

The Marine-Atmospheric Emitted Radiance Interferometer (M-AERI)

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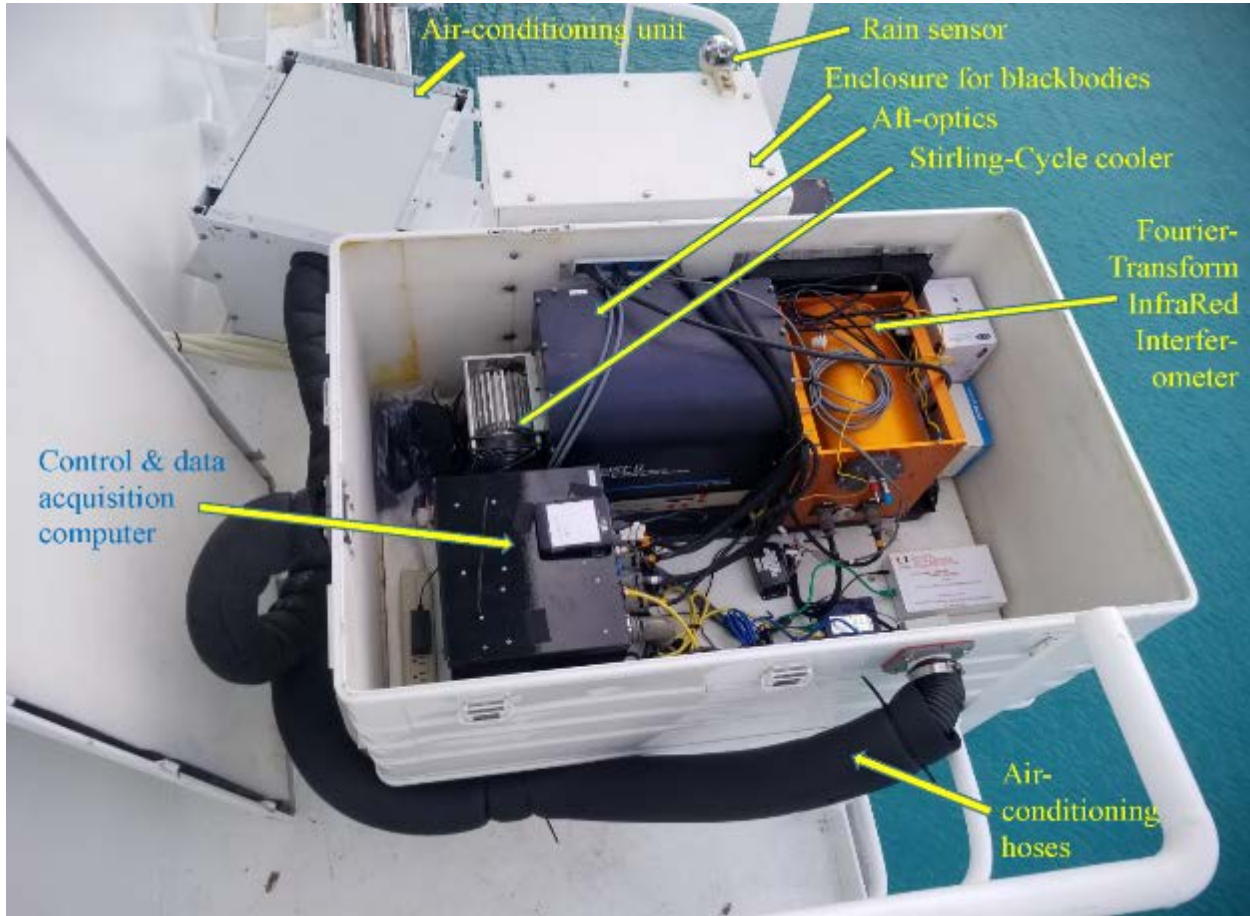
M-AERI

- M-AERI is a very well-calibrated and stable sea-going Fourier Transform Infrared Interferometer.
- At sea calibration by two internal blackbody cavities with thermometers with NIST-traceable calibration.
- Calibration sequence before and after each cycle of measurements.
- Calibration before and after deployments using NIST-designed water-bath blackbody calibration target at RSMAS. Uses SI-traceable thermometers at mK accuracy.
- Periodic radiometric characterization of RSMAS water-bath blackbody calibration target by NIST TXR and NPL AMBER.

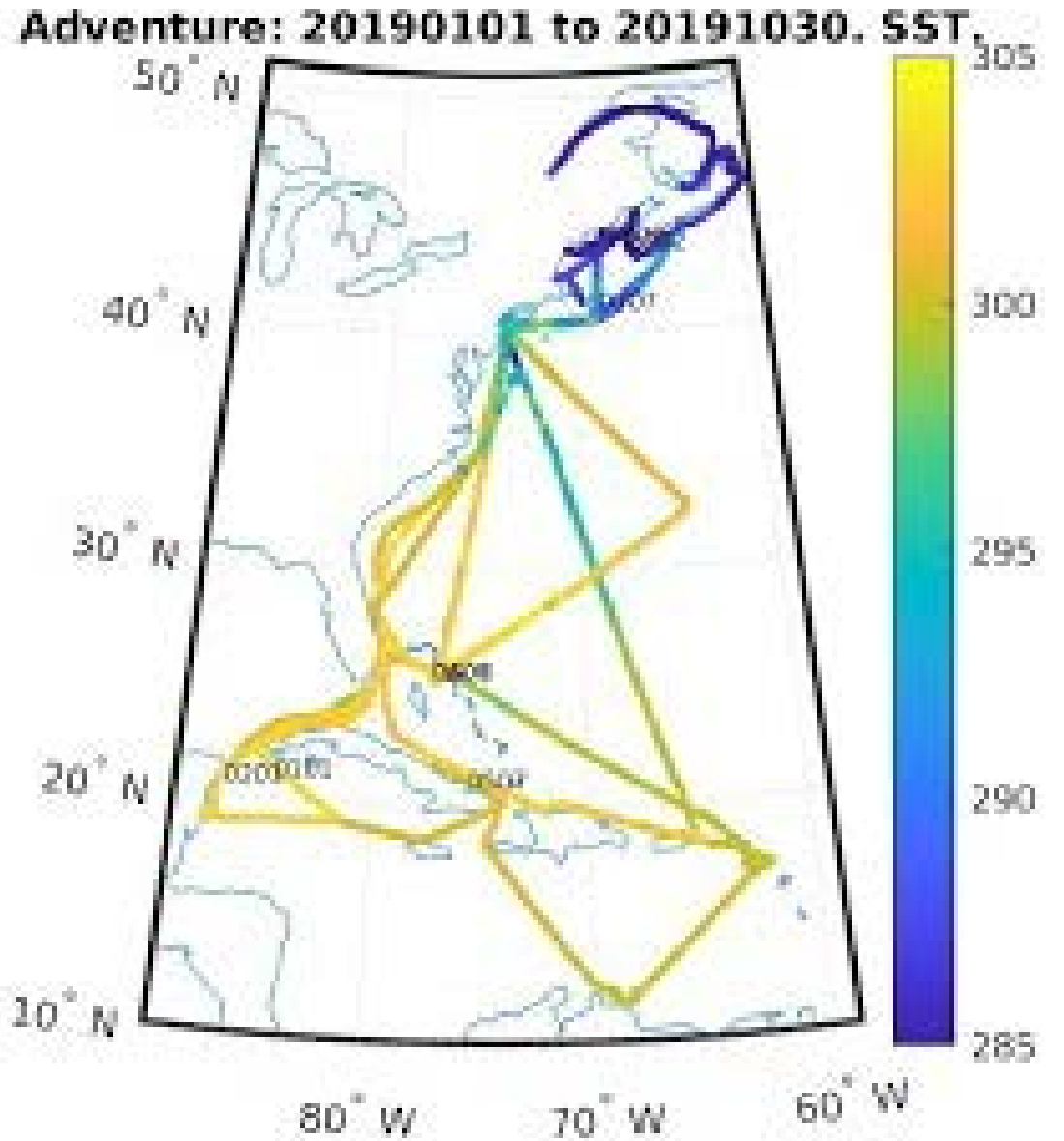


M-AERI deployments

- M-AERI deployments began in 1996.
- M-AERIs now operate autonomously over satellite internet link.
- Three Mk2 M-AERI's are usually deployed on Royal Caribbean International ships.
- One Mk3 deployed on research ships. Currently on the NOAA Ship *Ronald H Brown* for cruises in Atlantic and Pacific December 2019 – Summer 2021.
- Currently, RCI ships are not sailing, *Ronald H Brown* has been docked in Norfolk, VA, since April 17, but with plans to start cruises next month.

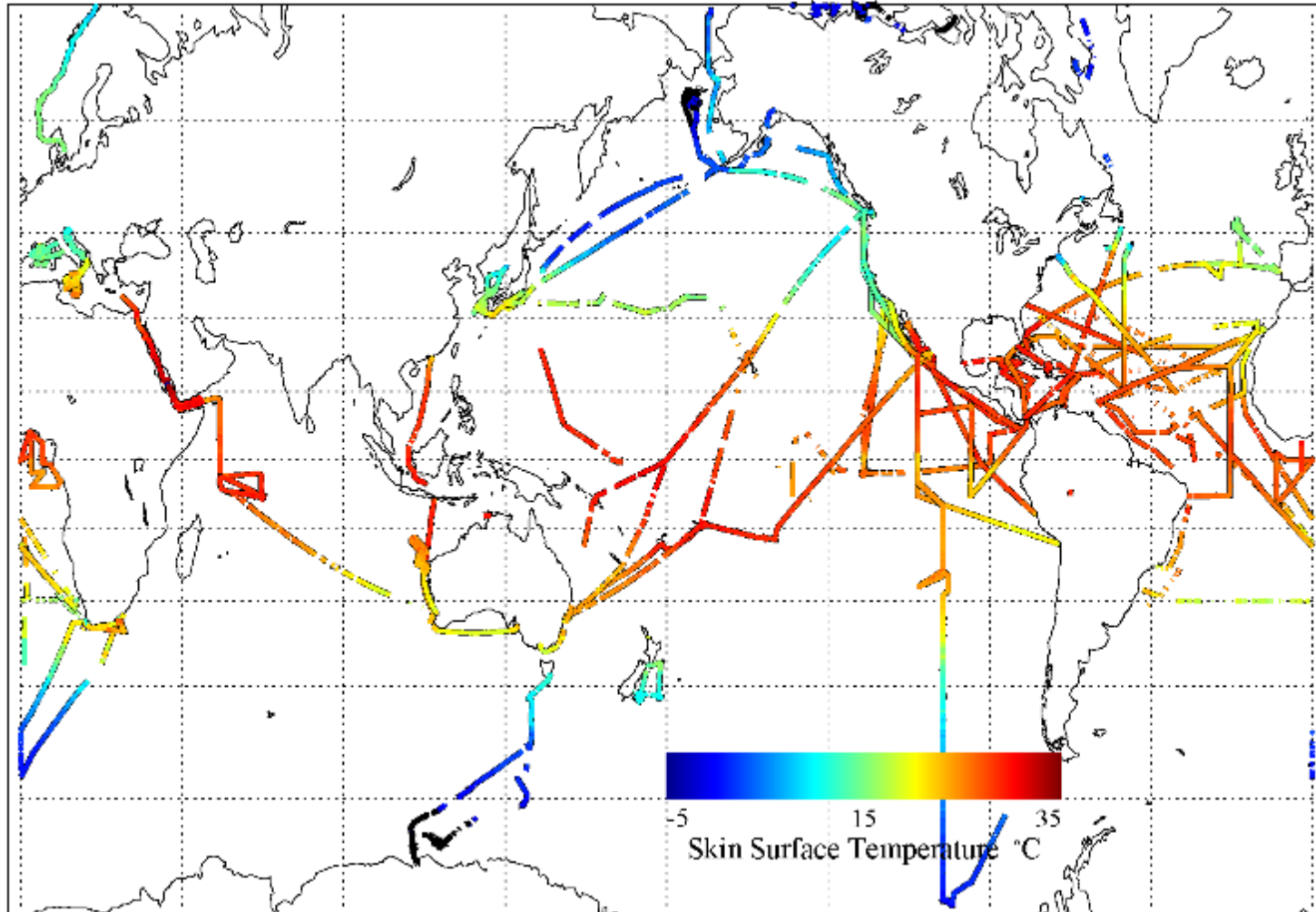


M-AERI Mk2 installed on the *Adventure of the Seas*.



M-AERI Cruises

M-AERI Skin SSTs



Explorer of the Seas



Explorer of the Seas: near continuous operation December 2000 – December 2007.

Research Ship M-AERI Mk 2 Deployments

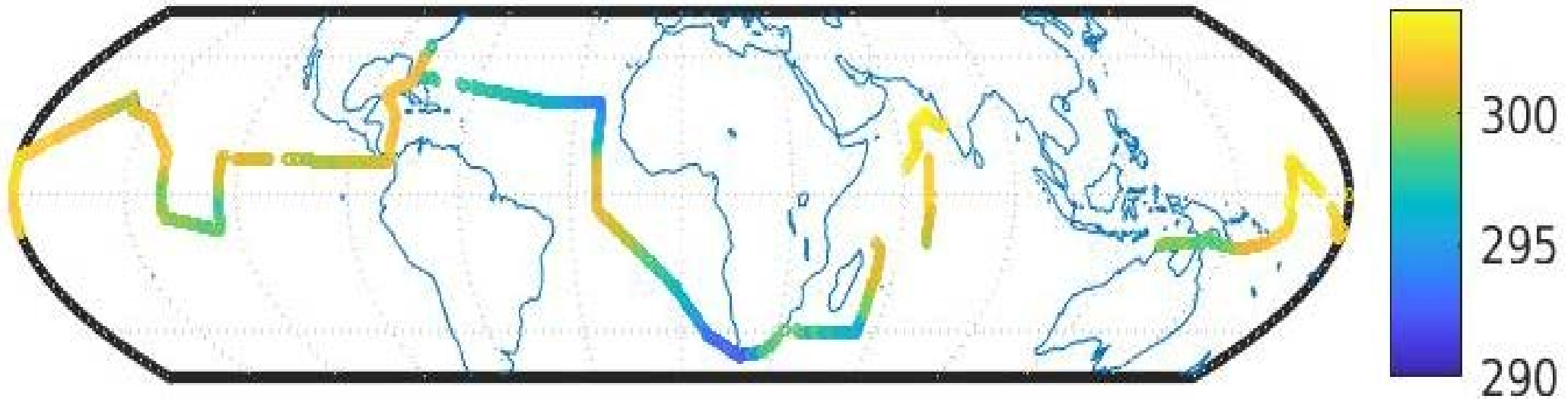


M-AERI Mk 3 on NOAA Ship *Ronald H Brown*



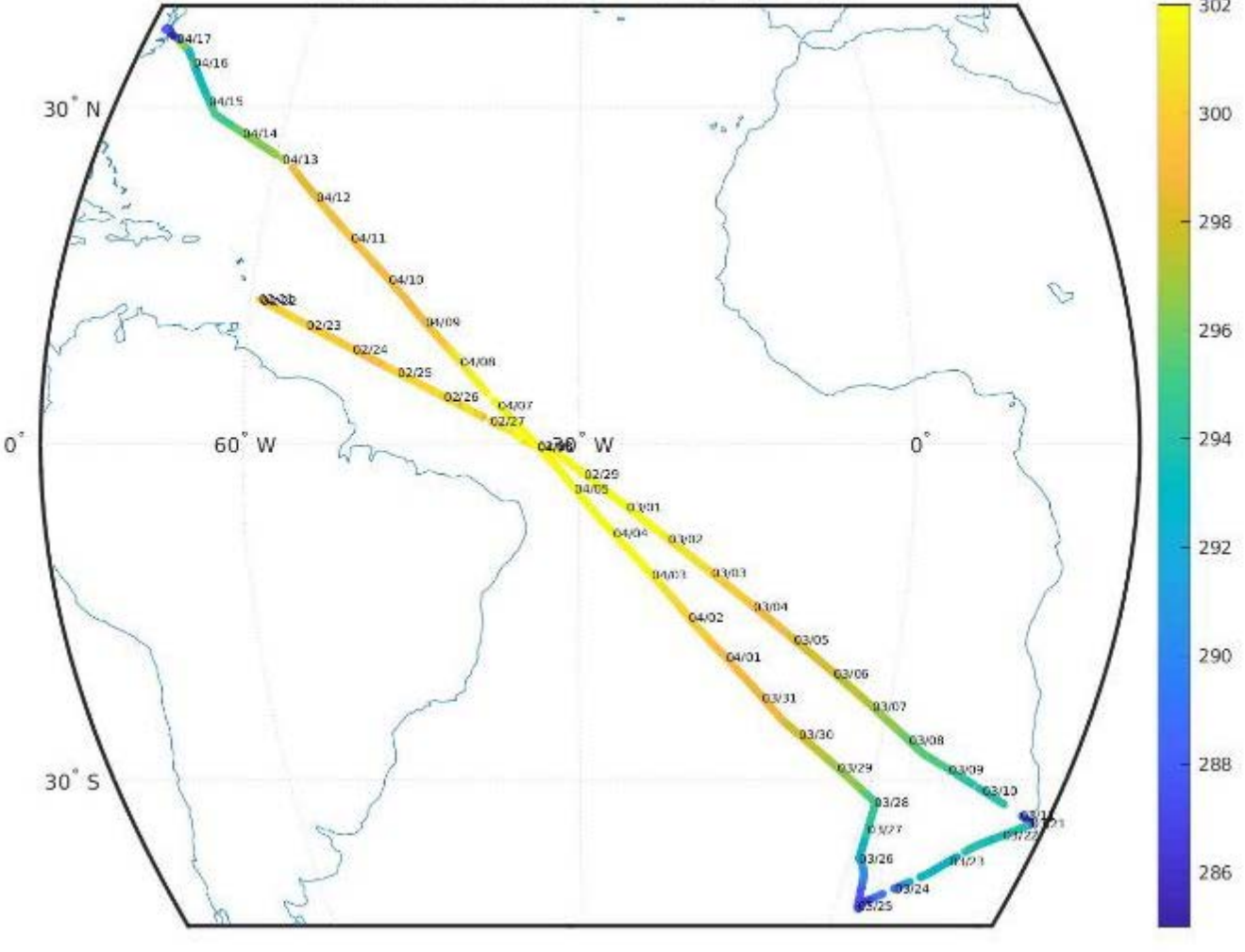
Track of the NOAA Ship *Ronald H. Brown*, colored by the SST_{skin} measured by the M-AERI-Mk3, scale at right in K. Gaps are due to rain, spray or instrument issues. The cruise started on Ft. Lauderdale, FL, on March 3, 2018 and ended in Charleston, SC, on October 23, 2018.

M-AERI-Mk3 was installed on November 25, 2019, in Charleston, SC, with planned removal in July 2020 in San Diego, CA..... but. Covid-19 spoiled those plans.



M-AERI Mk 3 on *Ronald H Brown* in 2020

Ronald H. Brown: 20200221-20200417 . SST



Current Cruise Ship Deployments

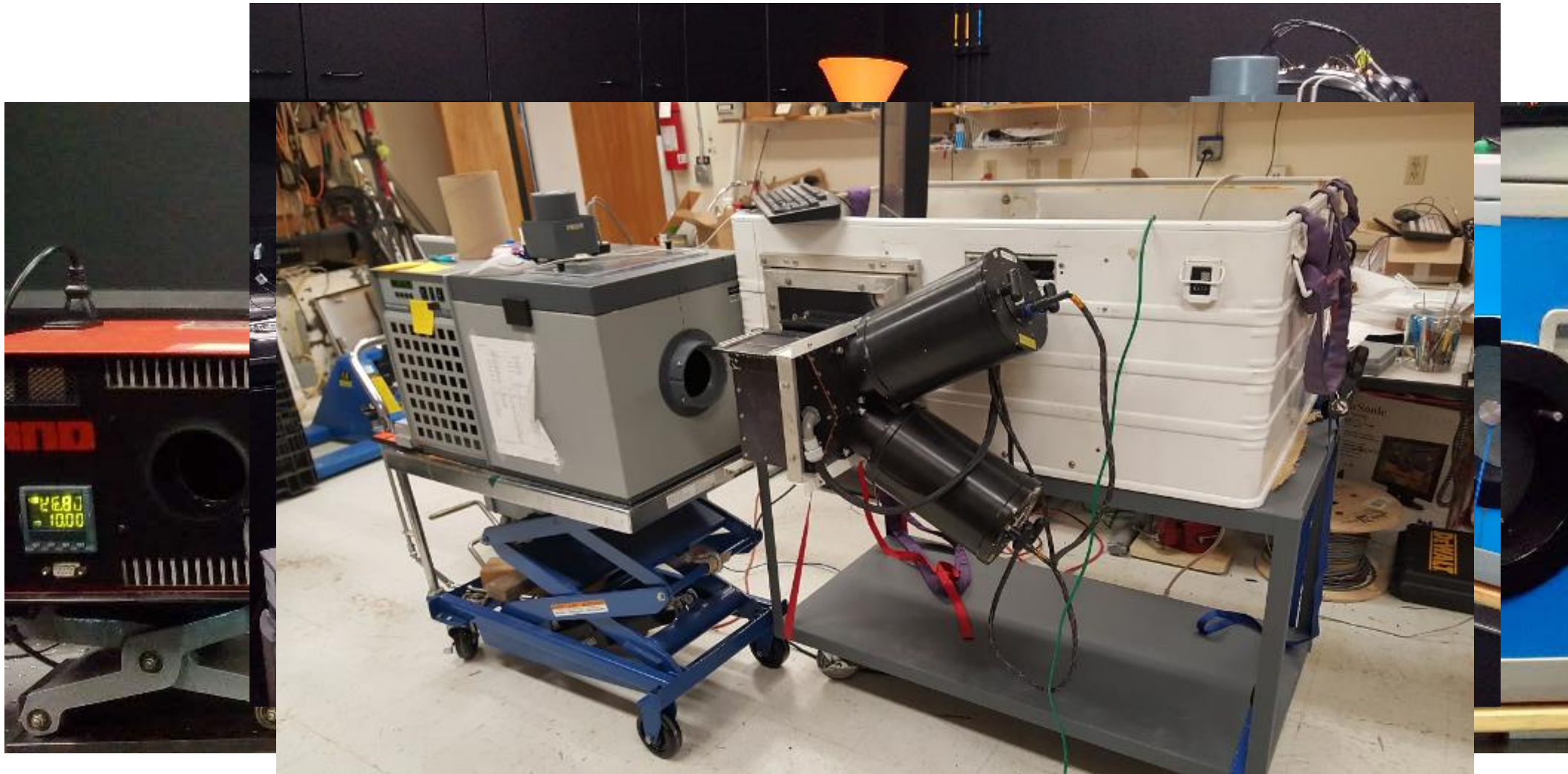
Collaboration with Royal Caribbean Cruise Lines



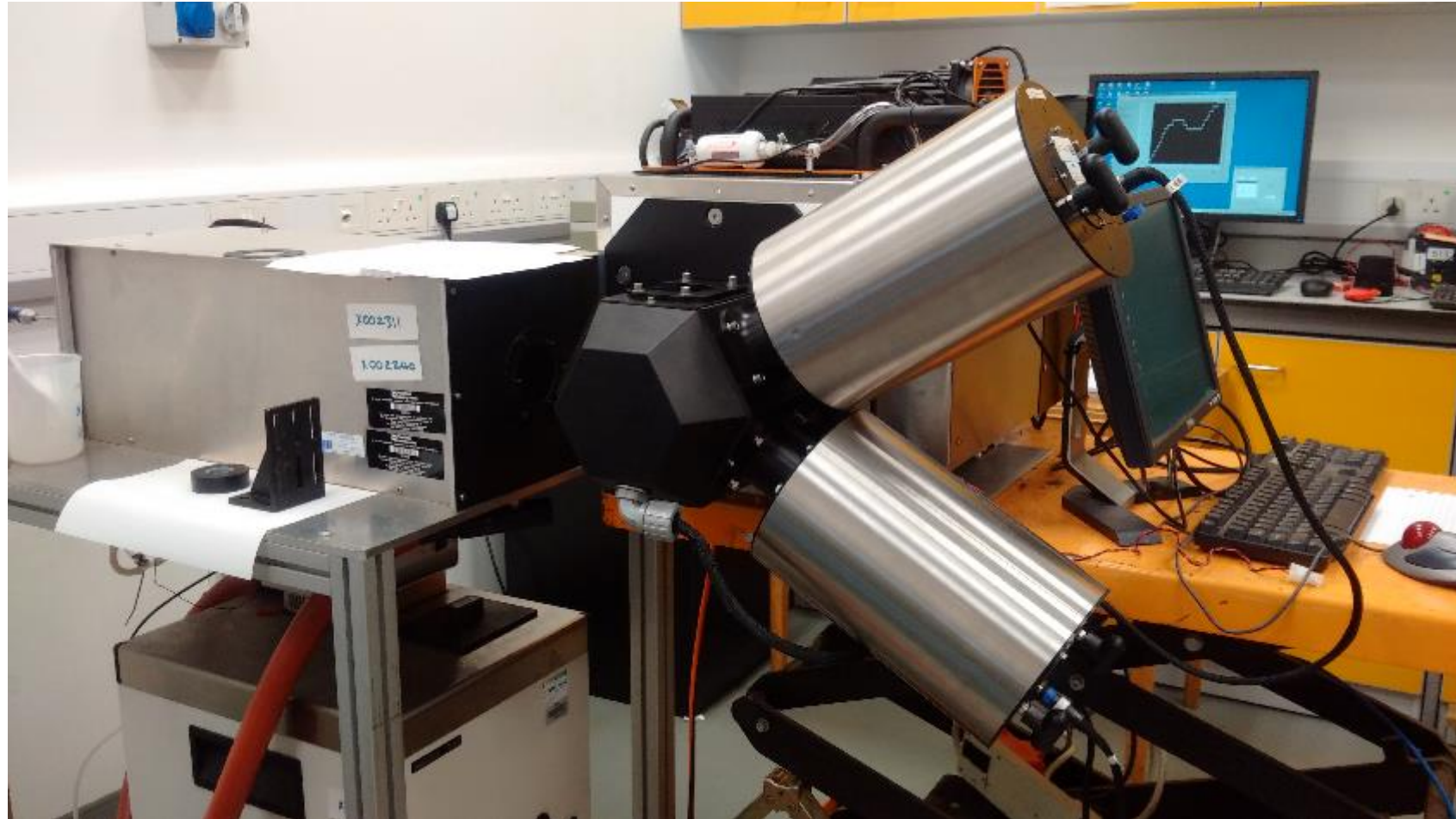
Adventure of the Seas installed in January 2018.

Fiducial Measurements for Surface Temperatures

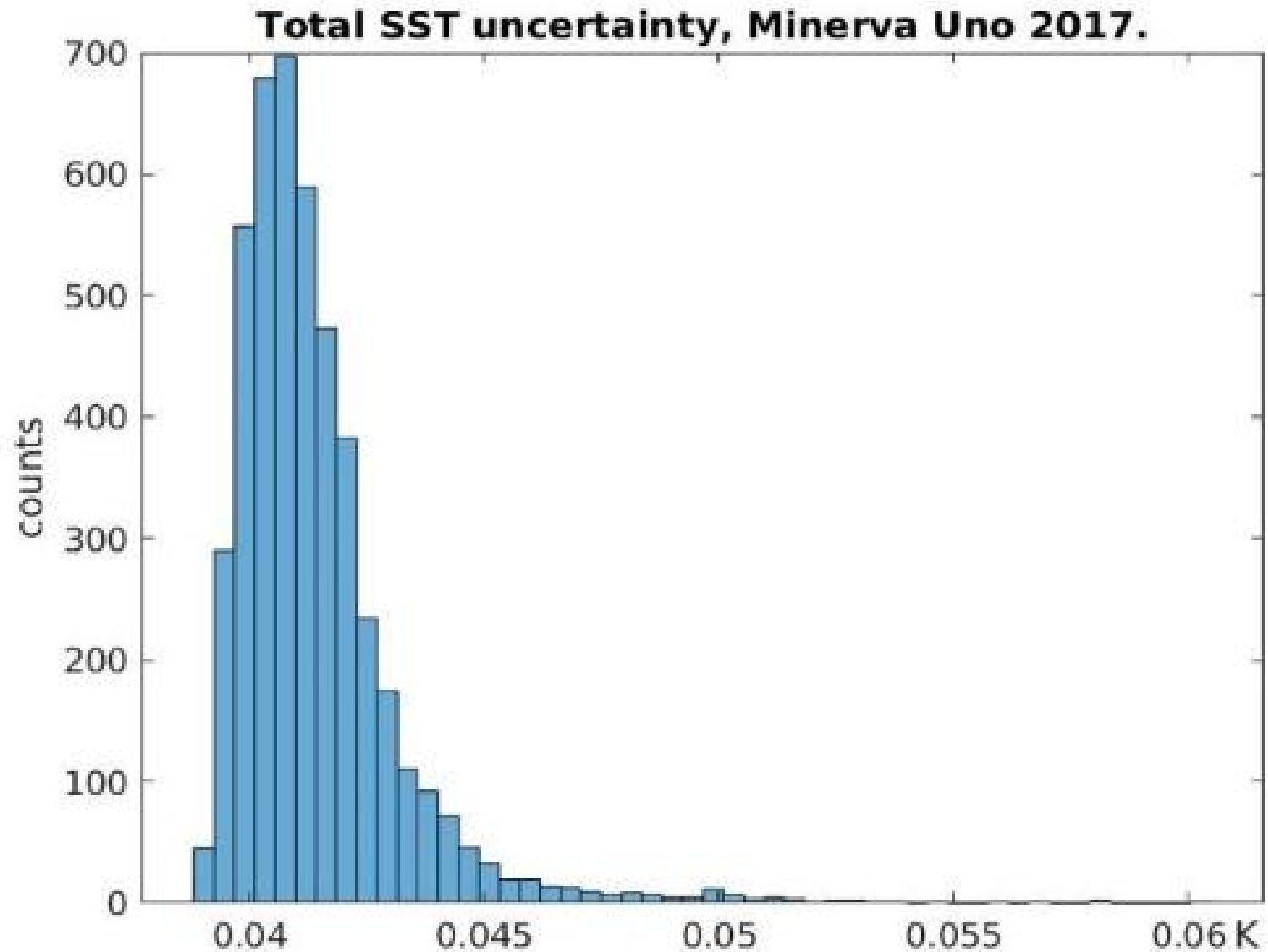
Workshop – NPL, June 2016.



Fiducial Measurements for Surface Temperatures Workshop – NPL, June 2016.



M-AERI Mk2 SST_{skin} accuracies



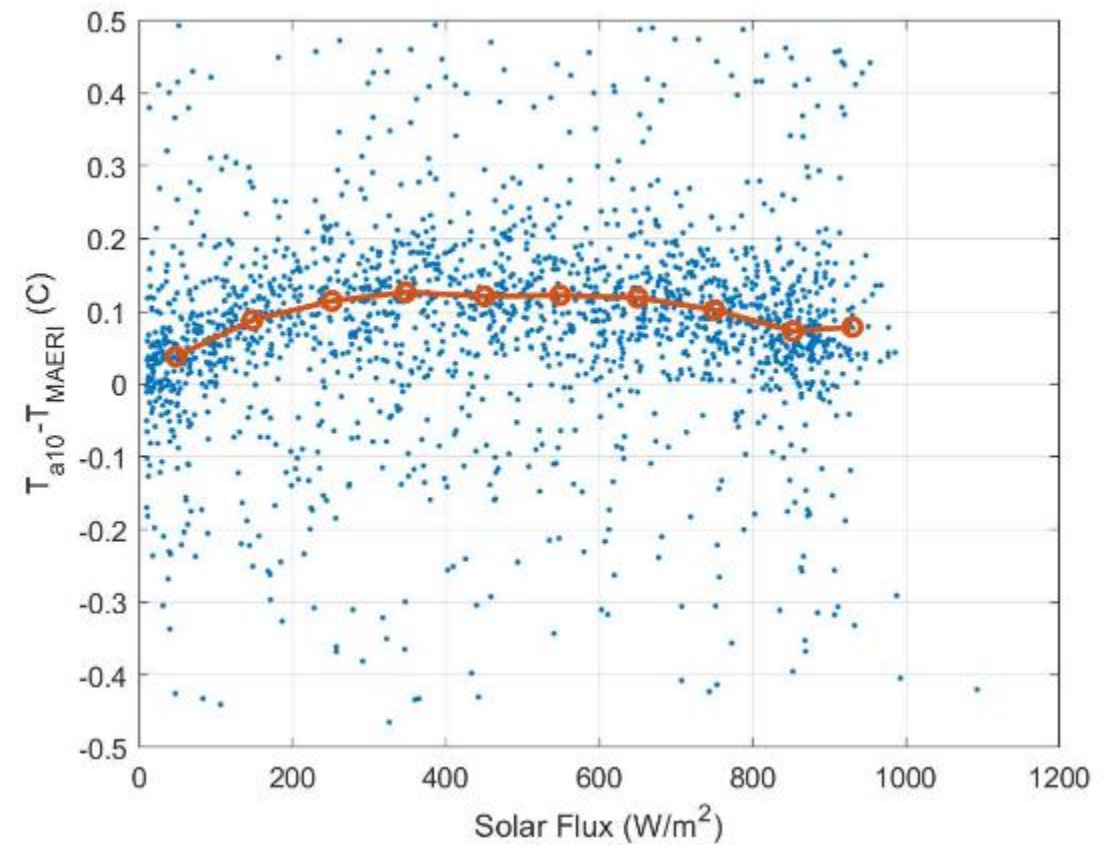
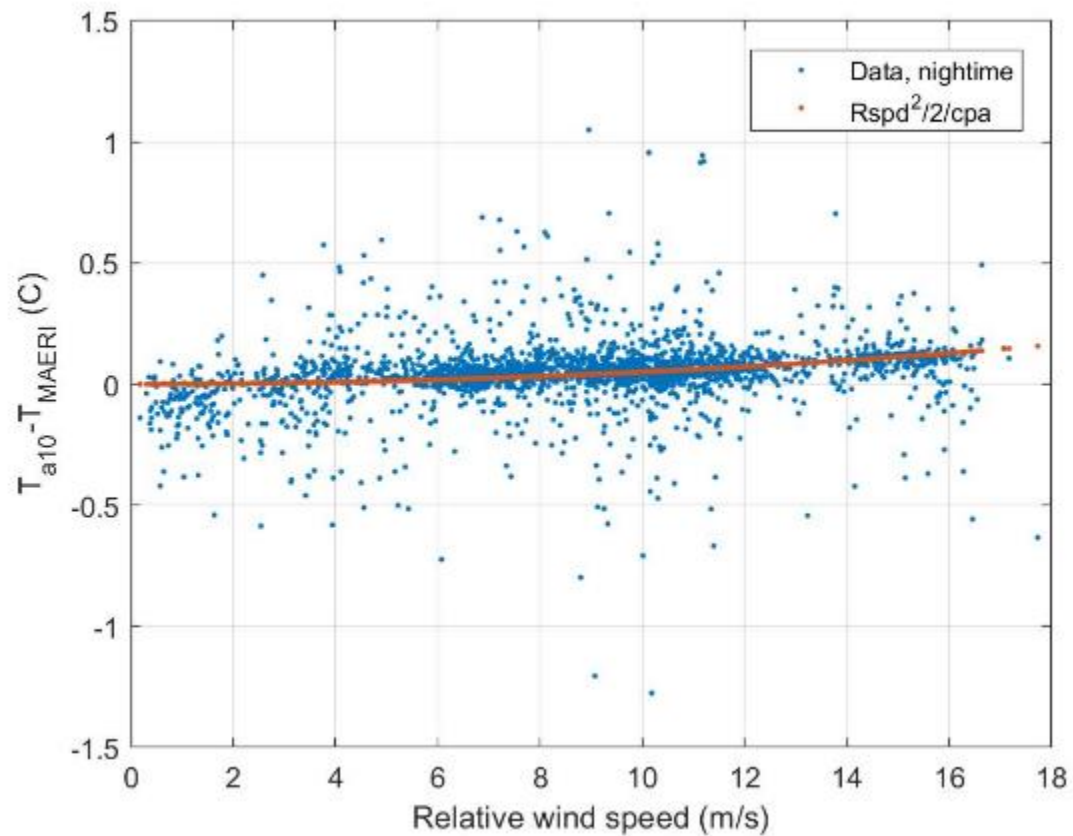
M-AERI accuracies - T_{air}

- An estimate of the near-surface air temperature can be made from the measured spectra of the atmospheric CO₂ emission where the photon e-folding path length is ~7m.
- Comparisons between M-AERI radiometric and research grade conventional measurements on recent ATOMIC (Atlantic Tradewind Ocean-Atmosphere Mesoscale Interaction Campaign) cruise on the RHB are very interesting.

Minnett, P.J., Maillet, K.A., Hanafin, J.A., & Osborne, B.J. (2005). Infrared interferometric measurements of the near surface air temperature over the oceans. *Journal of Atmospheric and Oceanic Technology* 22, 1016-1029.



ATOMIC T_{air} Comparison



Analysis and figures from Chris Fairall, NOAA ESRL

Accessing M-AERI data



DATASET

Ship-based high resolution sea surface skin temperature from the Marine-Atmospheric Emitted Radiance Interferometer (M-AERI) deployed between 2013 and 2020

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2020-05

DOI <https://doi.org/10.17604/bswq-0119>

 OPEN ACCESS

TOP


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METRICS

DETAILS

SEND TO

 Minnett_etal_2020_M-AERI_SST_2013_2020.zip (21.73 MB)

ZIP [Open Data Commons Attribution \(ODC-By\) V1.0](#), Open Access



Metrics



14 File views/ downloads



10 Record views



M-AERI data in doi.org/10.17604/bswq-0119

Ship	Region	Start	End	N	Days of Data
<i>Celebrity Equinox</i>	Caribbean Sea	2017-10-01	2017-12-31	16220	91
<i>Allure of the Seas</i>	Caribbean Sea	2017-10-02	2017-11-26	6713	56
<i>Celebrity Equinox</i>	Caribbean Sea	2018-01-11	2018-09-23	52479	255
<i>Adventure of the Seas</i>	Caribbean Sea and US East Coast	2018-02-12	2018-12-31	11201	322
<i>Allure of the Seas</i>	Caribbean Sea	2018-02-18	2018-10-14	37771	238
<i>Adventure of the Seas</i>	Caribbean Sea and US East Coast	2019-01-01	2019-10-30	41292	302
<i>NOAA S Ronald H. Brown</i>	Circumnavigation	2018-03-07	2018-10-23	38354	231
<i>NOAA S Ronald H. Brown</i>	North Atlantic Ocean	2019-02-24	2019-03-29	8407	34
Total	--	2017-10-01	2019-10-30	212437	1529



Summary

- The M-AERIs are robust and maintain their calibration during at-sea deployment over many months.
- The M-AERIs run autonomously, with ~daily checks on their wellbeing over ships' internet.
- Routine operations suspended when a rain sensor indicates rain or spray near the M-AERI aperture.
- Recent M-AERI data submitted to Felyx and to UM repository.
- Deployment on the *Ronald H Brown* expected to resume in early October.
- Deployments on RCCL ships will resume eventually.