

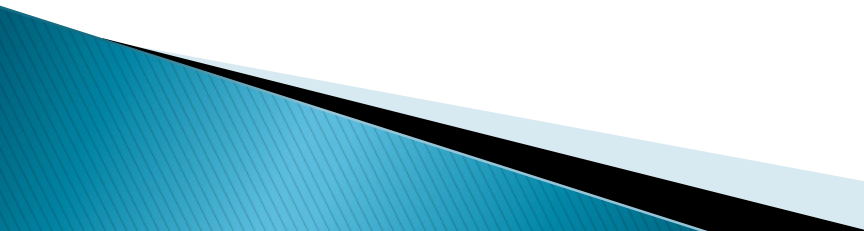
# Meteorology Data Validation/Open Forum



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Presented:  
June 5, 2019

# Meteorology Data

- ▶ **Background Information**
    - Typical parameters measured
    - Why collect met data?
    - Who collects met data?
    - How are data collected?
    - What are data used for?
    - Examples
  - ▶ **Data Validation and Audits**
    - Background
    - Tips and tricks
  - ▶ **Sonic vs. mechanical anemometers**
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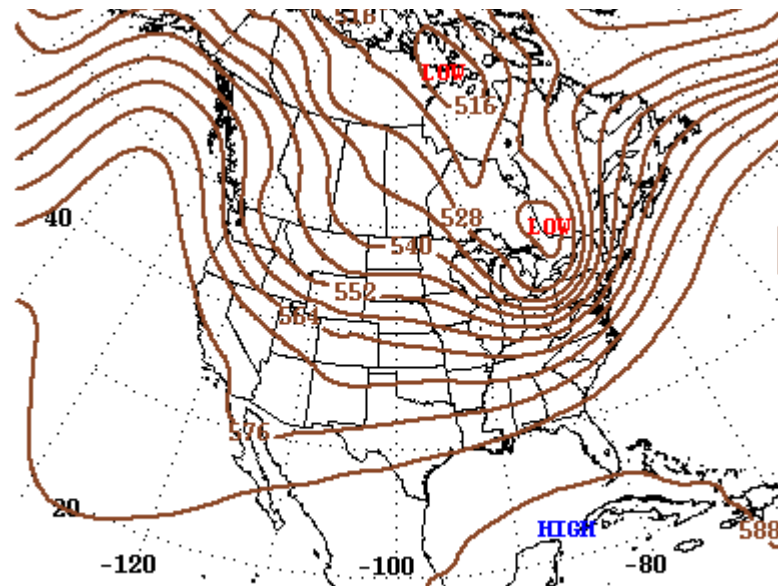
# Meteorology Data

- ▶ Typical parameters measured
  - Surface Wind Speed and Direction
  - Surface Temperature
  - Solar Radiation
  - Surface Pressure
  - Dew Point/Relative Humidity
  - Precipitation

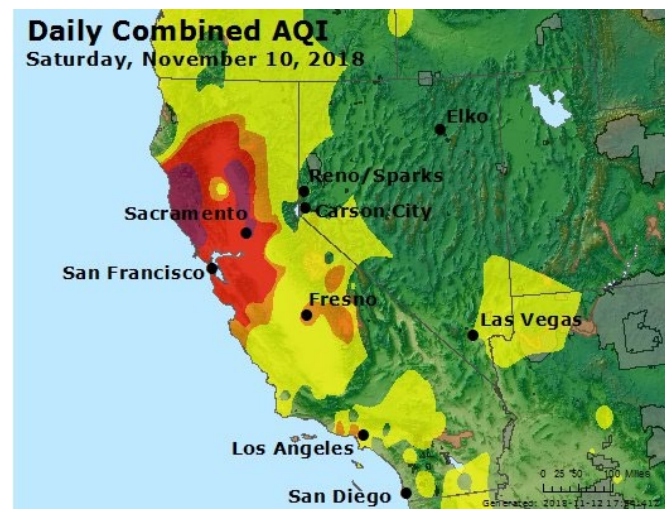


# Meteorology Data

- ▶ Why do we collect meteorology data?
  - Directly affects air quality
  - Needed for air quality forecasting
  - Useful for Weight of Evidence analyses
  - Exceptional event analyses
  - Interstate transport SIPs
  - Monitoring network assessments/designs
  - Health Risk Assessments



500-Millibar Height Contour at 7:00 A.M. E.S.T.



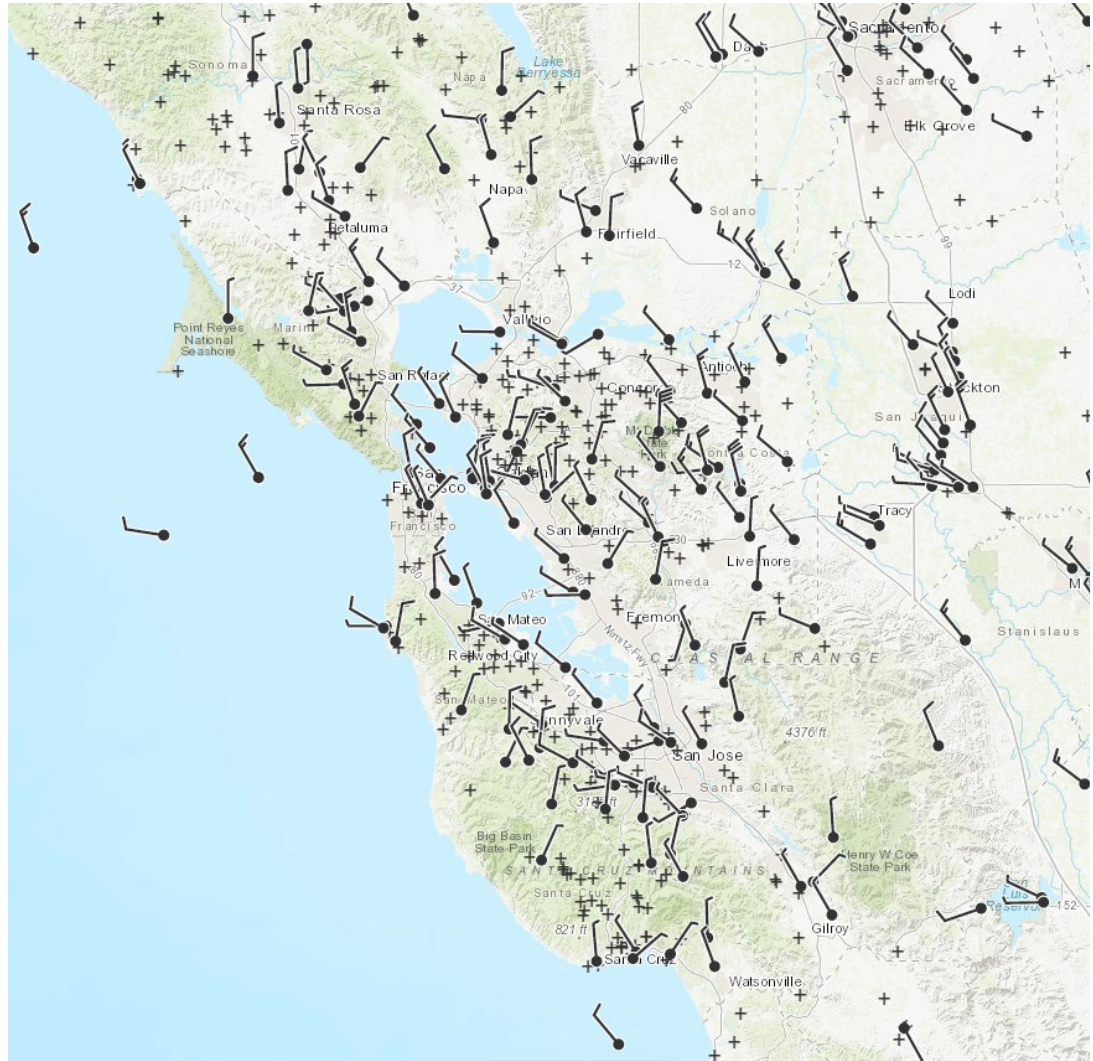
# Meteorology Data

- ▶ What does BAAQMD use meteorology data for?
  - Air quality forecasting
  - Development of regression equations
  - Transport analyses
  - Network assessments
  - Dispersion modelling
  - Compliance & enforcement of local regulations (such as fence line monitoring)
  - Health risk assessments



# Meteorology Data

- ▶ Who provides meteorological data?
  - Local air districts
  - NWS Office of Observations
  - NWS Cooperative Observer Program (COOP)
  - U.S. Forest Service and BLM
  - CARB
  - Caltrans
  - PG&E
  - Other private companies
- ▶ **Quality of data varies**



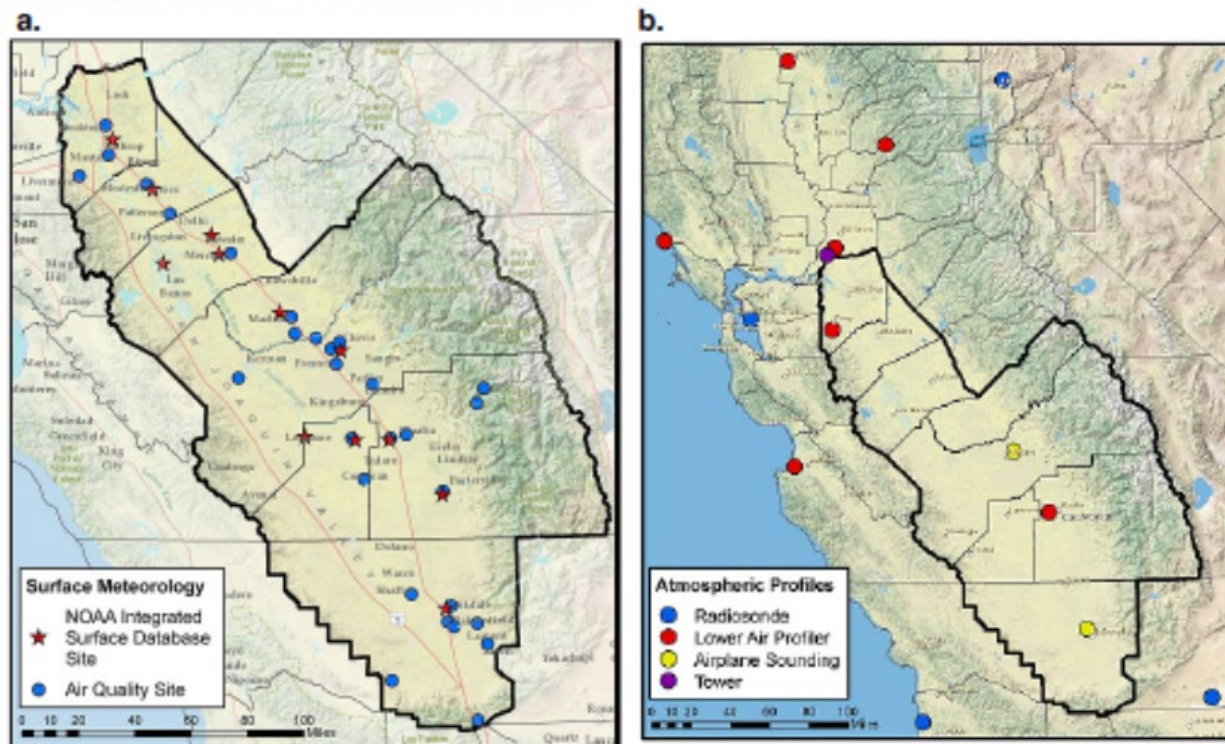
# Meteorology Data

- ▶ How are meteorological data collected?
  - Sensors on towers
    - anemometers, hygrometers, thermometers, barometers, shortwave/longwave pyranometers, rain gauges
  - Usually attached to a data logger with remote access
  - Available through NWS, Air District websites, AQMIS (<https://www.arb.ca.gov/aqmis2/metselect.php>), and other sites
  - Upper-air measurements
    - Rawinsondes, profilers, sodars, lidar, microwave radiometers

# Example – Monitoring Network Assessment and Design

- ▶ Meteorological conditions play a crucial role in ambient air pollution formation and transport. Meteorological data are used along with other information such as emissions, topography, and population densities to assess and design the ambient air quality monitoring network.

**Figure 3-1. Maps of the locations measuring various meteorological parameters within and around District Boundaries**



\* SJV 2015 Air Monitoring Network Assessment



# Example – Exceptional Event Analysis

- ▶ Meteorological data frequently utilized in exceptional event analysis:
  - Focuses on short-term hourly and daily analysis of potential exceptional events compared with past non-exceptional exceedances.

June 26, 2008, 1346 PST



NASA Visible Aqua MODIS Bands 1, 4, and 3 True Color Satellite Image (250 meter resolution)  
[http://activefiremaps.fs.fed.us/data/images/2008178/ca-north-000/creft2\\_A2008178214602\\_2008178215301\\_250m\\_ca-north-000\\_143.jpg](http://activefiremaps.fs.fed.us/data/images/2008178/ca-north-000/creft2_A2008178214602_2008178215301_250m_ca-north-000_143.jpg)

Figure 7  
Surface Winds June 26, 2008, 1500-1600 PST

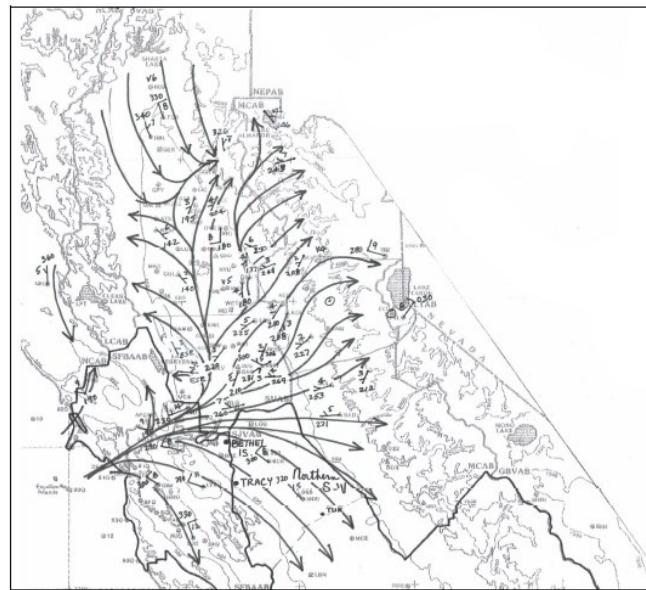
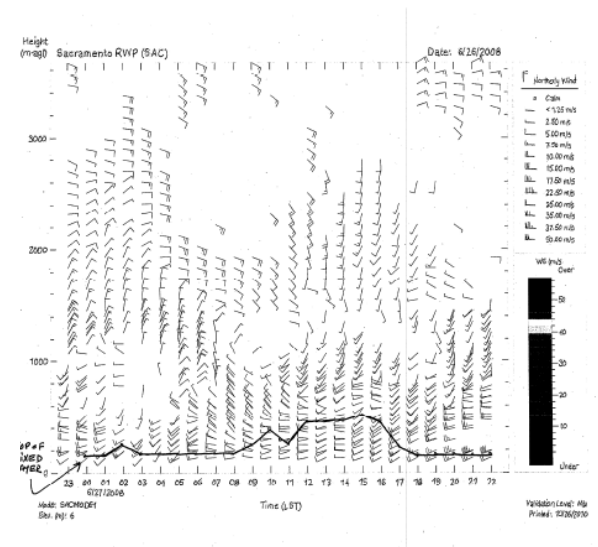


Figure 15  
Change in Height of Mixing Layer at Elk Grove on June 27, 2008

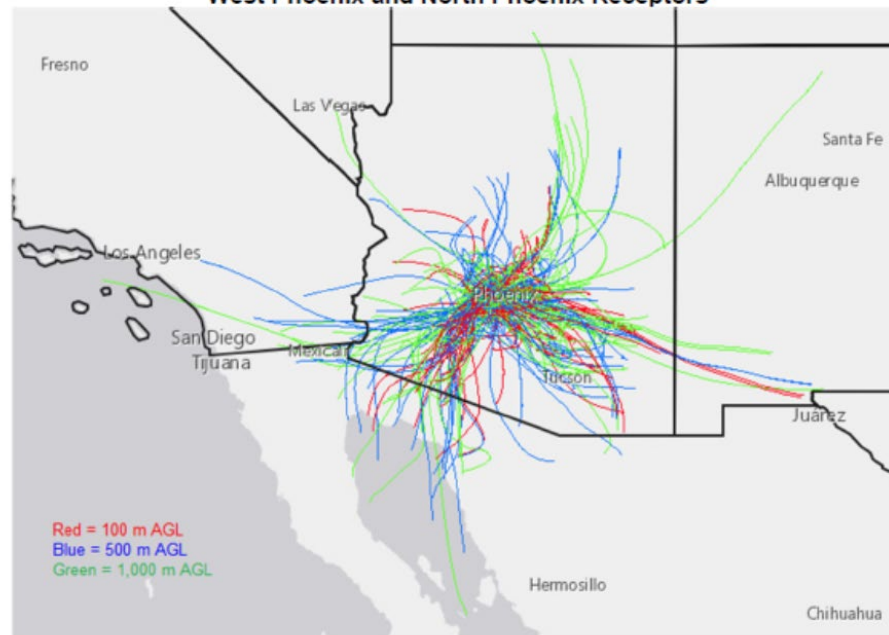


\* 8-Ozone Exceptional Event Documentation for 2008 Northern California Wildfires

# Example – Interstate Transport SIPs

- ▶ Meteorological data are used to evaluate the potential for transport of ozone or ozone precursors from California to downwind states.

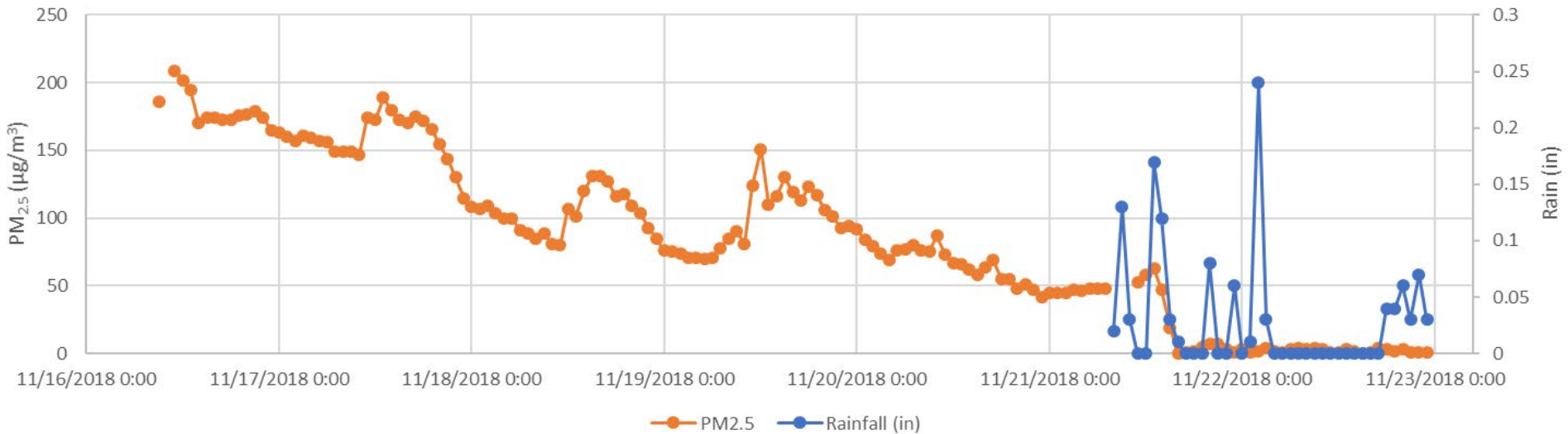
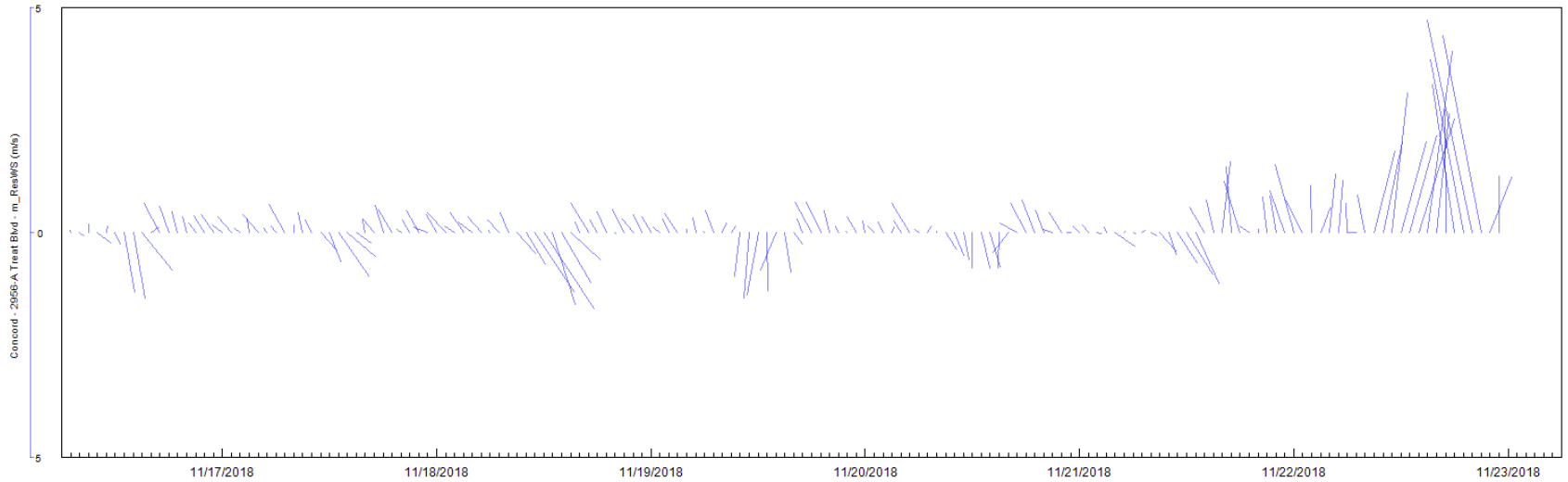
FIGURE 5: HYSPLIT Backward Trajectories on Ozone Exceedance Days in 2015-2016, West Phoenix and North Phoenix Receptors



\* 2018 California Infrastructure SIP Revision

# Example - Rainfall & PM<sub>2.5</sub> at Concord

Concord - 2956-A Treat Blvd - m\_ResWS (m/s) vs Concord - 2956-A Treat Blvd - m\_ResWD (deg)



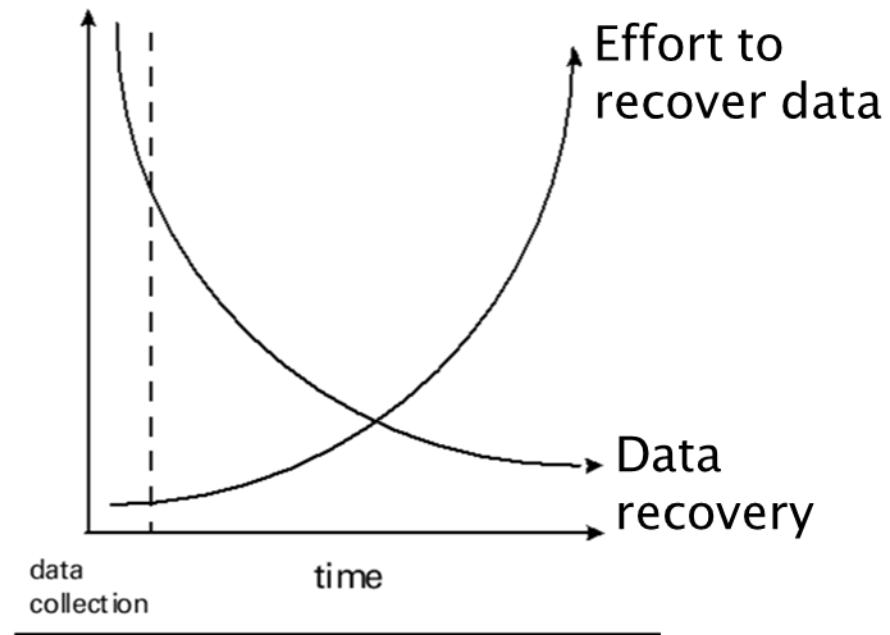
# Meteorology Data Validation

- ▶ Requirements depend on Program
  - EPA NCore: WS, WD, RH, Ambient Temperature (AT)
  - EPA PAMS: WS, WD, RH, AT, Pressure, Solar Radiation, Precipitation, UV radiation, and mixing heights
- ▶ Recommended by EPA
  - PSD
    - Recommended for permitting sources
  - Modeling applications
  - NWS MQO's

# Meteorology Data Validation

## ▶ Tips & Tricks

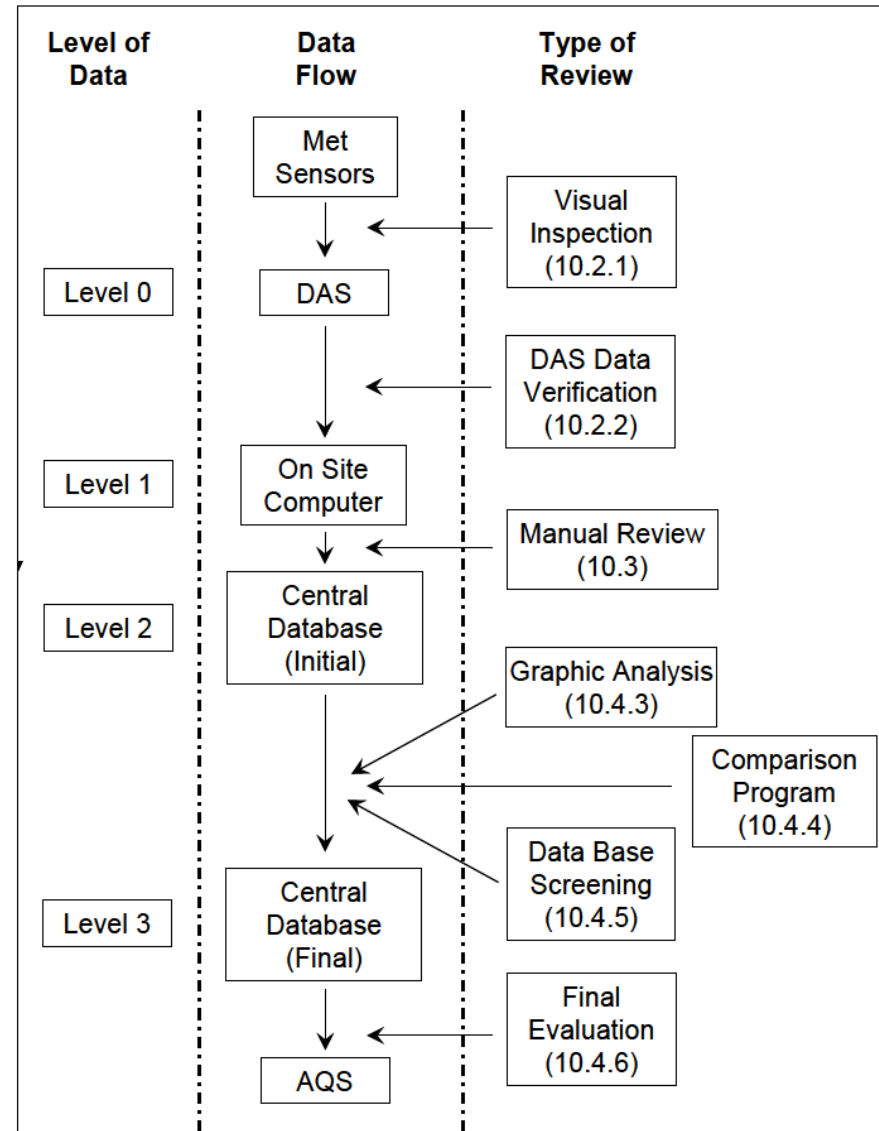
- Automated screening using DMS
- Audits
  - Timing
  - Best Practices {Quality Assurance Handbook for Air Pollution Measurement Systems Volume IV: Meteorological Measurements Version 2.0 (Final)}
  - Audit Tools
    - Calibration Videos (<https://www3.epa.gov/ttn/amtic/qaalist.html>)
- Operations/Checklists



# Meteorology Data Validation

## ▶ Best Practices

- Verify and validate at the same time as pollution data
- Review audit/calibration reports
- Comparison to other meteorological stations
- Data Screening Checklist



# Meteorology Data Validation

Example from Quality Assurance Handbook  
for Air Pollution Measurement Systems  
Volume IV: Meteorological Measurements  
Version 2.0 (Final)

## Meteorological Data Screening Checklist

Monitoring Station \_\_\_\_\_

Month/Year \_\_\_\_\_

### Data Screening Questions

- \_\_\_\_\_ Was percent data recovery criteria met (i.e., greater than 75%)
- \_\_\_\_\_ Do WSV & WDV have same data recovery?
- \_\_\_\_\_ Do WSV and WDV have same hour invalid?
- \_\_\_\_\_ Review missing data summary
- \_\_\_\_\_ Review site logs.
- \_\_\_\_\_ Multipoint calibration: WS slope =  $1 \pm 0.05$  m/s, WD average difference =  $\pm 5$  degrees
- \_\_\_\_\_ VWS maximum difference  $< 0.3$  m/s, T maximum difference  $< 1$  degree C?
- \_\_\_\_\_ Are all calibrations documented?
- \_\_\_\_\_ Vector WS  $\leq$  Average WS?
- \_\_\_\_\_ Compare average WD to vector WD?
- \_\_\_\_\_ Sigma phi calculation OK?
- \_\_\_\_\_ Compare sigma W vs. VWS?
- \_\_\_\_\_ Compare sigma V vs.  $WS * \sin(\text{sigma theta})$ ?
- \_\_\_\_\_ Any hand reduced sigma or vector data?
- \_\_\_\_\_ Check dependent parameters:
  - \_\_\_\_\_ WSA affects WSV, WDV, sigma phi, sigma V
  - \_\_\_\_\_ WDA affects WDV, WSV, sigma theta, sigma V
  - \_\_\_\_\_ VWS affects sigma W, sigma phi

### Strip Charts (paper or digital)

- \_\_\_\_\_ Random check of all meteorological parameters – (chart vs. data)
- \_\_\_\_\_ Random check of all calibrations - (chart vs. data)
- \_\_\_\_\_ Do sigma theta values and WD chart scatters coincide? Zero offset for WS OK?
- \_\_\_\_\_ Check WS noise/bearings at threshold speeds

# Meteorology Data

- ▶ Mechanical vs. Sonic Anemometers  
Demonstration



# Meteorology Data Validation

Questions/Discussion

