AQRP Monthly Technical Report

PROJECT TITLE	Galveston Offshore Ozone Observations (GO3)	**PROJECT #**	20-004
PROJECT PARTICIPANTS	James Flynn (UH) Yuxuan Wang (UH) Paul Walter (St. Edward's University) Gary Morris (St. Edward's University)	**DATE SUBMITTED**	11/6/2020
REPORTING PERIOD	**From:** October 1, 2020 **To:** October 31, 2020	**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 14th of the month following the reporting period shown above.

Detailed Accomplishments by Task for reporting period

- Worked with AQRP, TCEQ and project team to discuss implications of adding a NO_2 photocell to the sampling packages.
- Began testing pontoon boat on local lake to gain experience with the handling and operation prior to beginning tests of science operations.
- Switched pontoon boat onto galvanized trailer.
- UH team continued taking online boater safety courses.
- Sent partially executed liability waiver to Larry Willis for execution before installing research equipment on his shrimp boat for Galveston Bay measurements
- Coordinated new deployment schedule with Ryan Marine Services for operations in the Gulf of Mexico

Data Collected

Initial field test of the first instrument package was conducted between October 10 and 17 at the Moody Tower. The system was placed on the roof deck of a lab trailer ~7-8 m from the main sample inlet and about 4 m lower. The sampling system, mast with weather sensor, filter, and rain guard can be seen in the photo below. Time series data are also presented below.

Figure 1. GO3 sample box on the roof of a Moody Tower lab trailer with met sensor and inlet. The main Moody Tower (C695) sample mast is in the background where O_3 and met parameters are measured for C695.

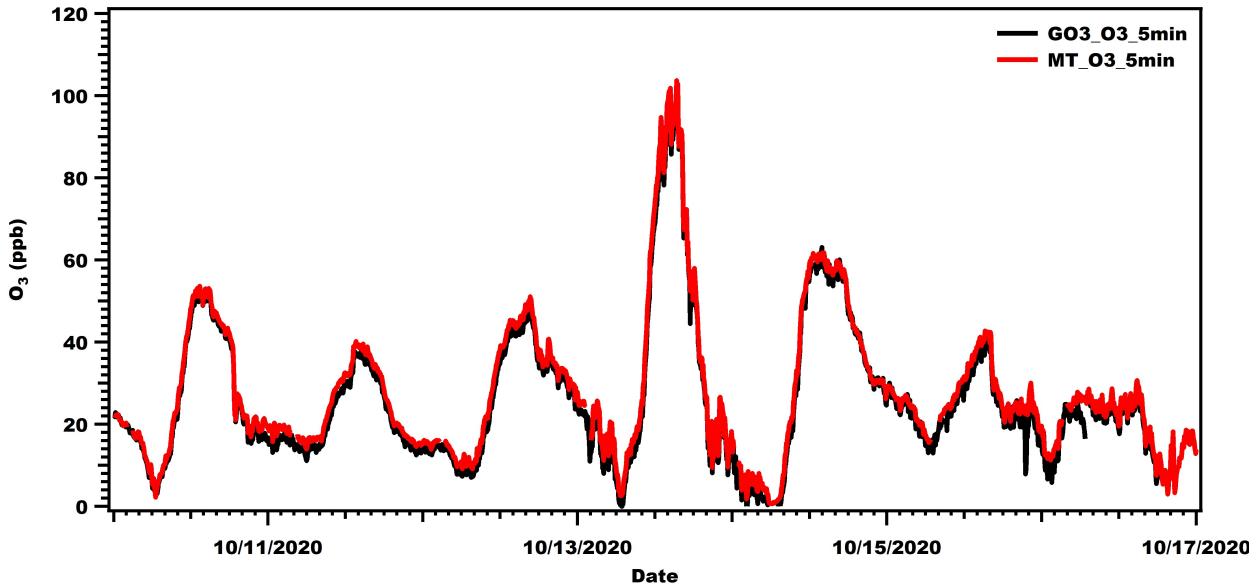


Figure 2. Time series of O_3 from the GO3 and Moody Tower systems.

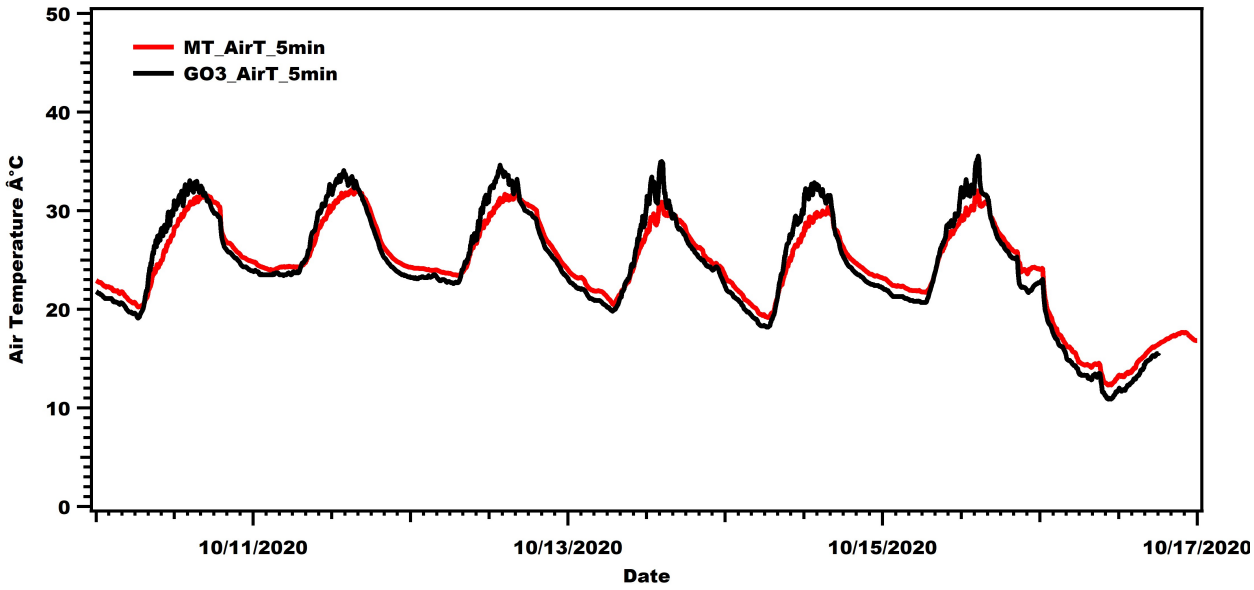


Figure 3. Time series of air temperature from the GO3 and Moody Tower systems.

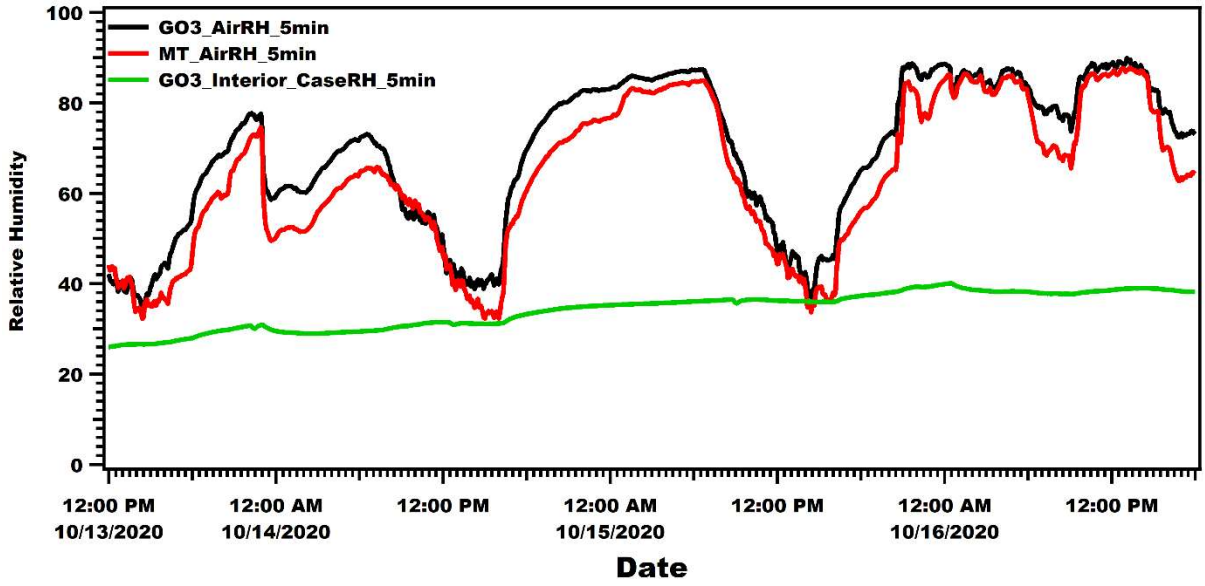


Figure 4. Time series of relative humidity from the GO3 and Moody Tower systems. The interior RH for the case is for housekeeping purposes and the progressive increase over time is addressed in more detail below.

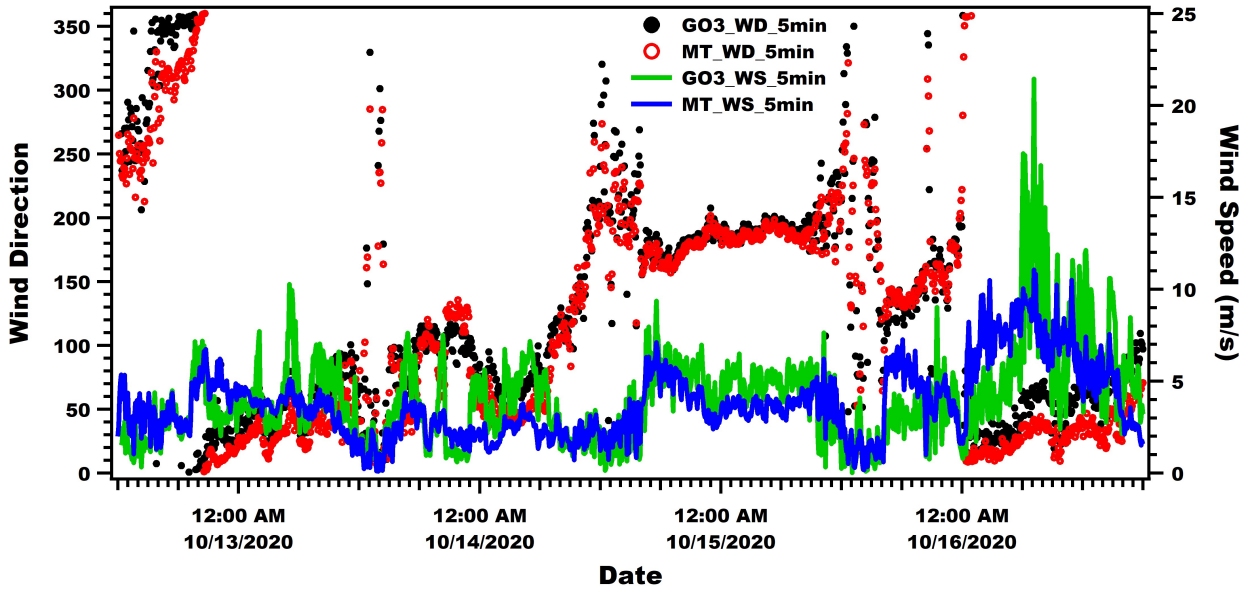


Figure 5. Time series of wind speed and wind direction from the GO3 and Moody Tower systems. It should be noted that the Moody Tower uses a propeller and vane anemometer and the GO3 uses a compact integrated met sensor with 2-D sonic anemometer.

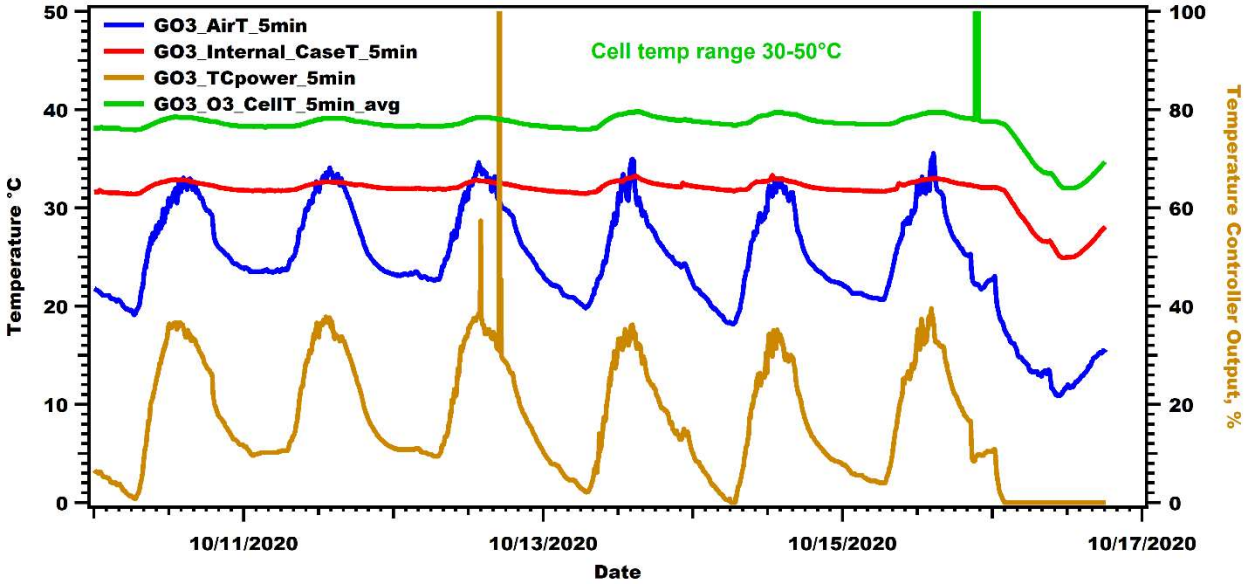
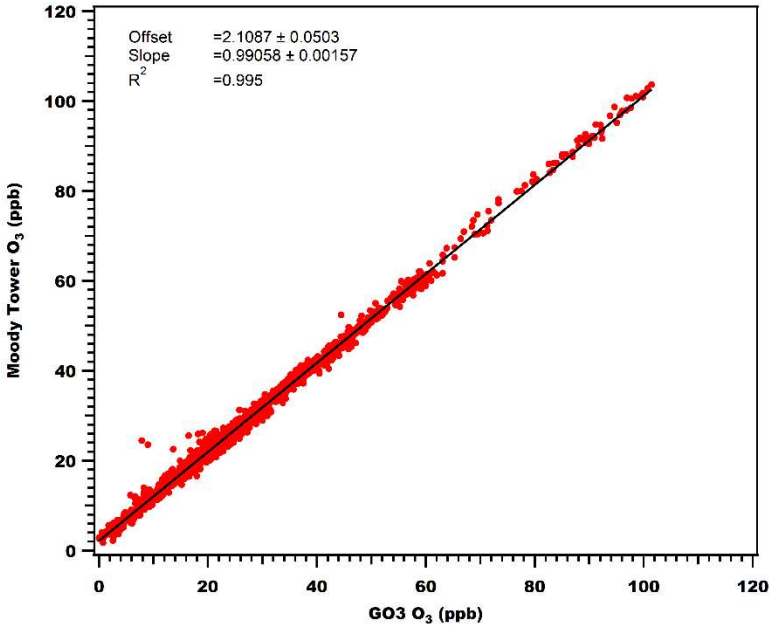


Figure 6. Time series of temperatures and thermoelectric cooler power output from the GO3 system. The cooling system power output did not exceed 40% other than two transient events. A cold front near the end of the test dropped temperatures below the threshold for active cooling however, the O_3 instrument remained within its operational range of 30-50 ˚C. It is not anticipated that temperatures as cool as these will be experienced for significant periods during the operational period which will begin April 1, 2021.

Preliminary Analysis

Preliminary analysis of the initial field test of the first instrument system which is intended for the crew boat in the Gulf of Mexico showed excellent agreement with the O_3 monitor at Moody Tower (C695). The GO3 package agrees with Moody Tower within a couple of percent and has a high degree of correlation ($r^2 = 0.995$).



Identify Any Problems or Issues Encountered and Proposed Solutions or Adjustments

The previous report noted that Larry Willis had requested a liability waiver. This waiver has been approved by all parties and a fully executed copy will be picked up from Mr. Willis in November when the UH sampling trailer at Smith Point is shut down for O_3 season.

As seen in Figure 4 the relative humidity inside the case was increasing over time. We believe that this is due to outside humid air being drawn into the case by the O_3 sample pump. From the factory the 2B Tech instrument does not have an exhaust port, air is simply exhausted inside the instrument. The sample case does have a factory pressure valve to relieve the increase in pressure from the sample exhaust, however over time the addition of ~2 liters per minute of ambient air was introducing more humidity into the case, gradually exceeding the capacity of the desiccant bags. To address this an exhaust port is being added to the O_3 monitors, which will then allow us to exhaust the humid sample back out of the case. Operationally the desiccant bags will be changed once per month when the inlet filter is changed, or any time the case is opened for maintenance. The case internal temperature is held relatively warm to avoid condensation issues. The coldest point in the system is the cold plate of the thermoelectric cooler which is held to 26.7 ˚C, or 80 ˚F and should be well above the dew point while still keeping the equipment within normal operating temperatures. This humidity measurement is a housekeeping parameter and intended to help identify potential leaks in the case and avoid excessive moisture rather than a reportable measurement.

Goals and Anticipated Issues for the Succeeding Reporting Period

- Finalize change in scope of work with AQRP and TCEQ
- Make adjustments to GO3 sampling package and retest at UH Moody Tower before finalizing the build plan for the second system.
- Test CL-51 ceilometer at the UH Launch Trailer
- Complete preparations and continue testing of pontoon boat
- Conduct test launch of ozonesonde from pontoon boat to identify issues to be addressed prior to deployment in Galveston Bay

Detailed Analysis of the Progress of the Task Order to Date

The project is moving forward quite well with respect to the Task Order issue date. With the request from AQRP and TCEQ to delay deployment into the 2021 O_3 season the timeline has shifted which will allow more time for preparation and coordination.

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** ☒ **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** ☒ **No**

Do you have any bibliographic publications (ie: publications that cite the project) 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** ☒ **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** ☒ **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** ☒ **No**

Have any personnel changes occurred that were not listed in the original proposal? If so, please include a detailed description of the personnel change(s) below.

☐ **Yes** ☒ **No**

Are any delays expected in the progress of the research? If so, please include a detailed description of the potential delay below.

☒ **Yes** ☐ **No**

The AQRP and TCEQ have requested the deployment to be delayed into CY2021.

Describe any possible concerns/issues (technical or non-technical) that AQRP should be made aware of.

☐ **Yes** ☒ **No**

Are you anticipating using all the available funds allocated to this project by the end date? If not, why and approximately what is the amount to be returned?

☒ **Yes** ☐ **No**

Submitted to AQRP by

James Flynn