

Session 5: Surface Meteorological Measurements

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



October 2011

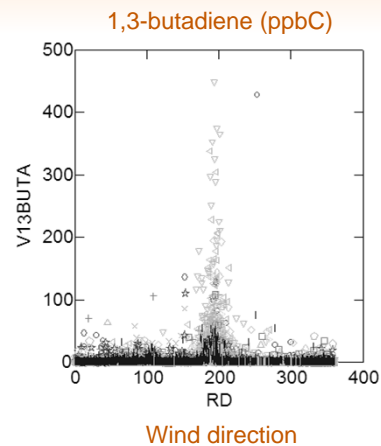
STI

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

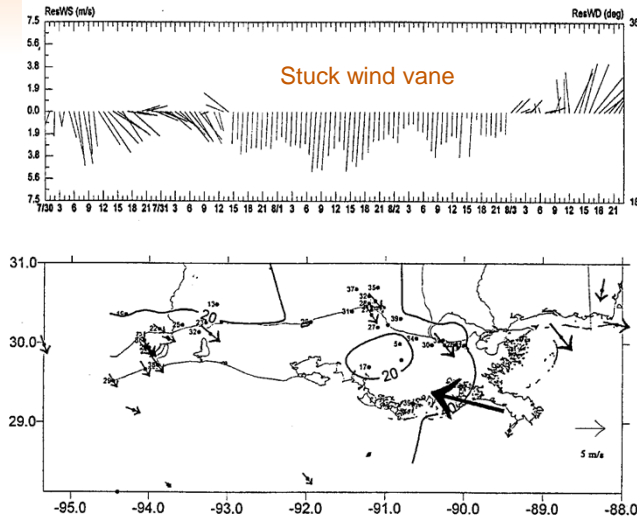
Sigma Theta

is less than 0° or greater than 90°

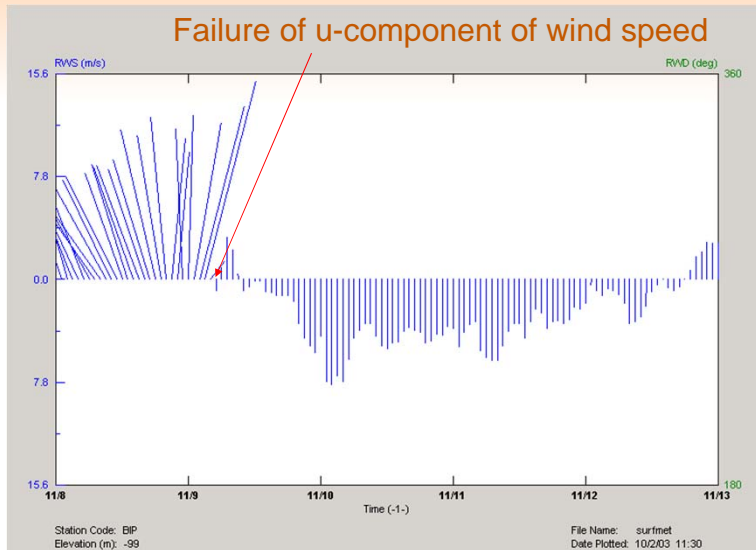
Example Meteorological Data Validation

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

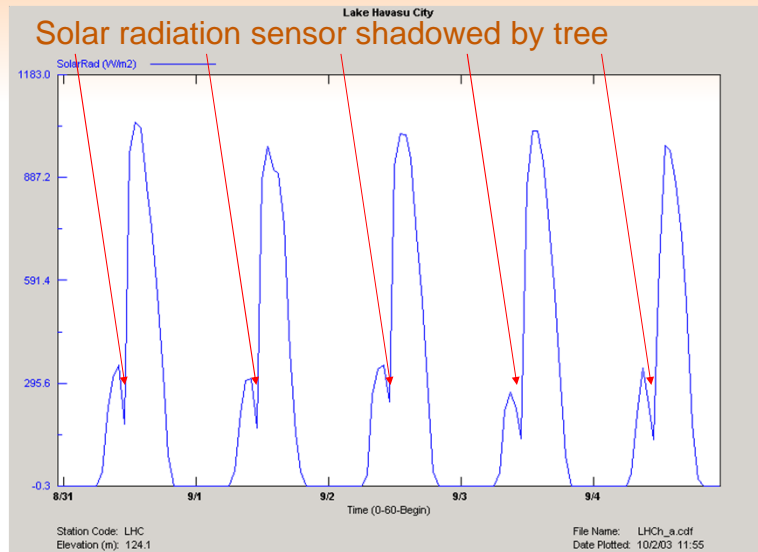
- **Top:** Constant wind directions were reported at Cocodrie, Louisiana, from July 31–August 2, 1993. The wind direction data were invalidated
- **Bottom:** High surface winds at a surface station in Grand Isle, Louisiana, on August 29, 1993, at 0800 CST appear spatially erroneous



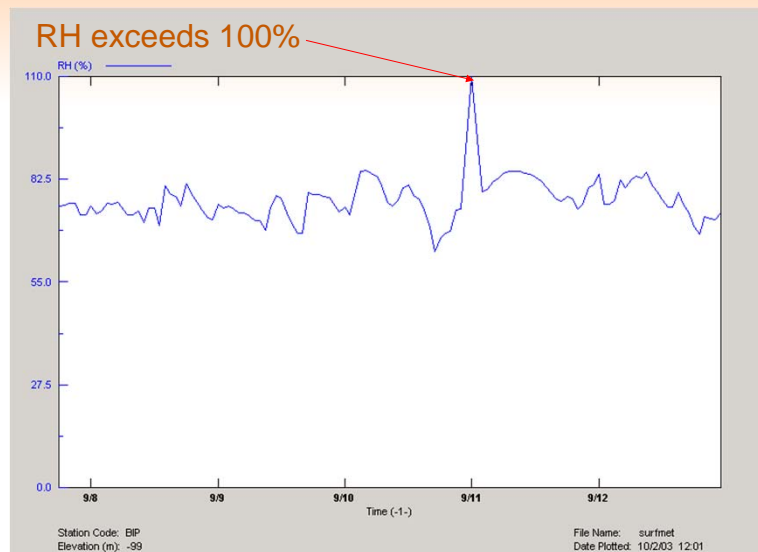
More Surface Meteorological Examples



More Surface Meteorological Examples

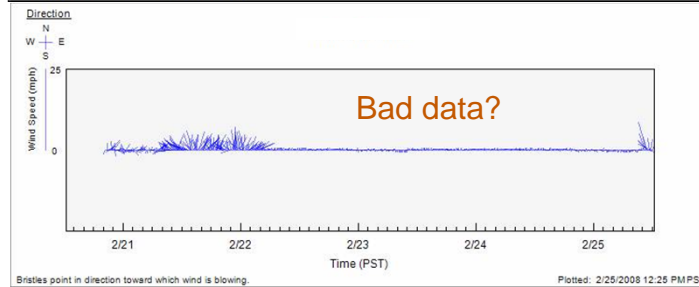
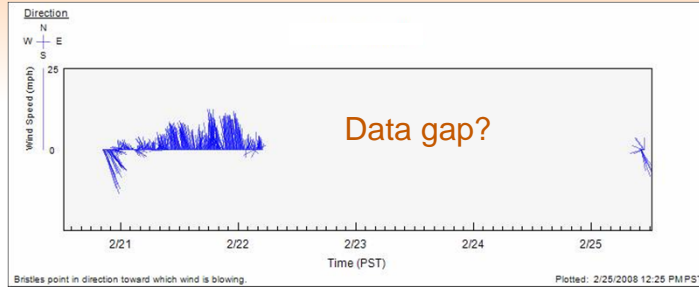


More Surface Meteorological Examples

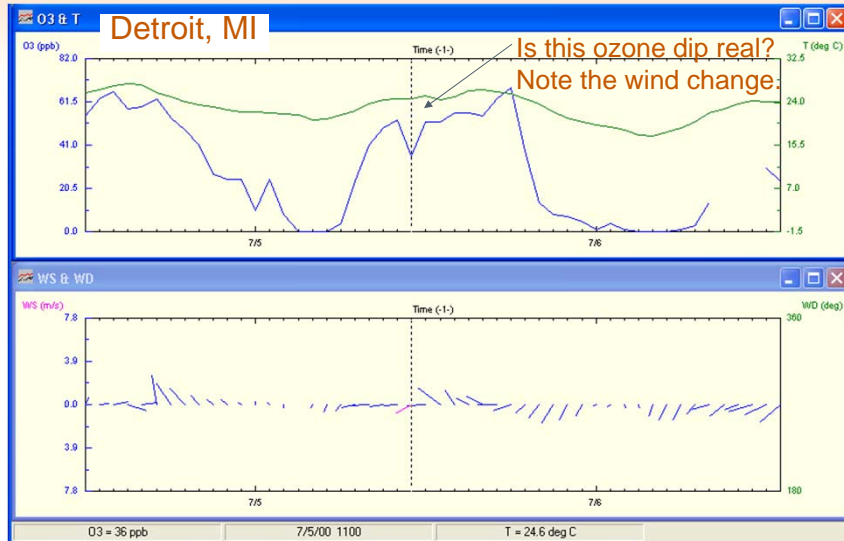


More Surface Meteorological Examples

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