

A Brief Presentation:

Evaluations of CALPUFF 6.4; Experience with Modeling for 1 hour NO₂ and SO₂ Compliance in Baltimore; Using MM5 Data for Local Scale Modeling

For Presentation at the:
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Topics

- Evaluations of CALPUFF 6.4;
- Experience with Modeling for 1 hour NO₂ and SO₂ Compliance in Baltimore;
- Using MM5 Data for Local Scale Modeling



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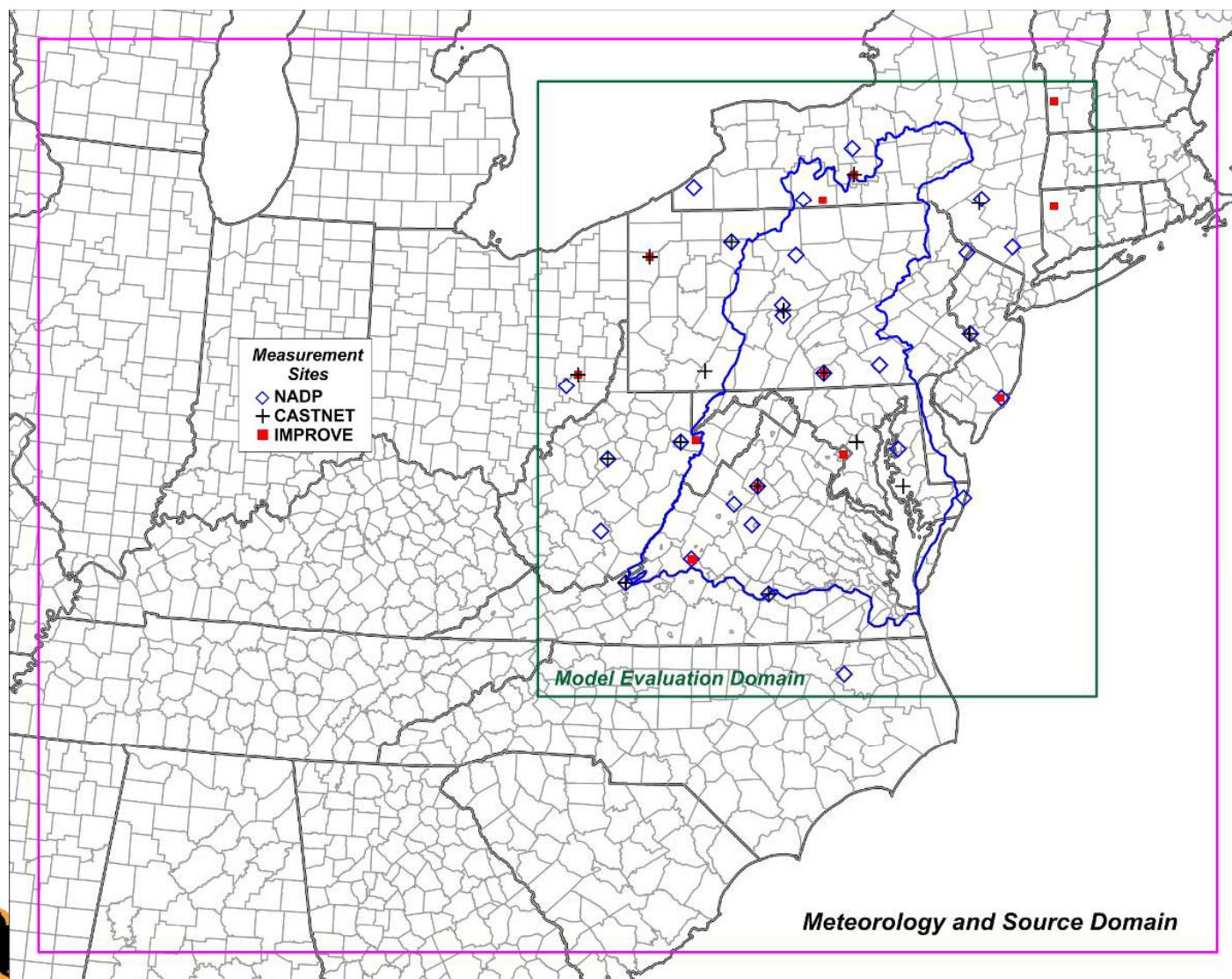


Evaluations of CALPUFF 6.4

- Maryland DNR Power Plant Research Program (PPRP) has a long-standing interest in the Chesapeake Bay including excess nutrient loading due to anthropogenic emissions of NO_x
- CALPUFF has been used as a tool to help understand source and source sector contributions to N loading; compare and contrast with CMAQ
- New chemistry included in v. 6.4 holds promise in terms of improving predictions of N loading
- Work-in-Progress includes evaluations of CALPUFF predictions compared to aerosol and gas concentrations, and wet deposition, measured at CASTNET, IMPROVE, and NADP measurement stations



Evaluations of CALPUFF 6.4: Modeling Domain



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Evaluations of CALPUFF 6.4: Initial Observations

- Summary of NO_x and SO₂ Emissions (Millions of short tons) – NEI 2005

Pollutant	Total	EGU	Industry	Mobile	Non-Point
NO _x	7.09	1.85	0.39	2.69	2.14
SO ₂	8.81	7.27	0.61	0.06	0.87

- Preliminary Results Indicate improvements in predictions of nitric acid concentrations, particulate nitrate concentrations, and wet deposition of nitrates



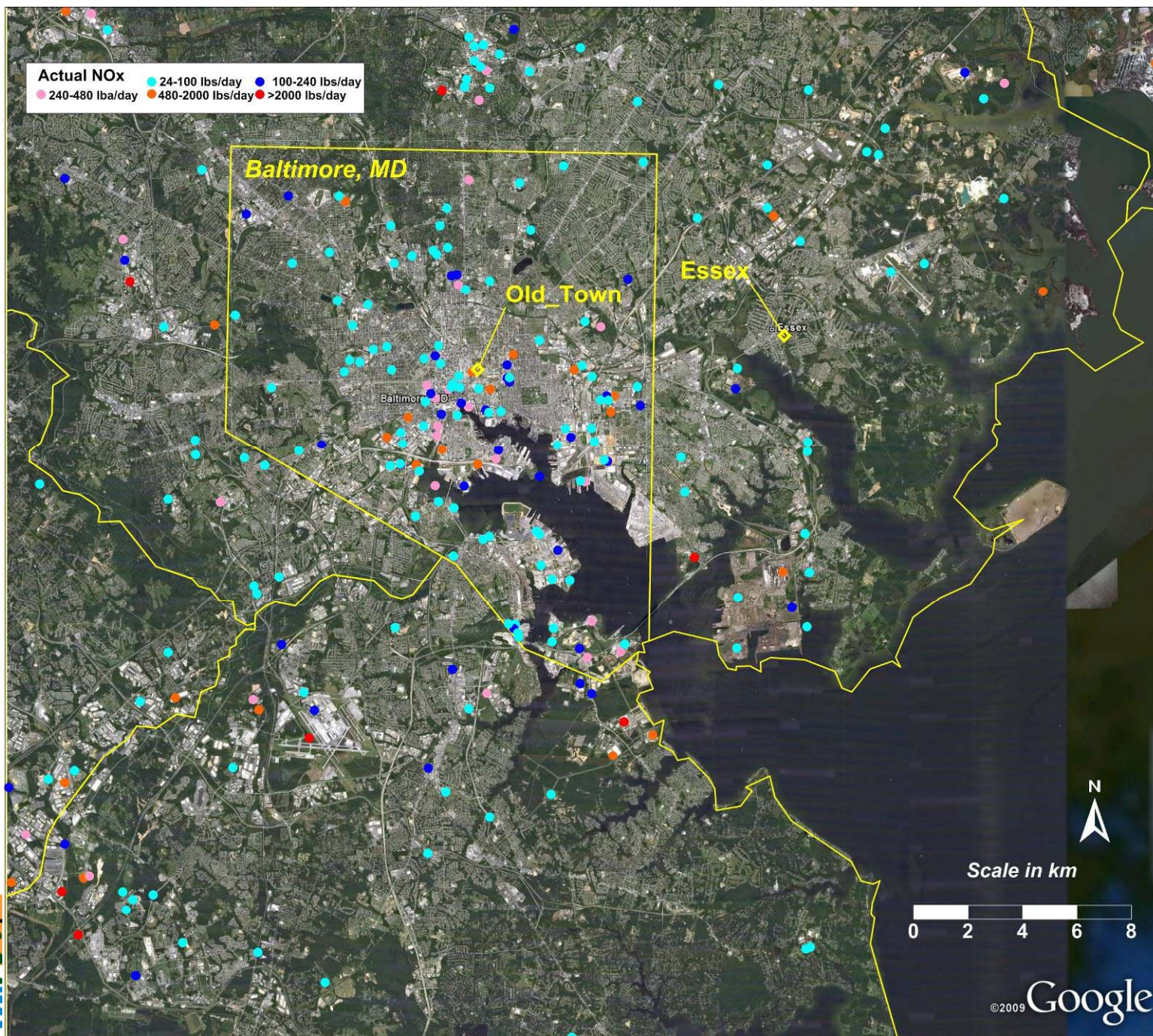
Baltimore NO_x Monitors/Sources for Evaluation

- Two measurement sites – Old Town and Essex – have recorded NO_x and NO₂ concentrations for over 20 years
- 2009 actual emissions inventory prepared for AERMOD
- Focus on stationary sources (approx. 500 facilities)
- Approx. 438,000 lbs/ day of NO_x
- NO_x/NO₂ measurements for 2009 for comparison

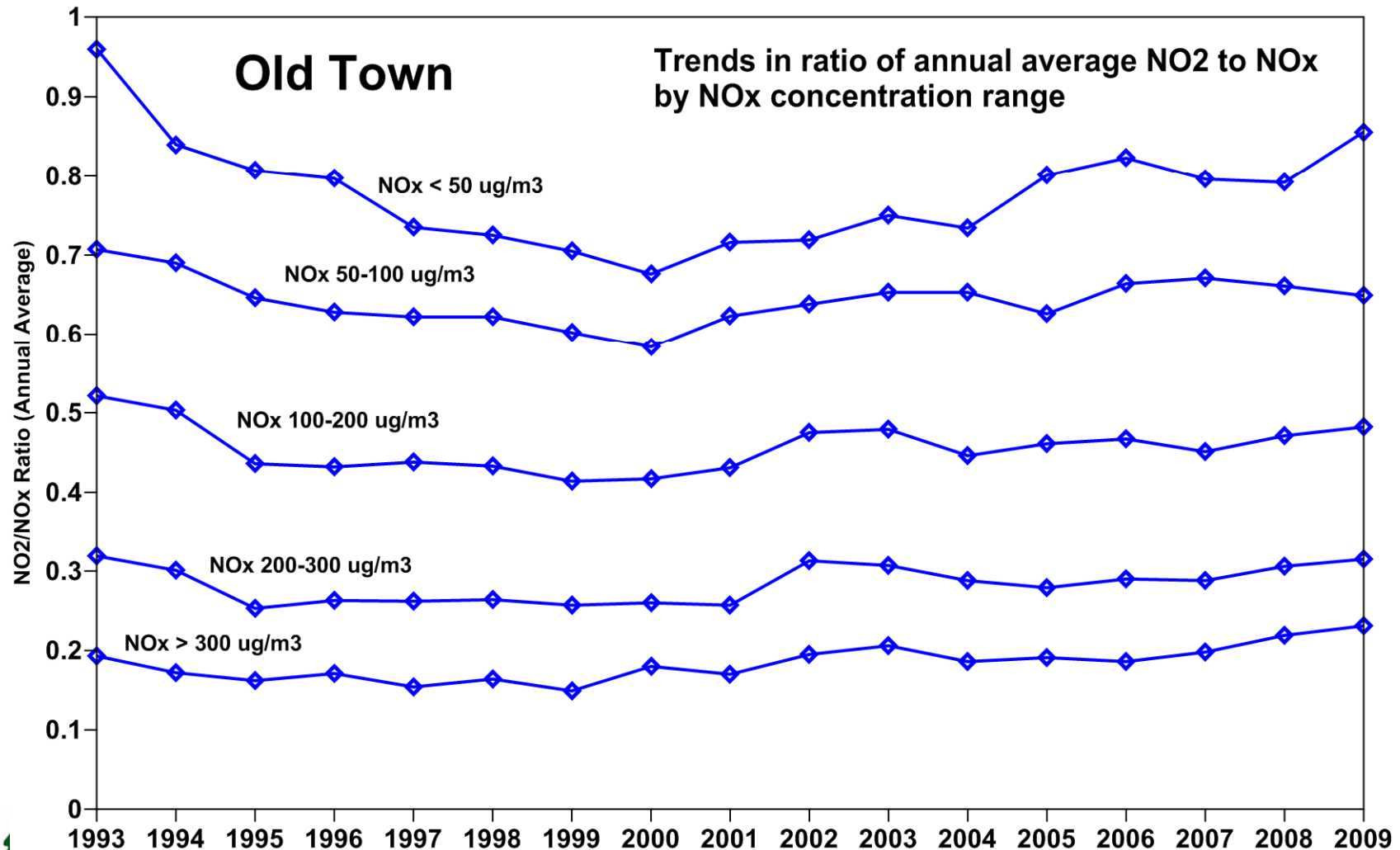


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Trends in NO₂/NO_x Ratios



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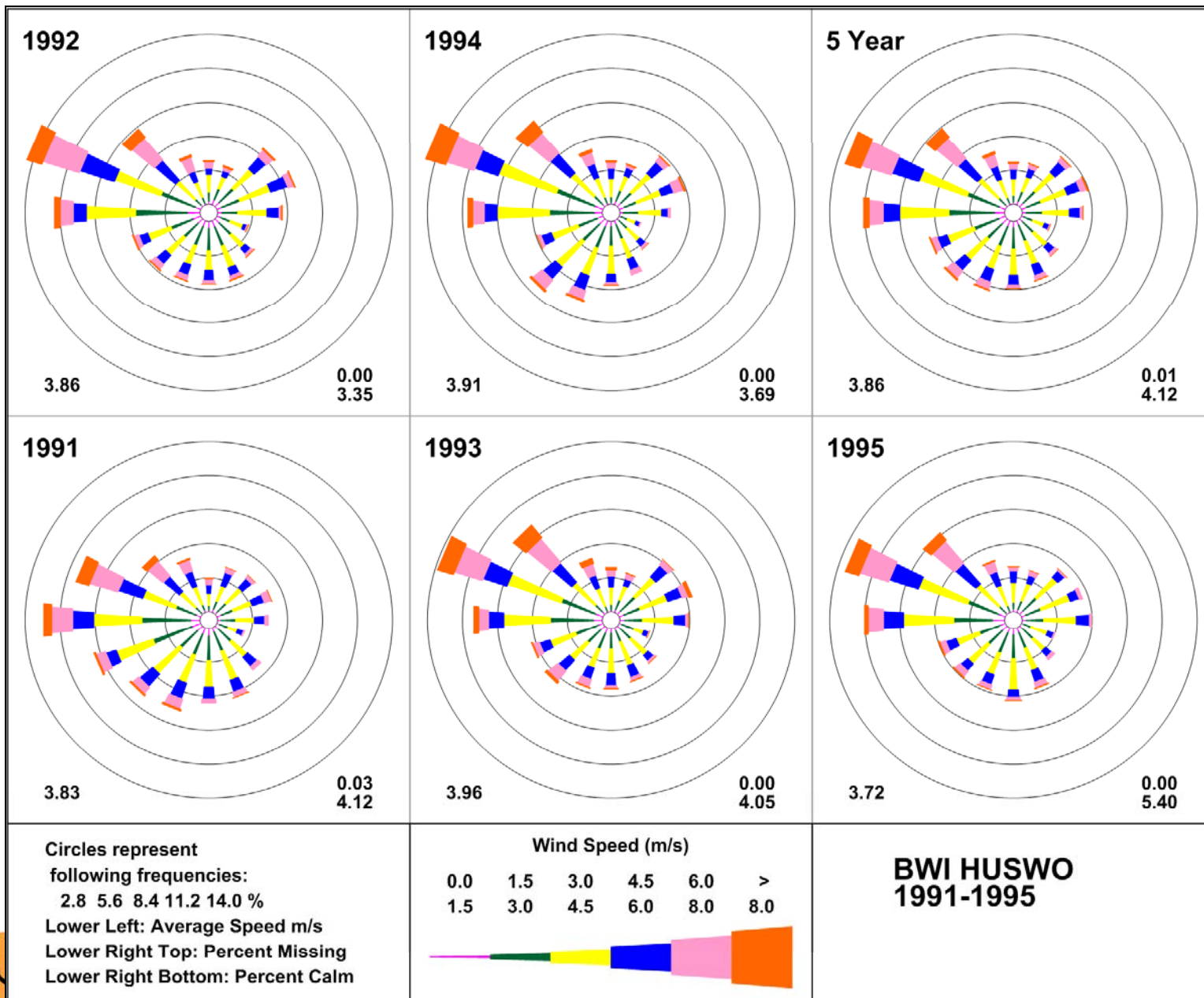
Meteorological Data

- Baltimore-Washington International (BWI) surface, Dulles (Sterling, VA) upper air for 2009
- Utilized new AERMINUTE processing to reduce missing, calm hours
- Significant number of low (<1 m/s) winds
- AERMOD in the urban mode



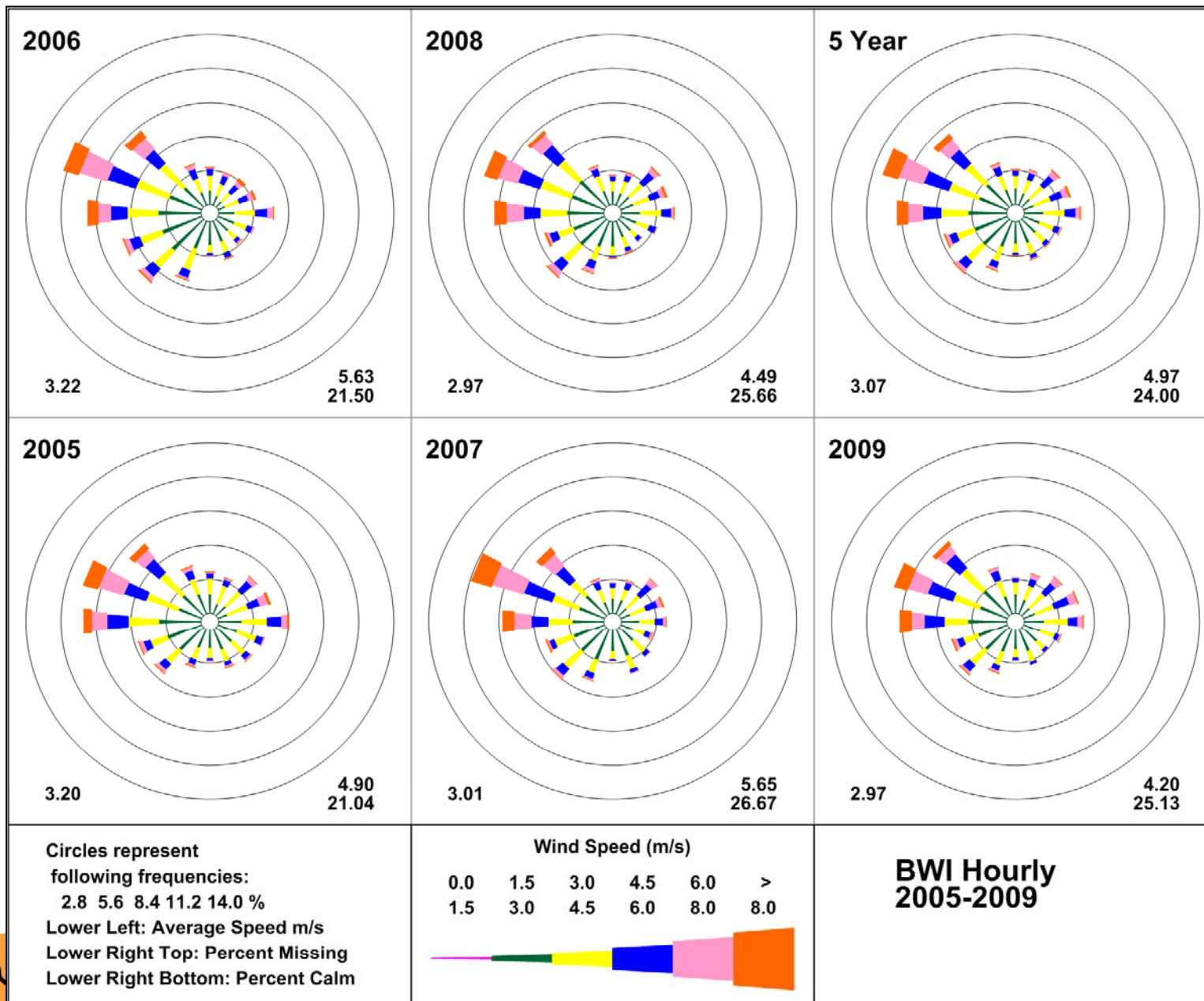
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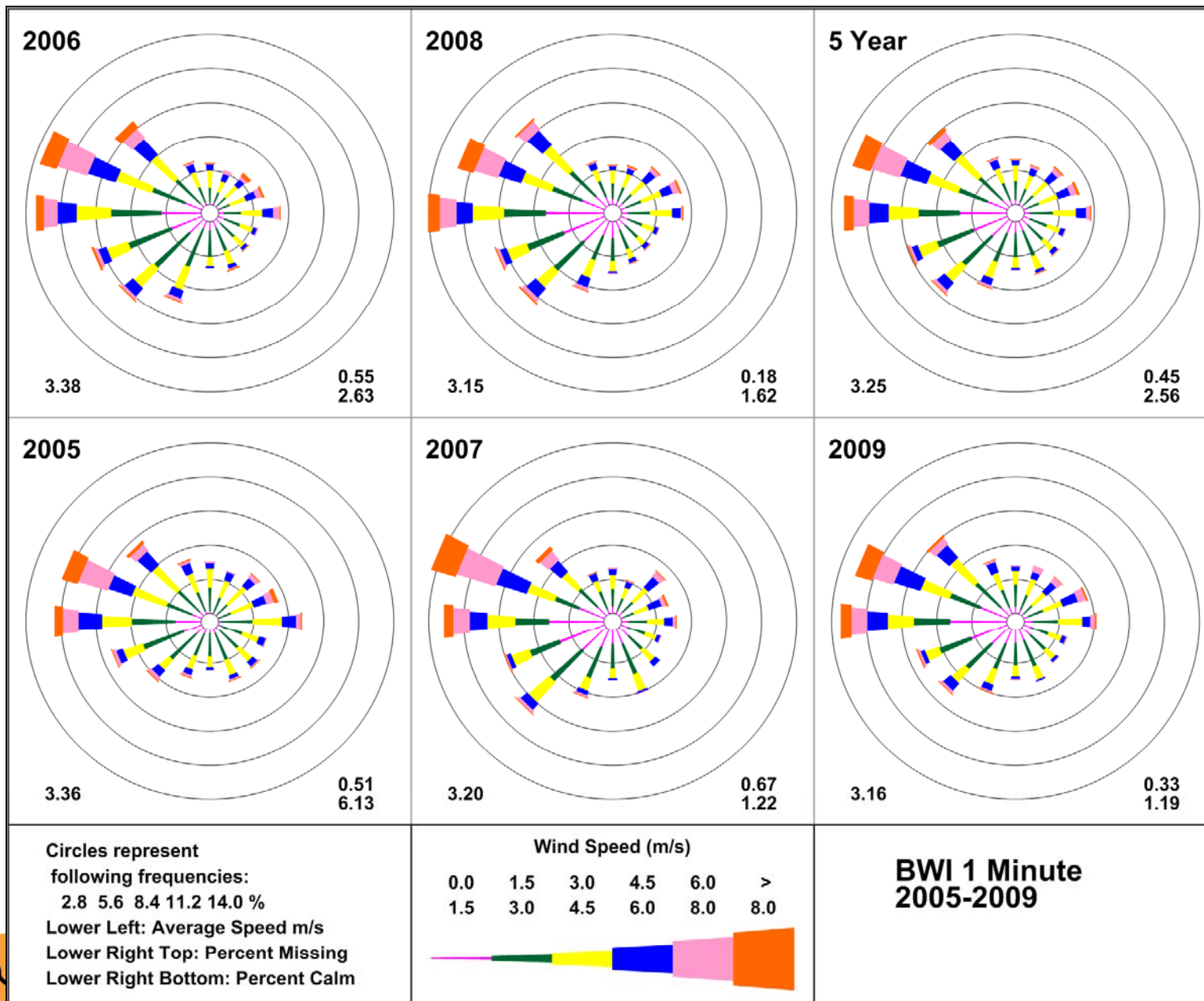




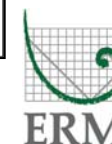
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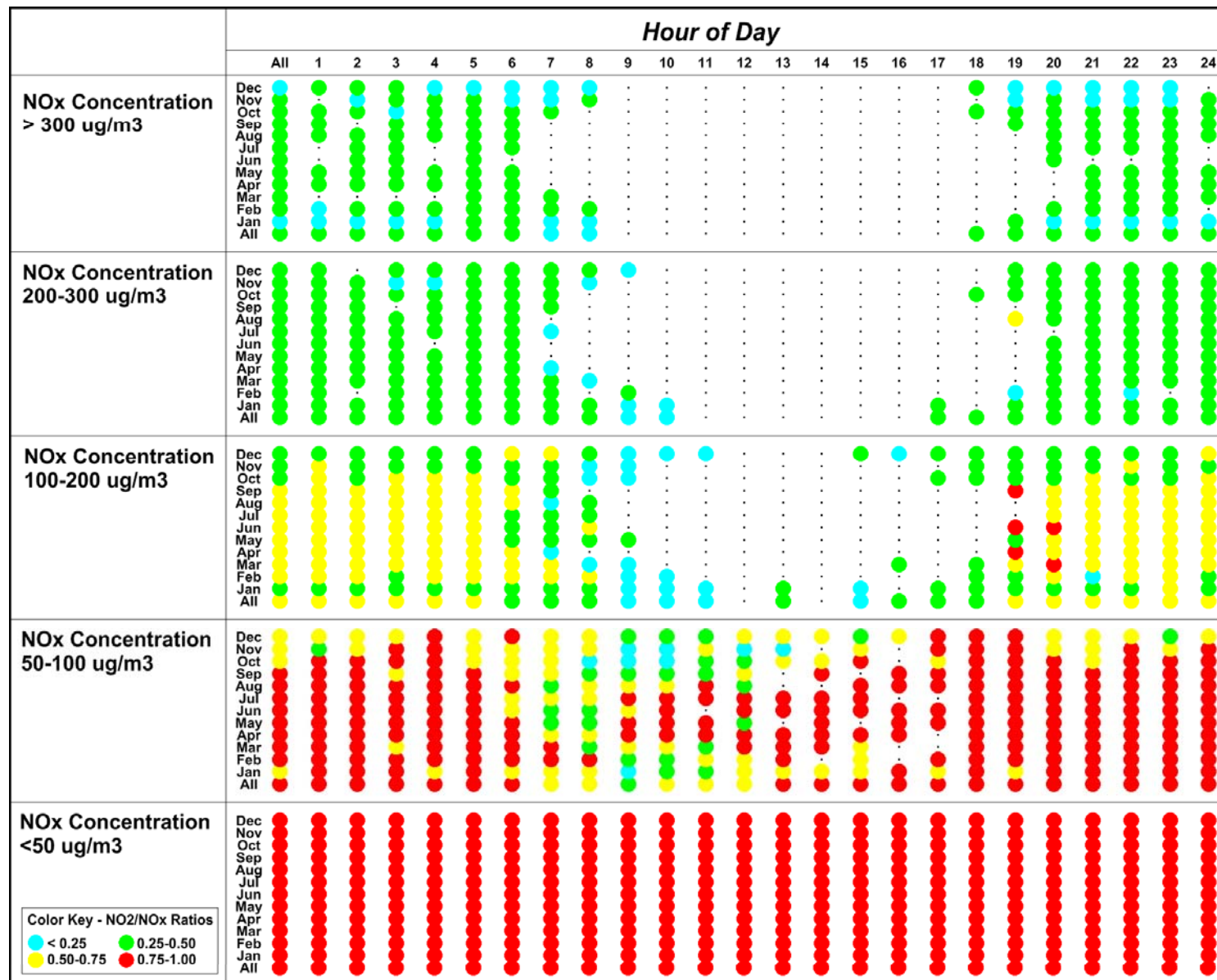




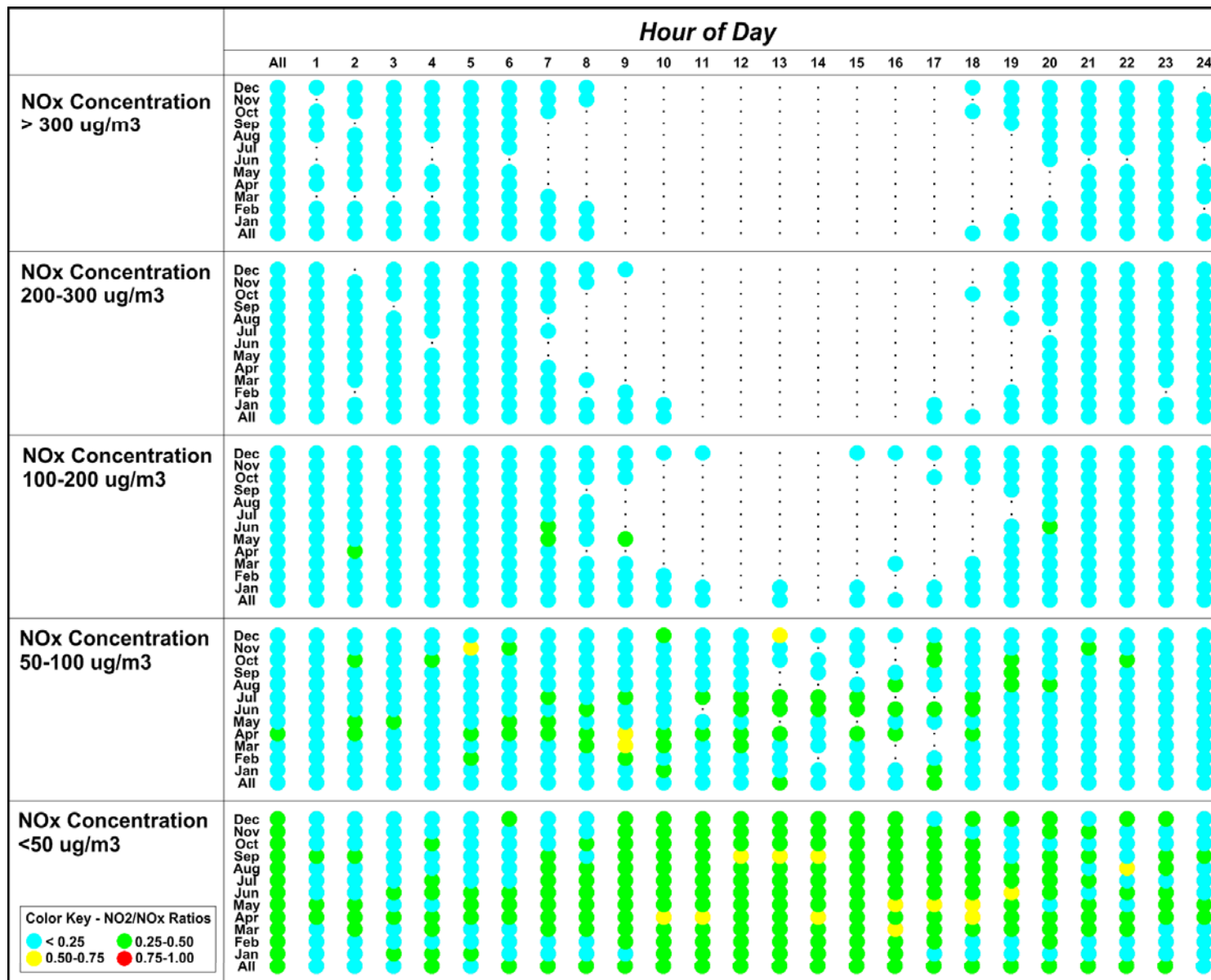
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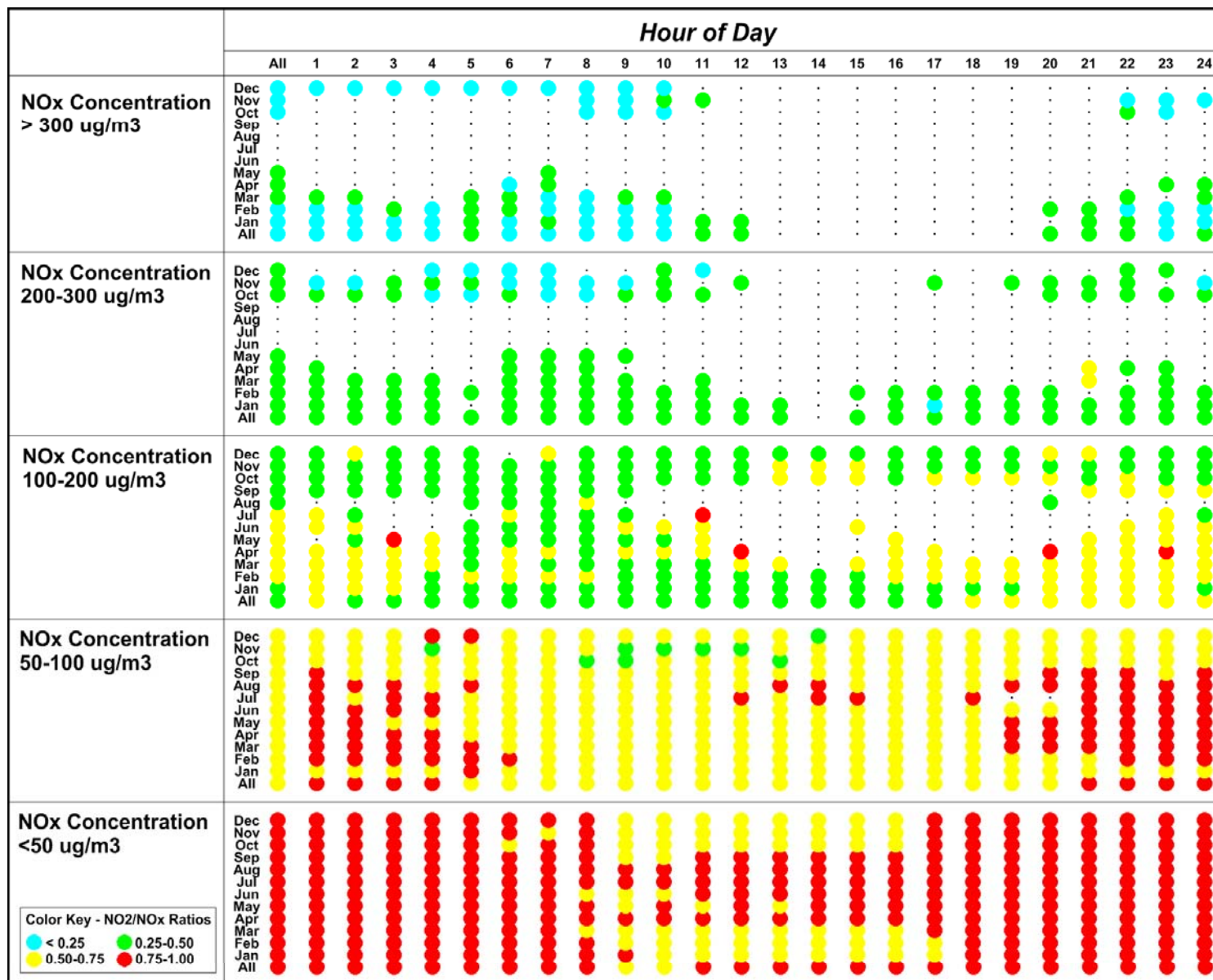
Old Town:
Predicted
Concentration
Ratios
OLMGROUP/
0.10 in-stack
ratio



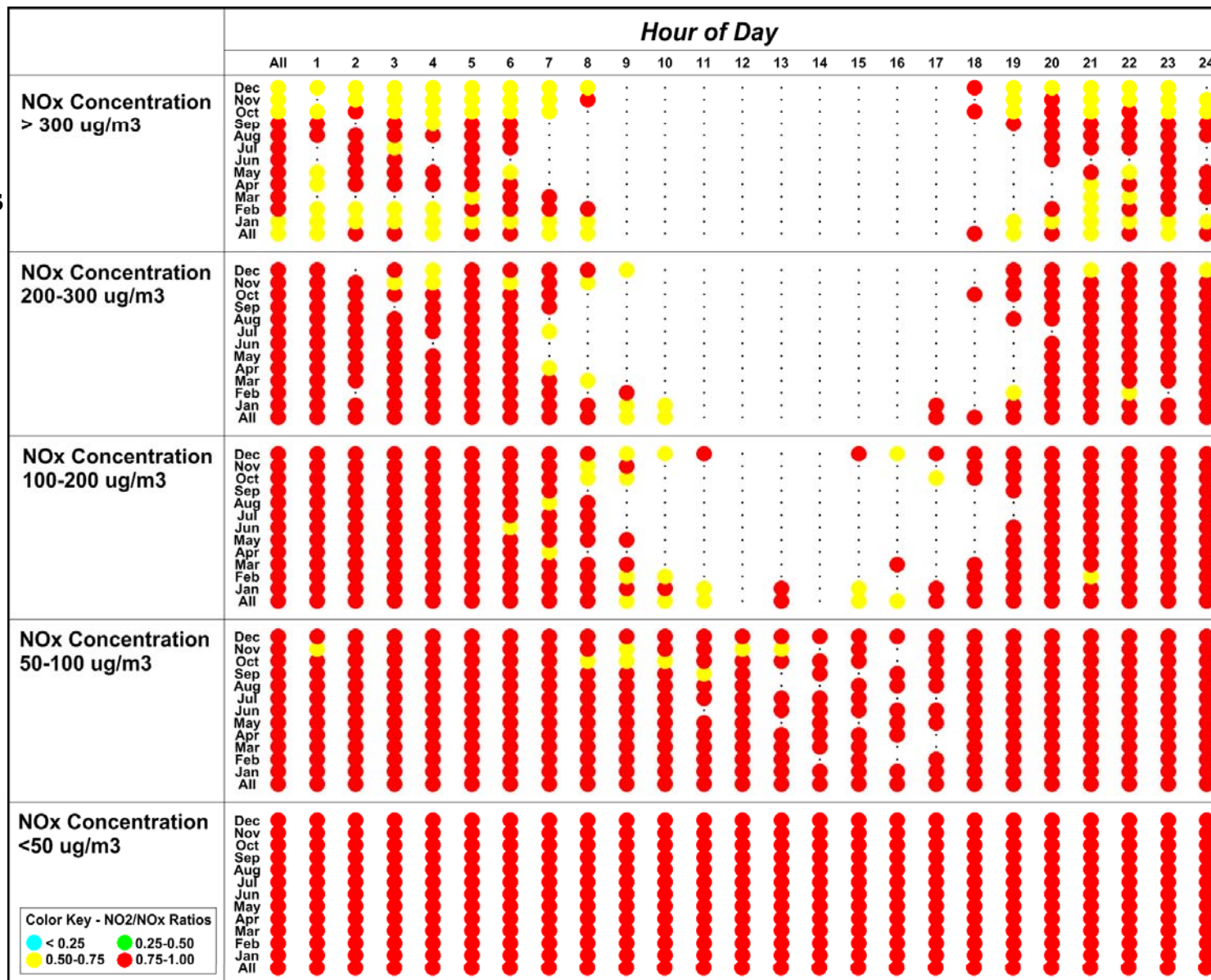
Old Town:
Predicted
Concentration
Ratios
PVMRM/ 0.10
in-stack ratio

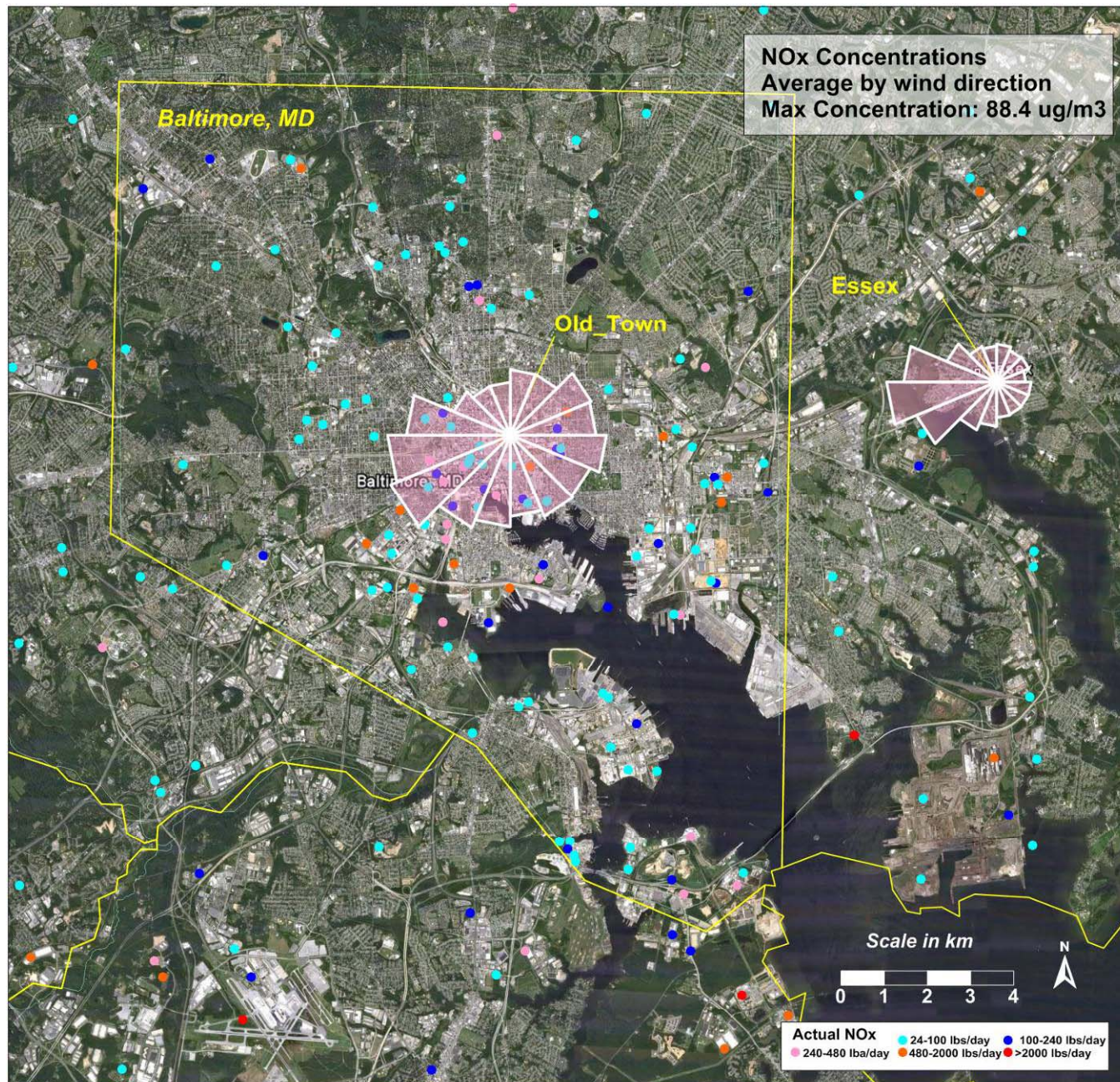


Old Town: Measured Concentration Patterns



Old Town:
Predicted
Concentrations
OLM/ 0.50 in-
stack ratio





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Baltimore Analysis: Observations

- OLMGROUP appears to produce better patterns of NO₂/NO_x ratios than PVMRM
- Evaluation suggests use of 0.1 in-stack ratio for all sources
- Problems with AERMINUTE processing; DNR currently recommending use of pre-ASOS meteorological data
- Baltimore analysis points out shortcomings of AERMOD application at this scale; transport times are an issue.. possible future application of CALPUFF
- Evaluating improvements in treating “urban core” plume



Use of MM5 for Local Scale Meteorology

- PPRP has used MM5 data to extract local winds for near-field analyses in a number of cases;
- Evaluations of extracted winds compared to tall towers (primarily at nuclear stations) and profilers are encouraging;
- Initiating evaluations of beta version of MMIF
- Use of MM5 (and WRF) holds promise for improving local scale meteorology, particularly in situations where airports are somewhat remote

