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**	3/9/2015
REPORTING PERIOD	**From:** February 1, 2015 **To:** February 28, 2015	**REPORT #**	10

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

Work was done on the comparison between observed isoprene mixing ratios and estimated isoprene emissions with the WRF-Chem model. WRF-Chem was run with 12-km resolution and with the NEI-2011 emissions and BEIS3.14 for biogenic emissions. Isoprene mixing ratios calculated from WRF-Chem showed a good correlation with the measurements for the NOAA WP-3D flights, but were 45% lower on average (Figure 1). This difference is consistent with a difference in emissions between BEIS and the emissions estimated from the mixed boundary layer method (see progress report from January). However, other factors that determine isoprene mixing ratios from isoprene emissions also need to be considered. Temperature and radiation were compared between WRF-Chem and the NOAA WP-3D data and were in decent agreement. Concentrations of OH radicals were not measured onboard the NOAA WP-3D. Instead, they can be estimated from a parameterization published by Ehhalt [Ehhalt and Rohrer, 2000]. The OH concentrations from WRF-Chem were found to be a factor of 2.3 higher on average than the Ehhalt parameterization (Figure 1). Part of the explanation, again, could be underestimated isoprene emissions in WRF-Chem: OH will decrease with higher isoprene emissions. However, since the calculated OH concentrations from the Ehhalt parameterization were also used in estimating isoprene emissions, these findings require further and more detailed examination.

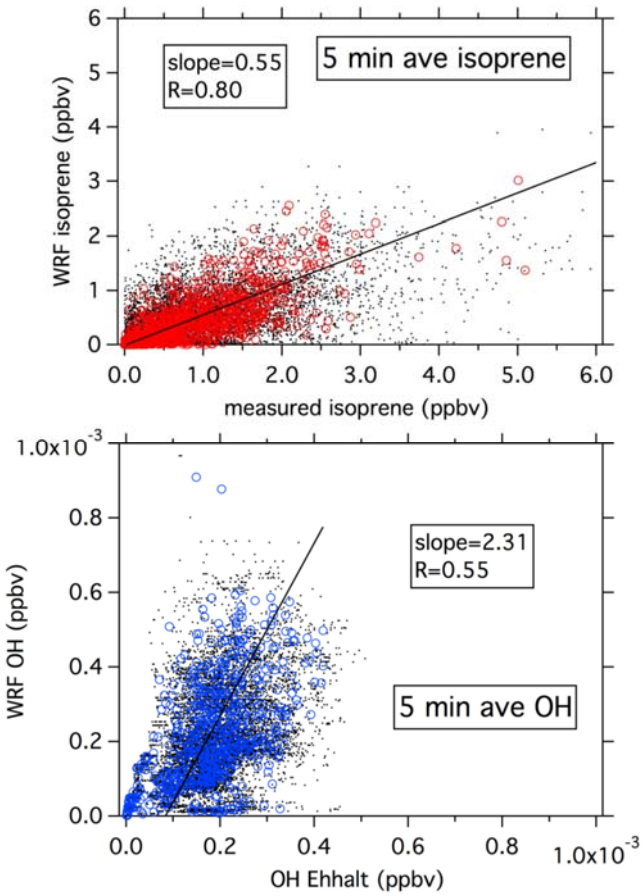

Figure 1: Comparison between (top) WRF-Chem model results for isoprene with the NOAA WP-3D data, and (bottom) WRF-Chem model results for OH with the concentrations estimated from a parameterization and NOAA WP-3D data.

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 has developed a 30 meter resolution emission factor dataset for the continental US and prepared data for ENVIRON to be used in Task 4. Meanwhile, PNNL continues working on improving current 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 using default inputs and the final WRF run. We evaluated the model against ozone surface observations from the CASTNet monitoring network and the TCEQ's CAMS network as well as against aircraft observations of isoprene, ozone and other species along the C-130 aircraft flight tracks. Model performance for ozone at surface monitoring sites was reasonably good given the 12 km model resolution, but there was a positive bias for ozone overall. CAMx concentrations of isoprene and ozone were well-correlated with the C-130 observations, but showed an overall high bias for both species (Figure 2).

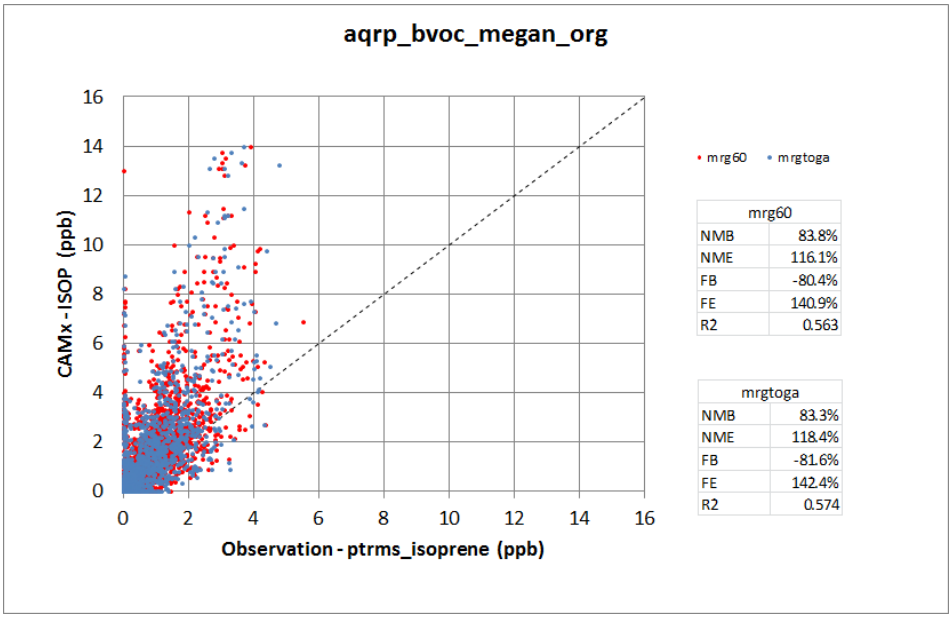

Figure 2: Comparison of CAMx modeled isoprene and isoprene measured by PTRMS along the C-130 flight tracks during the period June 1-July 14, 2013. mrg60 data are 1-minute averages of observed data, and mrgTOGA data are 2-minute averages.

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 1: In the succeeding reporting period, we will work on these remaining points:

- We have now received and will compare CAMx modeled isoprene and OH along the C-130 and P3 flight tracks
- We will compare the modeled MEGAN v2.1 surface emissions along flight tracks with the emissions determined from the measurements

- We will work on the final report to summarize the findings from our research.

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

Task 4: ENVIRON will prepare MEGAN emissions using updated MEGAN inputs provided by PNNL under Tasks 2 and 3 and will run CAMx with the updated MEGAN emissions. Performance in the two CAMx runs will be compared. We 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

Ehhalt, D. H., and F. Rohrer (2000), Dependence of the OH concentration on solar UV, *Journal of Geophysical Research, 105*, 3565–3571.

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