AQRP Monthly Technical Report

PROJECT TITLE	Improved Land Cover and Emission Factor Inputs for Estimating Biogenic Isoprene and Monoterpene Emissions for Texas Air Quality Simulations	**PROJECT #**	14-016
PROJECT PARTICIPANTS	Alex Guenther (Battelle/PNNL) Joost de Gouw (NOAA) Greg Yarwood, Sue Kemball-Cook (ENVIRON)	**DATE SUBMITTED**	4/8/2015
REPORTING PERIOD	**From:** March 1, 2015 **To:** March 31, 2015	**REPORT #**	11

A Financial Status Report (FSR) and Invoice will be submitted separately from each of the Project Participants reflecting charges for this Reporting Period. I understand that the FSR and Invoice are due to the AQRP by the 15th of the month following the reporting period shown above.

Detailed Accomplishments by Task

Task 1: Estimation of Terpenoid Emission Fluxes from Aircraft Data

NOAA will report on March efforts on Task 1 once they return from the SONGNEX field experiment.

Task 2: Development of High Resolution Land Cover Data for MEGAN Modeling in Texas and the Southeastern U.S.

No work was done on Task 2 during February 2015.

Task 3: Emission Factor Database Development

PNNL continued work on improving the updated land cover and emission factor dataset.

Task 4: Development of MEGAN Biogenic Emission Inventories and Inventory Evaluation using Regional Photochemical Modeling

ENVIRON ran CAMx for the June 1-July 15, 2013 period using MEGAN emissions developed with updated inputs developed by PNNL under Tasks 2 and 3. The high bias for isoprene seen in the base run with default inputs grew larger in the run with updated inputs. ENVIRON carried out several sensitivity tests aimed at understanding and improving model performance for isoprene. A summary of CAMx runs performed to date is given below:

1. Base run: MEGAN emissions developed with default inputs

– LAI, Emission factors, plant functional types

2. Add OH production to isoprene chemistry (Peeters et al., 2013; 2014)
3. New PNNL LAI, EF, PFT inputs for MEGAN
4. Divide MEGAN default isoprene emissions by 2 for all grid cells and times. Factor of two was selected based on the results of the CAMx bias in the base run.
5. Increase CAMx dry deposition of oxygenated VOCs based on the SOAS dry deposition velocity measurements of Nguyen et al. (2014).

Sensitivity test results are summarized in Figure 1. Results indicate that:

- The best overall performance for these species shown in Figure 1 came in test 4, in which isoprene emissions were divided by 2
- In Run 3, with updated MEGAN inputs, CAMx bias for monoterpenes improved, but bias for isoprene, isoprene products and OH increased
- The NMB for zone was nearly unchanged in all sensitivity tests

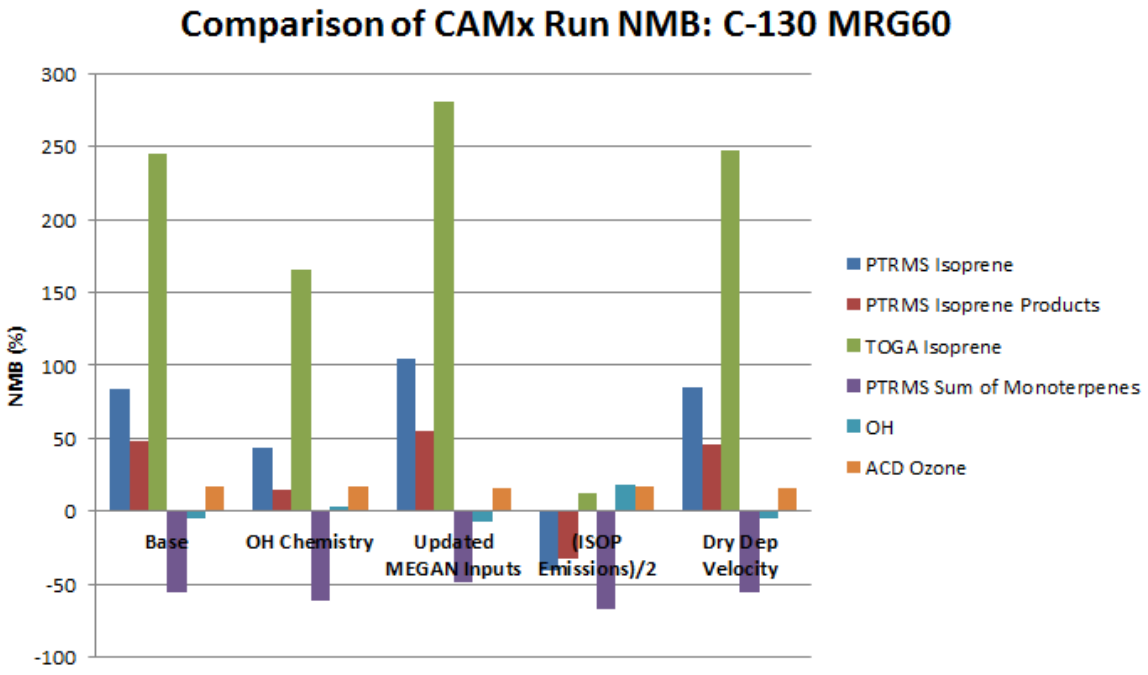

Figure 1: Comparison of normalized mean bias (NMB) for selected CAMx modeled species and species measured along the C-130 flight tracks during the period June 1-July 14, 2013. mrg60 data are 1-minute averages of observed data.

Data Collected

None

Identify Problems or Issues Encountered and Proposed Solutions or Adjustments
None to date

Goals and Anticipated Issues for the Succeeding Reporting Period

Task 3: Continue developing high resolution emission factor database by incorporating aircraft observations.

Task 4: ENVIRON will carry out a new sensitivity test using MEGAN emissions developed with another set of updated MEGAN inputs currently being developed by PNNL under Task 3.

Task 5: NOAA, PNNL and ENVIRON will work on the final report.

Detailed Analysis of the Progress of the Task Order to Date

The project remains on schedule and budget for completion and delivery of the final AQRP-reviewed report by the AQRP contract end date of June 30, 2015.

References

Nguyen, T., J. D. Crounse, A. P. Teng, J. M. St. Clair, F. Paulot, G. M. Wolfe, and P. O. Wennberg. 2014. Rapid deposition of oxidized biogenic compounds to a temperate forest. *PNAS*. www.pnas.org/cgi/doi/10.1073/pnas.1418702112.

Peeters, J., Nguyen, S.V., Nguyen, T.L., Stavrakou, T., Müller, J.-F., 2013. Hydroxyl radical regeneration in isoprene oxidation: the upgraded mechanism LIM1. Presentation to ACCENT Meeting, Urbino, Italy.

Peeters, J., Müller, J.-F., Stavrakou, T., Nguyen, V.S., 2014. Hydroxyl radical recycling in isoprene oxidation driven by hydrogen bonding and hydrogen tunneling: The upgraded LIM1 mechanism. *J. Phys. Chem.* A 118, 8625-8643.

Submitted to AQRP by: Joost de Gouw, Haofei Yu and Sue Kemball-Cook
Principal Investigator: Greg Yarwood