Modeling Air Quality in WRF-Chem for LISTOS 2018

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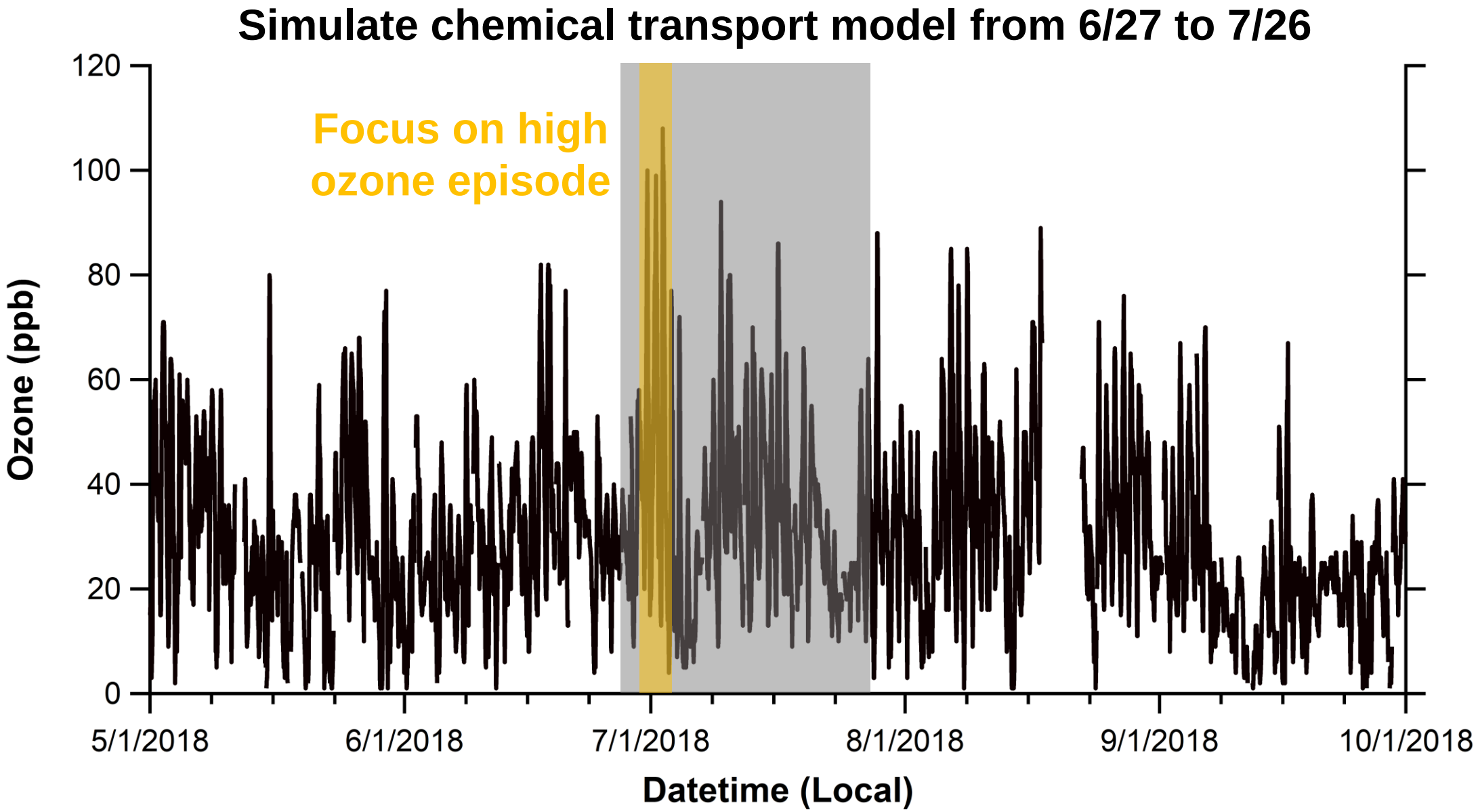
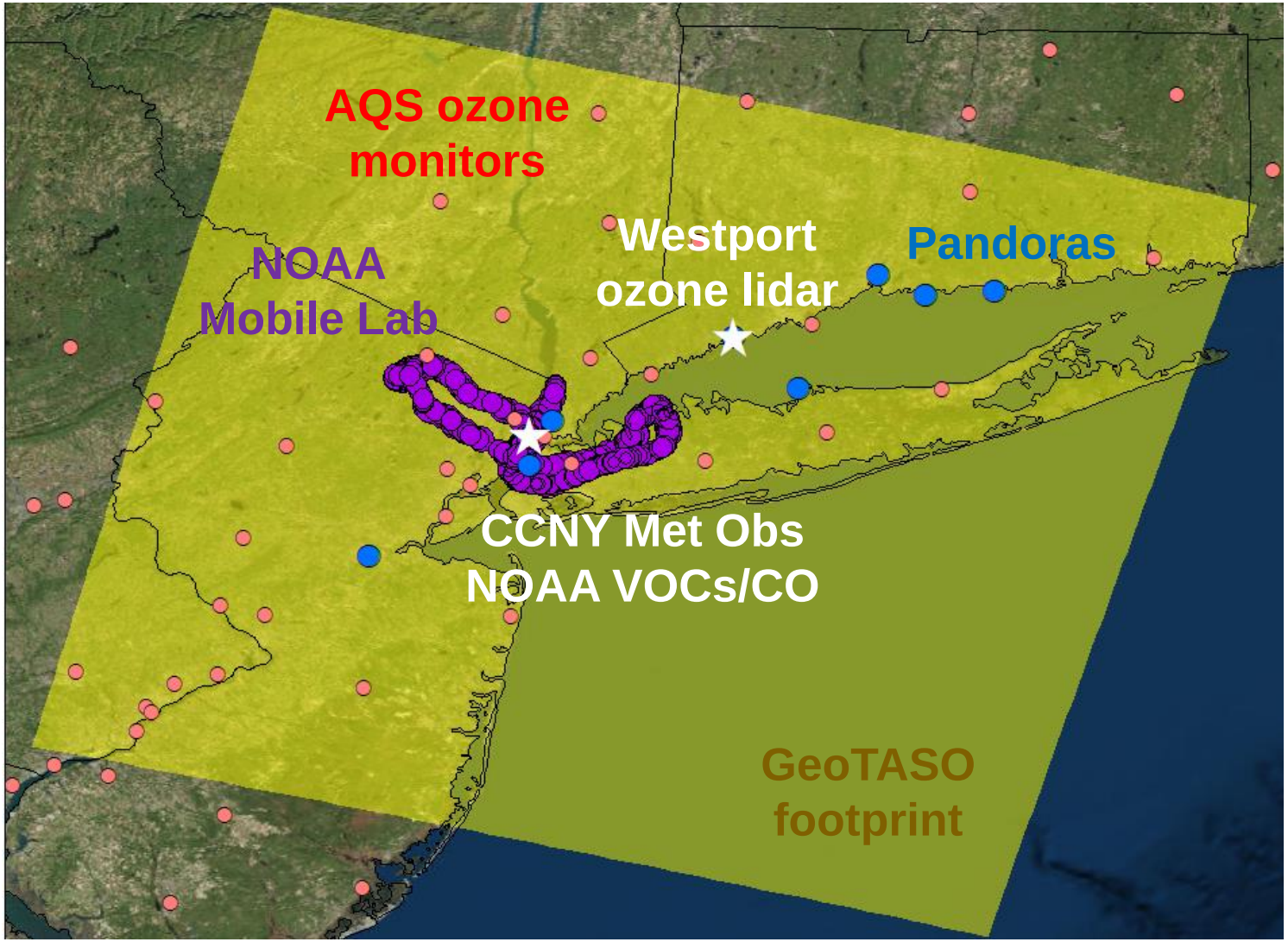
4. NASA LaRC, Hampton, VA, USA

LISTOS Workshop (April 11, 2019)

Peak Ozone >100 ppb at CCNY during Early July Heatwave

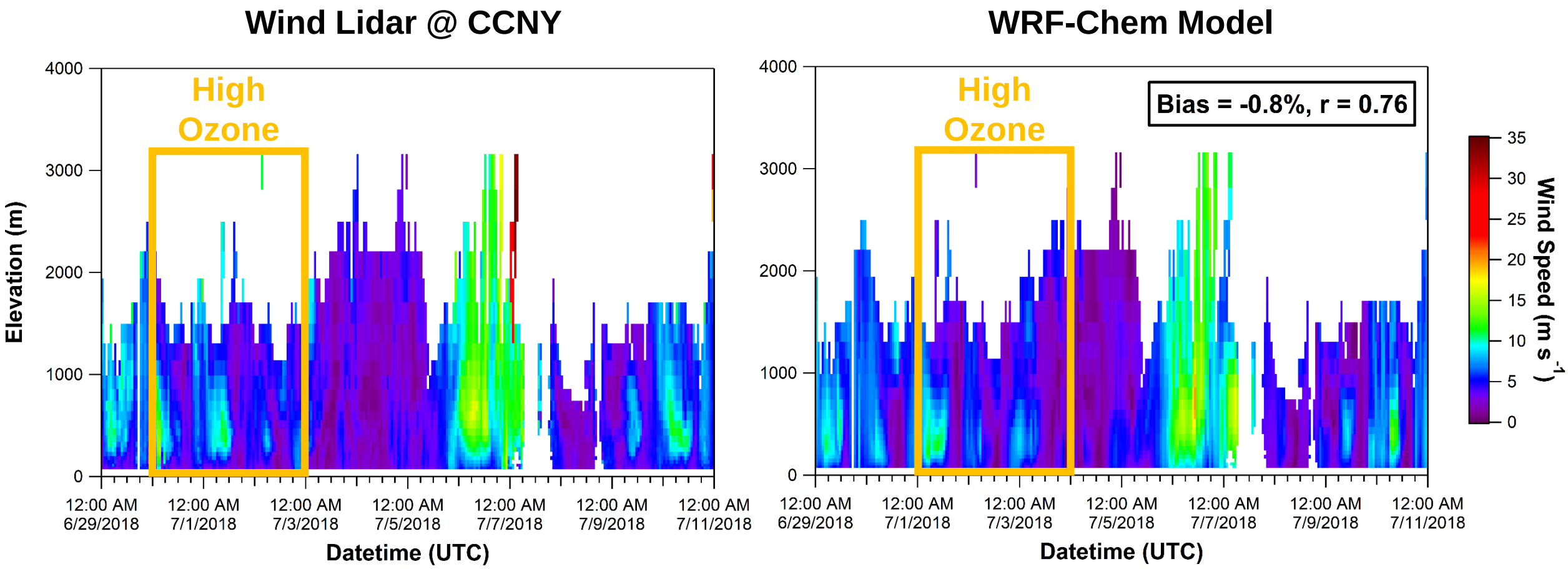


Weather Research Forecast with Chemistry Model (WRF-Chem)



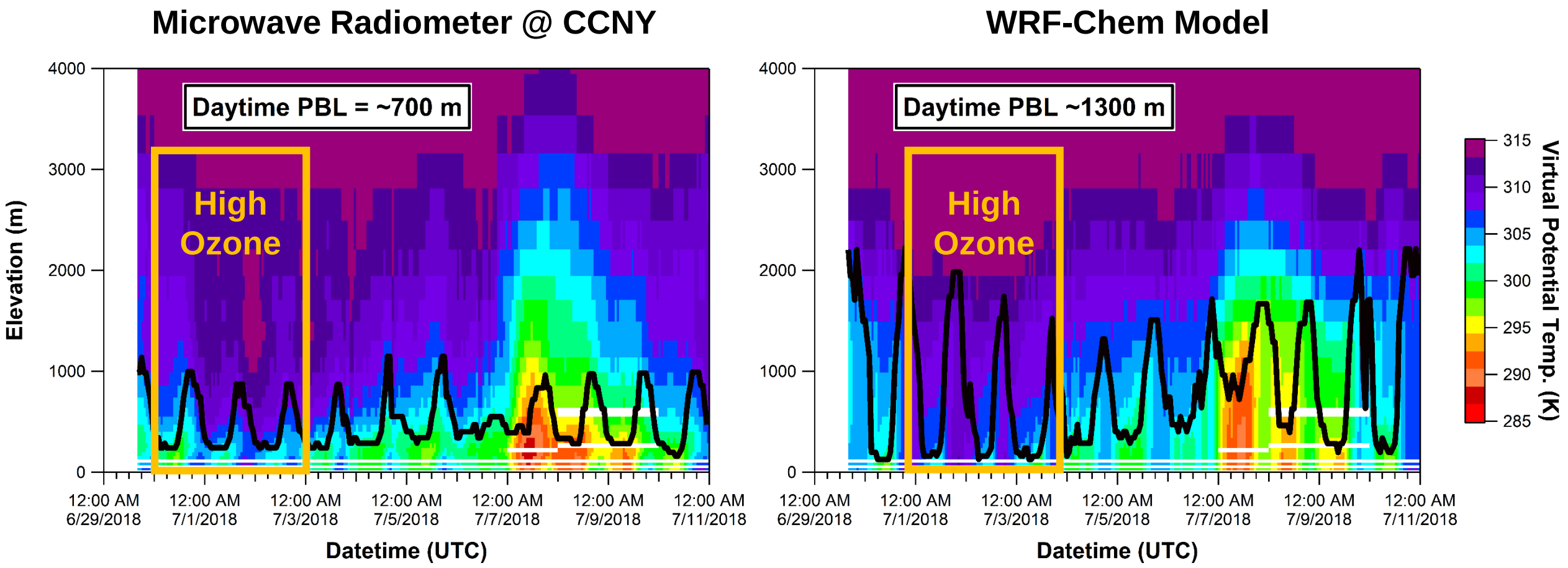
- Eastern US (4 km x 4 km)
- NAM meteorology
- Chemical I.C. & B.C. from CONUS (12 km x 12 km)
- MYNN PBL Scheme
- FIVE18 modifications to anthro. CO & NO_x
- MEGAN biogenic VOCs

WRF Model Simulates Stagnant Winds During Heatwave



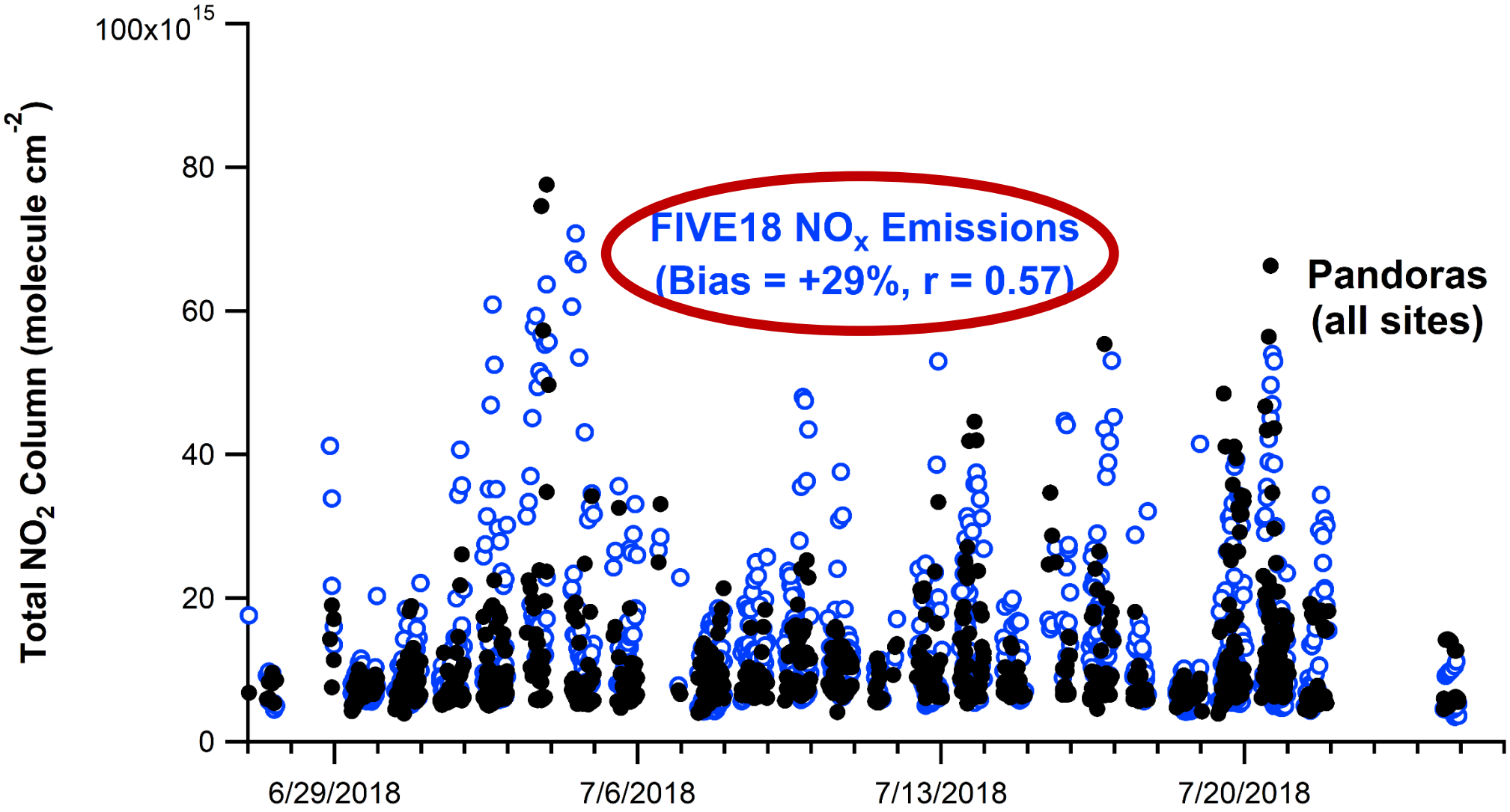
Acknowledgments (CCNY): Fred Moshary, Mark Arend, Yonghua Wu, David Melecio-Vazquez

WRF Model PBL within Factor of ~2 of Obs. (Manhattan)



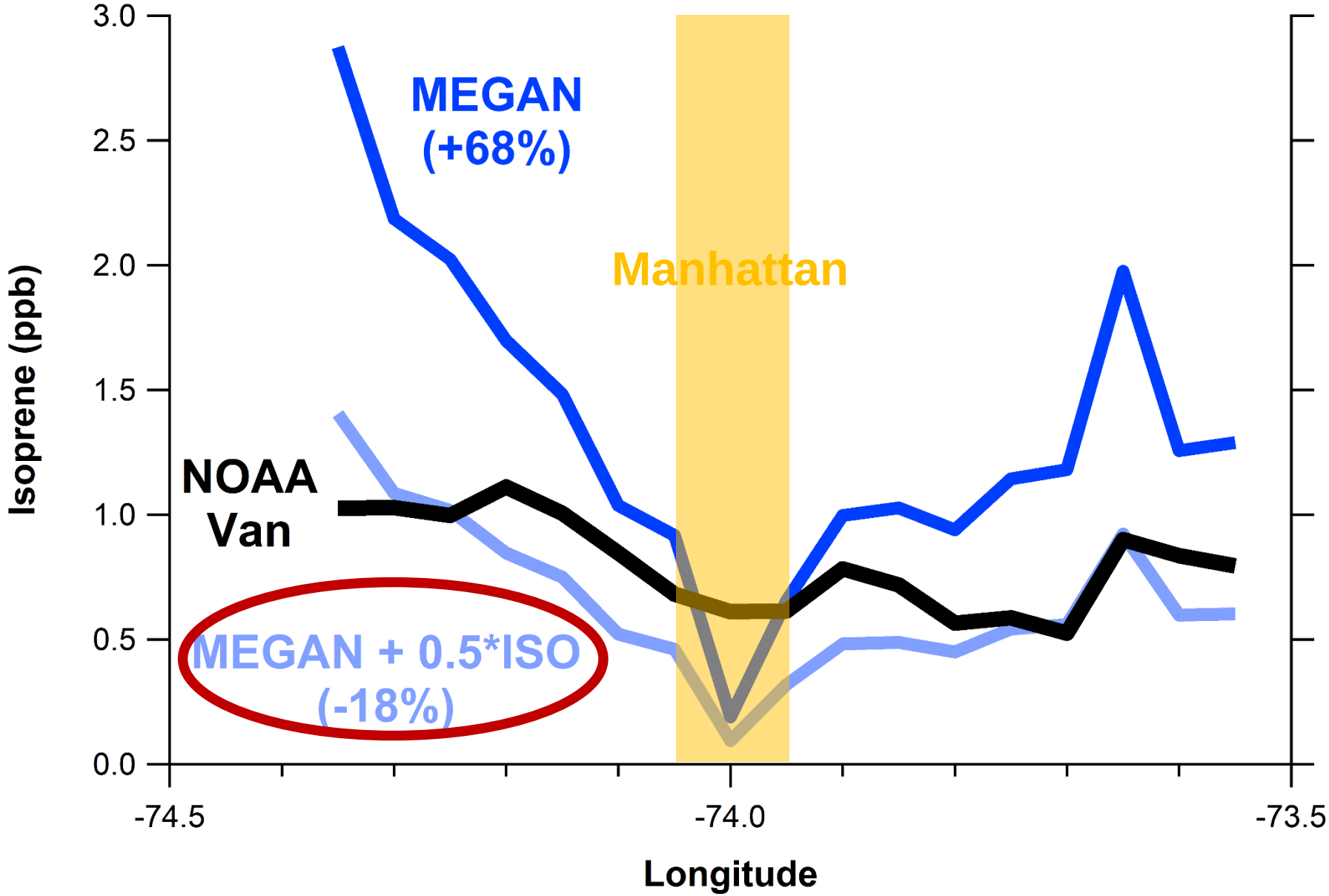
Acknowledgments (CCNY): Fred Moshary, Mark Arend, Yonghua Wu, David Melecio-Vazquez

WRF Model NO_2 Consistent with Pandora Data in NYC Region



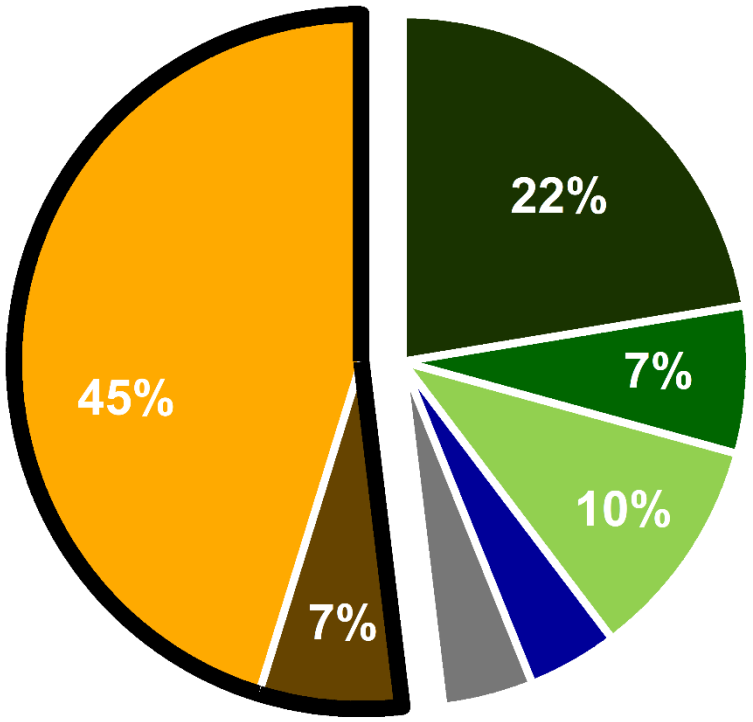
Acknowledgments: Luke Valin and Jim Szykman (EPA), Bob Swap, Nader Abuhassan, Alexander Cede (NASA)

Isoprene High by ~2x in the MEGAN Biogenic Inventory



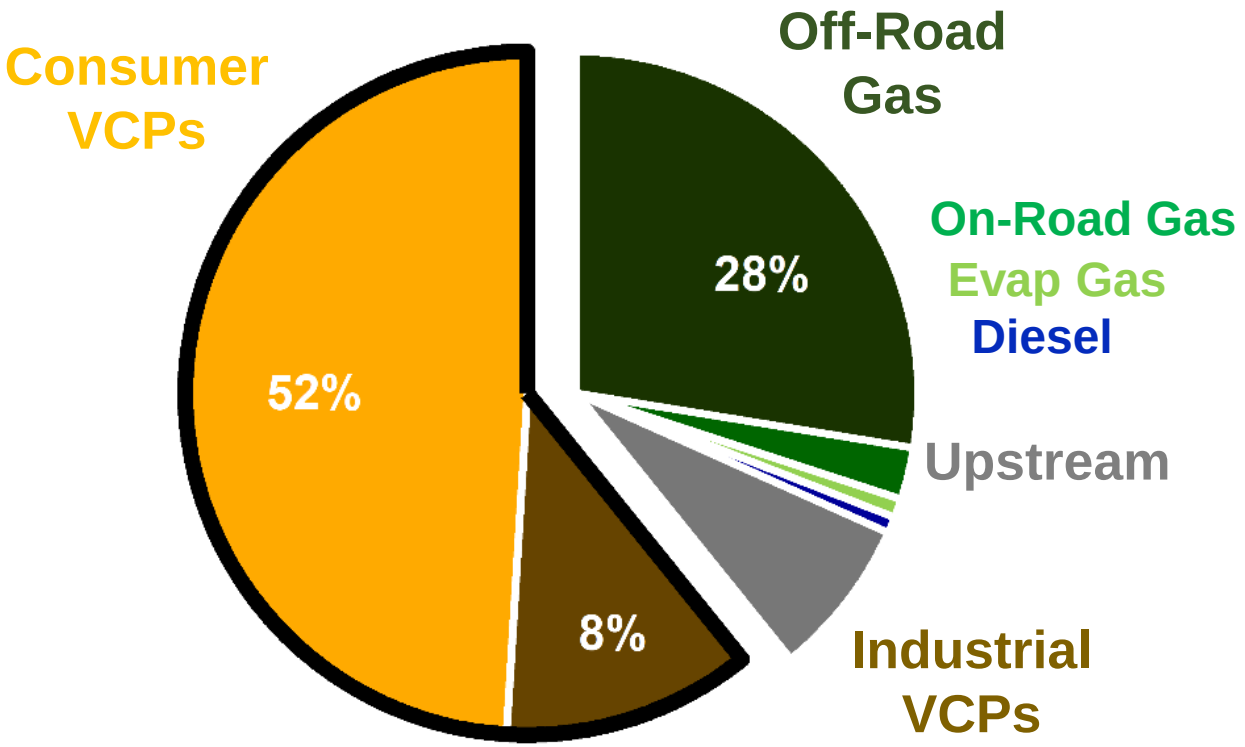
Factor of ~2 Differences in Anthropogenic VOC Inventories

NEI 2011 (Manhattan)



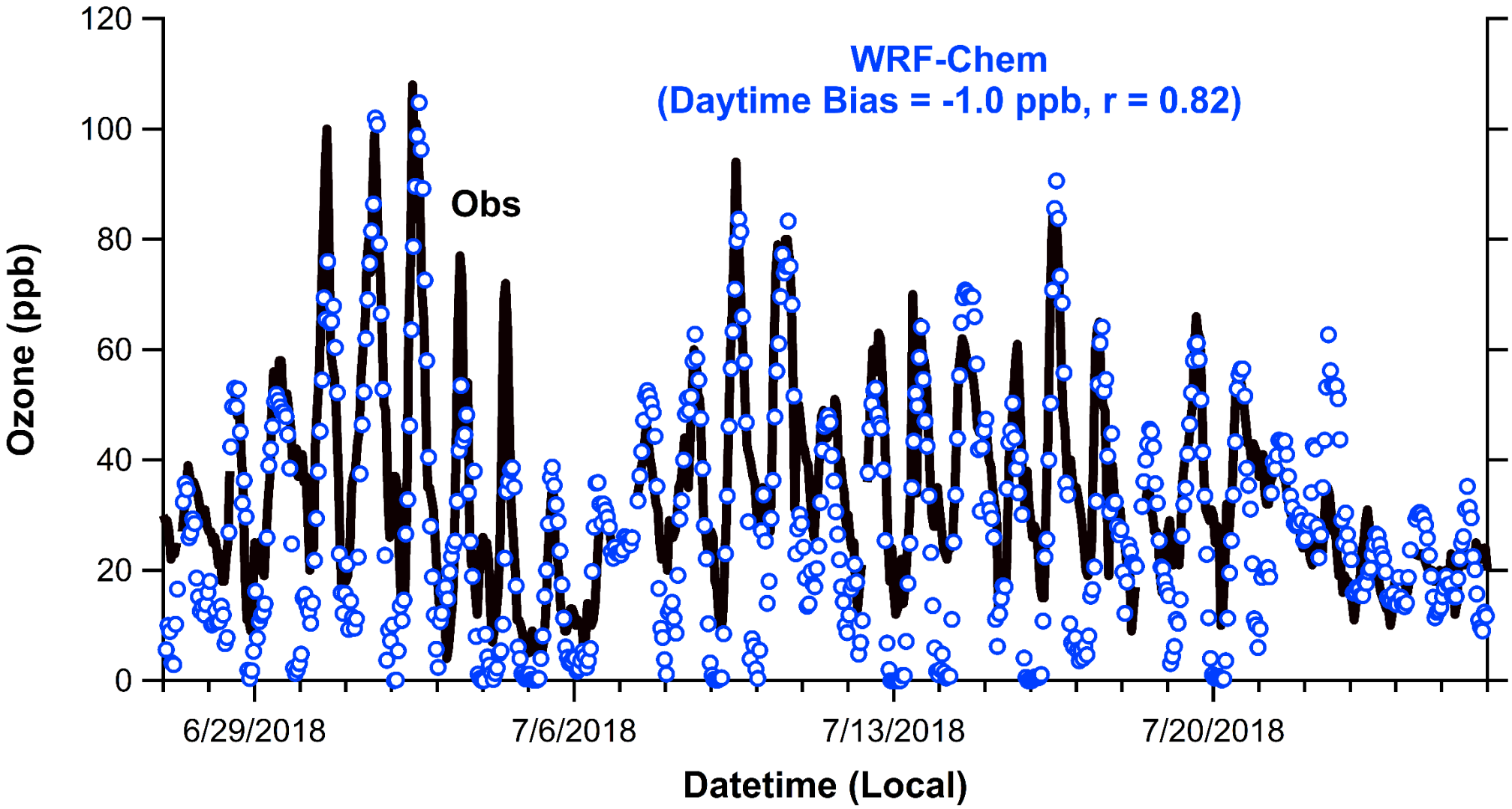
VOC Emissions = 27 g/person/d

This Study (Manhattan)



VOC Emissions = 46 ± 12 g/person/d

WRF-Chem Simulates Temporal Pattern and Peak Ozone (CCNY)

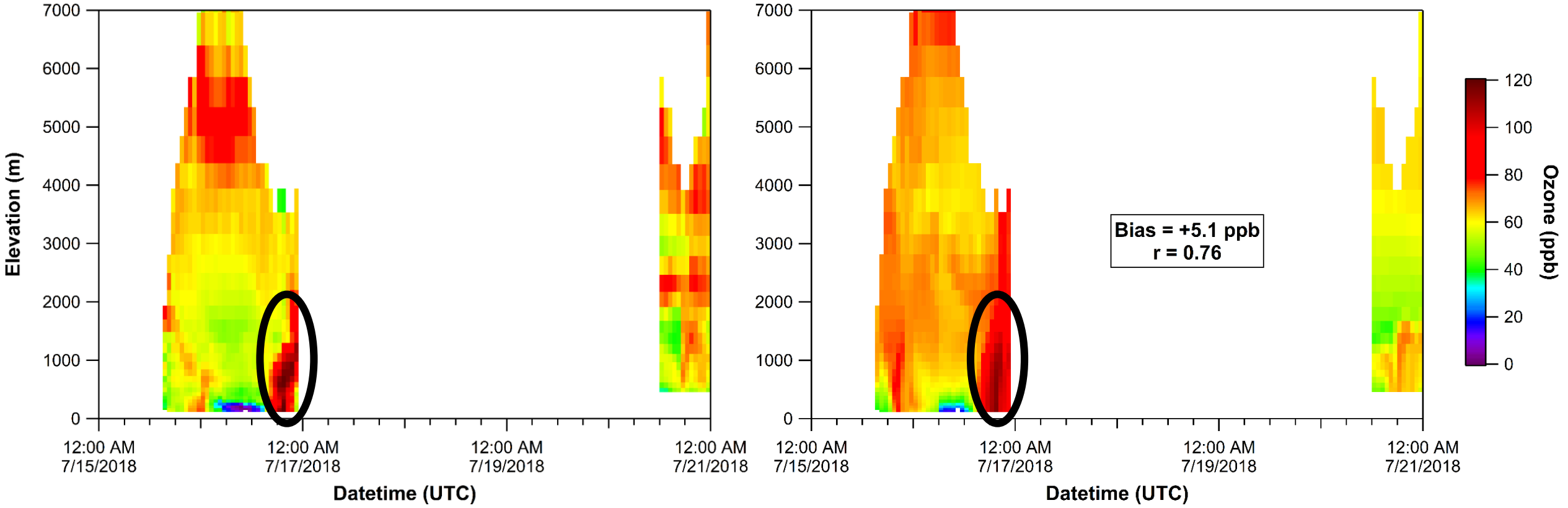


Does not include revised AVOC emissions based on LISTOS measurements

WRF-Chem Evaluation of Ozone on Connecticut Coast

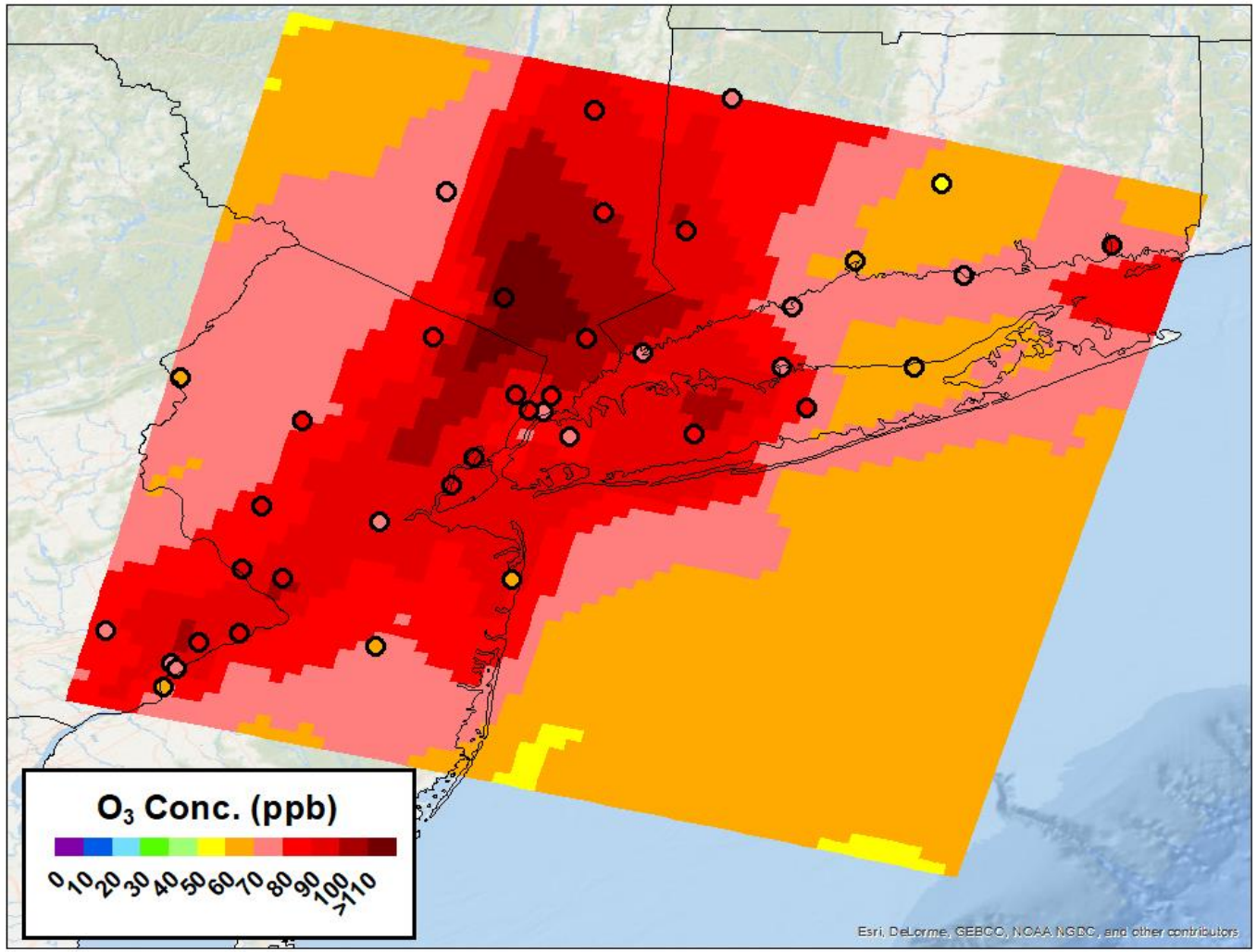
Ozone Lidar
(Westport, CT)

WRF-Chem Model
(Westport, CT)



Acknowledgments: Tim Berkoff (NASA)

Model Captures Spatial Pattern of 8-Hour Ozone on July 2nd



Obs Max = 115 ppb
Model Max = 120 ppb

Next Steps

- Develop anthropogenic VOC emissions for model including speciation
- Test chemical mechanisms
- Test impacts of mobile source NOx + VOCs, consumer VCPs, biogenic VOCs