Poster 1480

The Kiritimati Island and NOAA Ship *Ronald H. Brown* ENRR 2016 Datasets: Detailed Views of Local Responses to El Niño

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The El Niño Rapid Response (ENRR) Field Campaign

In 2015, ENRR was proposed as a joint effort by operational and research-oriented sectors within NOAA to the forecasting challenges associated with the developing major El Niño event. The NOAA/Earth System Research Laboratory's (ESRL) Physical Sciences Division (PSD) led the design and implementation of one component, the ENRR Field Campaign (Dole et al. 2017). The field campaign had several observational (**Fig. A**) and research components, including surface meteorology and hundreds of radiosonde launches from Kiritimati (pronounced "Christmas") Island and the NOAA Ship *Ronald H. Brown*.

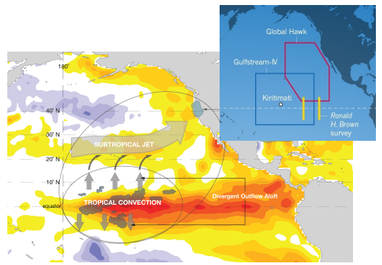


Figure A. Large-scale synoptic/dynamic features associated with El Niño SST anomalies, together with the locations of major ENRR observing platforms (inset). *Schematic courtesy of R. Spackman; inset* ©nature.

Data Availability

- Post-processed ENRR surface meteorology and "Level 2" radiosonde data collected from Kiritimati Island and the NOAA *Ship Ronald H. Brown* is being submitted to the NOAA/National Centers for Environmental Information (NCEI) for archival. Please contact Leslie.M.Hartten@noaa.gov for information on their status.
- ENRR data from Kiritimati Island and the NOAA *Ship Ronald H. Brown*, as well as skew-T plots and some ancillary materials, can be obtained at https://www.esrl.noaa.gov/psd/enso/rapid_response/data_pub/.

To Learn More

More information about ENRR can be found at https://www.esrl.noaa.gov/psd/enso/rapid_response/, in blog posts at http://ciresblogs.colorado.edu/el-nino-rapid-response/, and from the references below:

Dole, R.and Co-Authors, 2017: The NOAA 2015-16 El Niño Rapid Response Field Campaign. *Bull. Amer. Meteor. Soc.*, in preparation.

Hartten, L. M., C. J. Cox, P. E. Johnston, and D. E. Wolfe, 2017a: Central-Pacific surface meteorology from the 2016 El Niño Rapid Response (ENRR) field campaign. *Earth System Science Data*, in preparation.

Hartten, L. M., _____, _____, and _____, 2017b: Ship- and island-based soundings from the 2016 El Niño Rapid Response (ENRR) field campaign. *Earth System Science Data*, in preparation.

Hartten, L.M., S. Abbott, T. Falkland, P.E. Johnston, H. A. McColl, J. D. Parks, X.-W. Quan, and K. Tuevi, 2017c: El Niño in 2015-16: The View from Kiritimati Island. *Major Weather Impacts of 2016*, Seattle, WA, American Meteorological Society. https://ams.confex.com/ams/97Annual/webprogram/Paper312048.html

Kiritimati Island Operations

- From 25 January to 28 March 2016
- Along the northeast coast (**Fig. B**), 6 km from the Kiribati Meteorological Service's station at Cassidy International Airport (PLCH)
- Two balloon launches per day (124 total; 67% reached 25 km), with TEMP messages sent as "CXENRR"
- Surface meteorology at 2- or 1-minute resolution: pressure, temperature, relative humidity, wind speed & direction, and rain

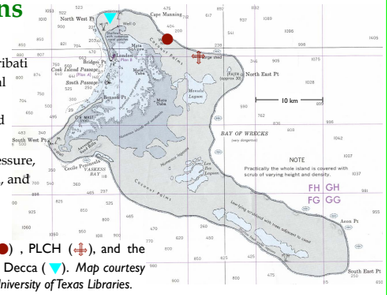
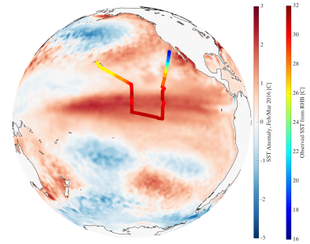


Figure B. The location of CXENRR (●), PLCH (⊞), and the Kiritimati Island Water Project's rain gauge at Decca (▼). *Map courtesy of the Perry-Castañeda Library Map Collection, University of Texas Libraries.*

NOAA Ship *Ronald H. Brown* Operations



- From 16 Febuary to 16 March 2016
- From Oahu to the 140°W and 125°W TAO buoys (**Fig. C**), then to San Diego
- Two to eight balloon launches per day (193 total; 72% reached 25 km), with TEMP SHIP messages sent as "WTEC"
- Surface meteorology at 1-minute resolution: pressure, temperature, relative humidity, wind speed & direction, downwelling shortwave radiation, and SST, plus ship position, heading, and course & speed over ground

Figure C. SSTs observed by the NOAA Ship *Ronald H. Brown* during ENRR, overlaid on SST anomalies (departure from 1979-2016 Feb.-Mar. mean, ERA-Interim).

Data Post-Processing

Post-processed surface and sonde data have been released for use and are being archived (see **Data Availability**). The surface datasets are considered final; the sonde datasets are considered "Level 2" (Ciesielski et al. 2012), with further quality control (QC) scheduled for 2017. All files are in NASA-Ames (ascii) format, with considerable documentation in the header of each.

Kiritimati Island Surface Data

- Pressure: post-deployment calibration
- Relative Humidity: corrected for bias relative to sonde during colocated measurements
- Winds: corrected for error in original alignment

Ronald H. Brown Surface Data

- Pressure: corrected to 3.8 m height
- Relative Humidity: corrected to match sondes/buoys at 3-4 m
- Winds: corrected alignment & effective height; used windward sonic; corrected for flow distortion

Sonde Data

- Reprocessed with Vaisala's DigiCORA® sounding software using corrected surface values at time closest to launch.
- Subjected to automated QC using NCAR's ASPEN software, which removed data that failed objective QC checks; smoothed the wind, pressure, temperature, and relative humidity; recomputed geopotential height; and computed the sonde ascent rate.

Some Highlights

Kiritimati Island:

It was wet while we were here! We recorded 0.938 m of rain, with 69% of it coming during 6 big events (**Fig. D, E**).

For context, annual mean rainfall is ~1 m (σ = ~0.75 m) but is a poor metric; during an El Niño event, the island can receive 3 m or more during a 12-16 month period. From April 2015 to May 2016, PLCH recorded 5.078 m of rain.

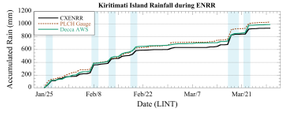


Figure D. Accumulated rainfall during ENRR at CXENRR as well as the airport and Decca. Blue bars mark the 6 largest events.

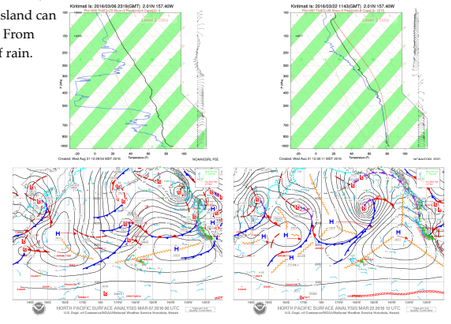


Figure E. Conditions during the driest (left) and wettest (right) soundings taken at CXENRR. The ITCZ is marked with ▨.

NOAA Ship *Ronald H. Brown*:

We sampled a wide range of conditions (**Figs. F, G**), including

- extremely dry layers between 300 and 500 hPa (also seen from Kiritimati Island and the G-IV)
- deep tropical moisture
- strongly capped marine boundary layers

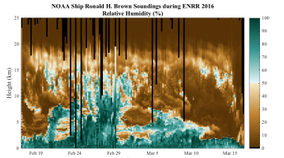


Figure F. A composite of the humidity profiles observed by the NOAA Ship *Ronald H. Brown* during ENRR. Approximate dates of key positions are shown below.

	140°W	125°W
8°N	Feb. 23	Mar. 11
0°N	Feb. 26	Mar. 8
5°S	Mar. 1	
8°S		Mar. 4

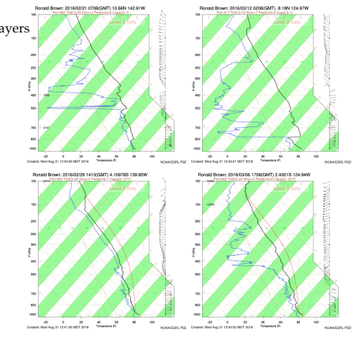


Figure G. A sampling of conditions observed by the NOAA Ship *Ronald H. Brown* during ENRR.

Acknowledgments

The ENRR Field Campaign was funded by NOAA through the Office of Oceanic and Atmospheric Research (OAR) as well as the National Weather Service (NWS), the Office of Marine and Aviation Operations (OMAO) and the National Environmental Satellite, Data and Information Service (NESDIS).

We thank the Republic of Kiribati for allowing NOAA to conduct research on Kiritimati Island, and the Kiribati Meteorological Service for engaging with our observers.

We appreciate the support we received from the crew of the NOAA Ship *Ronald H. Brown*, in particular NOAA/OMAO Survey Technicians Josh Gunter and Mark Bradley and NOAA/OMAO Lieutenant Adrienne Hopper.

The management and staff of the Captain Cook Hotel welcomed ENRR into their lives, hydrogen canisters and all, and went out of their way to make our work and stay very pleasant. *Kam bati n rabwa.*

Thanks to Tim Coleman (CIRES) for his efforts in real-time file transfer, to Cathy Smith (CIRES) for generating the skew-T plots and helping to navigate archival waters, and to Hoop (CIRES) for scripting magic.