AERMOD Implementation Workgroup – Update

Randy Robinson
EPA Region 5

9th Conference on Air Quality Modeling
October 9-10, 2008

Outline

- Provide background on AIWG
- Discuss group organization and purpose
- Discuss issue identification and prioritization
- AIWG accomplishments to date
- Highlight issues and actions

AIWG Background

- First AERMOD Implementation Workgroup
  - Initiated in April 2005
    - Co-Chaired by Al Cimorelli (R3), Warren Peters (OAQPS)
    - Members – States, Locals and EPA Regions
    - 3 goals -
      - Recommend process for handling implementation issues
      - Establish “Implementation Guide”
      - Identify all known unresolved issues.
  - Final Report April 2006

Current AIWG - Organization

- Full AIWG Group
  - Co-chairs: Roger Brode (OAQPS), Randy Robinson (R5)
  - State, Local, EPA Regions, EPA HQ
- Inaugural AIWG Conference Call - January 2007
- Purpose
  - Advise OAQPS on implementation issues
  - Provide input for planning/budgeting purposes
  - Develop action plans with other groups, e.g., AERMIC
  - Provide feedback on guidance, Clearinghouse process, and communication materials.

ISSUES

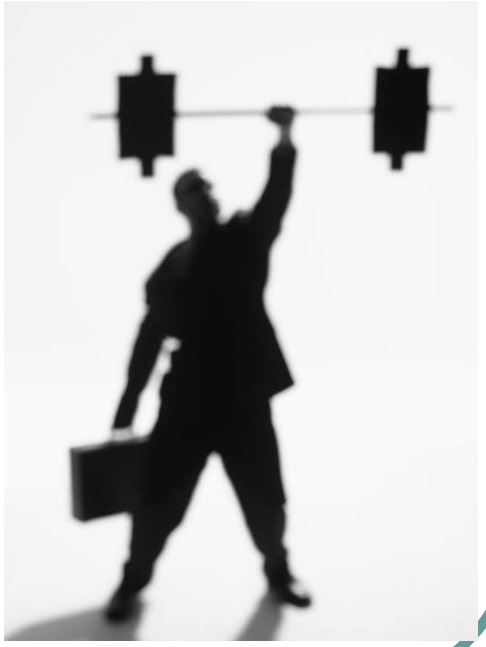
- Initial list of 57 AERMOD related issues
- Narrowed to 10, then to 3
  - Developed Subgroups – Chairs
    - ASOS/Met Data – Alan Dresser (NJDEP) / Joe Sims (ADEM)
    - Urban Issues - Margaret Valis (NYDEC)
    - Surface Characteristics – Doris Jung (CO DPHE)
- All issues important. Work on others as time permits.

Accomplishments

- Updated AERMOD Implementation Guide
  - Original Document - September 2005
  - Latest Version - January 9, 2008

  Revisions include:
  - New and improved structure
  - Met Data and Processing
  - Urban Applications

- AERSURFACE



AERMOD Implementation Guide Updates

- New Structure
  - Added Table of Contents
  - What's new section
  - Background and Purpose section
  - References Section
  - Designed to be easier for EPA to update and for user to find relevant information

AERMOD Implementation Guide Updates

- Meteorological Data and Processing
  - Determining Surface Characteristics
    - Discussion of representativeness
    - Updated method for determining Surface Characteristics
    - Use of AERSURFACE
  - Processing upper air data
  - Processing site-specific met in urban areas

AERMOD Implementation Guide Updates

- Urban Applications
  - Urban/Rural Determination
    - Recommend examining heat island effect across domain rather than source-by-source
  - Population Input
    - Recommendations on approach for determining appropriate population input.
  - Clarification of urban roughness length
    - Used to account for urban heat island effect, not for differences in roughness between measurement site and urban application site.

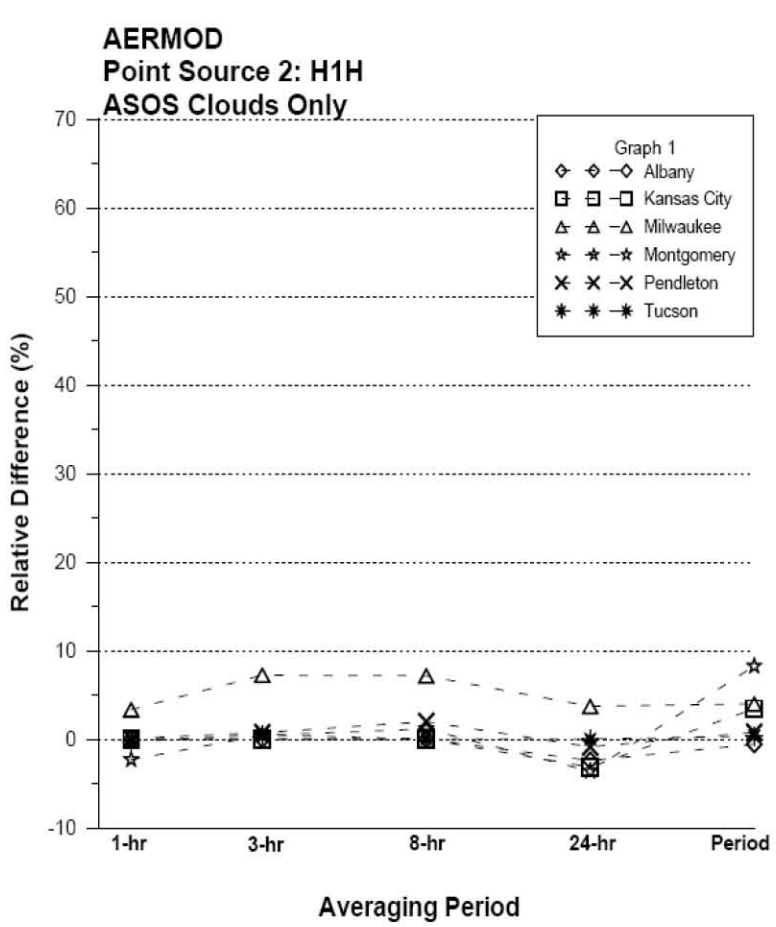
ASOS and Met Data Processing Subgroup – Issues and Actions

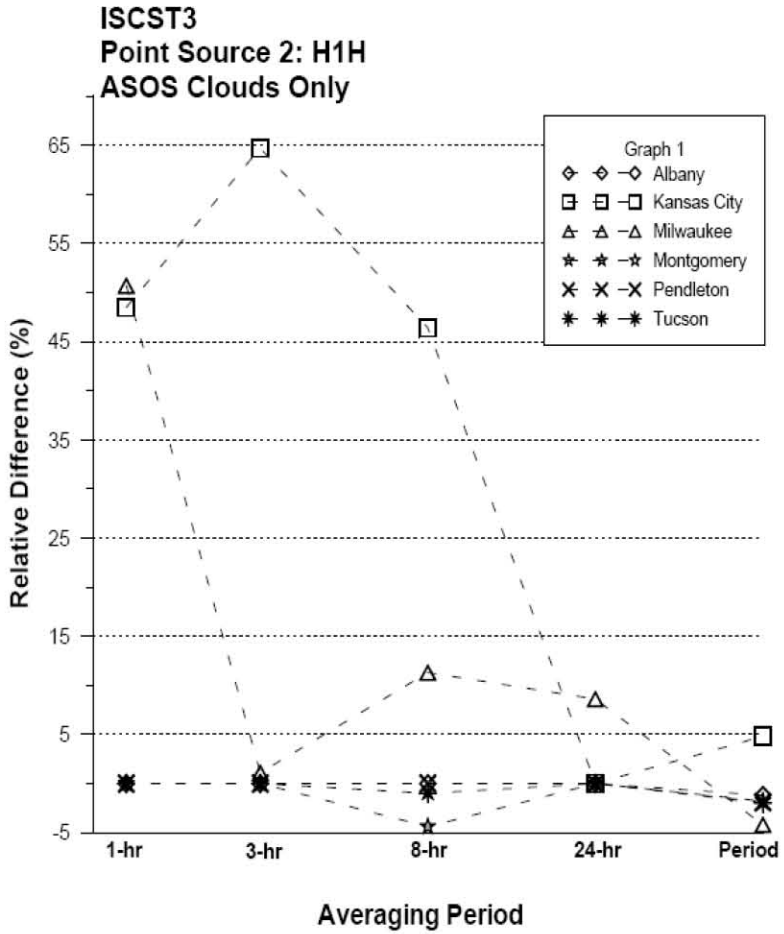
- Impact of ASOS data versus pre-ASOS data on AERMOD predicted concentrations.
- Guidance and tools for missing data and improving quality assessment and reporting in AERMOD.
- Impact of light winds in AERMOD
- Use of hourly average ASOS winds.

ASOS vs. Pre-ASOS Predictions

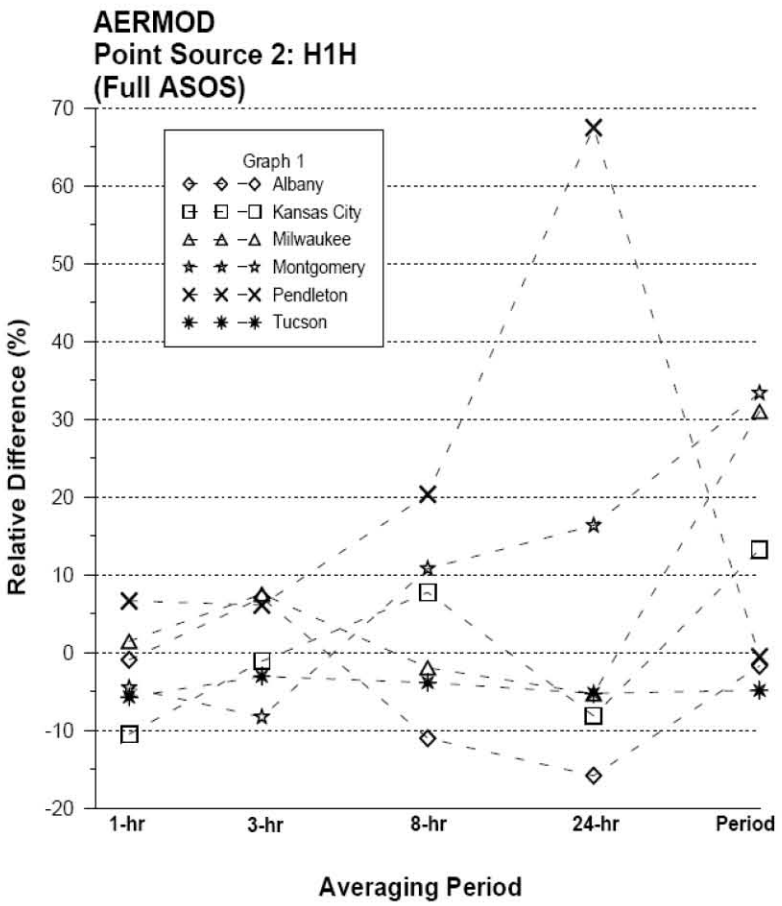
- Action:
  - Compare AERMOD model predictions using pre-ASOS and ASOS met data from same NWS stations and times. (Redo 1997 Study)
- Conclusions:
  - Use of ASOS data overall, less of an issue with AERMOD than with ISCST3. Lack of complete cloud cover less significant for AERMOD than for ISCST3.

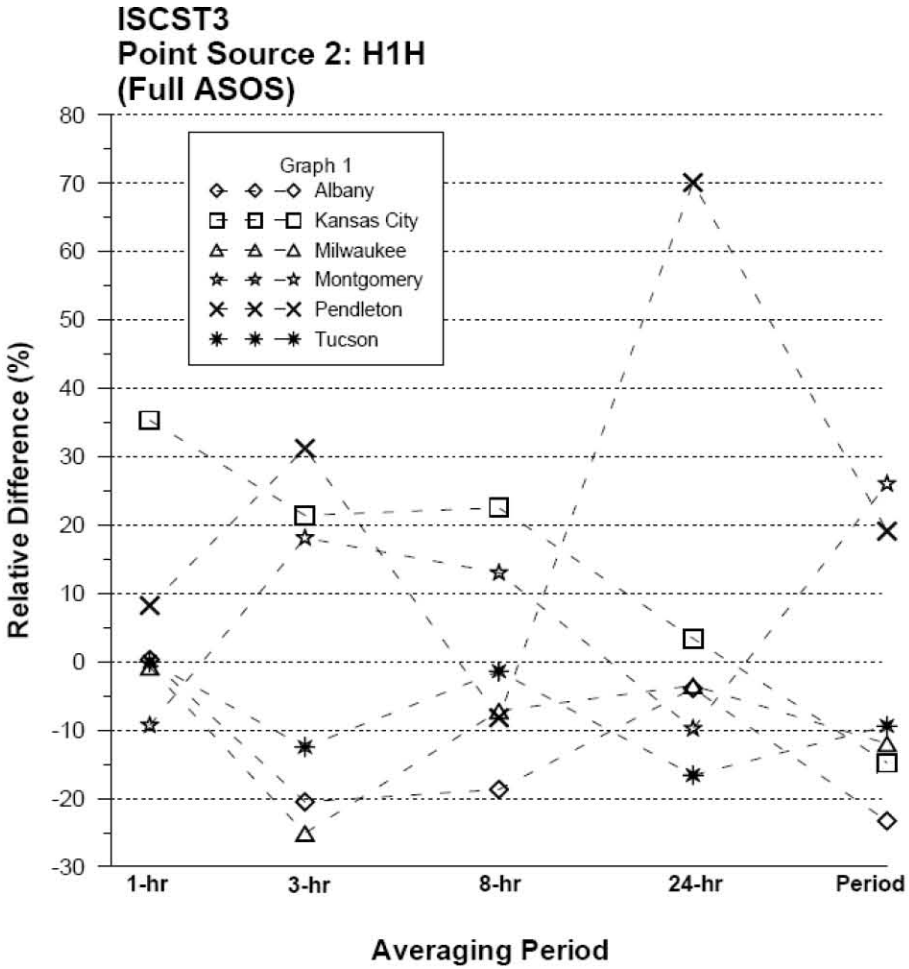
AERMOD ASOS Sensitivity – Clouds Only: 35m Stack No Downwash





AERMOD ASOS Sensitivity – Full Data: 35m Stack No Downwash



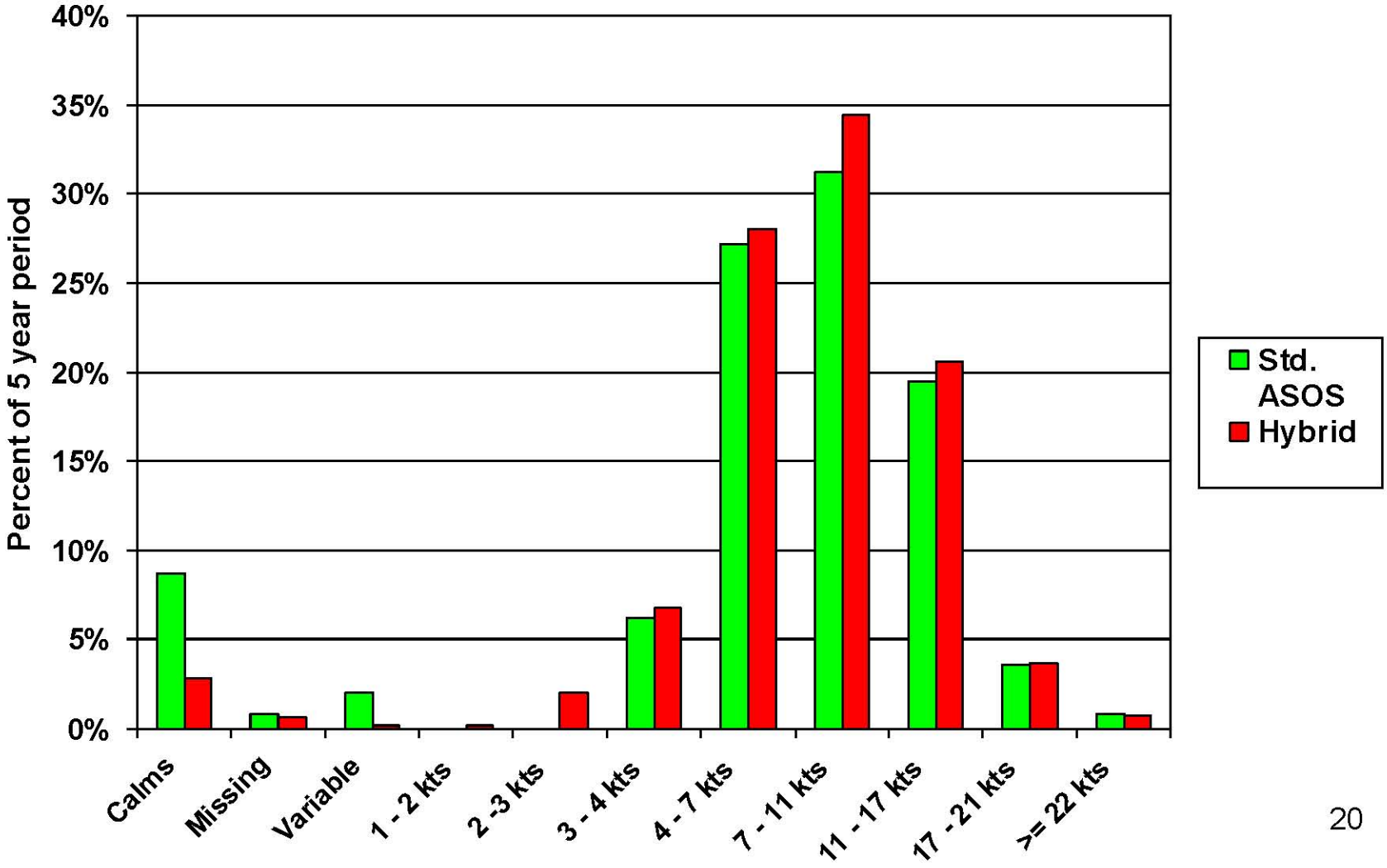


Hourly Averaged Winds

- Currently use 2-minute average winds taken about 10 minutes before the hour.
- 2-minute winds are available every minute for first order NWS stations (starting in 2000, other sites starting in 2005).
- Capability to compute hourly average winds from the 2-minute data.
- Expectation that this would reduce reported “calms” and missing data currently reported.
- What is the impact on AERMOD concentrations of using hourly ave. winds

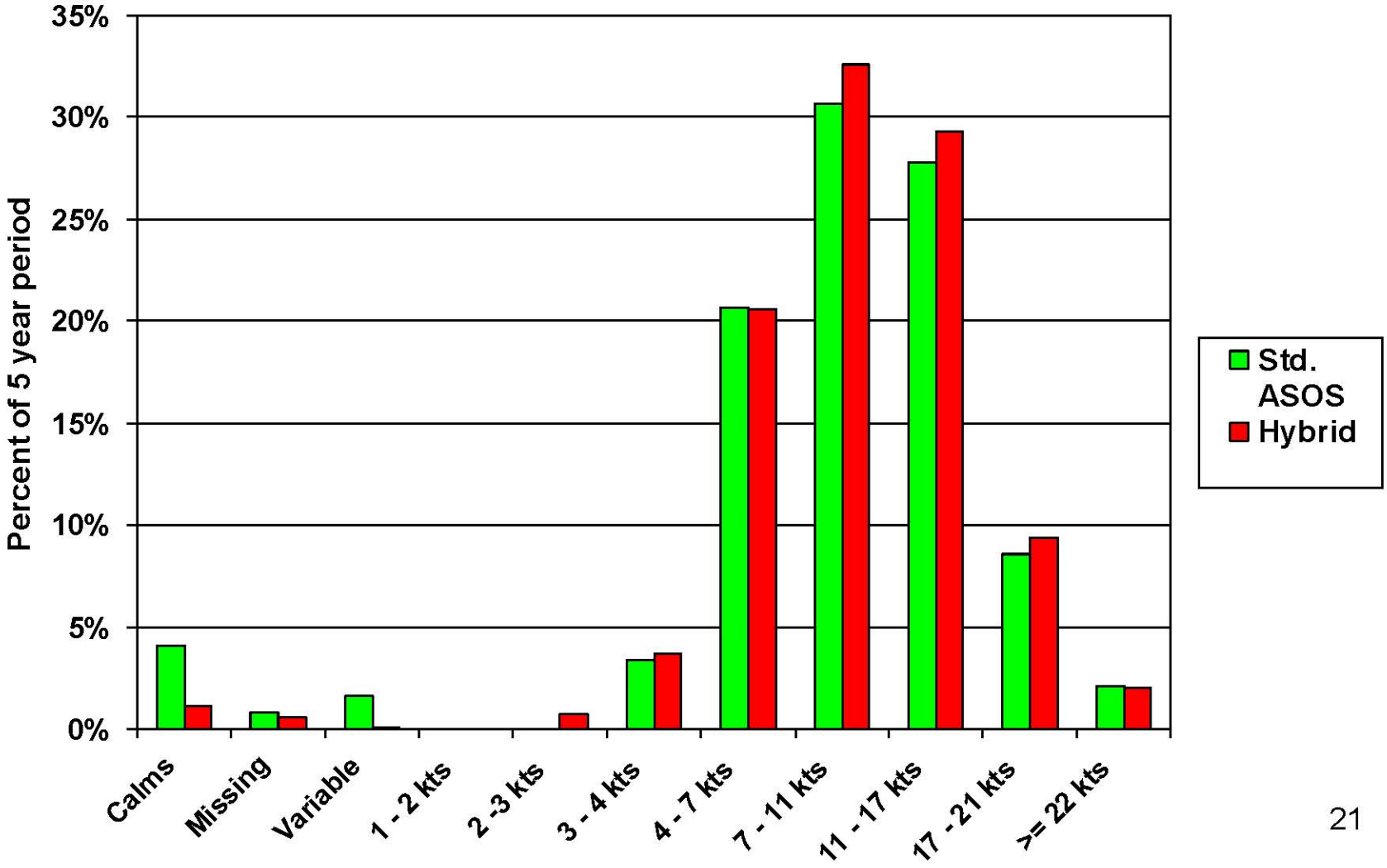
Wind Speed Distributions

Detroit, MI 2003-2007



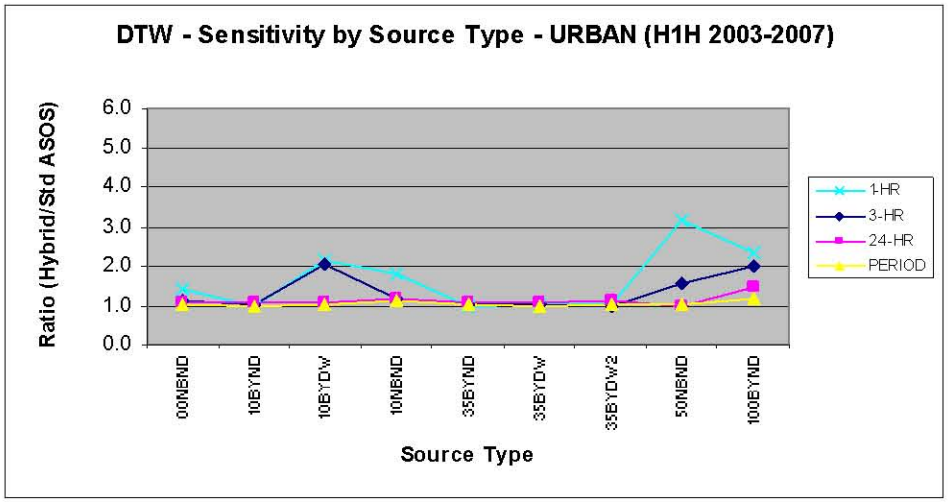
Wind Speed Distributions

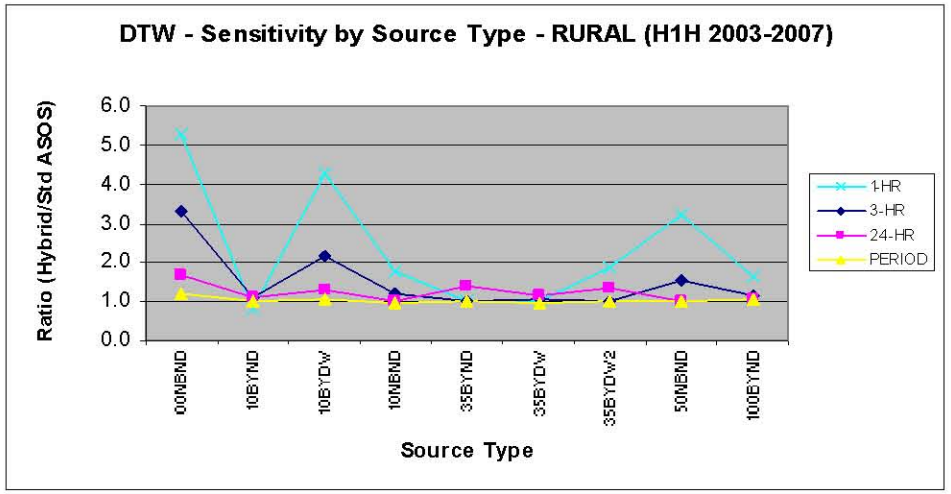
Oklahoma City, OK 2003-2007

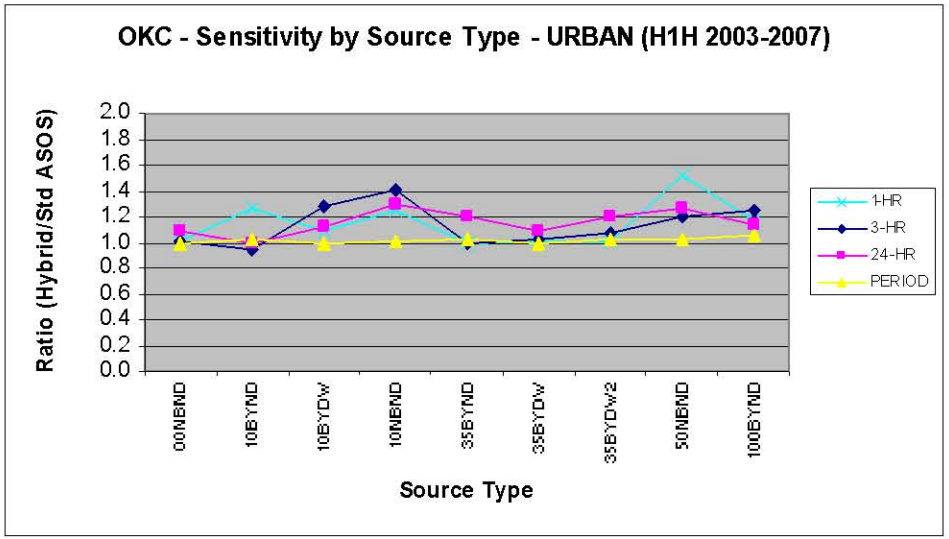


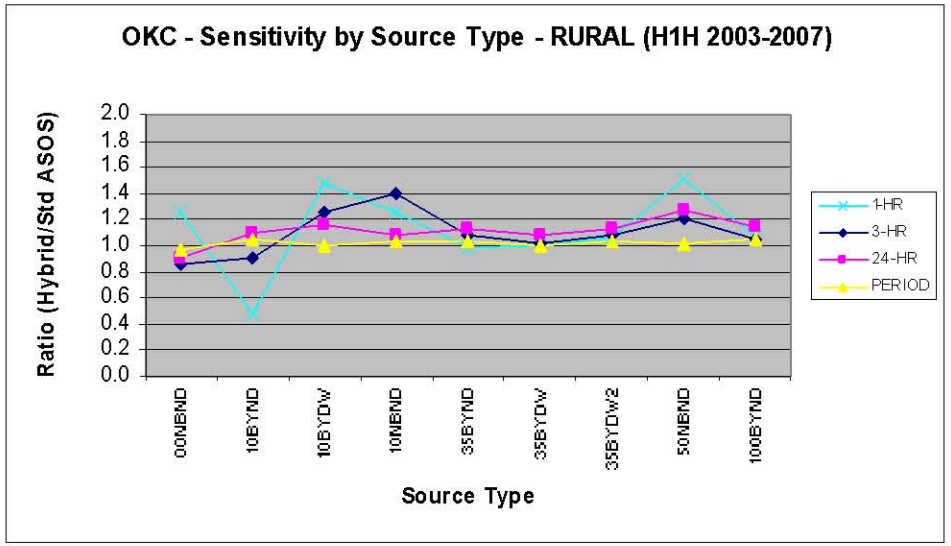
AERMOD Using Hourly Averaged Winds

Variation of AERMOD concentrations for a variety of source types and averaging periods, using standard ASOS and 1-min/standard ASOS hybrid.









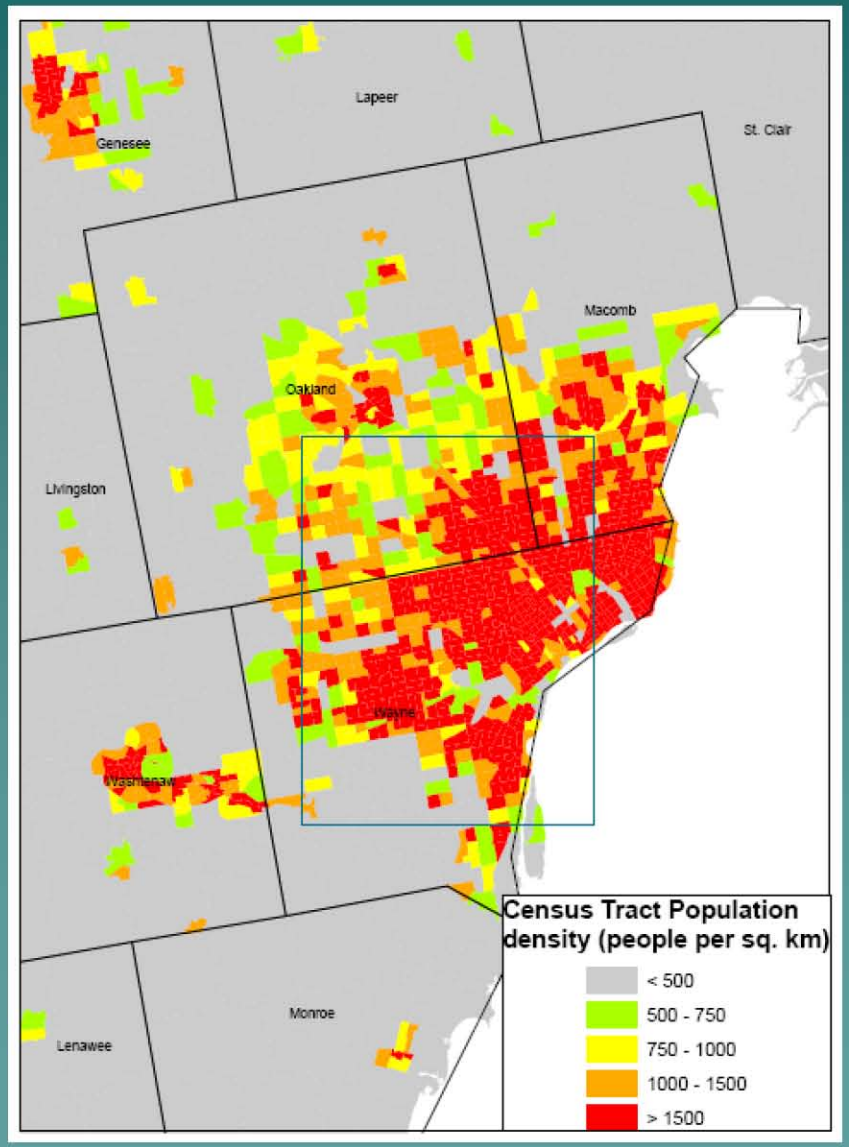
Urban Issues Subgroup – Issues and Actions

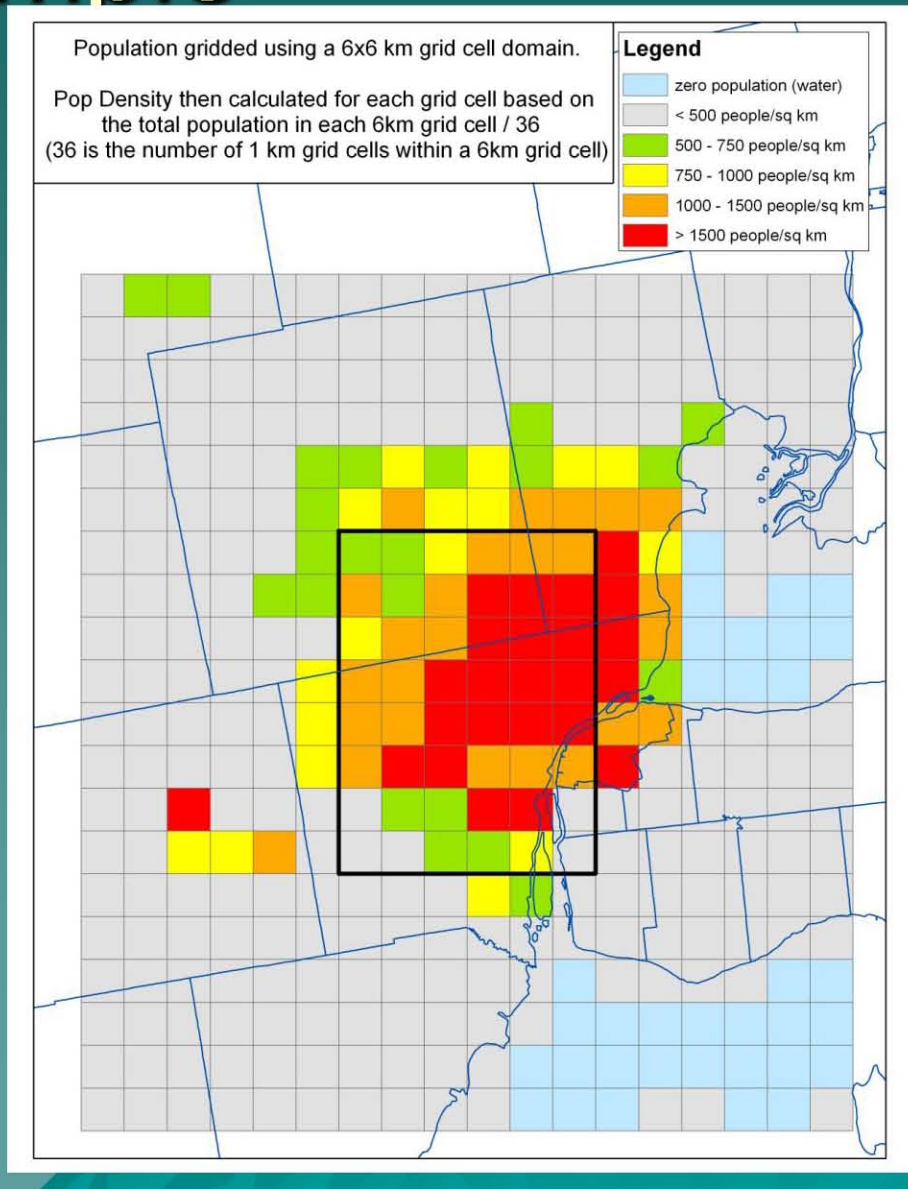
- Urban/Rural Determination
- Guidance on Population Input for urban option
- Urban roughness length clarification
- Methods/surrogates for quantifying heat island effect
- Enhanced dispersion from large heat sources not related to population.

Population Input Issue

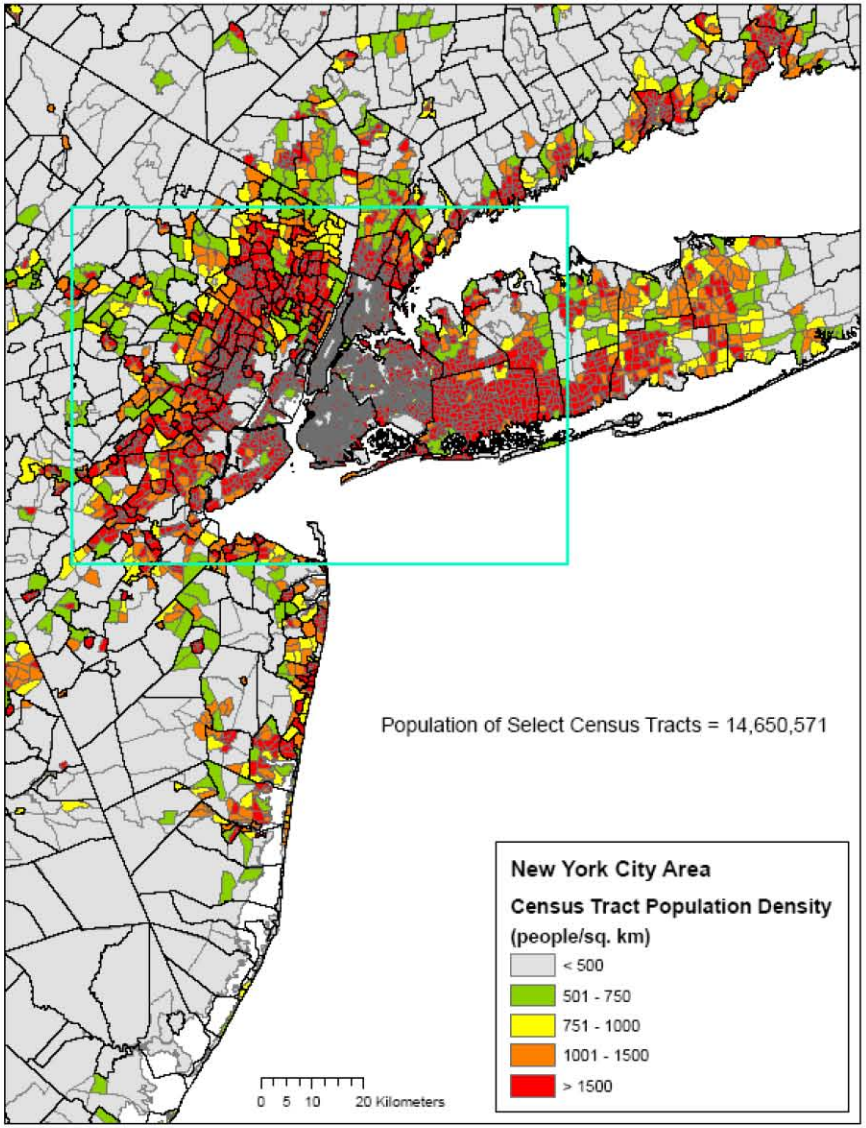
- Population used as surrogate for urban heat island nighttime impacts.
  - Magnitude of population value used inversely related to modeled concentrations.
  - What population is appropriate?

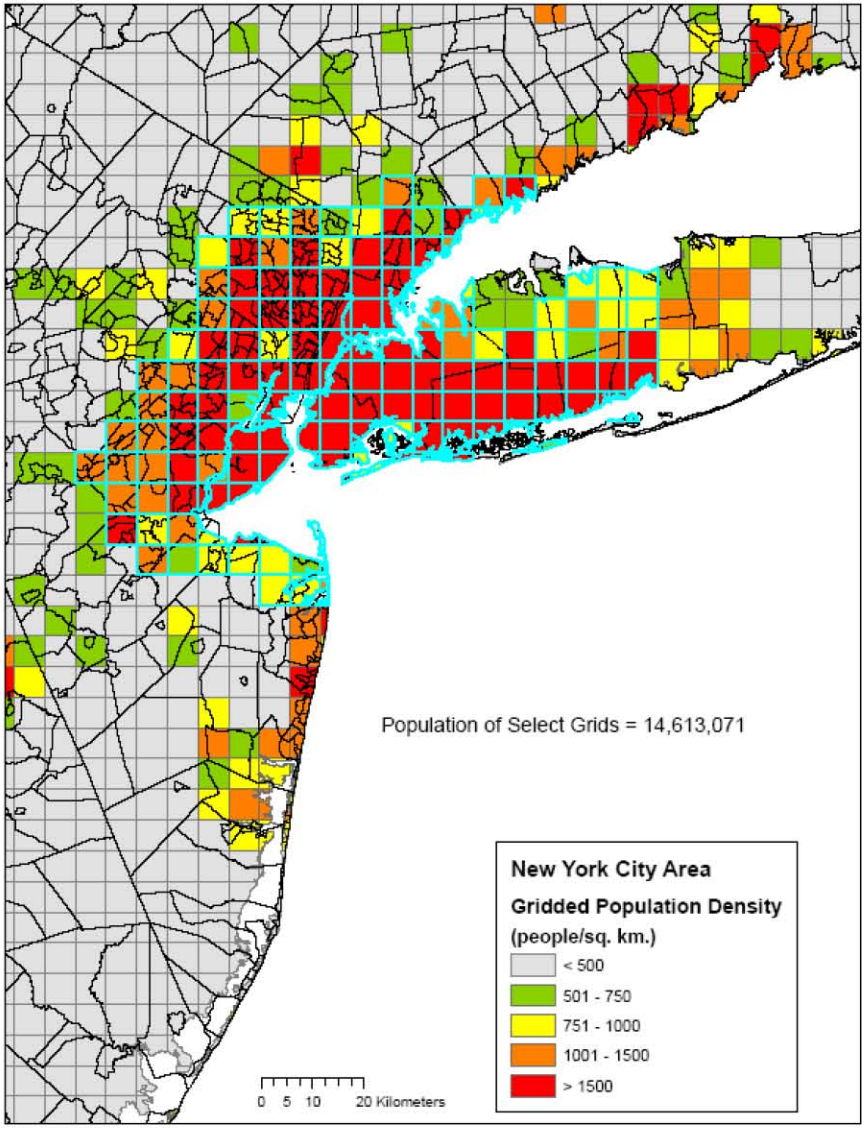
Population Density – Detroit Example



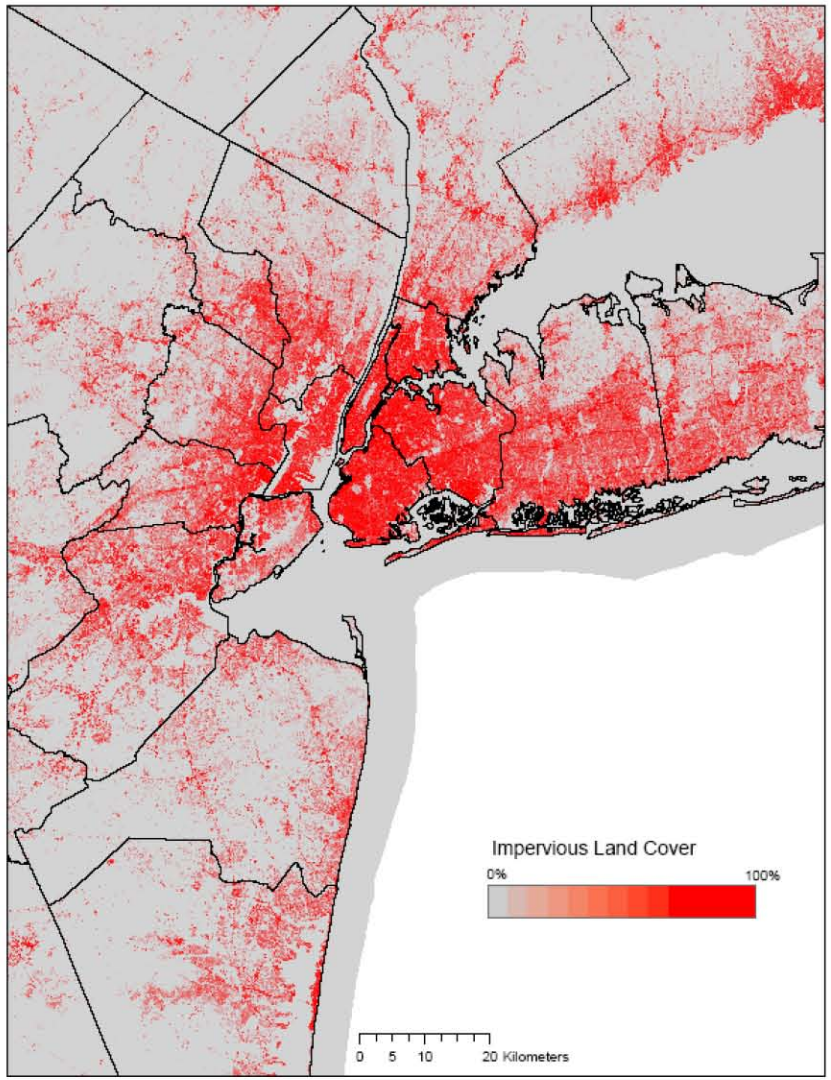


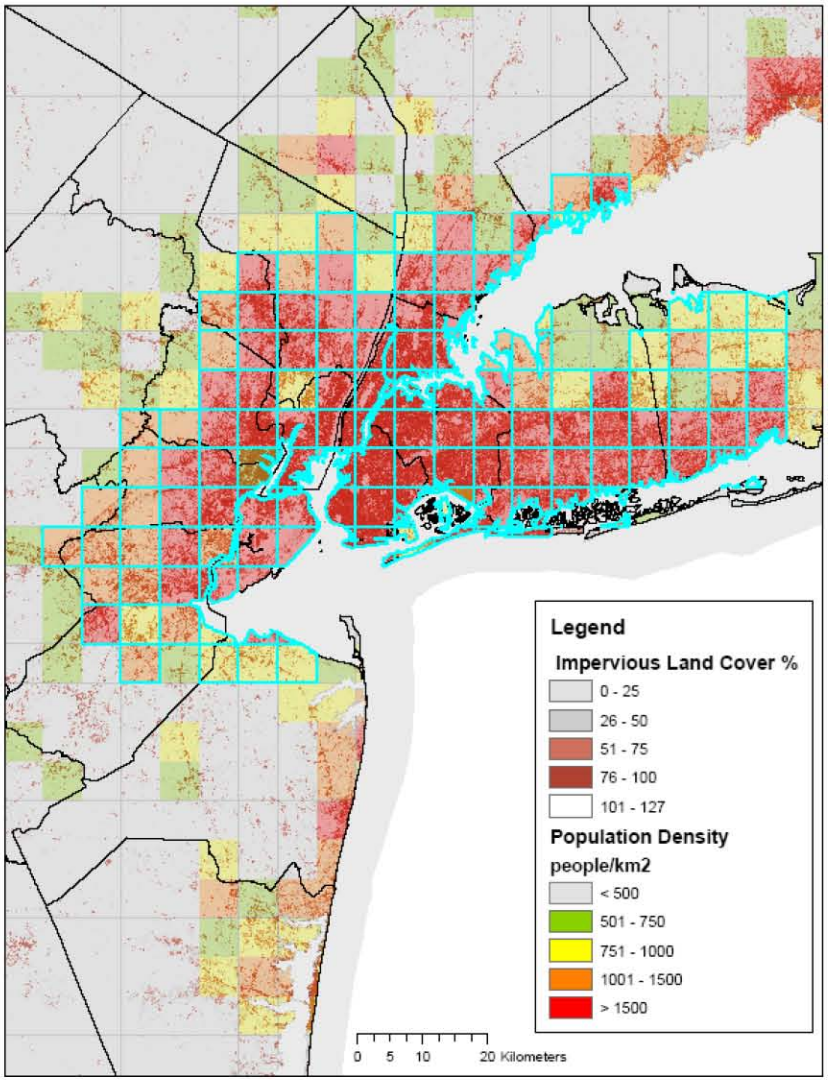
Population Density NYC Example





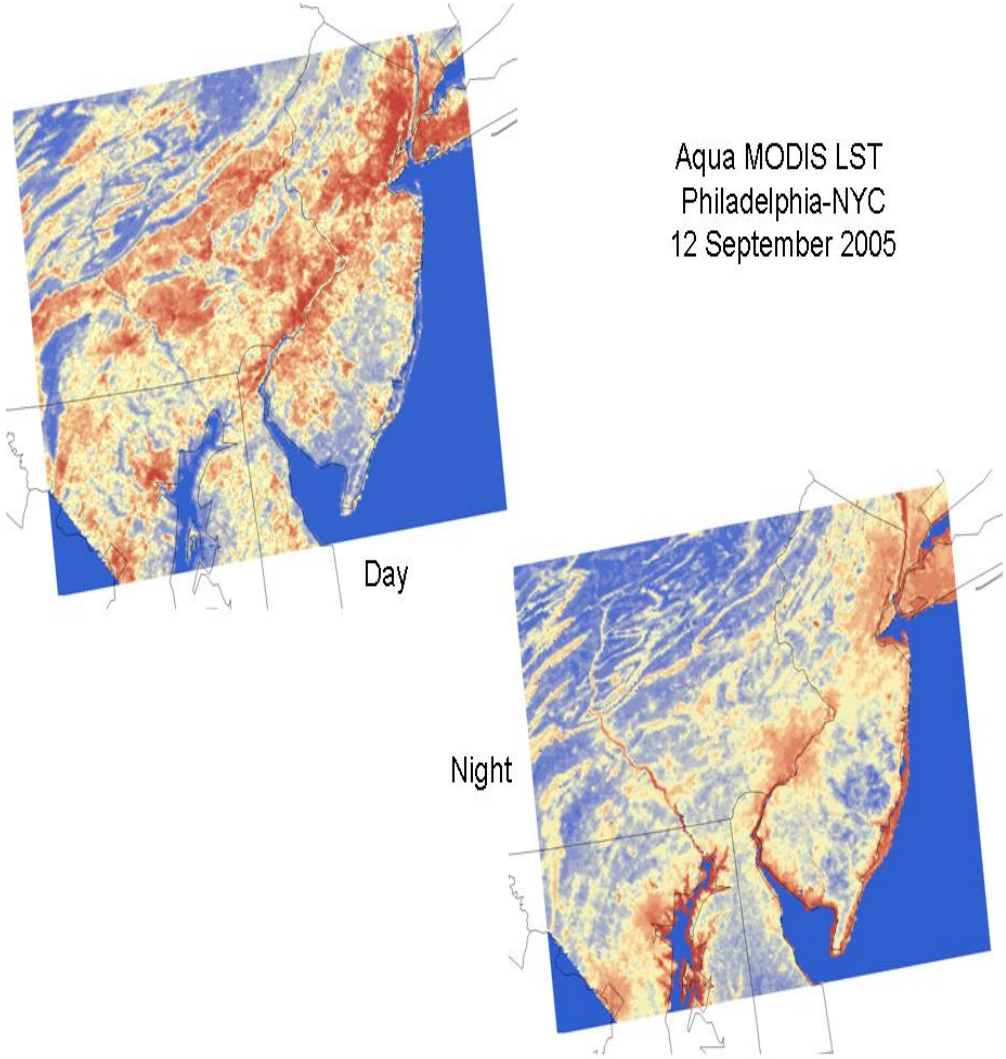
Impervious Land Cover to Determine Urban Extent





Remote Sensing – Urban/Rural Temperature Differences

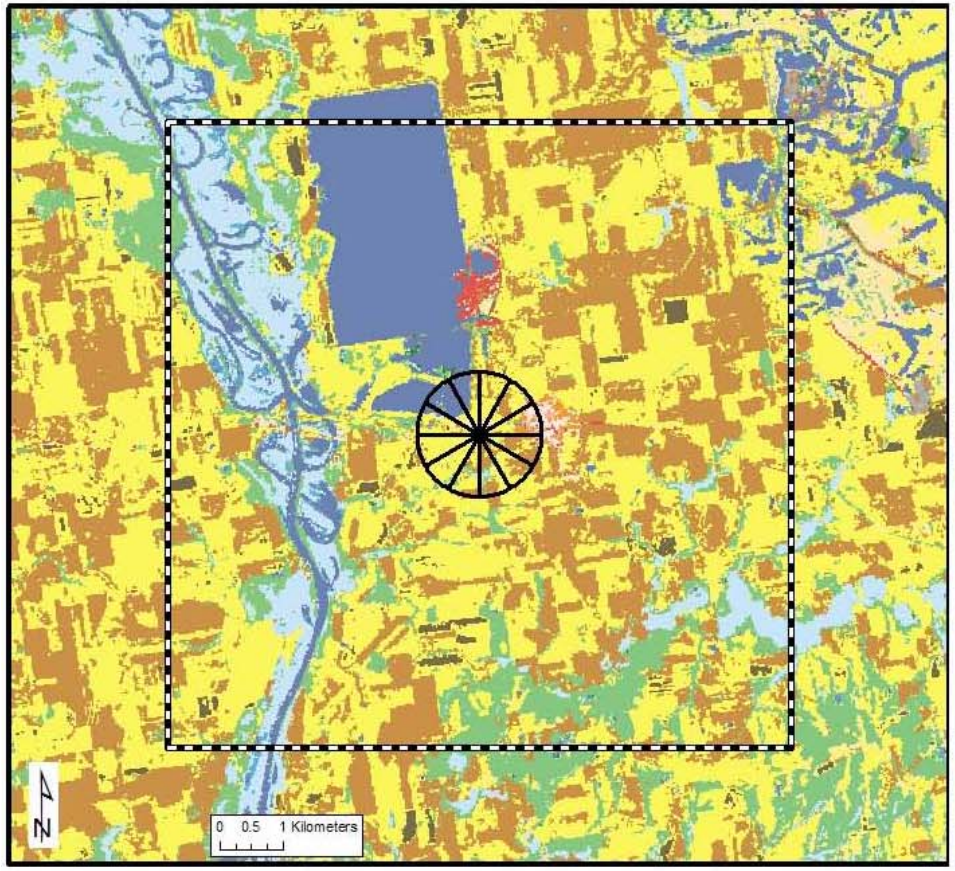
- Subgroup is looking into using satellite imagery for information on urban/rural temperature differences.



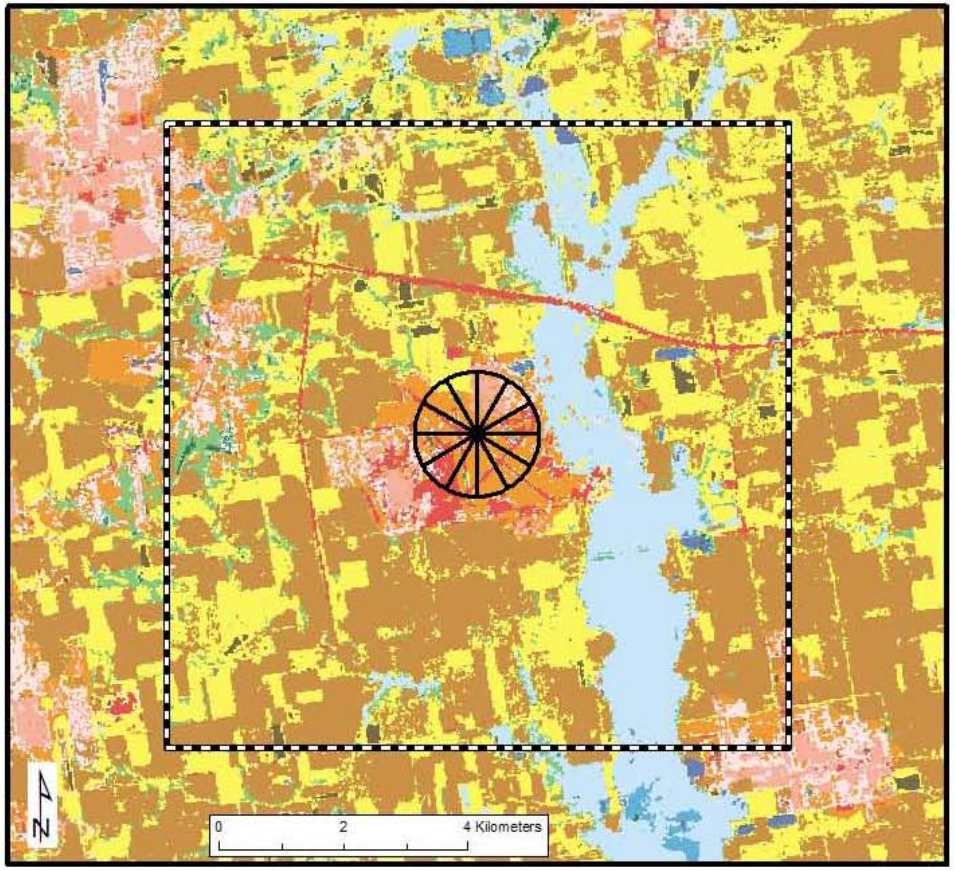
Surface Characteristics Subgroup – Issues and Actions

- Main Issues
  - Lack of representative met data
    - Potential for alternative methods of obtaining representative data: gridded met, up-over-down?
  - Surface parameter determination
    - Development of AERSURFACE methodology
  - Representativeness of processed met data

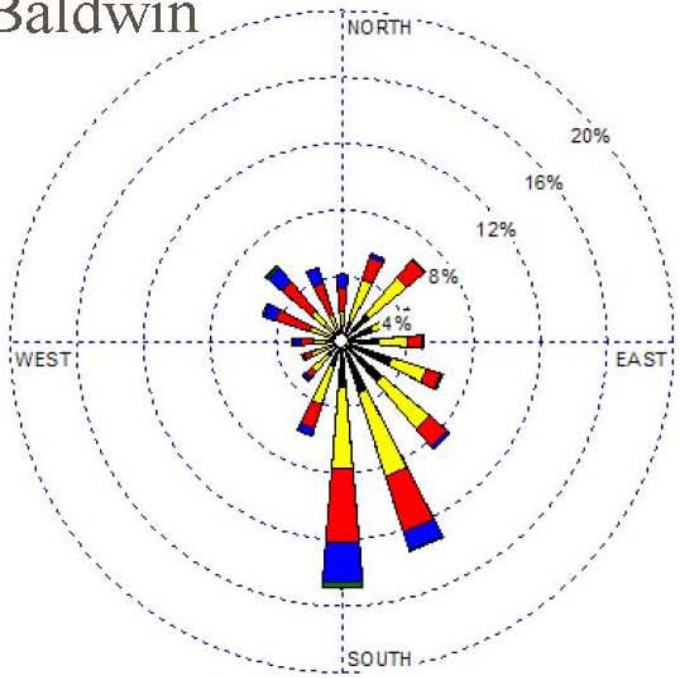
Baldwin Sectors and Grid

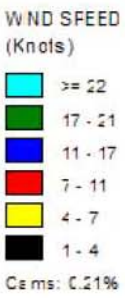


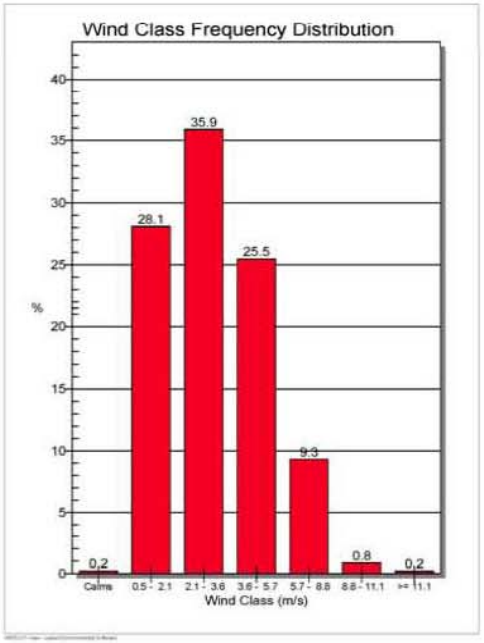
Belleville Sectors and Grid



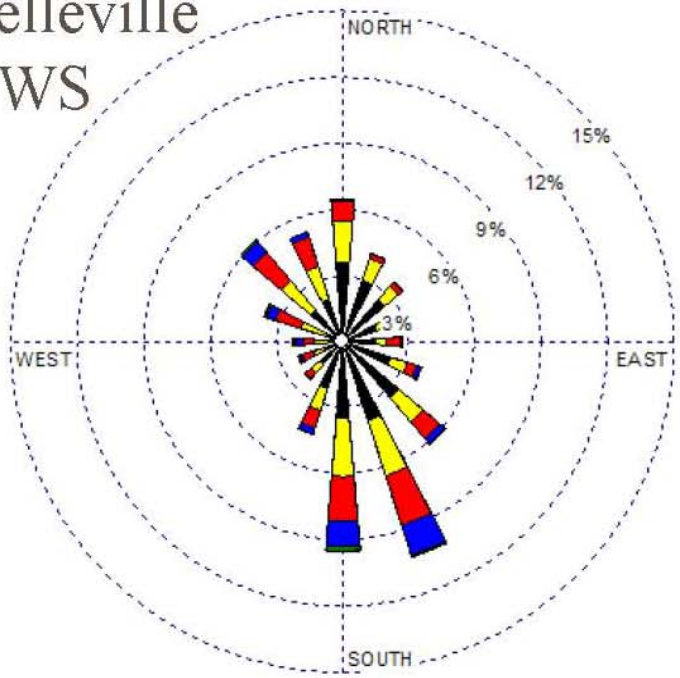
Baldwin

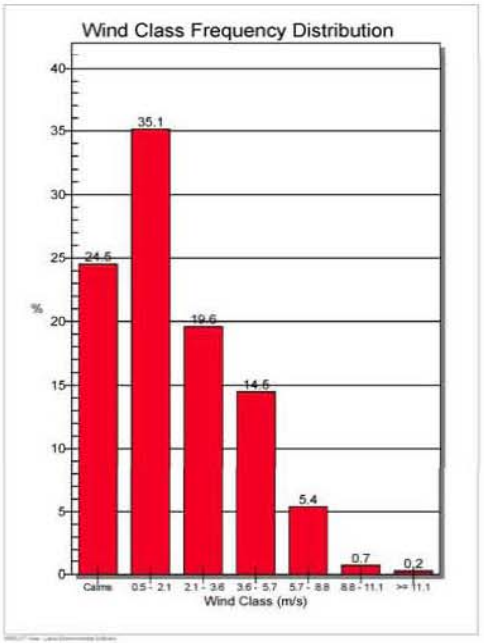






Belleville NWS





Baldwin

Belleville

dwin 1 km & 3 km Roughness Length Analysis

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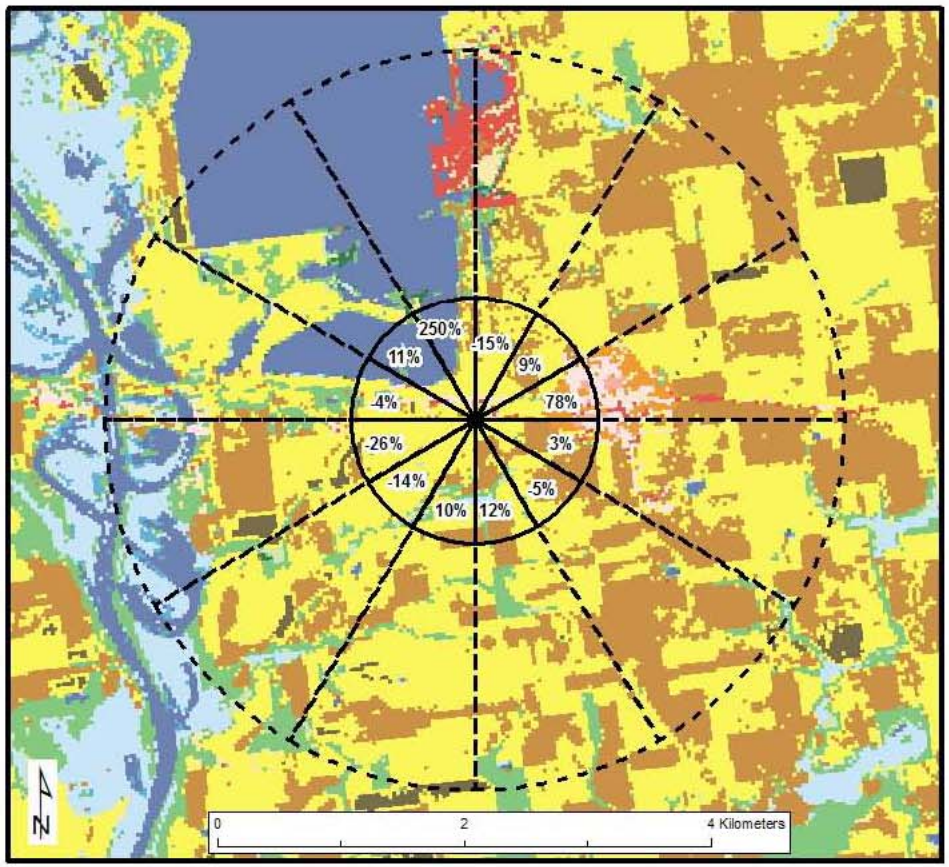
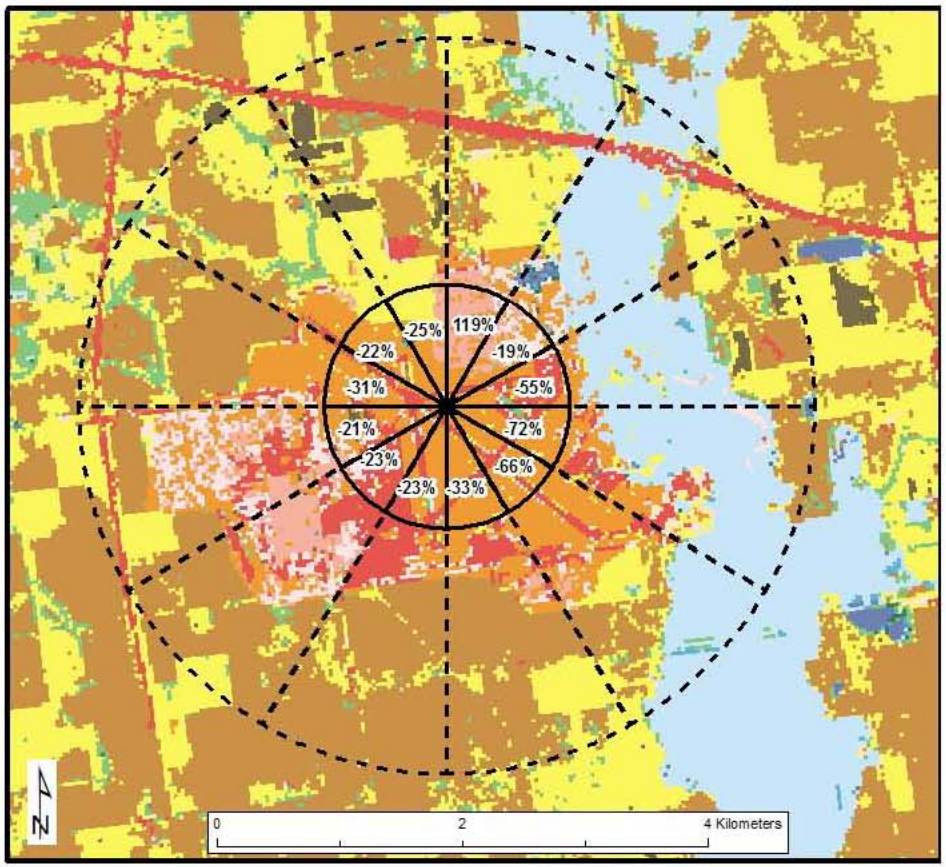
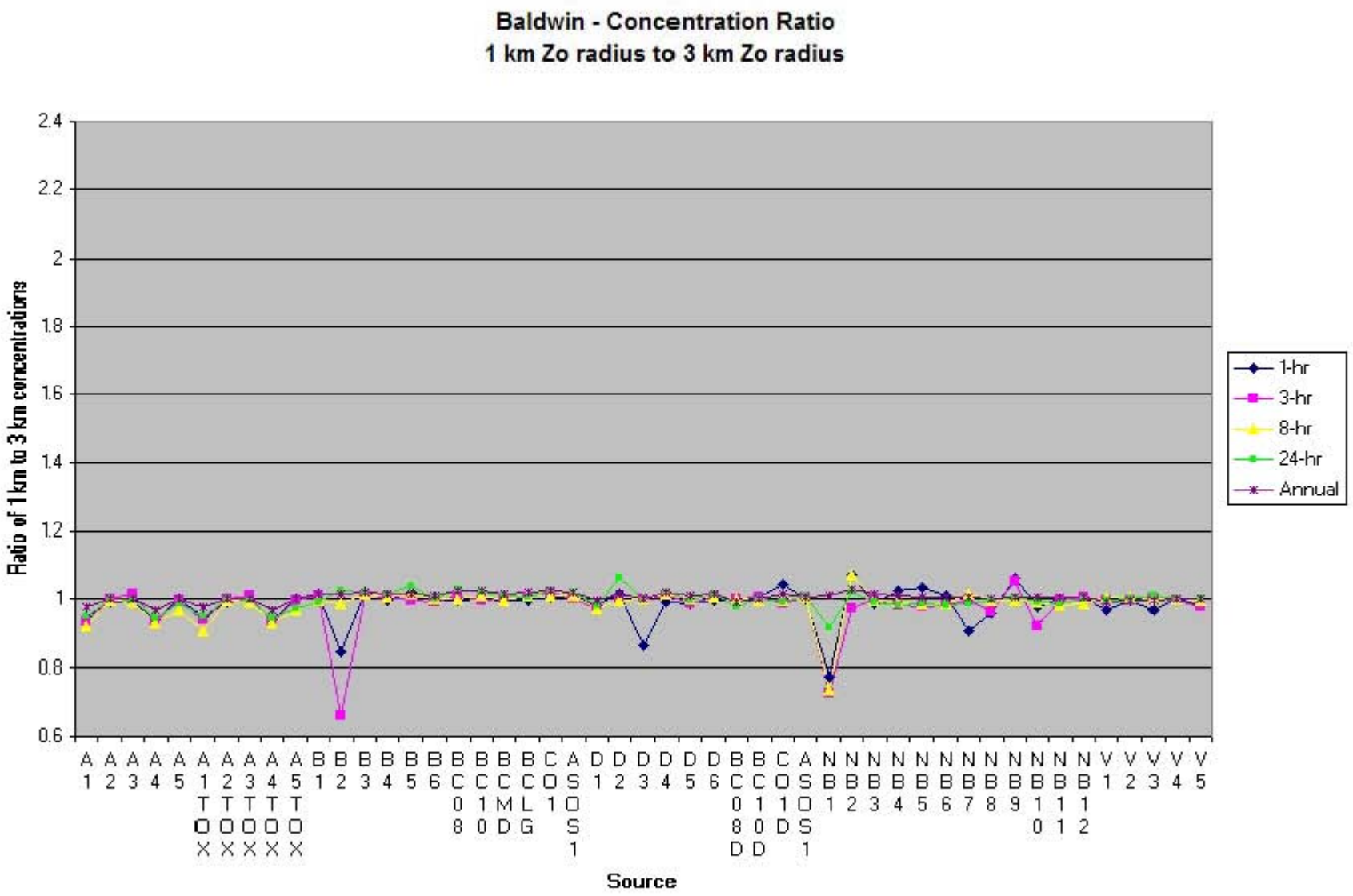
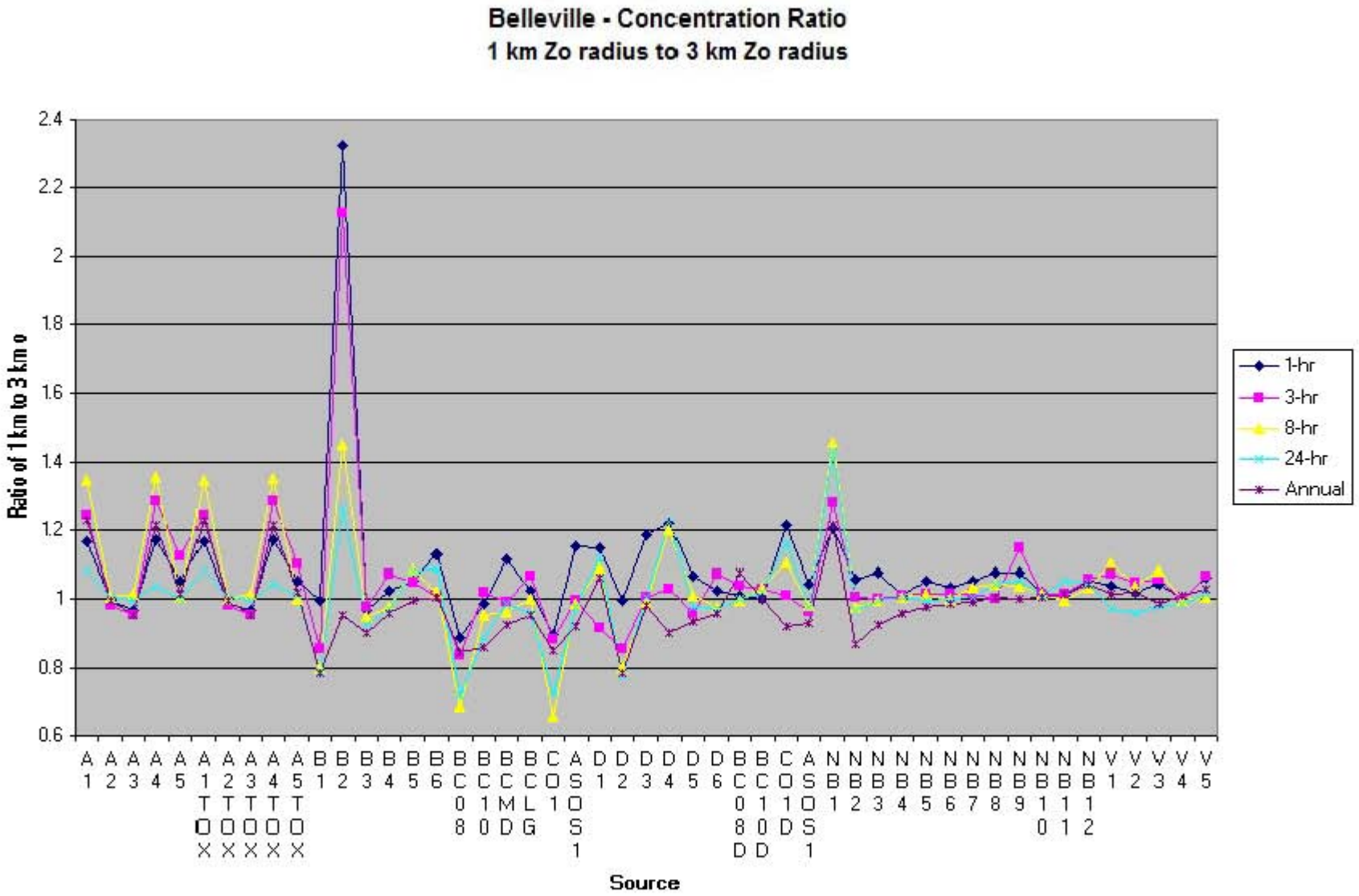





Baldwin - Concentration Ratio
1 km Zo radius to 3 km Zo radius
Ratio of 1 km to 3 km concentrations
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
1-hr
3-hr
8-hr
24-hr
Annual
A1 A2 A3 A4 A5 A1TOX A2TOX A3TOX A4TOX A5TOX B1 B2 B3 B4 B5 B6 BC08 BC10 BCMD BCLG CO1 ASOS1 D1 D2 D3 D4 D5 D6 BC08DD BC10DD CO1DD ASOS1 NB1 NB2 NB3 NB4 NB5 NB6 NB7 NB8 NB9 NB10 NB11 NB12 V1 V2 V3 V4 V5
Source


Belleville - Concentration Ratio
1 km Zo radius to 3 km Zo radius
Ratio of 1 km to 3 km z
2.4
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1.2
1
0.8
0.6
1-hr
3-hr
8-hr
24-hr
Annual
A1 A2 A3 A4 A5 A1TOX A2TOX A3TOX A4TOX A5TOX B1 B2 B3 B4 B5 B6 BC08 BC10 BCMDG BCLG BCO1 ASOS1 D1 D2 D3 D4 D5 D6 BC08DD BC10DD COD1 ASOS1 NB1 NB2 NB3 NB4 NB5 NB6 NB7 NB8 NB9 NB10 NB11 NB12 V1 V2 V3 V4 V5
Source

Final Points to Remember

- AIWG is an inclusive process, relying on the experience and knowledge of model users in the states and regions to advise OAQPS on implementation issues.
- Good work has been done, and continues to be done by the workgroup and subgroups.
- Communication is key; both inward and outward.
- Very appreciative of workgroup members' donation of time and efforts.