# AQRP Monthly Technical Report

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| **PROJECT TITLE** | Next steps for improving Texas biogenic VOC and NO emission estimates | **PROJECT #** | 18-005 |
| **PROJECT PARTICIPANTS** | UCI<br>Ramboll | **DATE SUBMITTED** | 6/30/2019 |
| **REPORTING PERIOD** | **From:** 6/1/2019<br>**To:** 6/30/2019 | **REPORT #** | 9 |

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

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**Detailed Accomplishments by Task**

*Task 1. Measure Texas BVOC emission factors and their variability*

A field campaign in the Houston and Austin areas was conducted from June 5 to 26 and was successful in acquiring the targeted measurement data. Nearly 250 leaves were sampled including those from dominant isoprene emitters including Quercus nigra (water oak), Quercus phellos (willow oak), Quercus stellata (post oak), Quercus virginiana (southern live oak), Quercus fusiformis (plateau live oak) and Liquidambar styraciflua (sweetgum). The results indicated that sun leaves were more than a factor of 2 higher than shade leaves. The average and standard deviation for all trees was within the range of what has previously been reported but the values for individual species varied by more than a factor of 2.

More than a dozen terpenoid compounds were observed in samples from these species and other regional or urban dominant species including Carya illinoinensis (pecan), Cinnamonum camphora (camphor), Lagerstroemia indica (crape myrtle), Magnolia grandiflora (magnolia), Taxodium distichum (bald cypress), Triadica sebifera (Chinese tallow tree), Celtis occidentalis (hackberry), Juniperus virginiana (eastern redcedar), Pinus echinata (shortleaf pine), Pinus palustris (longleaf pine), Pinus taeda (loblolly pine), and Ulmus crassifolia (cedar elm).

*Task 2. MEGAN model improvements*

The implementation of the new soil NO algorithm in MEGAN3 has been initiated. The initial approach that was considered was to take the BDSNP algorithm in CMAQ and call it as a compact package but this proved to be difficult since it requires subroutines and functions within the CMAQ source code. The strategy that is now being pursued is to build the BDSNP algorithm from scratch following the existing BDSNP subroutine by providing necessary inputs needed by BDSNP. This should result in a cleaner and more effective code.

*Task 3. MEGAN3.1 sensitivity analysis of Texas biogenic emissions*

The MEGAN3.1 model has been setup in preparation for the revised emission factors based on the field measurements.

**Preliminary Analysis**

All plant species studied emitted some BVOC but those emitting isoprene had much higher total emission rates. Shade leaves were observed to emit at much lower rates that sun leaves. Additional

measurements (fisheye lens photographs, leaf fluorescence measurements, photosynthesis, etc have been compiled and are being used to interpret the observations and investigate the source of variability.

**Data Collected**
Measurements were made on trees in the Houston and Austin regions. Nearly 250 leaves were sampled including those from dominant isoprene emitters including Quercus nigra (water oak), Quercus phellos (willow oak), Quercus stellata (post oak), Quercus virginiana (southern live oak), Quercus fusiformis (plateau live oak) and Liquidambar styraciflua (sweetgum). Isoprene was analyzed in-situ in Houston while a comprehensive analysis of the emissions is being conducted on samples in the Guenther laboratory at UCI. More than a dozen terpenoid compounds have been observed in samples from regional or urban dominant species including Carya illinoinensis (pecan), Cinnamonum camphora (camphor), Lagerstroemia indica (crape myrtle), Magnolia grandiflora (magnolia), Taxodium distichum (bald cypress), Triadica sebifera (Chinese tallow tree), Celtis occidentalis (hackberry), Juniperus virginiana (eastern redcedar), Pinus echinata (shortleaf pine), Pinus palustris (longleaf pine), Pinus taeda (loblolly pine), and Ulmus crassifolia (cedar elm).

**Identify Problems or Issues Encountered and Proposed Solutions or Adjustments**
None.

**Goals and Anticipated Issues for the Succeeding Reporting Period**
UCI will complete analysis of the emission measurements. UCI and Ramboll will implement the new MEGAN soil NO emission approach and updated BVOC emission data and initiate the MEGAN3.1 sensitivity analysis.

**Detailed Analysis of the Progress of the Task Order to Date**
The project is proceeding as planned.

**Do you have any publications related to this project currently under development? If so, please provide a working title, and the journals you plan to submit to.**

**___Yes __X_No**

**Do you have any publications related to this project currently under review by a journal? If so, what is the working title and the journal name? Have you sent a copy of the article to your AQRP Project Manager and your TCEQ Liaison?**

**___Yes _X No**

**Do you have any bibliographic publications related to this project that have been published? If so, please list the reference information. List all items for the lifetime of the project.**

**___Yes __X_No**

**Do you have any presentations related to this project currently under development? If so, please provide working title, and the conference you plan to present it (this does not include presentations for the AQRP Workshop).**
**___Yes __X_No**

**Do you have any presentations related to this project that have been published? If so, please list reference information. List all items for the lifetime of the project.**

**___Yes _X No**

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Submitted to AQRP by

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