

Session 5: Surface Meteorological Measurements

- I. Overview
- II. Screening Criteria
- III. Examples



October 2011

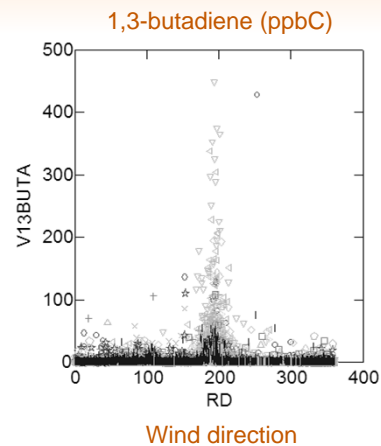
STI

Sonoma Technology, Inc.

Using Surface Meteorological Measurements

Data analysts can use surface meteorological measurements

- to understand the diurnal changes in concentration associated with meteorology (temperature, wind speed)
- to investigate emission sources affecting a monitoring site (source apportionment)
- to investigate pollutant transport
- for meteorological adjustments for trend analyses
- To evaluate models



Common Measurements

- Temperature
- Wind speed, wind direction
- Relative humidity
- Solar radiation
- Precipitation
- Barometric pressure



Example Screening Criteria: Surface Meteorological Measurements

Wind Direction

- is less than 0° or greater than 360°
- does not vary by more than 1° for 3 consecutive hours
- does not vary by more than 10° for 18 consecutive hours

Temperature

- is greater than the local record high: °C
- is less than the local record low: °C
- is more than 5°C above the mean monthly max: °C
- is more than 5°C below the mean monthly min: °C
- varies by more than 5°C in 1 hour
- does not vary by more than 0.5°C for 12 consecutive hours

Example Screening Criteria: Surface Meteorological Measurements

Data fails screening if...

Vertical Temperature Difference

is greater than 0.1°C/m during the day Dawn:

is less than -0.1°C/m during the night Dusk:

is greater than 5.0°C/m or less than -3.0°C/m

Relative Humidity

is less than 0% or greater than 100%

does not vary by more than 0.5% for 12 consecutive hours

Dew Point Temperature

is greater than the ambient temperature

varies by more than 5°C in 1 hour

does not vary by more than 0.5°C for 12 consecutive hours

equals the ambient temperature for 12 consecutive hours

is more than 2.5°C below the ambient temperature during precipitation

Precipitation

is greater than: inches per hour

is greater than: inches in 24 hours

is less than: inches in three months

Example Screening Criteria: Surface Meteorological Measurements

Data fails screening if...

Pressure

is greater than: mb

is less than: mb

changes by more than 6 mb in three hours

Radiation

is less than 0 W/m²

is greater than 0 W/m² at night

is greater than: W/m²

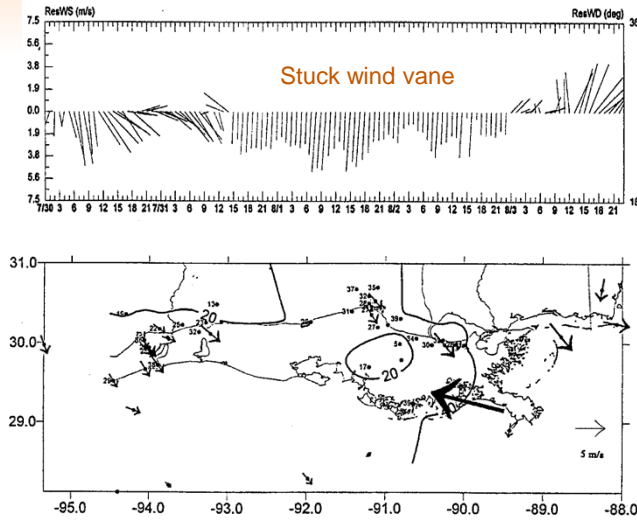
Sigma Theta

is less than 0° or greater than 90°

Example Meteorological Data Validation

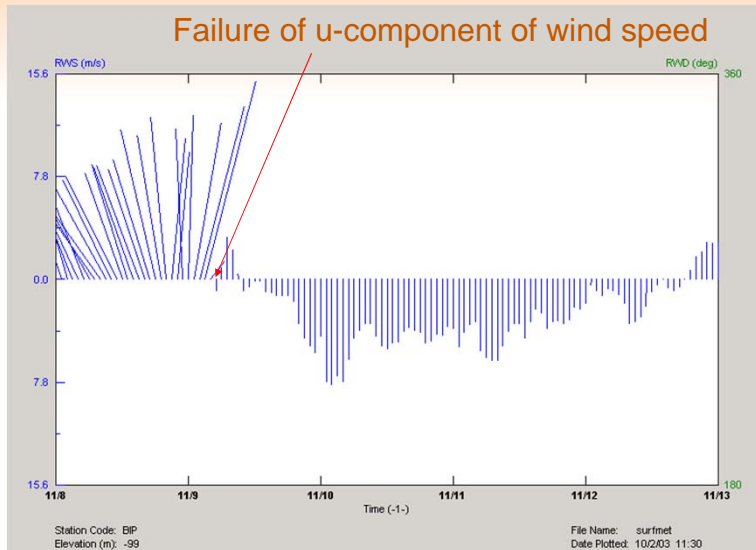
Examples of questionable meteorological data identified during data validation (SAI et al., 1995)

- **Top:** Constant wind directions were reported at Cocodrie, Louisiana, from July 31–August 2, 1993. The wind direction data were invalidated
- **Bottom:** High surface winds at a surface station in Grand Isle, Louisiana, on August 29, 1993, at 0800 CST appear spatially erroneous

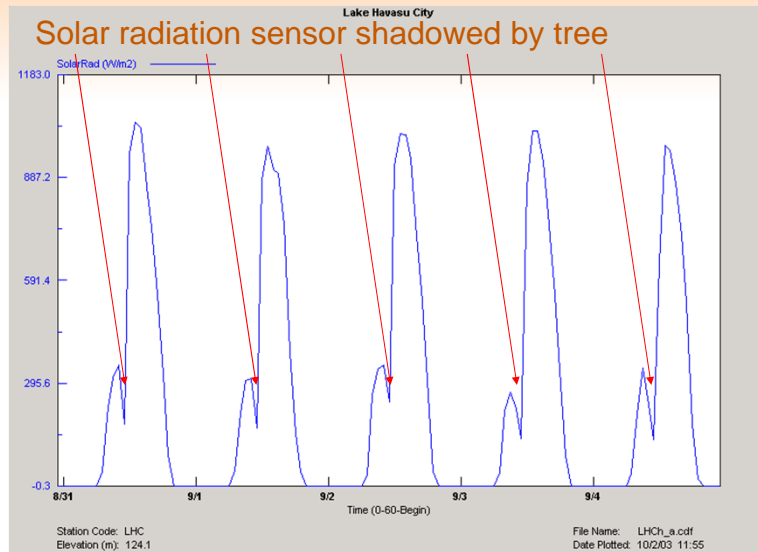


More Surface Meteorological Examples

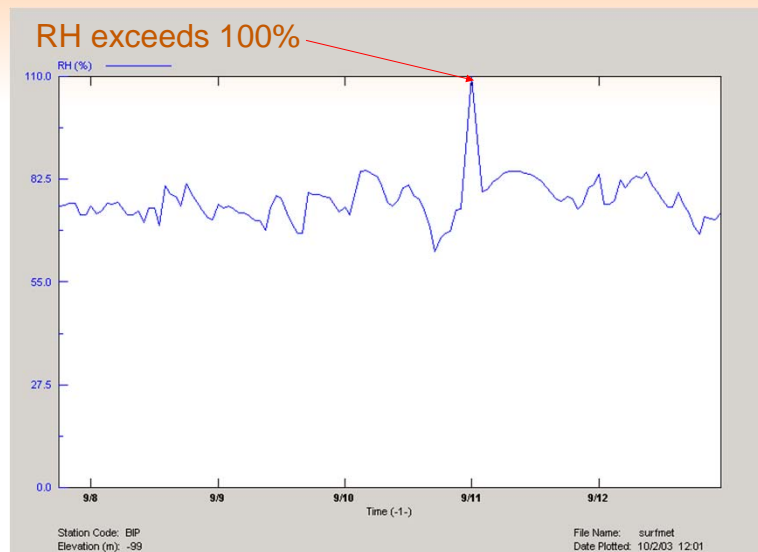
Failure of u-component of wind speed



More Surface Meteorological Examples

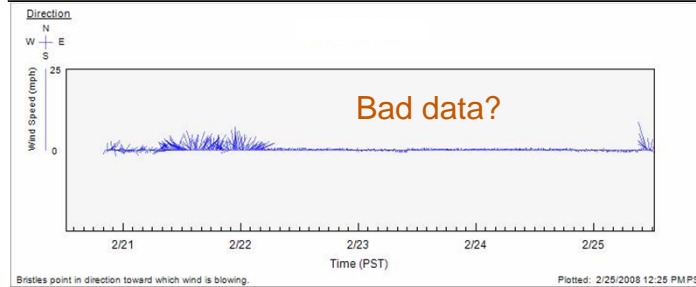
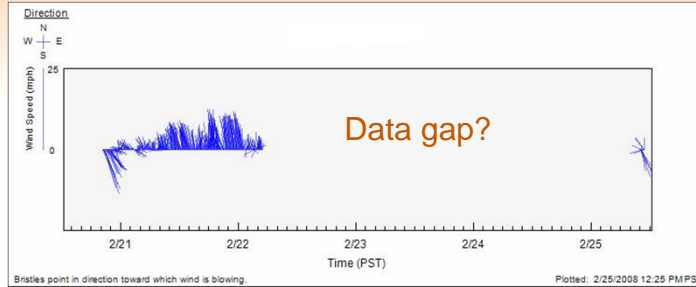


More Surface Meteorological Examples

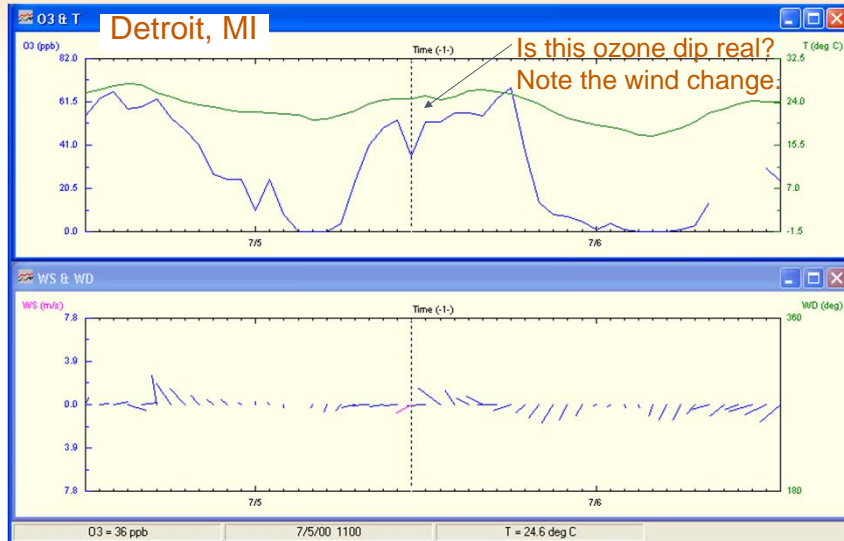


More Surface Meteorological Examples

Two sites located close together had a data collection problem at the same time. A site visit is planned to determine the cause of the problem.



Using Surface Meteorology to Investigate Other Pollutants



Data Sources

Surface meteorological data sources

- National Weather Service (NWS)
<http://www.nws.noaa.gov>
- EPA's AIRS/AQS
- Private meteorological agencies (e.g., forestry service, agricultural monitoring, industrial facilities)
- MesoWest data: <http://mesowest.utah.edu/index.html>

Summary

For surface meteorological data validation,

- Use established screening criteria
- Visually review data
- Use to assist with validation and analysis of pollutants