

## Site Selection



NORM, Oklahoma Mesonet

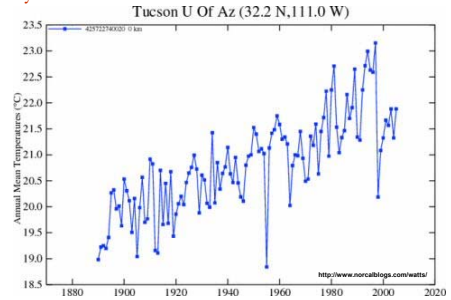


NRMN, Oklahoma Mesonet

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Interpreting data is important  
What does this graph of annual mean temperatures tell you?



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Here's the observing station  
Now what do you think?



Photo Credit: <http://www.norcalblogs.com/watts/>

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Site selection and maintenance is *very* important



We must understand not just how to interpret and analyze observational data, but also where and how those data were collected.

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## Goals for Site Selection

- "The most desirable landscape surrounding a proposed modernized site is an open area that is relatively large and flat with low vegetation so that the horizon can be viewed in an unobstructed manner in all directions except at low elevation angles above the horizon"

NOAA's Environmental Real-time Observation Network (NERON), Site Survey Instructions

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## Goals for Site Selection



Sometimes, achievement of these goals proves difficult...

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## Cradle of Forestry Observing Site



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## Guidance for Site Selection

- If possible, choose locations with existing long-term climate records
- Must provide real-time observations (a communications issue)
- Exposure that is expandable to meet future needs
- Representative of the regional climate within a 15- to 25-km radius
- Not heavily influenced by unique local topographic and mesoscale/microscale features
- Stability of the site for decades
  - Reduce risk of sale of land or encroachment by development
  - Legacy/new stations on land owned by
    - Institutions
    - Community airports
    - Government
    - Colleges (e.g., UNCA)

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## Favorable Site Characteristics

- Not heavily influenced by unique local topographic and mesoscale/microscale features
- Long-term stability of the site and surrounding area
- Large open area that is free of obstructions
- Slight ground slope to allow drainage and sampling of a larger volume of air
- Thick vegetation cover that will not grow so high that it obstructs flow to the air temperature, relative humidity, dewpoint, or water vapor sensors or adversely affects wind measurements

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## Site Characteristics for a Small Sample of Sites

- For a few sites in a small area, pay attention to the following significant characteristics:
  - Cold pockets
    - There should be just enough sites chosen to determine if cold pocket properties change differently through the decades than for other sites – climate research
  - Ridge tops
    - Better exposure for temperature than for precipitation

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## Site Characteristics to Avoid

- Adjacent to irrigated areas (avoided in all circumstances)
- Adjacent to changing land surface conditions
  - Cropping/fallowing cycles
  - Irrigation cycles that change from year to year
  - If unavoidable, site should be at least 90 meters from such land
- Adjacent to artificial heating sources



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## Site Characteristics to Avoid

- Young trees within ~50 meters of the site
- Large ground slope
- Flood plains
  - Unless representative of the region, elevated, and several hundred meters from coasts
- Enclosed locations that may trap air
  - Fog
  - Cold-air advection
- Complex meteorological zones (e.g., near large bodies of water)
- Areas subject to prolonged periods of extreme snow depths (e.g., several meters)

Avoid these characteristics **unless** they are representative of the region

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## Fences

- No fence is completely adequate for security
- Fence objective:
  - Physical barrier
  - Makes a statement: "Please do not come closer or touch the equipment"



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## The Unfortunate Reality...

- *Many sites will be less than ideal!*
  - Selecting a site requires a series of compromises between a number of factors



Cloudy, Oklahoma

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## Classification Scheme

- Documents the representativeness at each site
- Used by
  - NERON/COOP Modernization
  - U.S. Climate Reference Network
  - Meteo-France
- Ranges from 1–5 for each measured parameter

[See Handout](#)



Kenton, Oklahoma

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## Prioritized List of Site-Selection Criteria: NERON – High to Low Priority

1. High-quality siting and exposure meeting climate principles
2. Long-term stability of the instrument sites—low risk of being asked to leave the location during the next 50 years and low risk of significant changes to the surrounding area
3. Microscale features in the nearby landscape must not dominate the synoptic and mesoscale climate signals
4. Communication considerations
5. Year-round access for maintenance visits

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## Site Standards for the Oklahoma Mesonet

- Location
  - Rural sites to avoid anthropogenic influences
- Representativeness
  - Physical characteristics (including soil) representative of as large an area as possible
- Topography
  - As flat as possible
  - Minimum of obstructions
  - No obstructions within 300 m (WMO standard)
  - Distance between obstruction and anemometer is at least 20 times the height of the obstruction

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## Site Standards for the Oklahoma Mesonet

- Accessible by vehicles in all weather
- Vegetation
  - Uniform and low-cover
  - No bare soil
- Oversight
  - Weekly site monitoring

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## Site Standards for the Oklahoma Mesonet Instrumentation

- Wind speed and direction
  - 10 m AGL
  - No obstructions within 300 m
  - Horizontal slope to minimize Bernoulli effect
    - Slope < 17°
  - Second anemometer at height of temperature and moisture measurements for evapotranspiration studies



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## Site Standards for the Oklahoma Mesonet Instrumentation

- Temperature and relative humidity
  - Standard height of 1.5 m
    - Compatibility with existing measurements
    - WMO standard is 1.25–2.0 m
- Shortwave and longwave radiation
  - No shadows cast on solar radiation sensor
  - Slope < 5° to avoid aspect problems in measurements
- Pressure
  - Minimize dynamic pressure



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## Site Standards for the Oklahoma Mesonet Instrumentation

- Precipitation
  - Minimize turbulence around gauge
    - Open site is good for wind measurements, but **bad** for precipitation
    - Opening in grove of trees, bushes, or shrubbery provides the best exposure
    - Use a wind shield (Alter shield)
  - Level ground
  - Surrounding objects not closer than a distance equal to four times their height



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## Site Standards for the Oklahoma Mesonet Instrumentation

- Soil temperature and soil moisture
  - Soil is representative of entire area
    - Occurs naturally with uniform slope
  - WMO standard depths
    - 5, 10, 20, 50, 100 cm
    - This isn't exactly how things were done though...
  - Be careful of shadows!



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