NEI Proposal for Offsite Met Data Sources

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Background

- Section 206(c)(2)(C) of the ADVANCE Act calls for the NRC to consider matters related to "the availability of historical site-specific environmental data".
- Regarding requirements for site-specific meteorological data, RG 1.23 (1972, Rev 1 issued in 2007) is the sole NRC-endorsed methodology for site-specific meteorological data collection. RG 1.23 was developed in the 1970's to support the needs of large light-water power reactors.
- RG 1.23 Rev 1 requires installation of an onsite tower. This brings schedule impacts:
  - Potential critical path data collection
  - Eng/proc/install – up to 1 year (long-lead time on equipment)
  - Data collection – 1 to 2 years pre-application
  - Data processing and impact modeling – 6 months
- 10 CFR 50.160 (November 2023) provides a performance-based framework for emergency preparedness (EP) for SMRs, non-light-water-reactors, and non-power production or utilization facilities (NPUFs). A performance-based framework for EP is an alternative to 10 CFR 50 Appendix E.
- The ADVANCE Act when combined with a performance-based alternative to 10 CFR 50 Appendix E in 10 CFR 50.160 justifies the need for a more flexible and updated approach to collecting site-specific meteorological data for proposed projects.
  - Enables an efficient licensing process while meeting reasonable assurance of adequate protection of public health and safety

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Background

- Overall approach - leverage existing off-site meteorological data sources as much as possible
- Sargent & Lundy (S&L) developed a draft report to NEI (“Meteorological Data Alternatives to RG 1.23”). Report has been reviewed by NEI task force. Task force includes operating companies and advanced reactor developers.
- Gather information from this public meeting and issue final report in April.
- **NEI requests the NRC to update RG 1.23 to endorse off-site meteorological data sources as being acceptable alternatives to an on-site meteorological tower**
  - Requires endorsement of alternative methodologies to estimate atmospheric stability class

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Alternative Meteorological Data Sources

Leverage existing off-site meteorological data sources as much as possible

- Airport data from NCEI (National Centers for Environmental Information)
  - NCEI subjects data to detailed and published QA/QC procedures before archived data are available to the public
  - Archived data back to WWII for select airports
  - Approximately 5,000 airports in conterminous US
  - Data currently available at no cost
  - Data are readily available via the internet from NCEI and the National Weather Service (NWS)
    - Real-time hourly data available from NWS
  - Metadata available from NCEI ("data about meteorological data sources")
    - Climate zone maps (weather stations grouped by climate zone)
      - Reviewed by climatologists (representativeness in RG 1.249)
    - Published data inventories (data completeness in RG 1.249)
    - Weather station history (representativeness in RG 1.249)
      - Station elevation, siting characteristics
      - Types of weather instruments

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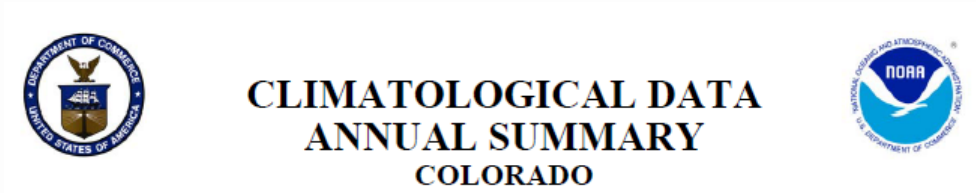
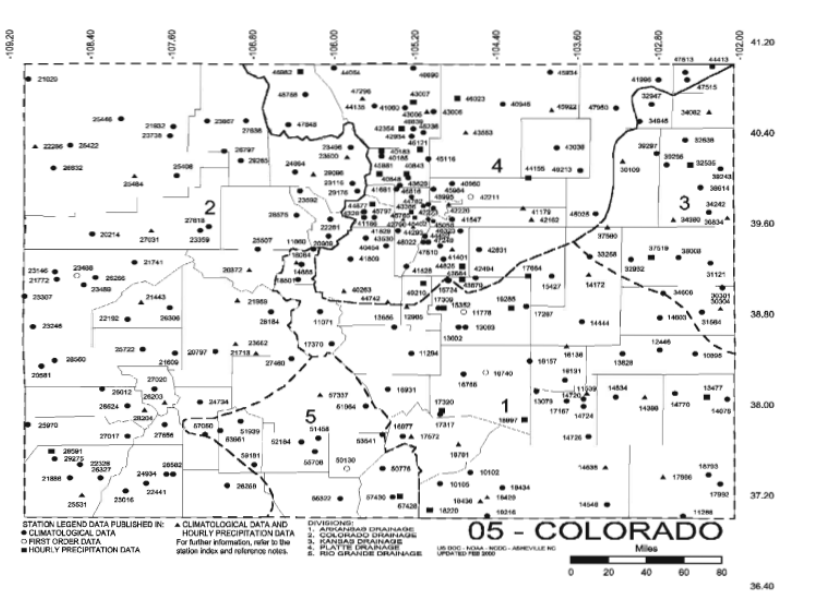
Alternative Meteorological Data





Source: www.ncei.noaa.gov

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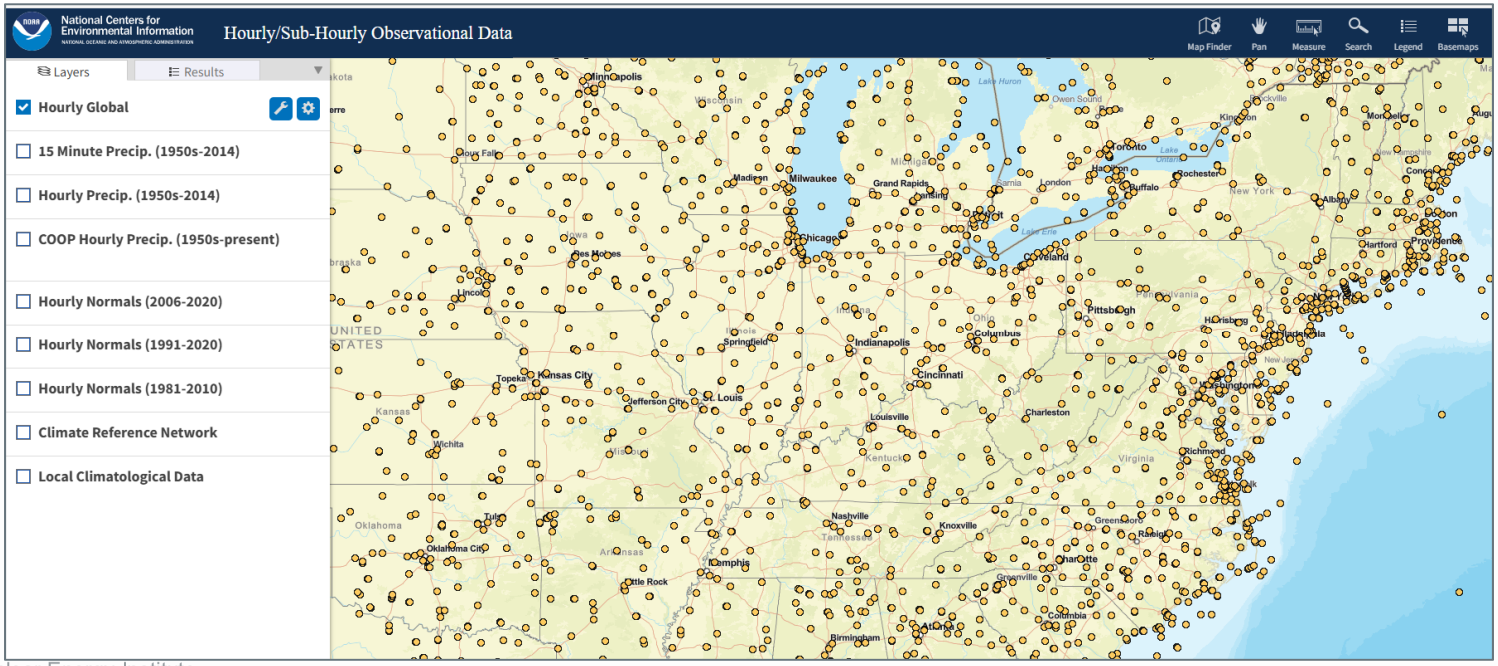
Alternative Meteorological Data Sources

NCEI Map Viewer Application - Data Locator

GIS Maps | National Centers for Environmental Information (NCEI)



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Alternative Meteorological Data Sources

- "Mesonets" – state-level networks of meteorological stations
  - Mesonets have grown in coverage since RG 1.23 Rev 1 was issued in 2007
    - 29 mesonets in U.S.
  - Federal, state, and private-sector network sponsors
  - Currently support weather-sensitive activities
    - Real-time weather analysis and forecasting
    - Agriculture and insurance industries
    - Emergency response
    - Air dispersion modeling
  - Stations may be available at the county- or sub-county level
    - Example: Oklahoma Mesonet: 77 counties on Oklahoma, some counties have more than one mesonet station

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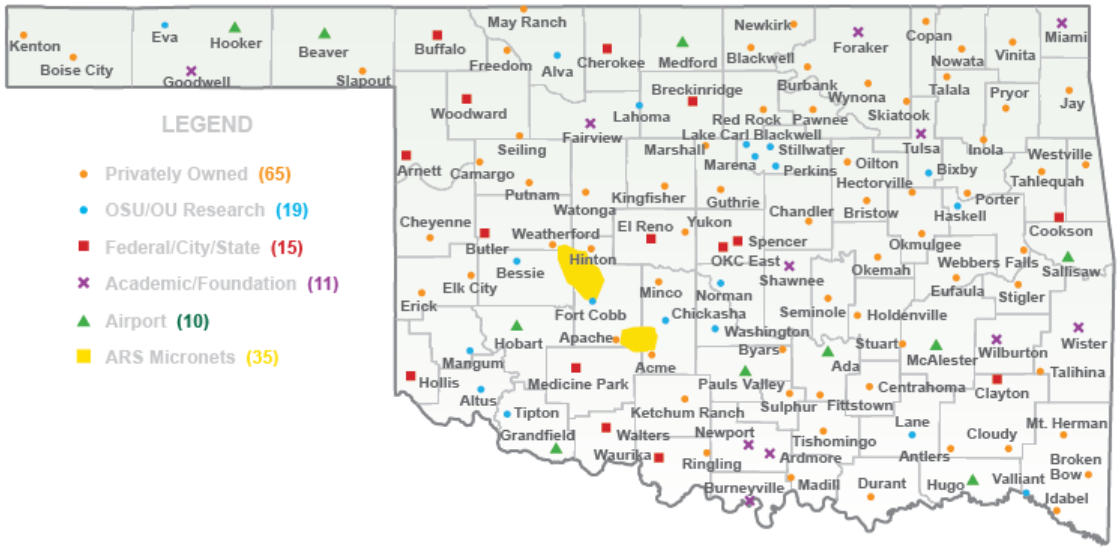
Alternative Meteorological Data Sources

Oklahoma Mesonet Stations and Sponsors



Source: www.mesonet.org

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Alternative Meteorological Data Sources

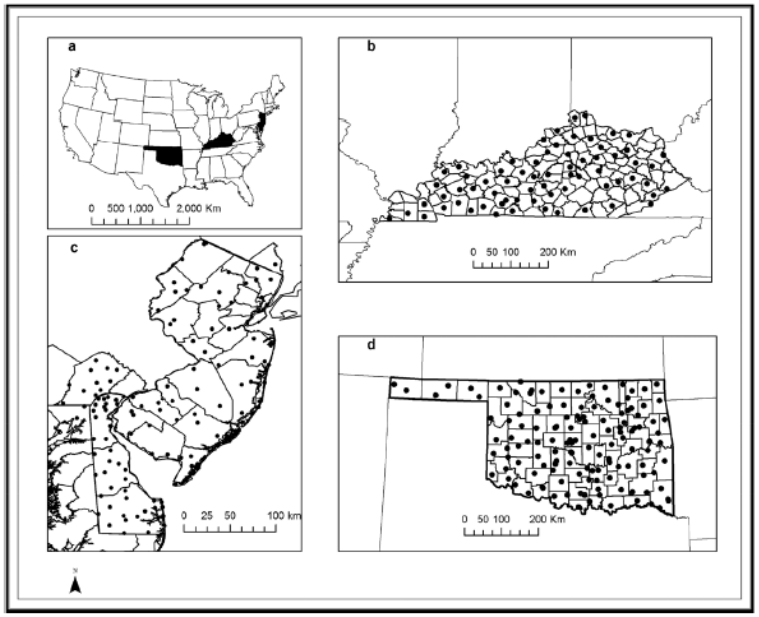
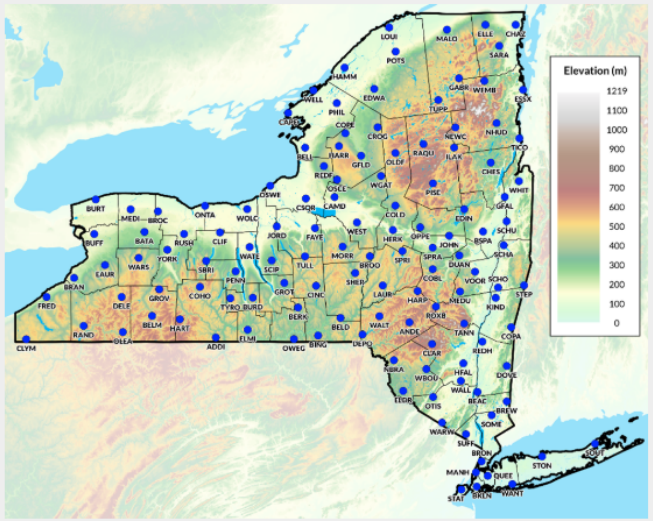


FIG. 1. Example of mesonets in the United States: (a) a map of conterminous United States with four states with mesonets (filled in black color), (b) Kentucky Mesonet, (c) Delware and New Jersey Mesonets, and (d) Oklahoma Mesonet.

Source: Mahmood *et al.,* 2017. MESONETS Mesoscale Weather and Climate Observations for the United States. Bulletin Amer. Meteor. Soc. July 2017.



— *The Mesonet network includes stations in all 62 New York State counties including the five boroughs of New York City*

Source: https://espatiallynewyork.com/tag/arcgis/ork

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Alternative Meteorological Data Sources

- "Mesonets" – state-level networks of meteorological stations
  - Mesonet stations often use research-grade instrumentation with similar specifications in RG 1.23 and USEPA guidance
  - Some state environmental agencies may require use of mesonet stations in industrial air quality modeling
    - Example: Oklahoma Department of Environmental Quality
  - Descriptions of instrumentation and metadata available from published literature and/or sponsor (RG 1.249 requirements)

Newly completed Mesonet Weather Station on the Lower Brule Sioux tribal reservation in South Dakota, Aug. 23, 2023. (U.S. Army Corps of Engineers photo by Makenzie Leonard)

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Alternative Meteorological Data Sources

- Data from state/local environmental agencies (starting in ~2011)
  - Data sets for use in industrial air dispersion modeling (Federal and State environmental agencies)
  - May use airport data from NCEI or mesonet data
  - High-resolution, 1-minute airport data (comparable to RG 1.23)
    - 0.1 m/s wind speed resolution
    - 1 degree wind direction resolution
  - Data sets have been vetted by environmental agencies
    - Benefit - additional examination of data quality, completeness, and representativeness (RG 1.249)
  - Representative data sets are identified at the county level
  - Data sets meet completion requirements specified by the USEPA and NRC
    - Both agencies require at least 90% annual data availability
- Portable weather stations from FEMA
  - Measure wind speed/direction, temperature, and turbulence levels
  - Currently used for temporary monitoring

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Alternative Meteorological Data Sources

- Atmospheric stability computational methods
- Draft report summarizes computational methods and published benchmarking studies that compare methods
  - Delta-T - vertical temperature difference (NRC 1972, 2007)
    - Currently seven stability classes (A-G) based on RG 1.23, Rev. 1
  - Turner's method (Journal of Applied Meteorology, February 1964)
    - Wind speed, cloud cover/amount, time of day
    - Seven discrete stability classes (A-G)
    - Used in EPA models for industrial sources until 1990s
    - Still used in emergency response models (e.g. EPA's ALOHA model)
  - Solar radiation/Delta-T (USEPA 1993)
    - Update of the Delta-T method
    - Improved results of the Delta-T method during unstable conditions
    - Retains Delta-T during the nighttime hours

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Alternative Meteorological Data Sources

- Atmospheric stability computational methods
- Direct measurements of turbulence
  - Uses standard deviation of horizontal and/or vertical wind direction at a single level
  - An early method from the early 1960s carried into NRC Safety Guide 23 (1972)
  - Alternative method when delta-T is not available

- AERMOD/AERMET stability computation methodology (2005-present)
  - State-of-the art methodology in industrial air quality modeling with USEPA's AERMOD
  - EPA replaced the Turner method in its update of air quality models in the 1990s-early 2000s
  - Atmospheric stability is treated as a continuum instead of discrete stability classes (A-G)
  - Flexible - uses various input data sources (e.g., airports, mesonet stations, met. towers)
  - Would require updates of NRC's air dispersion codes
  - Longer-term effort…not asking for the NRC's endorsement at this time

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