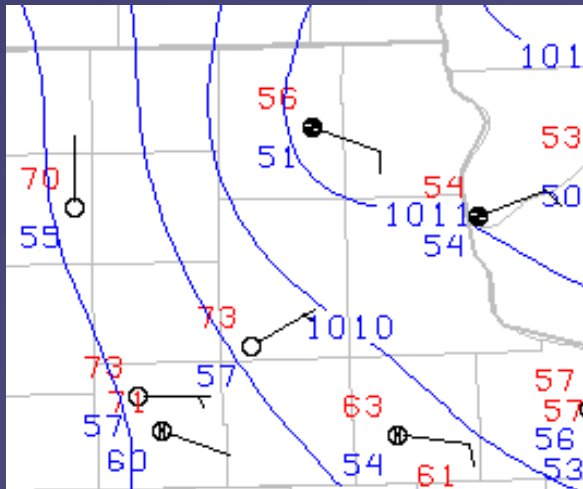
19Z



Time	T	Td	RH
2003-05-14 19:07	67	56	68
2003-05-14 19:08	67	56	68
2003-05-14 19:09	67	56	68
2003-05-14 19:47	72	56	57
2003-05-14 19:48	72	57	59
2003-05-14 19:49	72	57	59

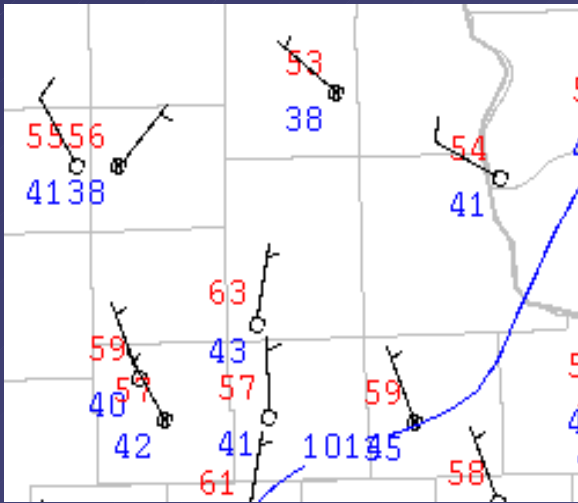
(It was set equal to ALO)

20Z

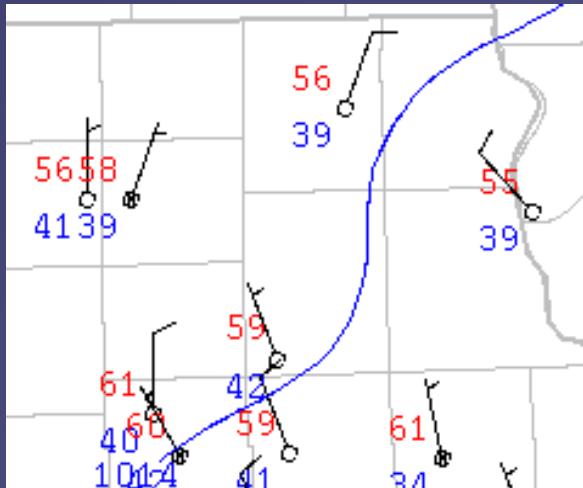


23 Oct 2003 17 Z

17Z



18Z



Time T Td RH

2003-10-23 17:00 63 43 46

2003-10-23 17:01 63 43 46

2003-10-23 17:02 63 43 46

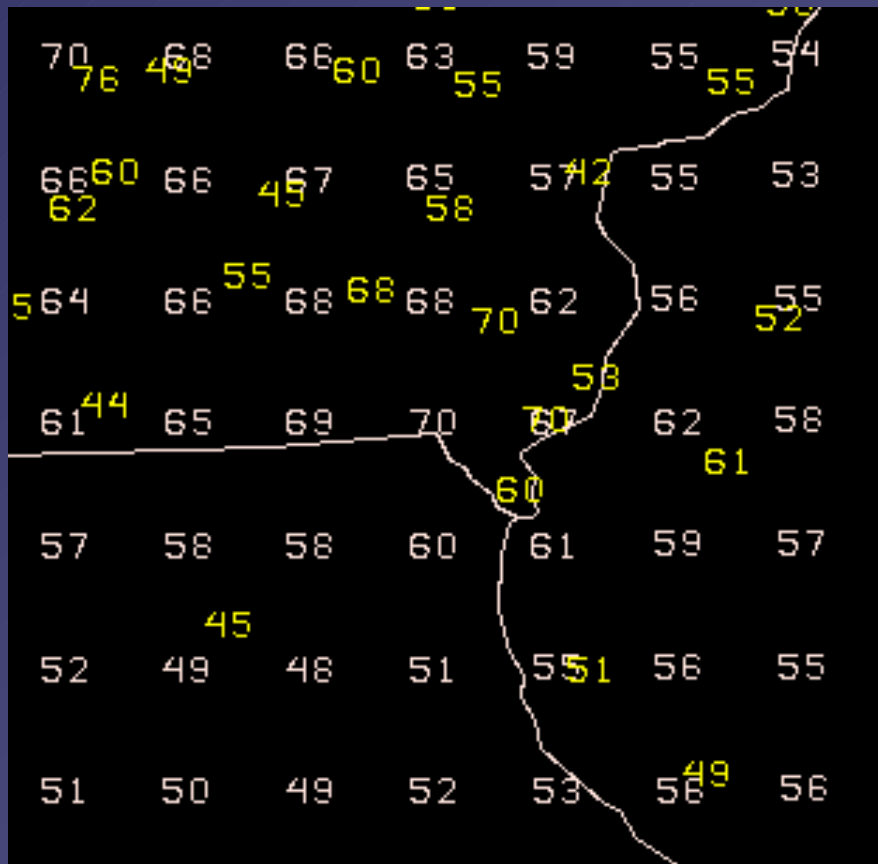
2003-10-23 17:14 58 43 57

2003-10-23 17:15 58 43 57

2003-10-23 17:16 58 43 57

(It was set equal to IIB)

NCEP Impacts



- As you know, AWOS data is ingested for the models.
- RUC is showing the effects of this data in its analysis
- Biggest impacts yet to come (CAPE!)

WFO Operations Impact

- Overnight low forecasting, NDFD :)
- Wind Chill advisory criteria
- Fog Forecasting
- Climatology
- MOS (most AWOS sites were removed 1 March)

Other problems

- Until just recently, all precipitation reported was wrong. DEH still is!
- MXO, IIB, VTI, MPZ, PEA don't have tipping buckets, does everyone know this?
- 4 versions of ADAS firmware are currently installed on sites. One effect is the north-wind report problem.

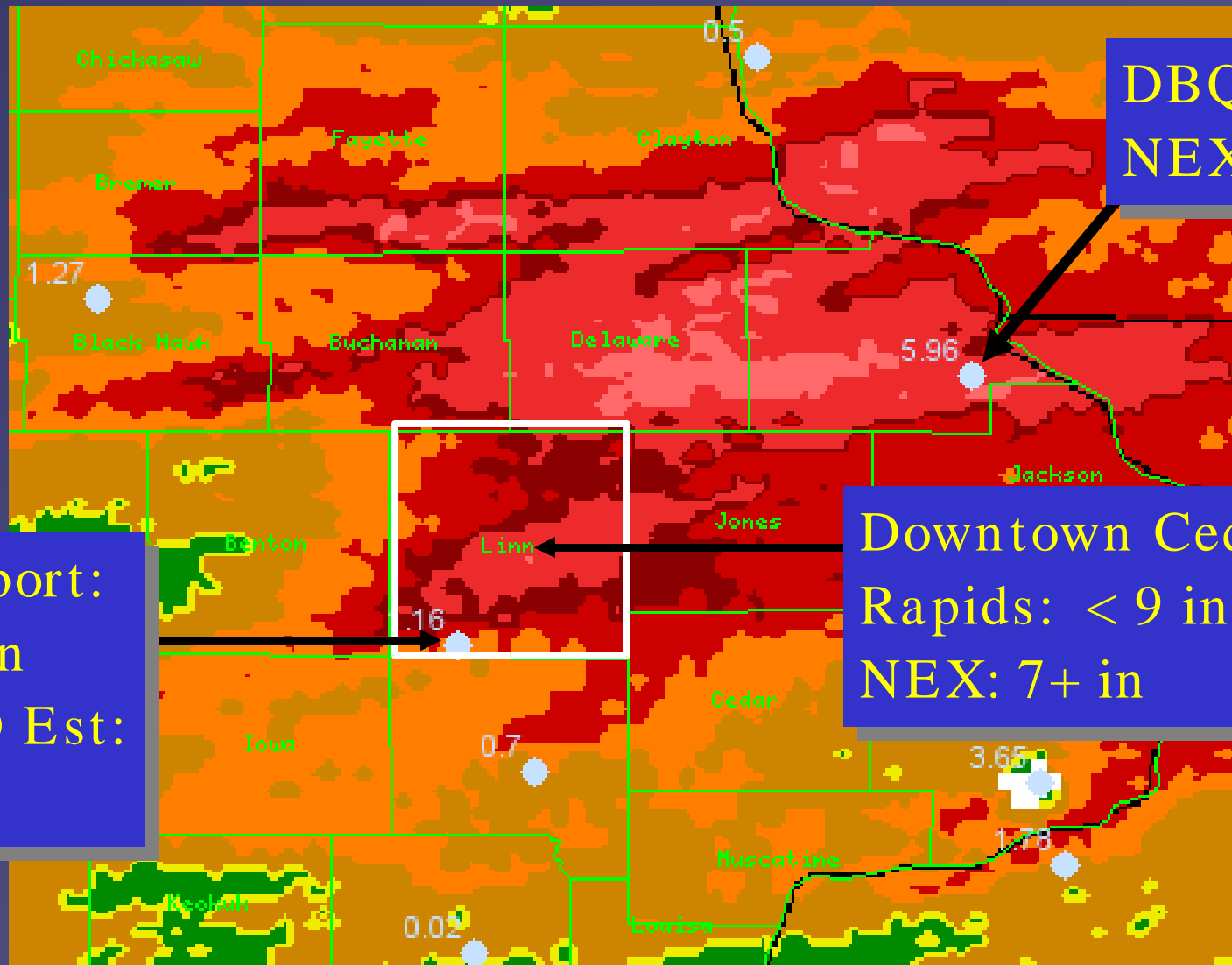
IEM GIS Applications

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<http://mesonet.agron.iastate.edu>

3-4 June 2002 Flooding

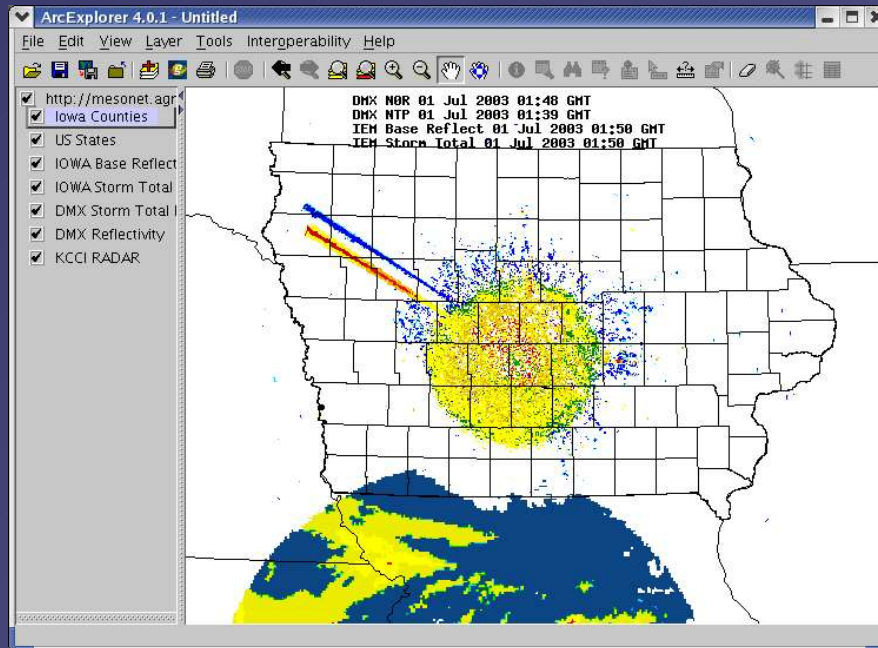


DBQ: 5.96 in
NEX: 7+ in

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

Map Type:

DECORAH



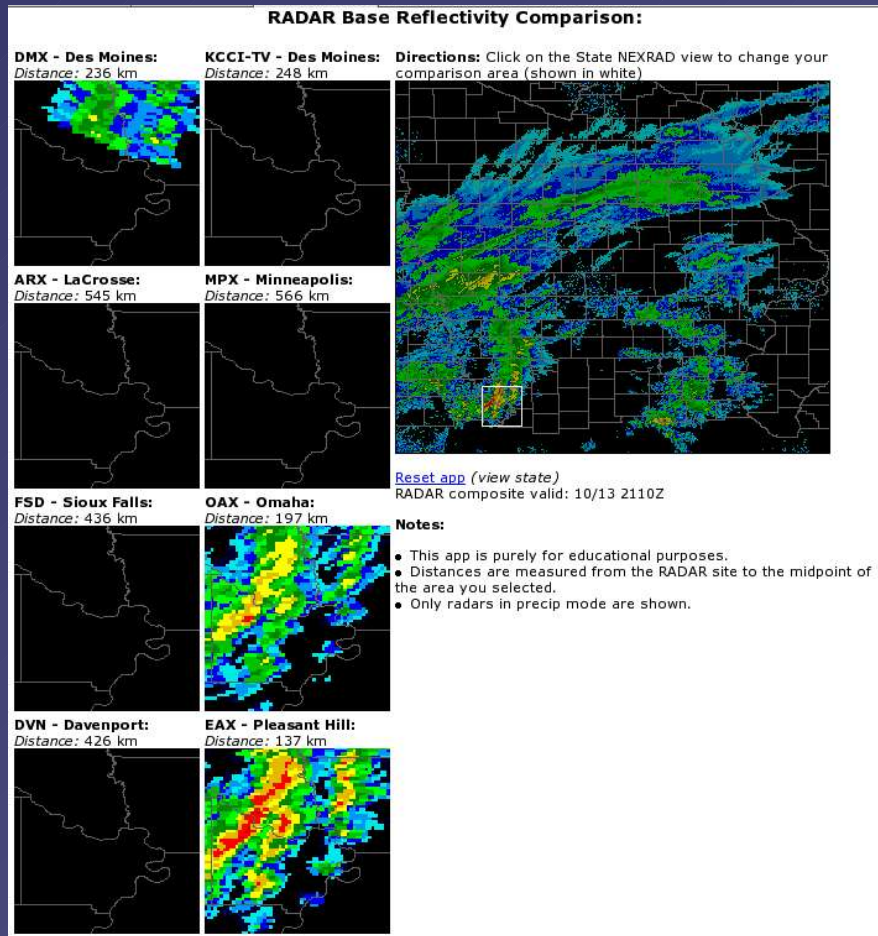
0 0.4 mi

Zoom Level: (near) 1 2 3 4 5 6 (far)

Note: While the white dot marks the location of our latitude and longitude measurements, the actual station location could be anywhere within the limits set by the white box. Depending on the accuracy of the location measurements, it is feasible that the actual station location is outside the box.

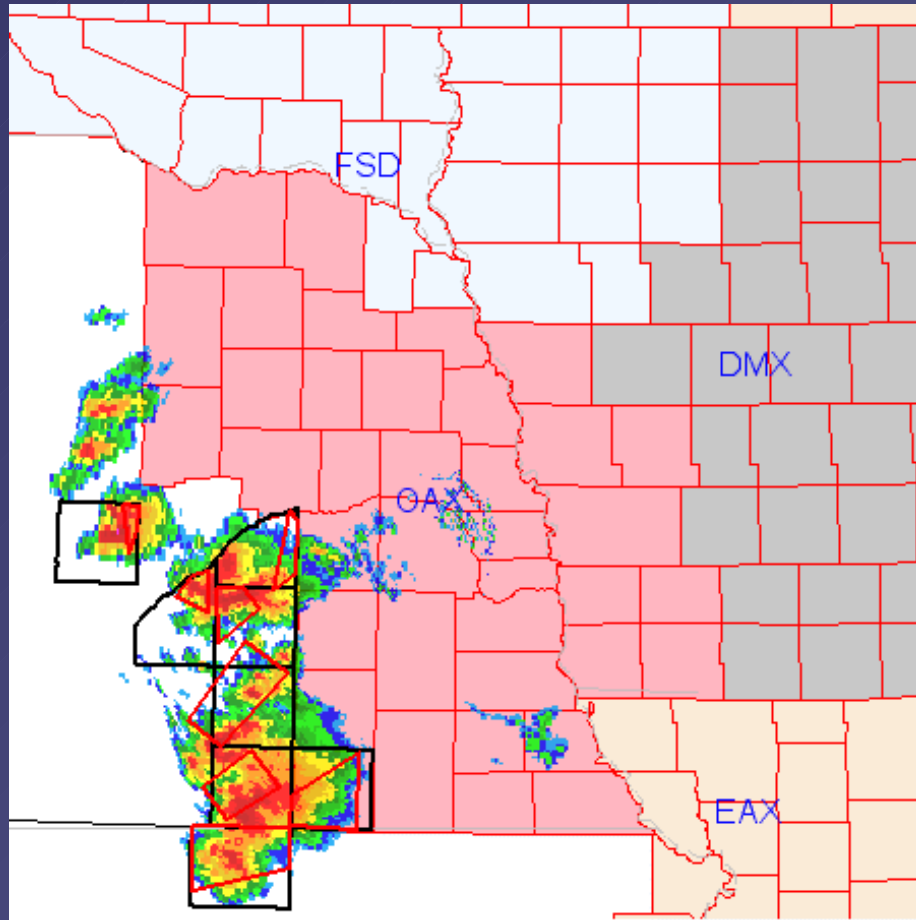
Image Generation provided by Iowa State GIS lab

Iowa RADAR comparison



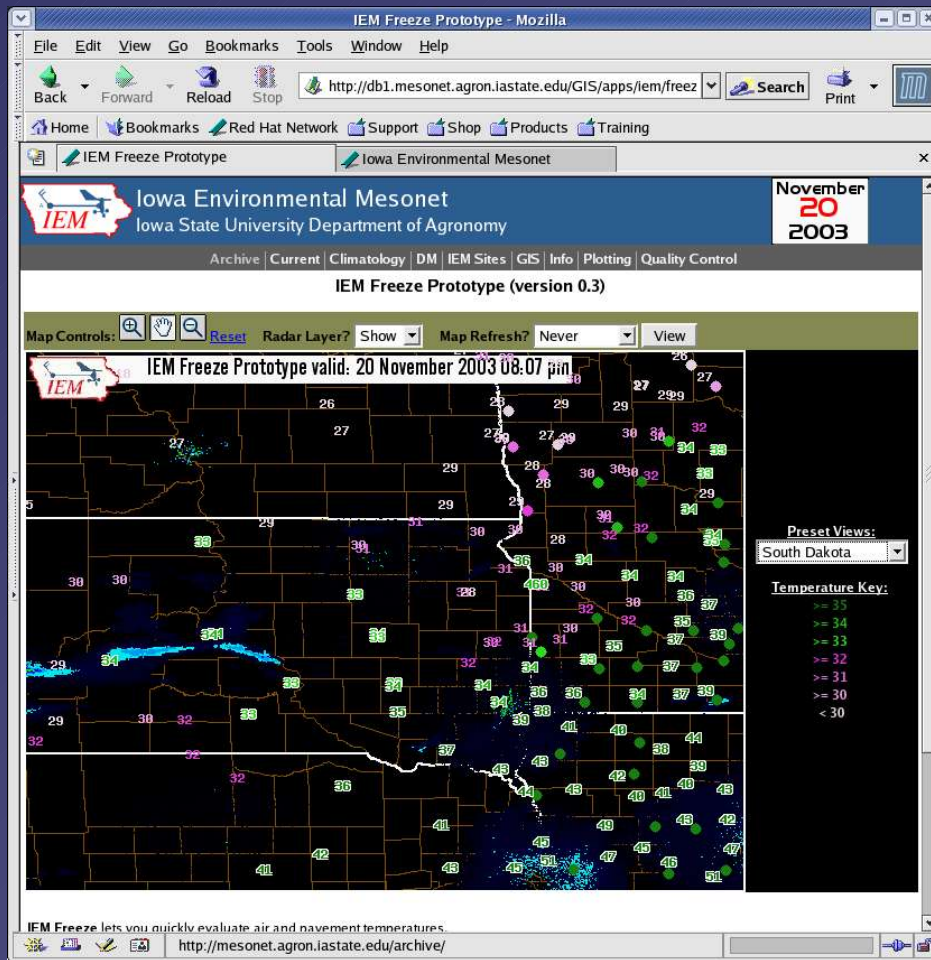
- Compare base reflectivity from the 8 RADARs we collect data from
- More GISish App
 - Click interface
 - Distance calculation
 - KCCI reprojected

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

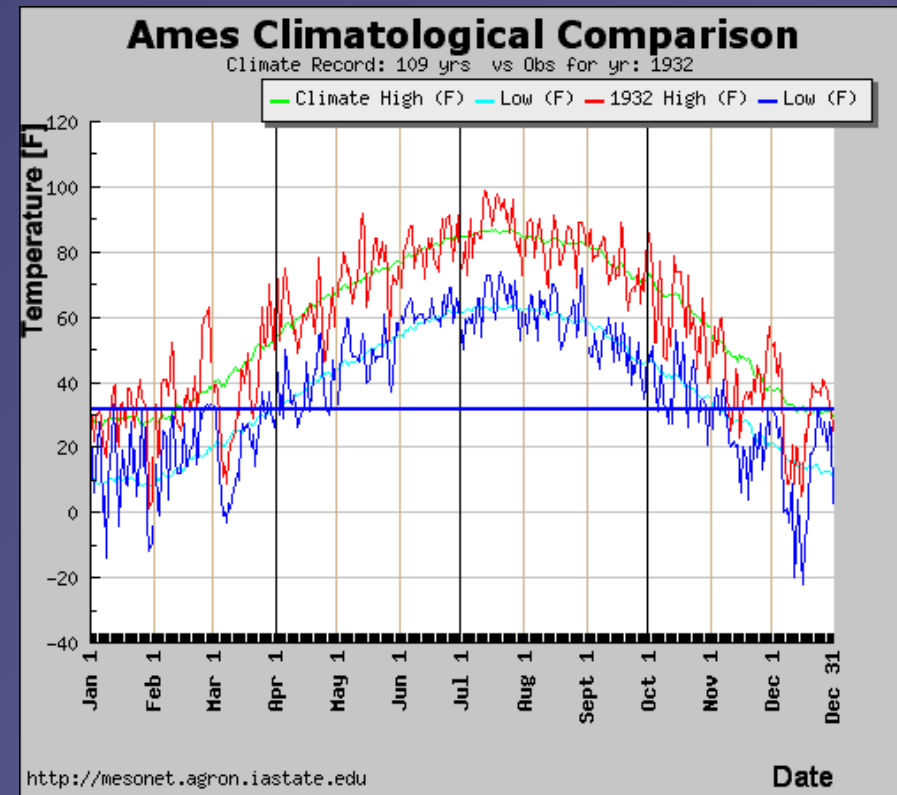
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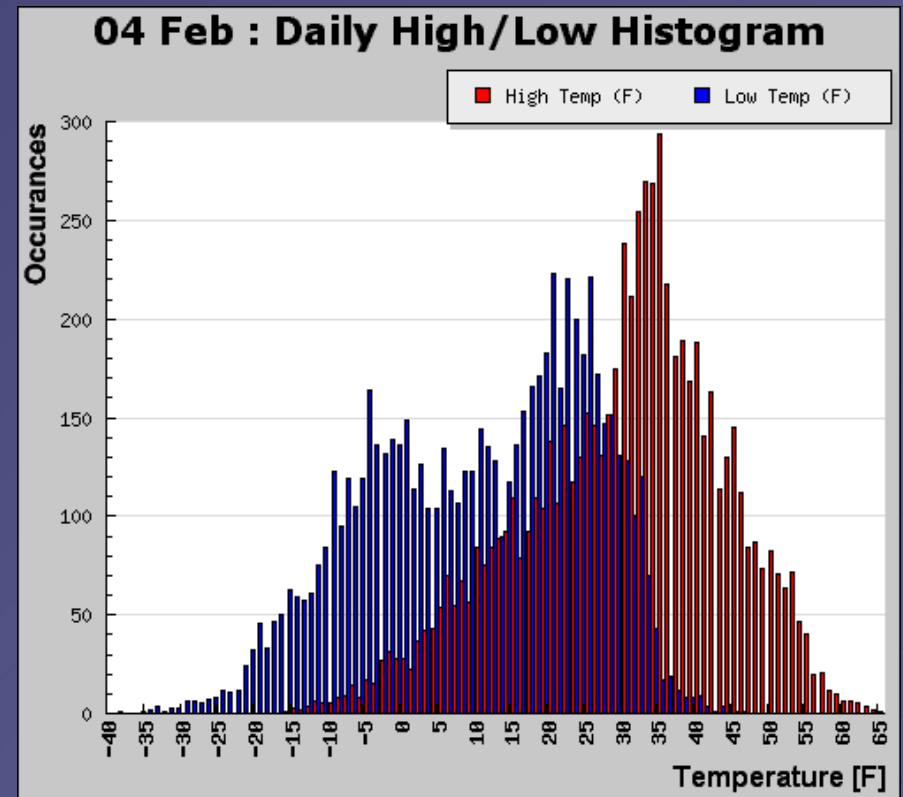
Climatological Differences

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



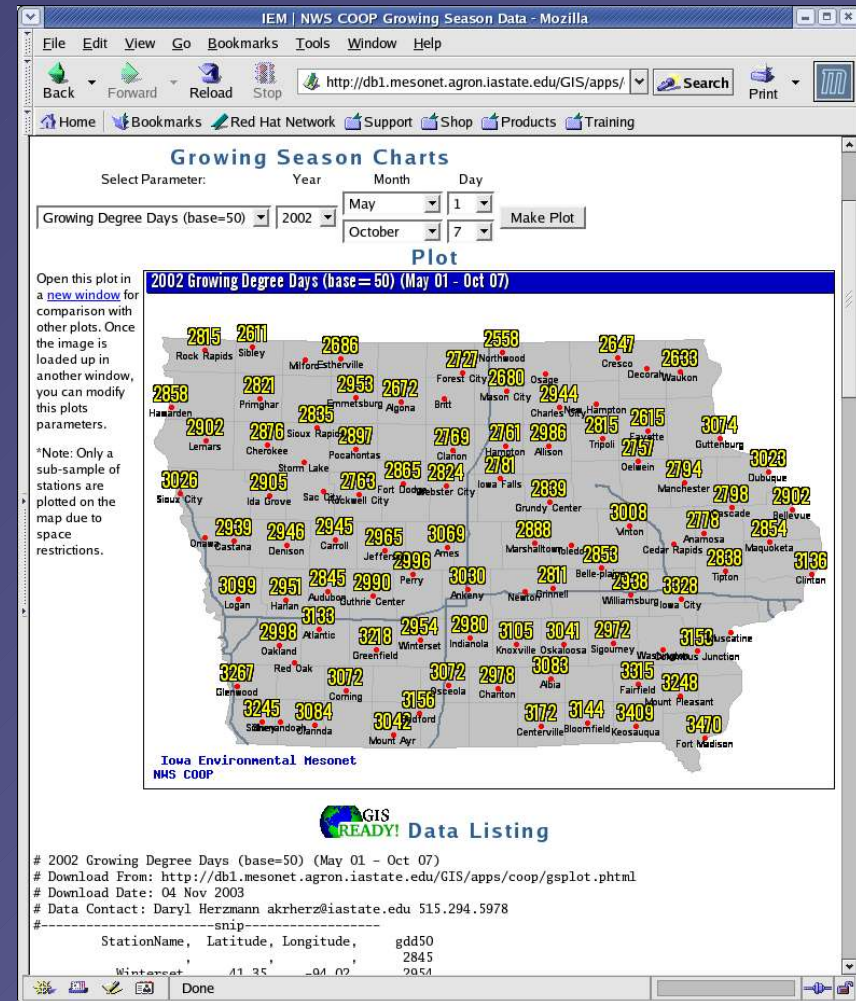
Daily Temperature Spreads

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



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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