# AQRP Monthly Technical Report

| | | | |
|---|---|---|---|
| **PROJECT TITLE** | Emission source region contribution to a high surface ozone episode during DISCOVER-AQ | **PROJECT #** | 14-004 |
| **PROJECT PARTICIPANTS** | Christopher P. Loughner and Melanie Follette-Cook | **DATE SUBMITTED** | 11/7/2014 |
| **REPORTING PERIOD** | **From:** October 1, 2014<br>**To:** October 31, 2014 | **REPORT #** | 4 |

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**

1) WRF model output analyzed alongside observations.
2) CMAQ simulations for the 36, 12, and 4 km domains were completed.
3) CMAQ model output analyzed alongside observation
4) RIP meteorological back trajectories were calculated and analyzed using the 4 km WRF model output.

**Preliminary Analysis**

We analyzed the 4 km WRF and CMAQ simulations alongside observations. On September 24, WRF diagnosed 2 m temperatures and 10 m wind velocities are in agreement with the observations (Figure 1), but CMAQ simulated a high bias in maximum 8 hour average ozone (Figure 2). CMAQ simulated a high bias on the two cleanest days during the field campaign. September 24 was one of the two cleanest days during the month long field campaign.

A back trajectory calculated from WRF model output shows transport from Dallas moving over the Houston metropolitan area on September 25 (Figure 3). This suggests that emissions from the Dallas area may of impacted ozone concentrations during this air pollution episode. On September 25, WRF simulated a weaker bay breeze than observed (Figure 4). This caused the model to simulate maximum surface ozone concentrations over the water and Galveston, whereas observations show peak ozone along the western shore of Galveston Bay (Figure 5). Observed southeasterlies along the western shore of the Galveston bay likely caused high air pollution levels over the Galveston Bay to be transported onshore resulting in peak maximum 8 hour average ozone concentrations to be located along the western shore of the Galveston Bay. WRF simulated northerlies near the western coastline of Galveston Bay, causing CMAQ to transport the pollutants over Galveston Bay southward toward Galveston, which was near the model simulated sea breeze convergence zone.

For September 26, WRF simulated southeasterly transport agrees with observations (Figure 6) and the magnitude and spatial pattern of CMAQ simulated maximum 8 hour average ozone is in agreement with observations (Figure 7).

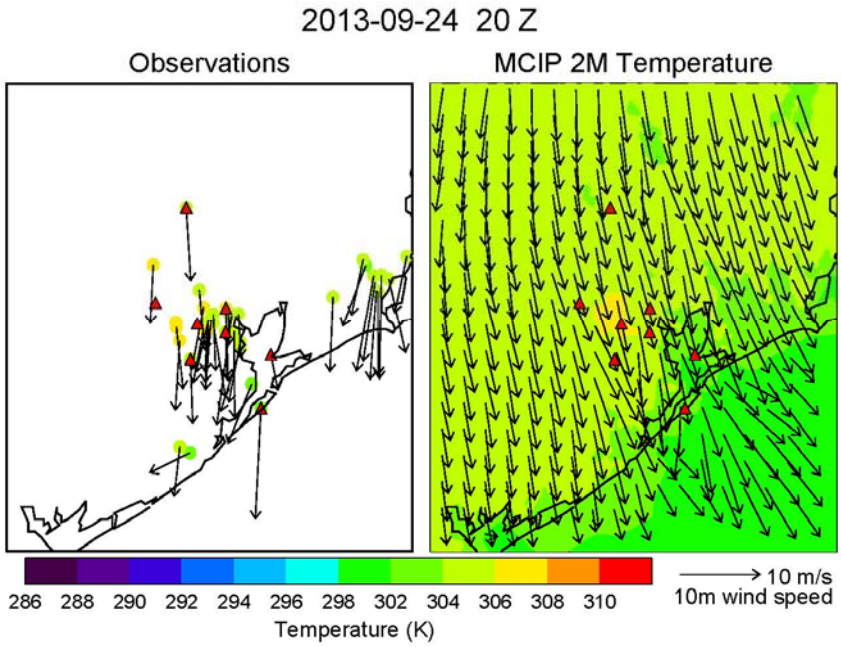


Figure 1. Observed (left) and WRF diagnosed (right) 2 m temperature and 10 m wind velocity at 20 UTC 24 September 2013.

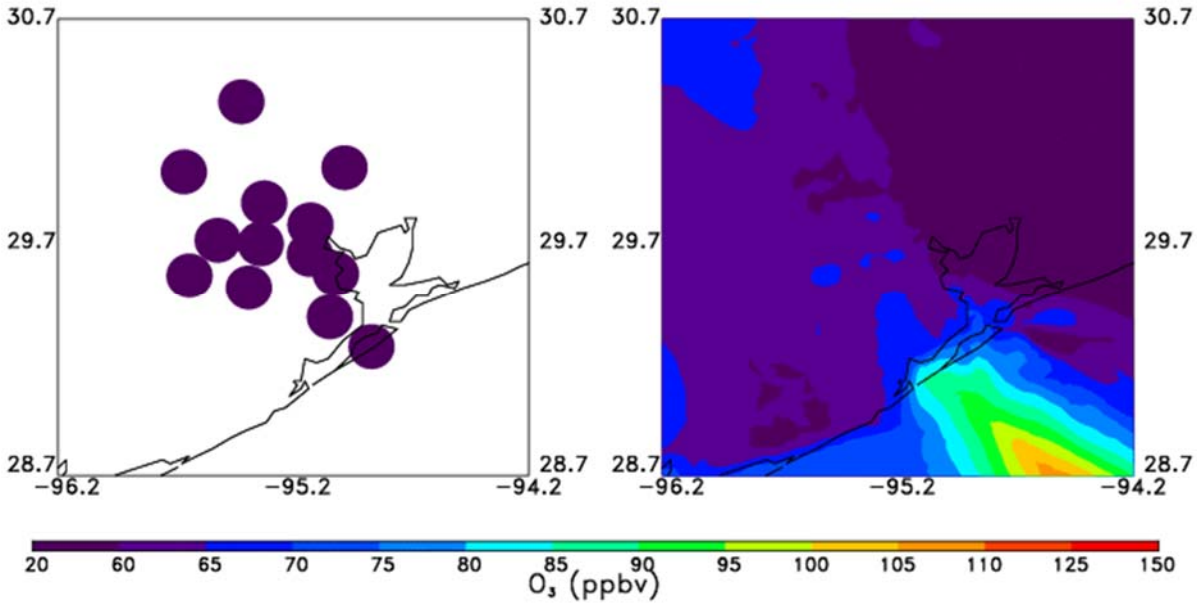


Figure 2. Observed (left) and CMAQ simulated (right) maximum 8 hour average ozone on 24 September 2013.

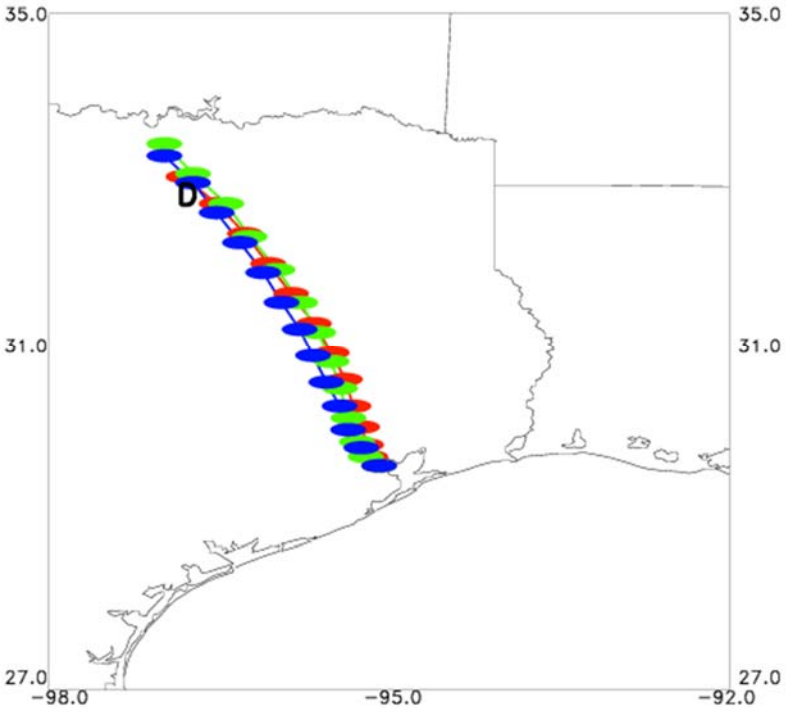


Figure 3. Back trajectories from 4 km WRF model output initialized at La Porte Sylvan Beach at 20 UTC at 0.5 km (red), 1 km (green), and 2 km (blue) AGL. The letter 'D' shows the location of Dallas, TX.

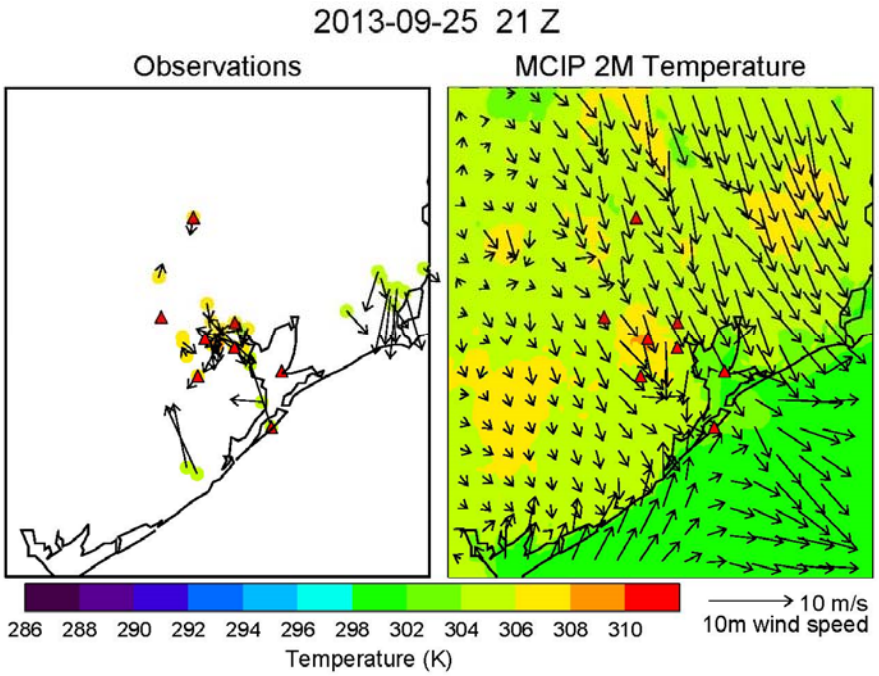


Figure 4. Observed (left) and WRF diagnosed (right) 2 m temperature and 10 m wind velocity at 21 UTC 25 September 2013.

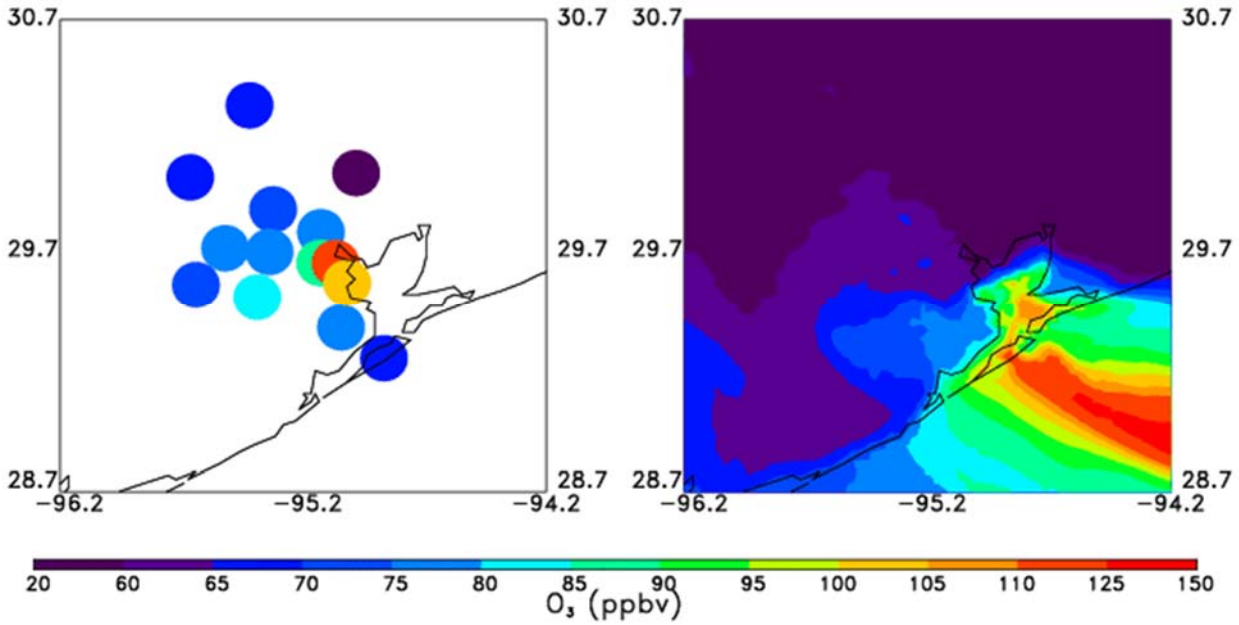


Figure 5. Observed (left) and CMAQ simulated (right) maximum 8 hour average ozone on 25 September 2013.

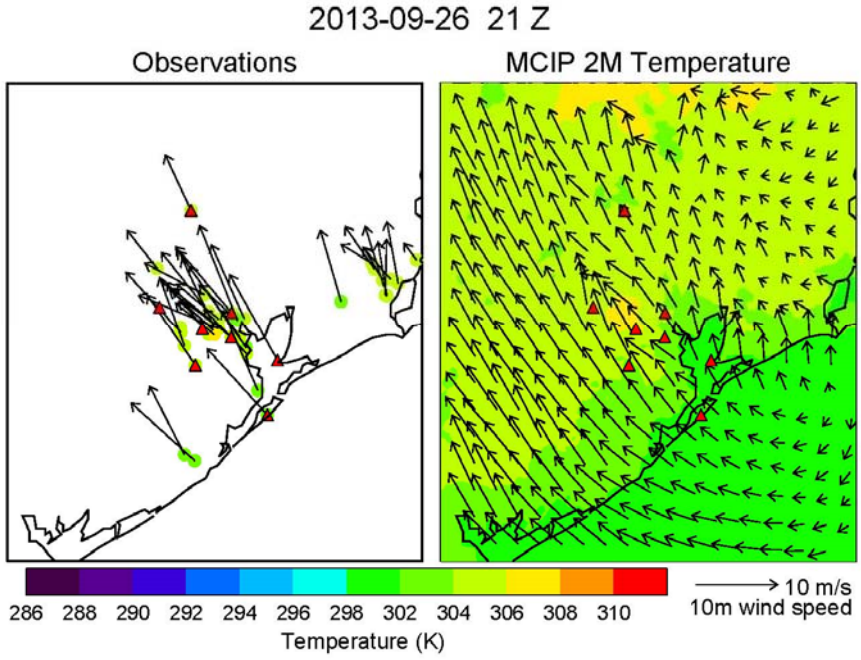


Figure 6. Observed (left) and WRF diagnosed (right) 2 m temperature and 10 m wind velocity at 21 UTC 26 September 2013.

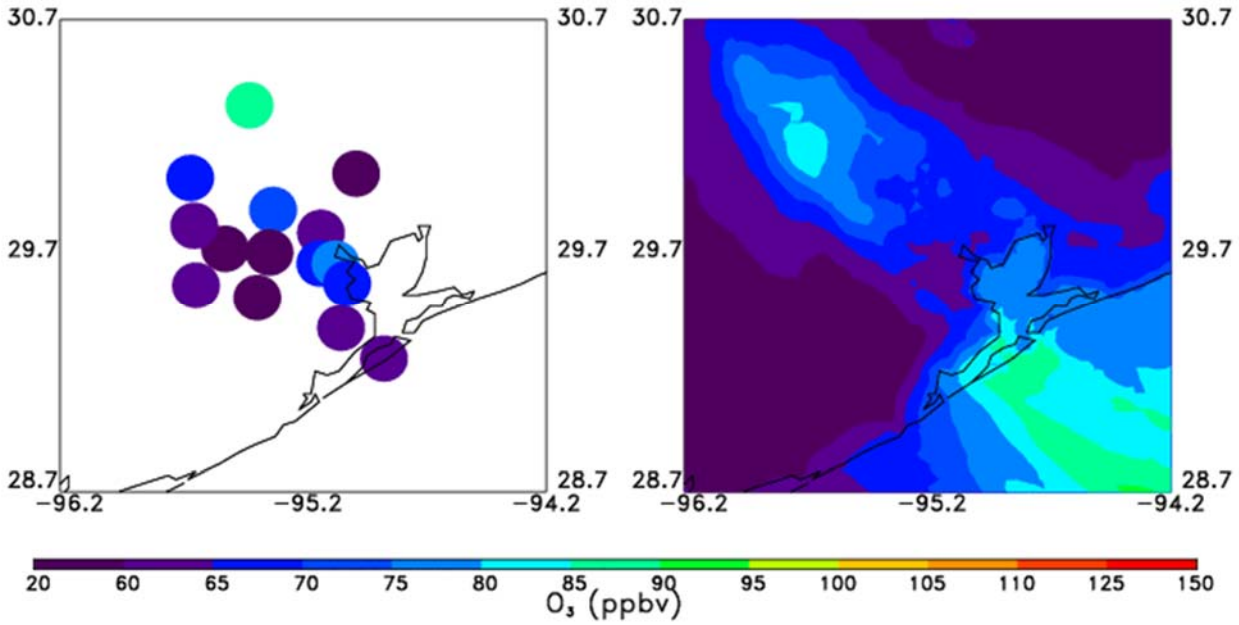


Figure 7. Observed (left) and CMAQ simulated (right) maximum 8 hour average ozone on 26 September 2013.

**Data Collected**

Temperature and wind velocity data was collected from the EPA (http://aqsdr1.epa.gov/aqsweb/aqstmp/airdata/download_files.html) for use in the above preliminary analysis.

**Identify Problems or Issues Encountered and Proposed Solutions or Adjustments**

The WRF model simulated a weaker bay breeze than observed. We intend to perform WRF sensitivity tests to improve the model simulation by increasing model resolution (1 km) and performing nudging in the finer domains (previously we only nudged the 36 km domain).

**Goals and Anticipated Issues for the Succeeding Reporting Period**

We will perform a WRF sensitivity simulation to improve the model representation of the bay breeze on September 25.

**Detailed Analysis of the Progress of the Task Order to Date**

We don't anticipate delays in the completion of this project.

---

Submitted to AQRP by: Chris Loughner

Principal Investigator: Chris Loughner