

Dust Storms in Arizona

Paul Iñiguez

**Operational Meteorologist
NOAA/NWS Phoenix, AZ**





The CHRISTIAN SCIENCE
MONITOR

4P
EMI
24/7

CBS
NEWS

92.9 KISM
CLASSIC ROCK
NW WASHINGTON'S CLASSIC ROCK
BRAD & JOHN
WEEKDAY MORNINGS - 5:30-10:00AM

KPHO.com HD

ACCU WEATHER

3

12 NEWS

REUTERS
theguardian

NEWS-TALK
82.3
KTAR

abc 15

K
Z Z
91.5 FM

20+ Dust
Events in

ourAmazing planet

EarthSky
A CLEAR VO

THE ARIZONA
REPUBLIC

The New York Times

PHOENIX
New Times

CNN

The weather
Channel

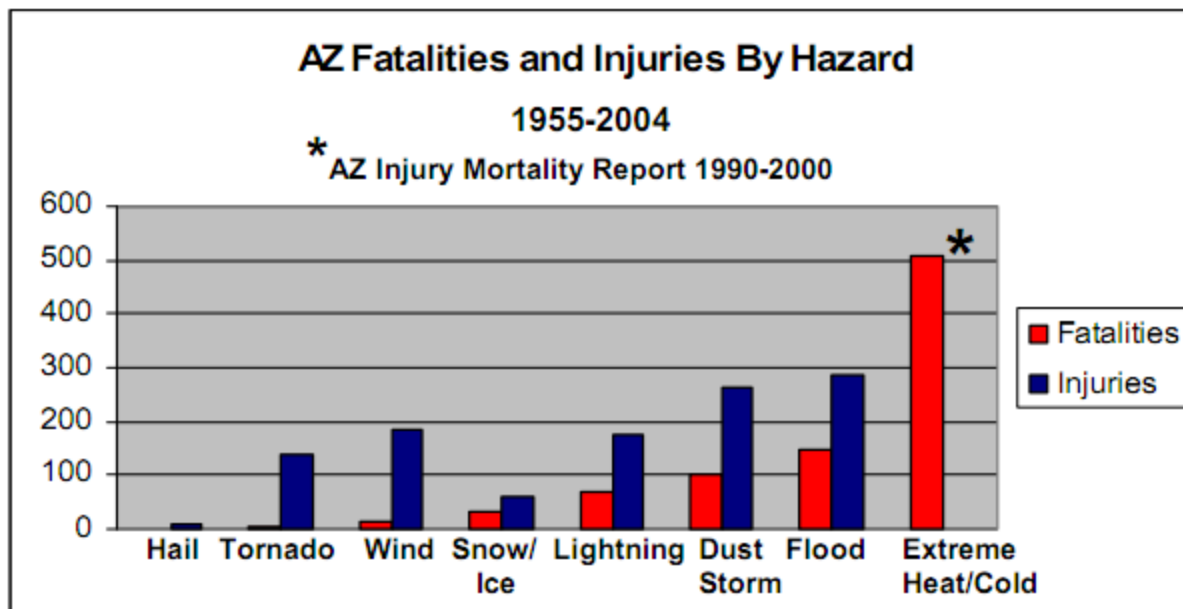
EAST VALLEY
Tribune.com
Met Phoenix's East Valley region

BBC

2011

Las Últimas Noticias

Arizona Deaths and Injuries by Hazardous Weather Type



Data Sources:

- Arizona Climate- *The First Hundred Years* (Sellers, Hill and Sanderson-Rae)
- NCDC Storm Data 1955-2004
- SPC Events Database 1950-2004
- NCDC Storm Events Database: Online- www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms
- DOT Fatality Analysis Reporting System: Online- www-fars.nhtsa.dot.gov
- University of Arizona Storm Database: Online- ag2.calsnet.arizona.edu/cgi-bin/storms.cgi
- Injury Mortality Among Arizona Residents, 1990-2000 Report (March 2002)



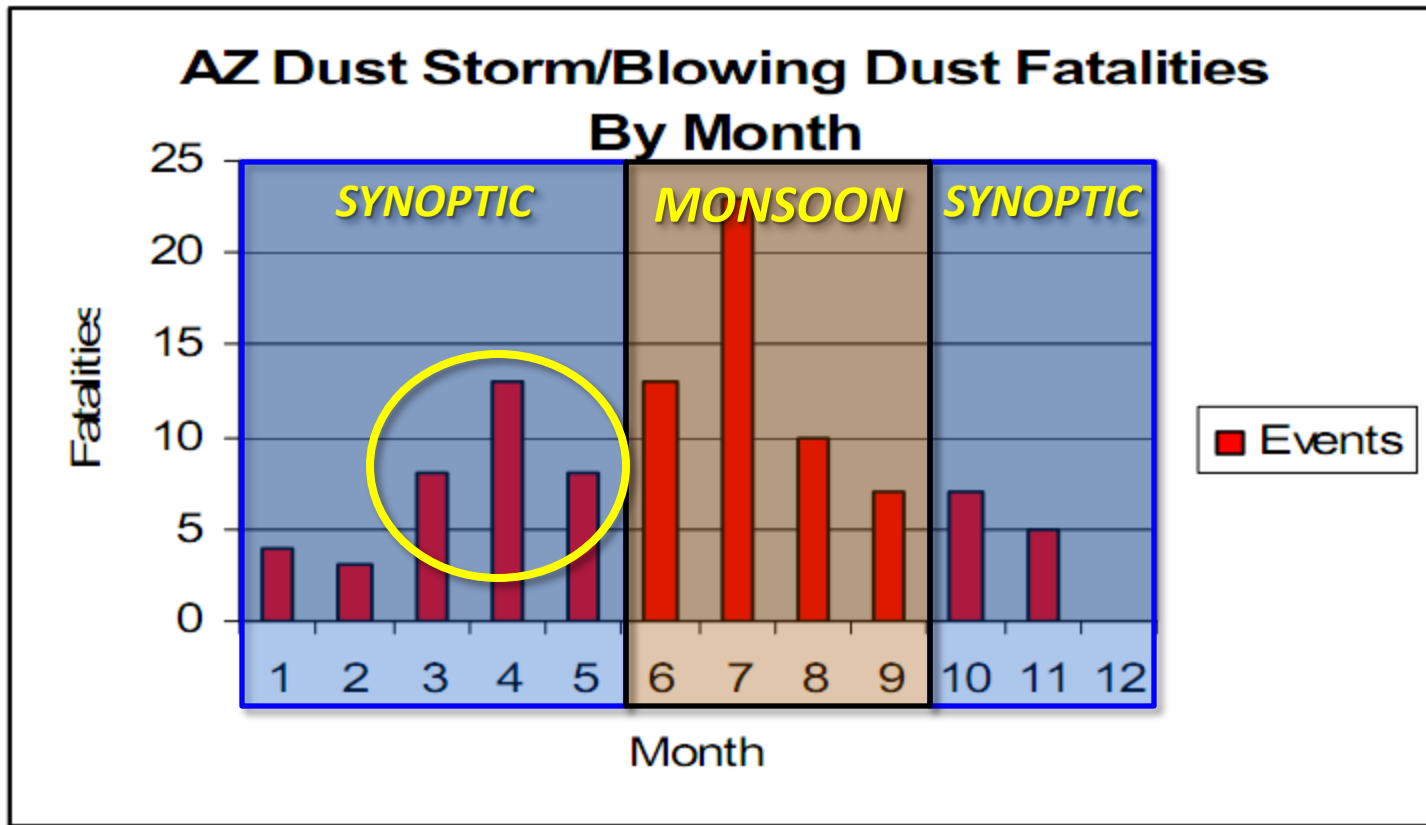


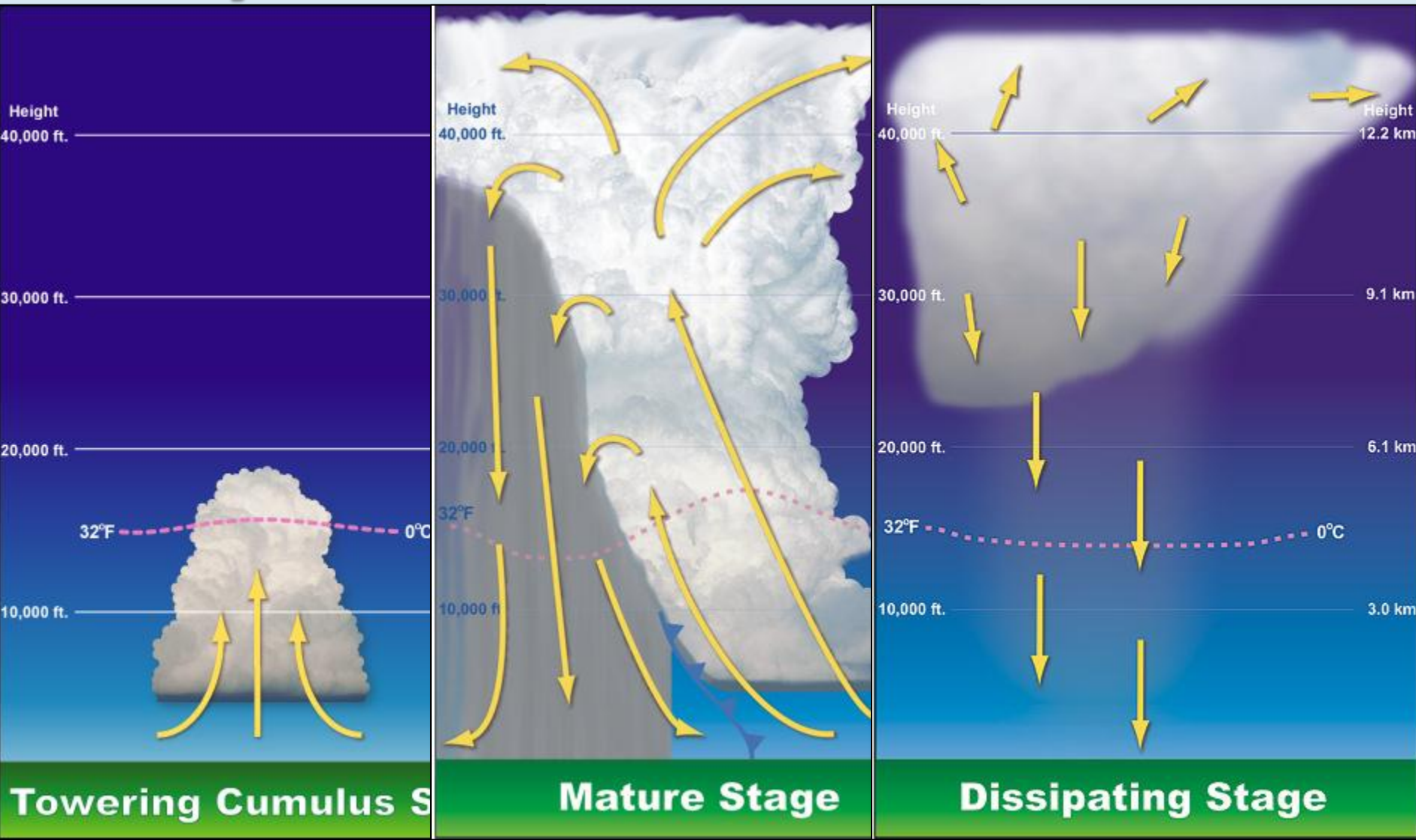
Figure 25. Frequency of dust storm fatalities by month from 1955 to 2004

Two Primary Sources for Blowing Dust

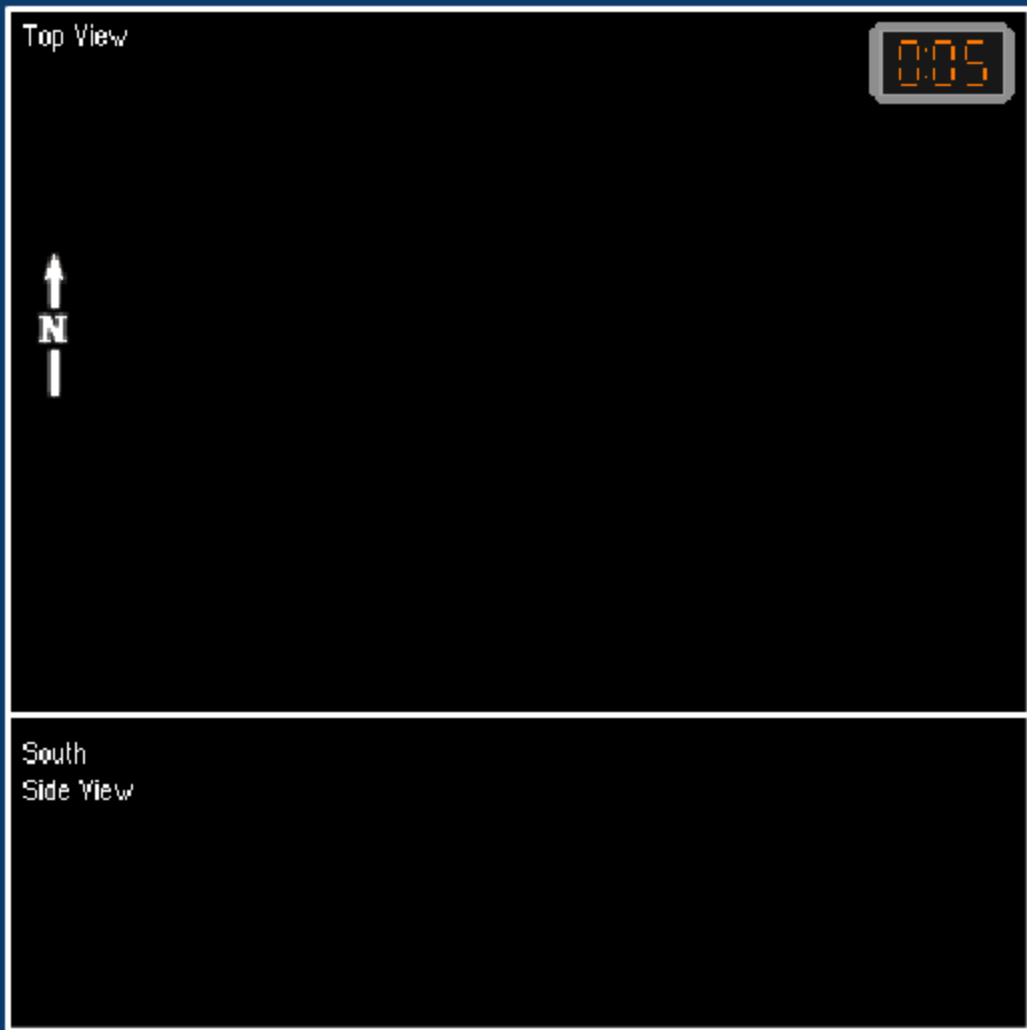
- **Monsoon/Thunderstorms
Summer → Haboobs**



Life Cycle of a Thunderstorm



Pulse Storms & Downburst/Outflow Formation



©The COMET Program

A set of navigation controls is located at the bottom of the simulation window. It includes a stop button (a square), followed by five directional buttons (left, right, up, down, left), and a slider control labeled "Animation Speed".



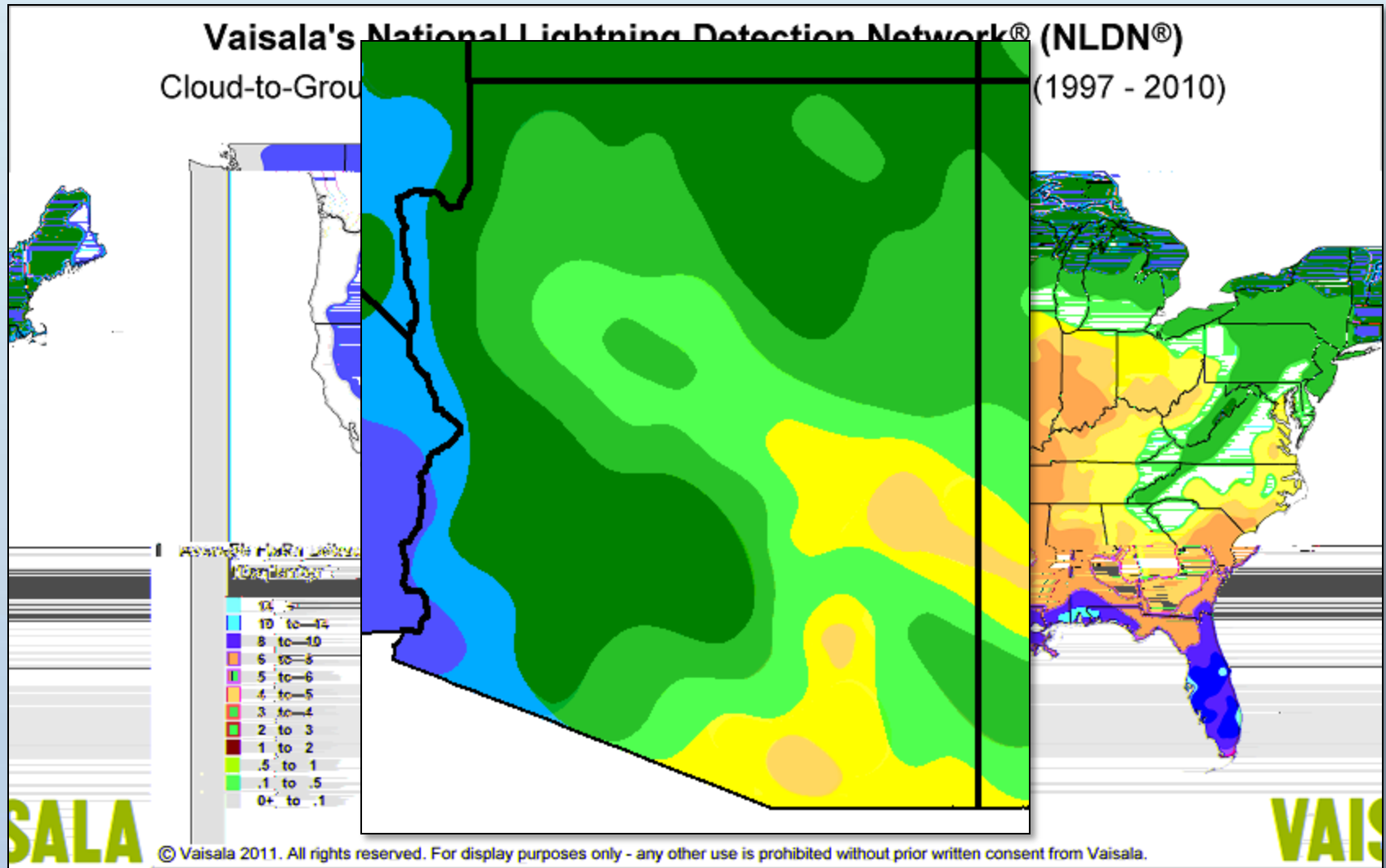
Birth of a Haboob



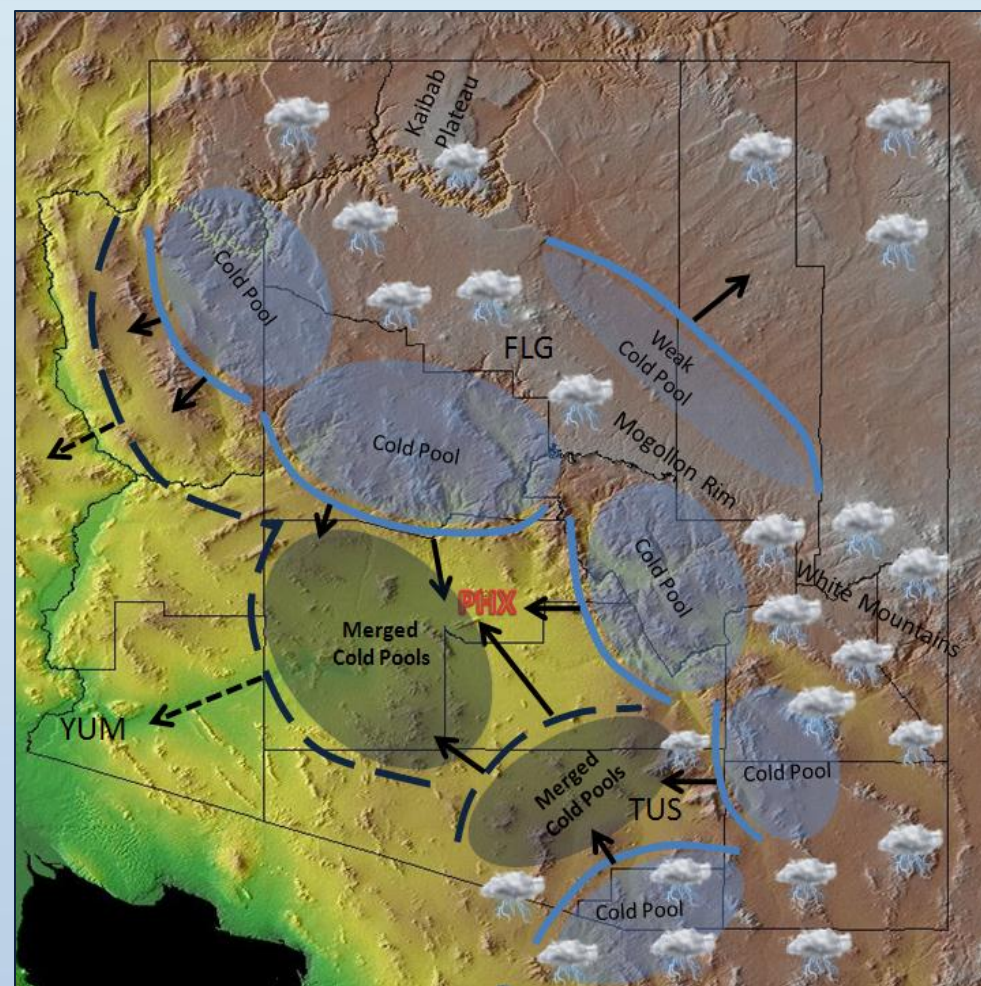
1% of 712KB loaded.



Thunderstorm Patterns



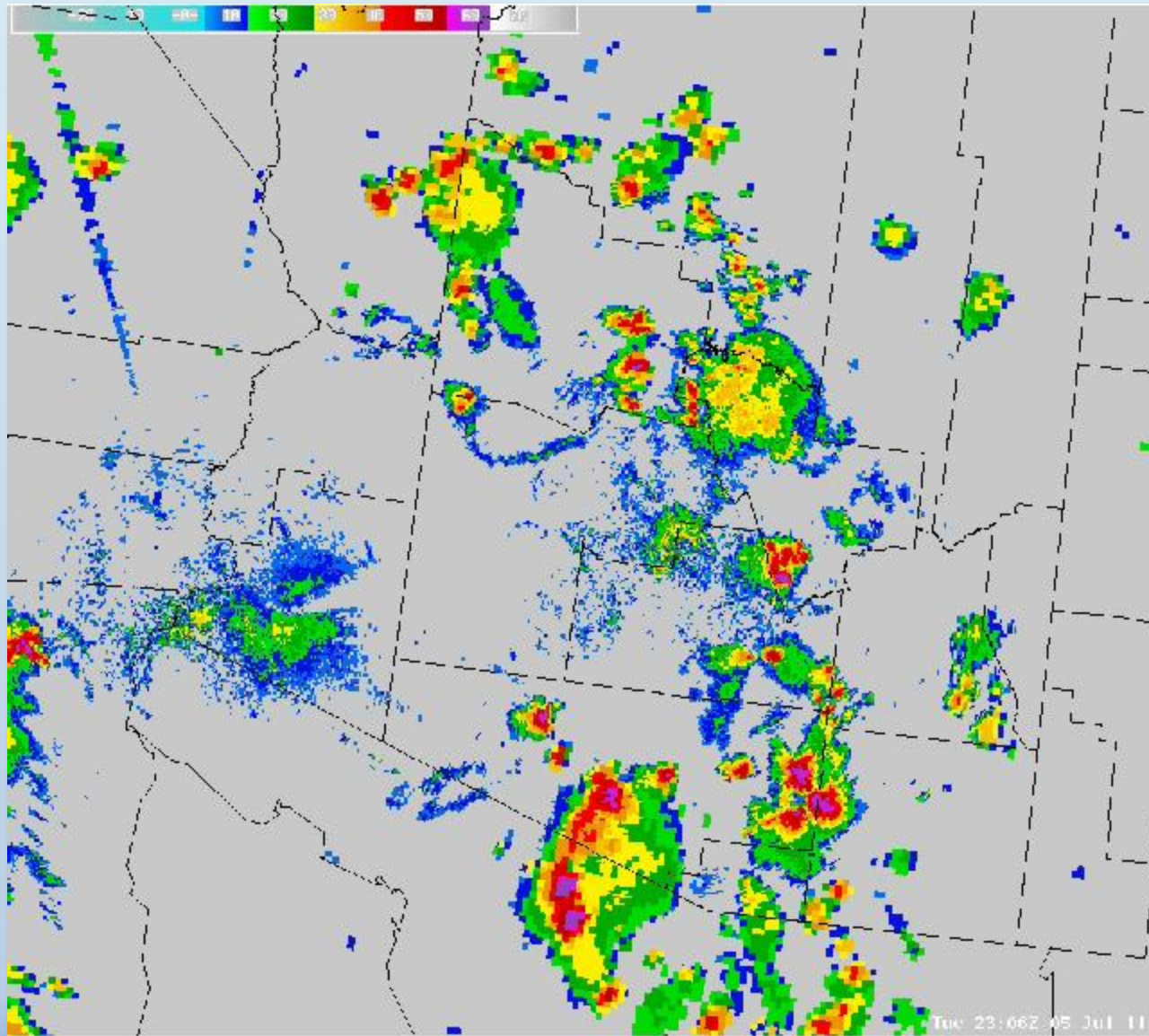
Thunderstorm Patterns: Cold Pool Formation/Movement



Conceptual Diagram of Cold Pool Formation and Movement

- Cold pools (CPs) typically originate from thunderstorm clusters over the higher terrain or mountains of Arizona.
- CPs travel the path of least resistance, down the slopes of river basins and valleys as a density current.
- Phoenix and Interstates 8/10 lie in a confluence region of major rivers and streams in which CPs can collide and merge.
- Under the right conditions, Cold Pools will form Dust Storms.

Monsoon Thunderstorm Patterns – 5 July '11



**50-80 MPH
Winds**

Impact of drought – more dust storms?

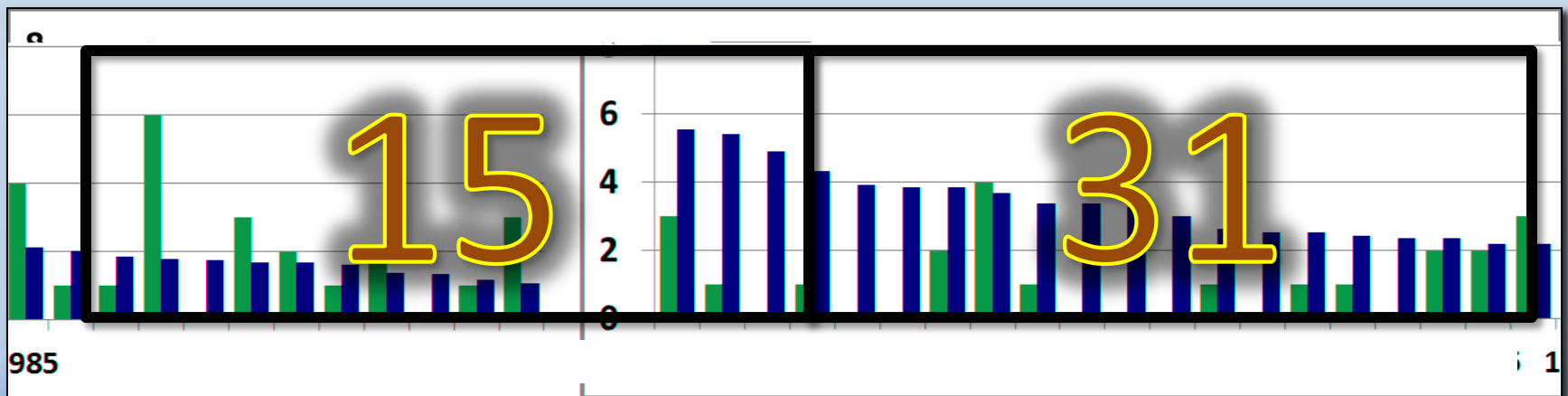
We heard from many people this summer – are the dust storms worse than “normal”? A very difficult question to answer...

- Use data from KPHX (1980-2011, only hard data that has not changed over time).
- 46 events total.

More “dust events” at KPHX in 2011 than any summer since 1980.

Twice as many dust events when summer precipitation in central Arizona is below median.

*Note: No bearing on size, intensity, or duration!
More robust analysis possible with impact data.*

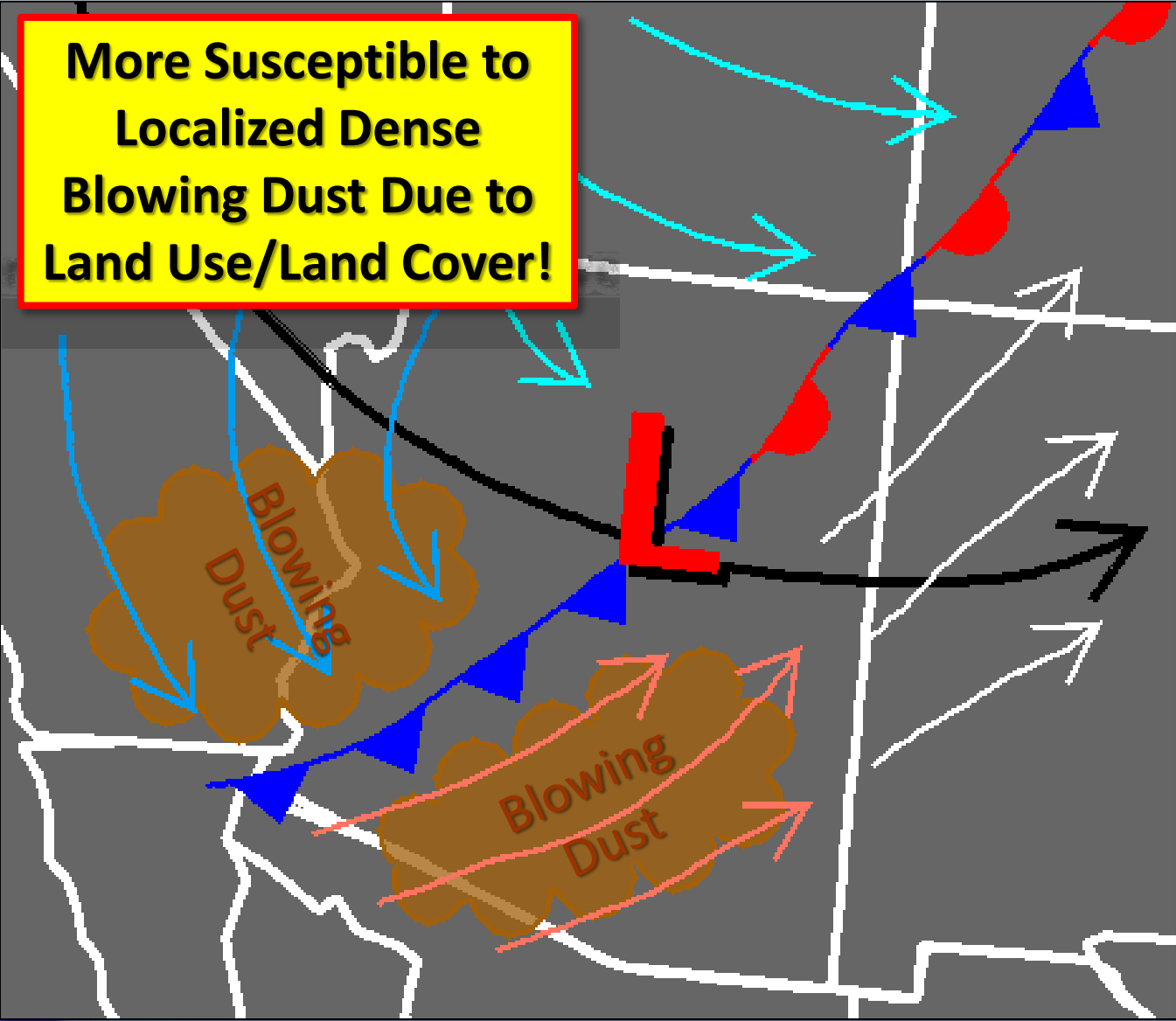


Two Primary Sources for Blowing Dust

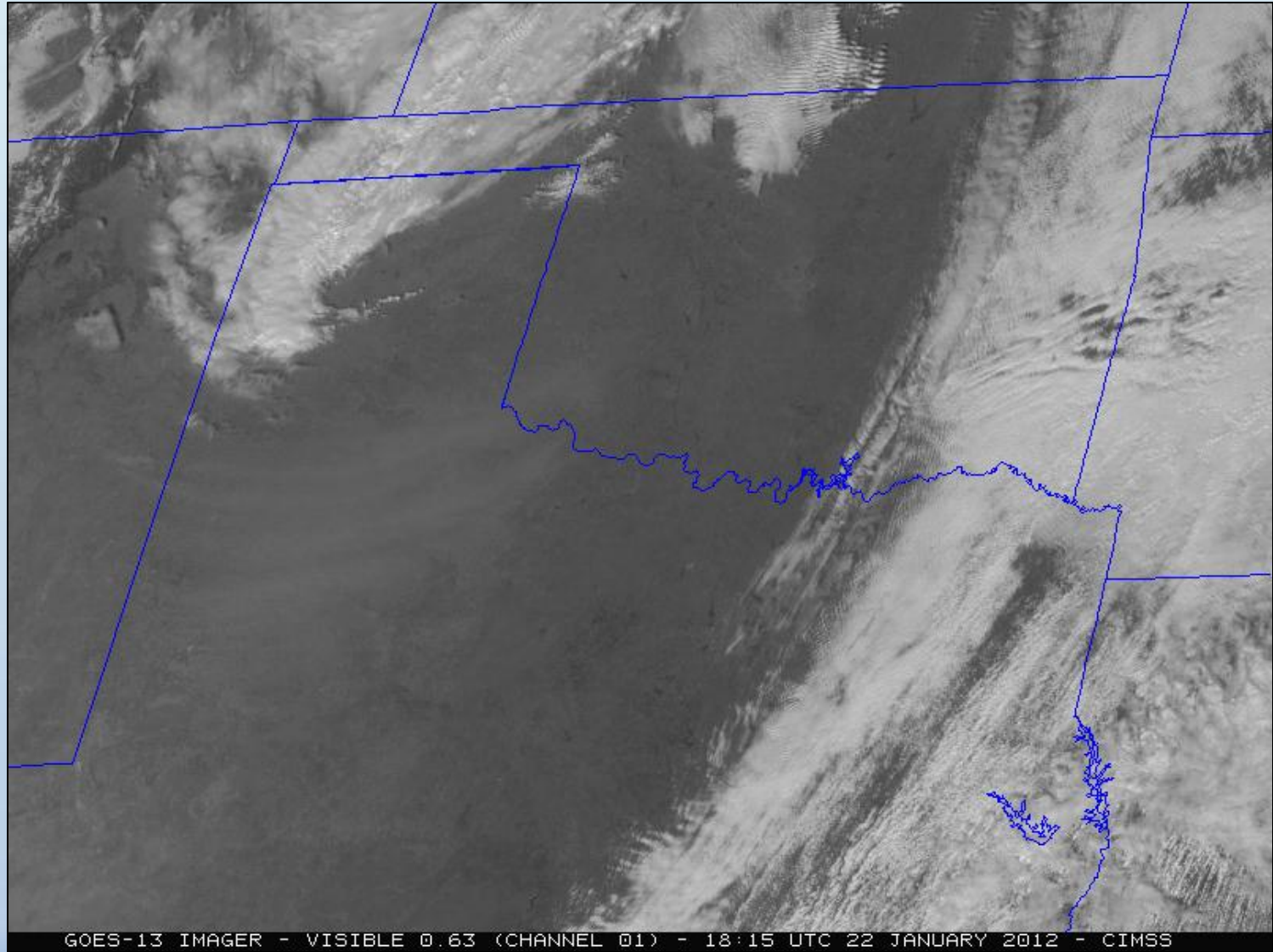
- **Strong Low Pressure (Synoptic) System
Fall/Winter/Spring → Blowing Dust**



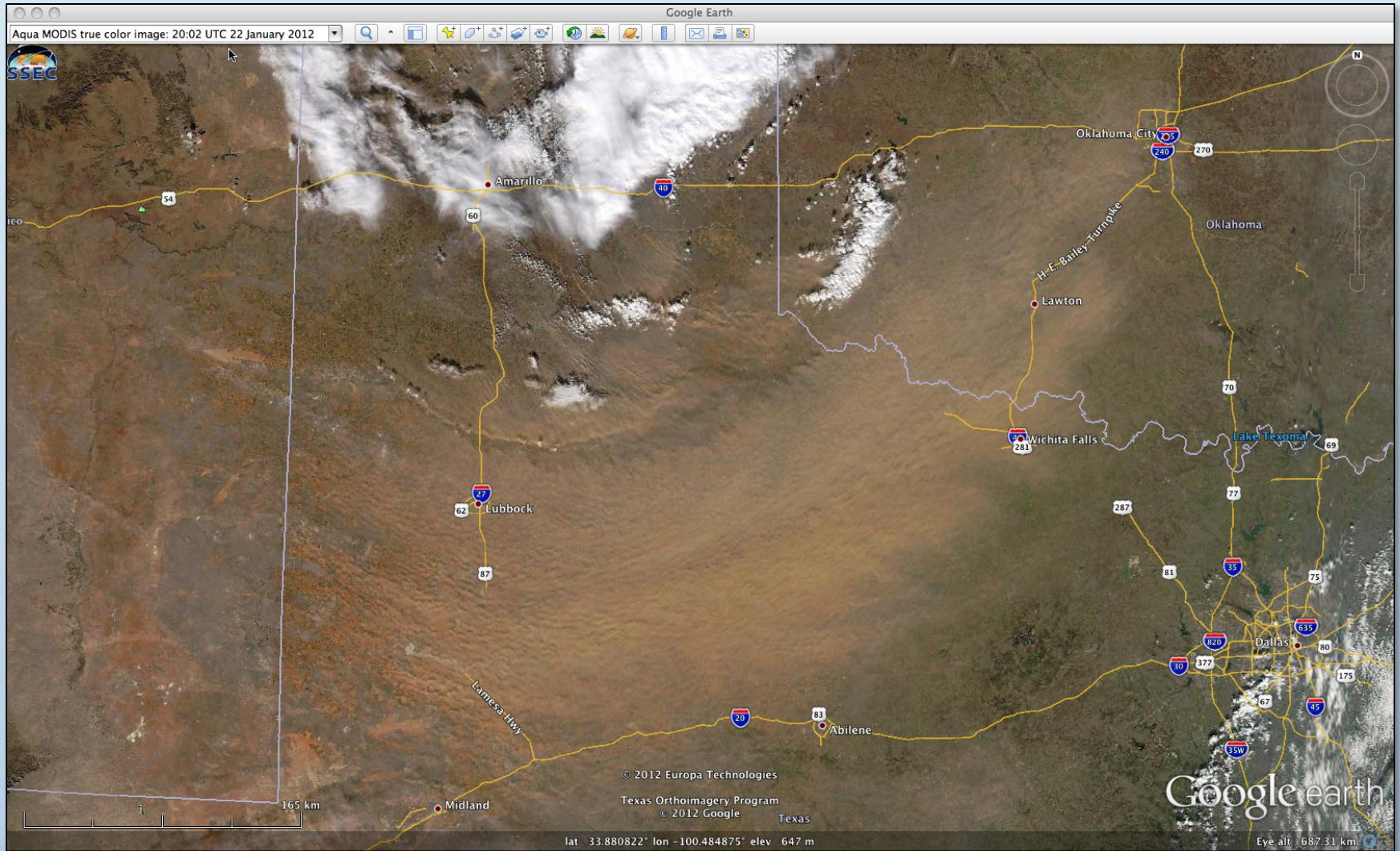
Fall/Winter/Spring Dust Storm Pattern



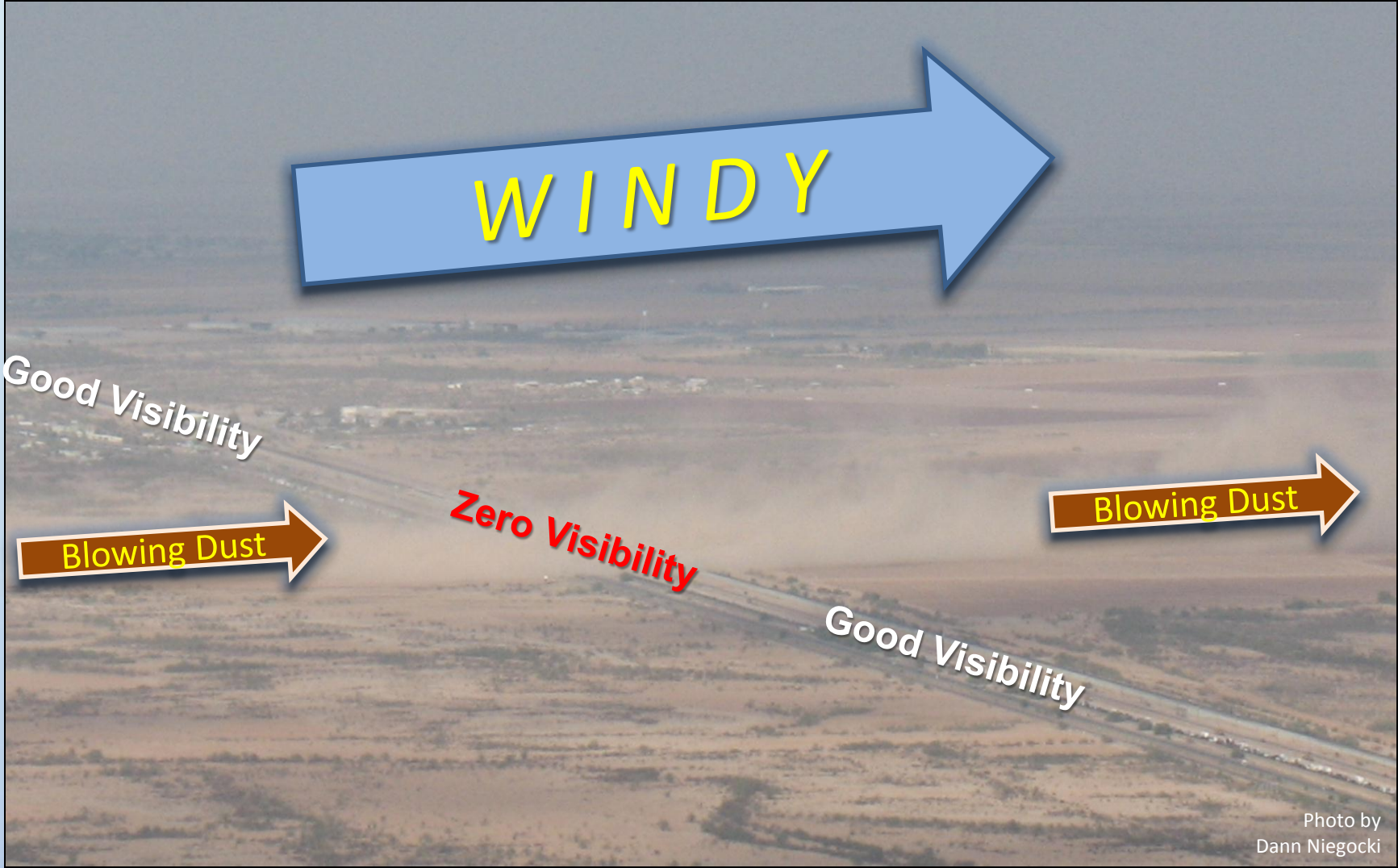
Widespread Blowing Dust



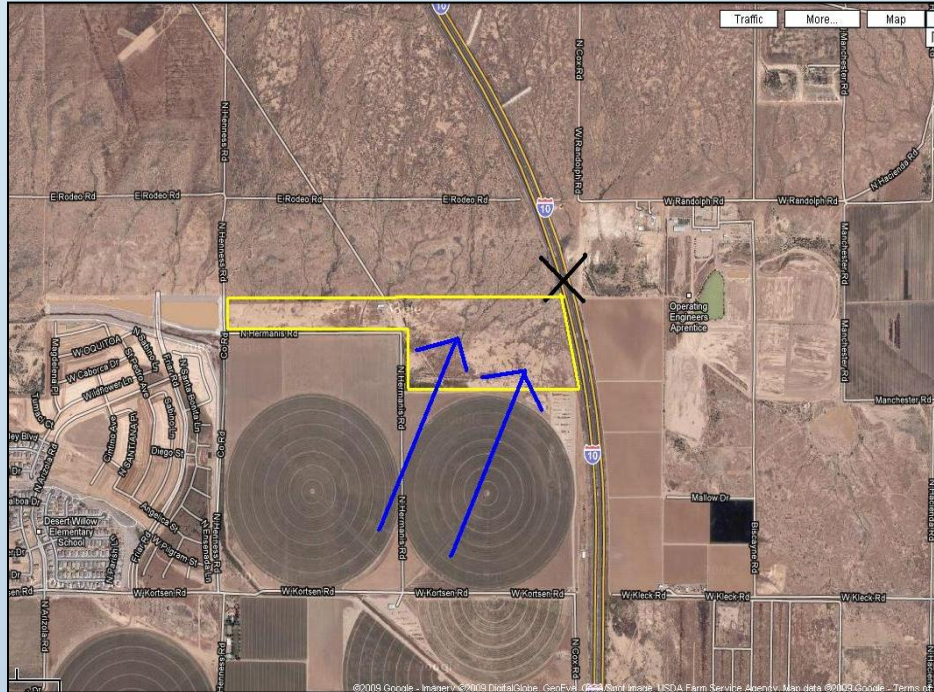
Widespread Blowing Dust



Localized Blowing Dust



Localized Blowing Dust – Dec. 22, 2009



Location in Casa Grande, AZ near MP 191 I-10. Confirmed upon visual inspection. Yellow box indicates land area that was grubbed prior to incident.

- **Two separate accidents at same location with 22 total vehicles and 3 fatalities**
- **Incident occurred at about 10:50 AM. SSW winds at 10-20 mph. Note: Winds of 25+ mph typically raise concern at NWS.**
- **Local land use and associated human activity play a significant role, hampers ability of NWS to forecast events.**

Localized Blowing Dust – Dec. 22, 2009



Conclusion

- **2011 had a lot of blowing dust & big events (but we always have dust).**
- **Two dust seasons described by source of winds - Monsoon and Synoptic (fall/winter/spring).**
- **Monsoon events develop quickly, not able to predict more than a few hours ahead. Difficult to detect and determine severity prior to impacting urban areas and freeways.**
- **Synoptic *wind* events have much higher predictability. However, antecedent conditions, land use, and human activity make *dust* prediction much more difficult. Same detection problems as monsoon, maybe even more difficult due to very localized impacts.**





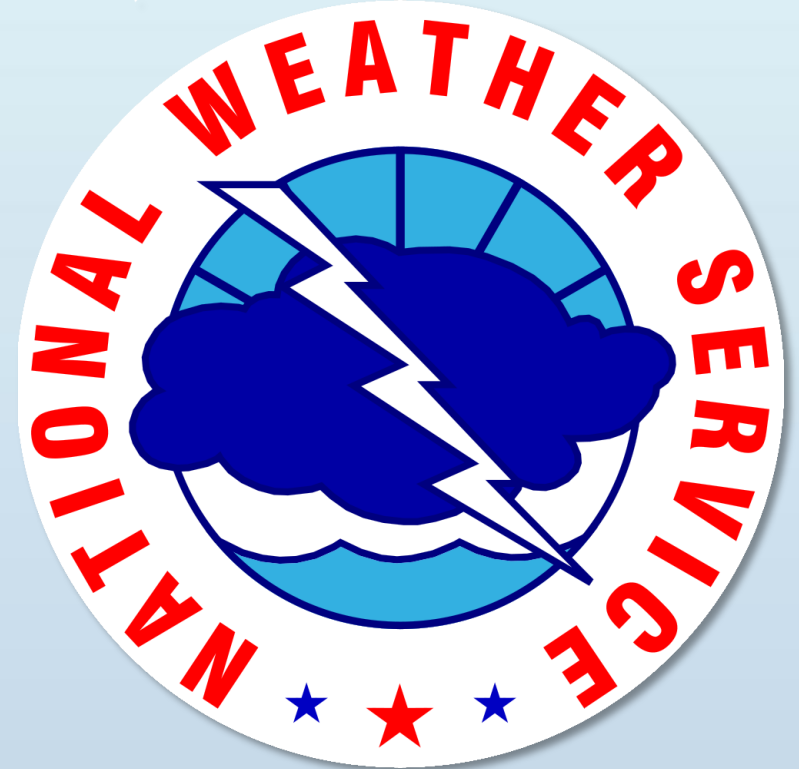
NWS Phoenix

Gary Woodall

Ken Waters

Michael McLane

Paul Iñiguez



NWS Tucson

Glen Sampson

Ken Drozd

JJ Brost

Glenn Lader

