

Separation of ARM Infrared Thermometers from SKYRAD and GNDRAD Systems



Pacific Northwest NATIONAL LABORATORY

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Introduction

The Infrared Thermometers (IRT) are being separated from the Sky Radiometer (SKYRAD) and Ground Radiometer (GNDRAD) systems at the ARM sites to avoid confusion and complications associated with the data collection and ingest.

Background

The analog output of the down-welling and up-welling IRTs have been sampled with a data logger to produce 1-min values of sky/cloud brightness temperature and ground surface temperature, respectively, and the serial output of the down-welling IRT has been simultaneously sampled with a computer program to produce 5-Hz values of sky temperature. The dual collections and datastreams have led to some confusion with operations, data quality, and data reprocessing. Therefore, the Reprocessing Advisory Board recommended the down-welling IRT be separated from SKYRAD to improve overall data quality and reduce reprocessing events.

Objectives

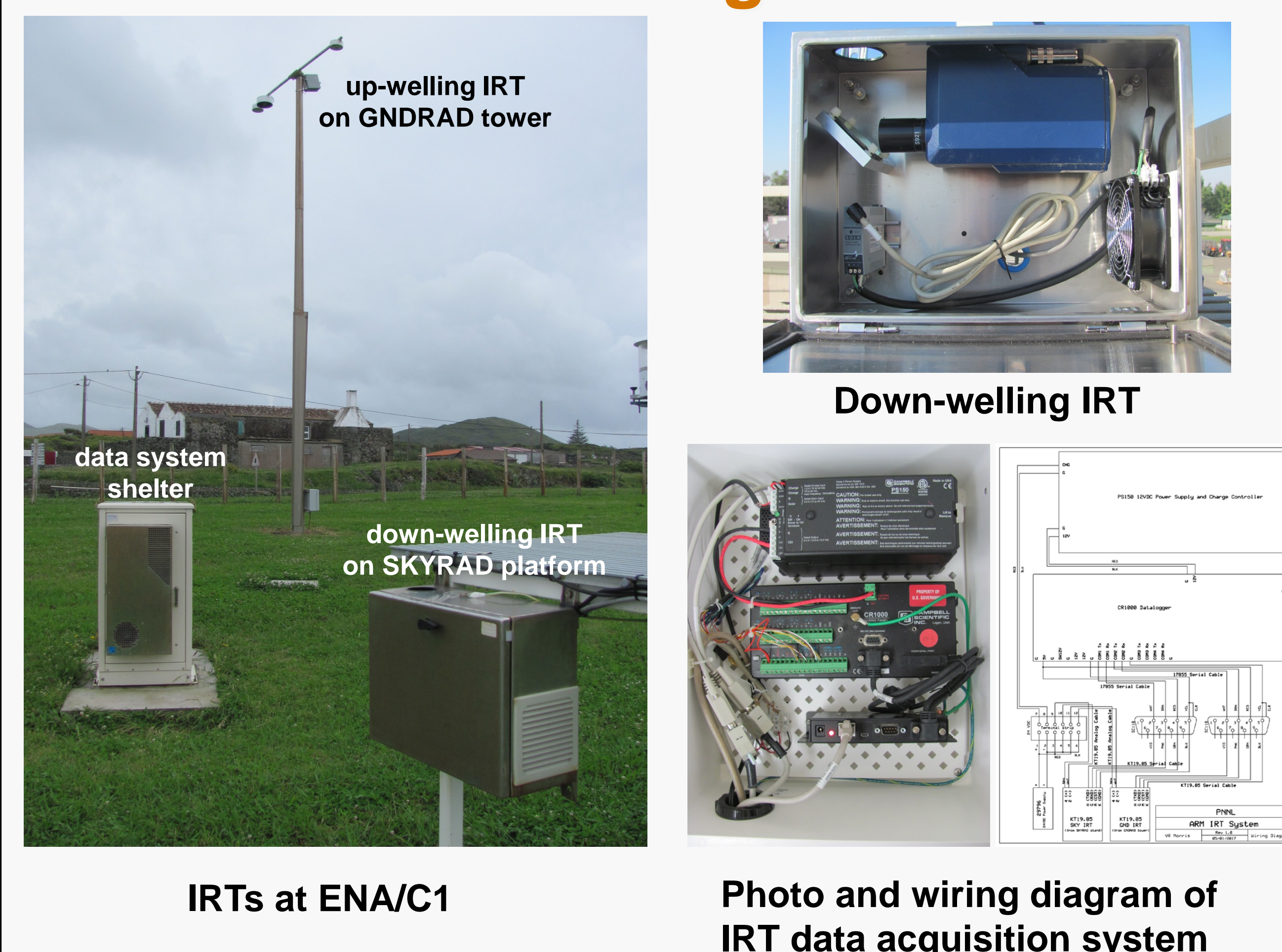
- ▶ Design new data acquisition system to record IRT measurements independent of SKYRAD and GNDRAD
- ▶ Build, test, and validate new IRT systems
- ▶ Develop new irt datastreams
- ▶ Reconfigure down-welling and up-welling IRTs at each site
- ▶ Update IRT Instrument Handbook
- ▶ Remove IRT measurements from skyrad and gndrad datastreams

IRT DataStreams

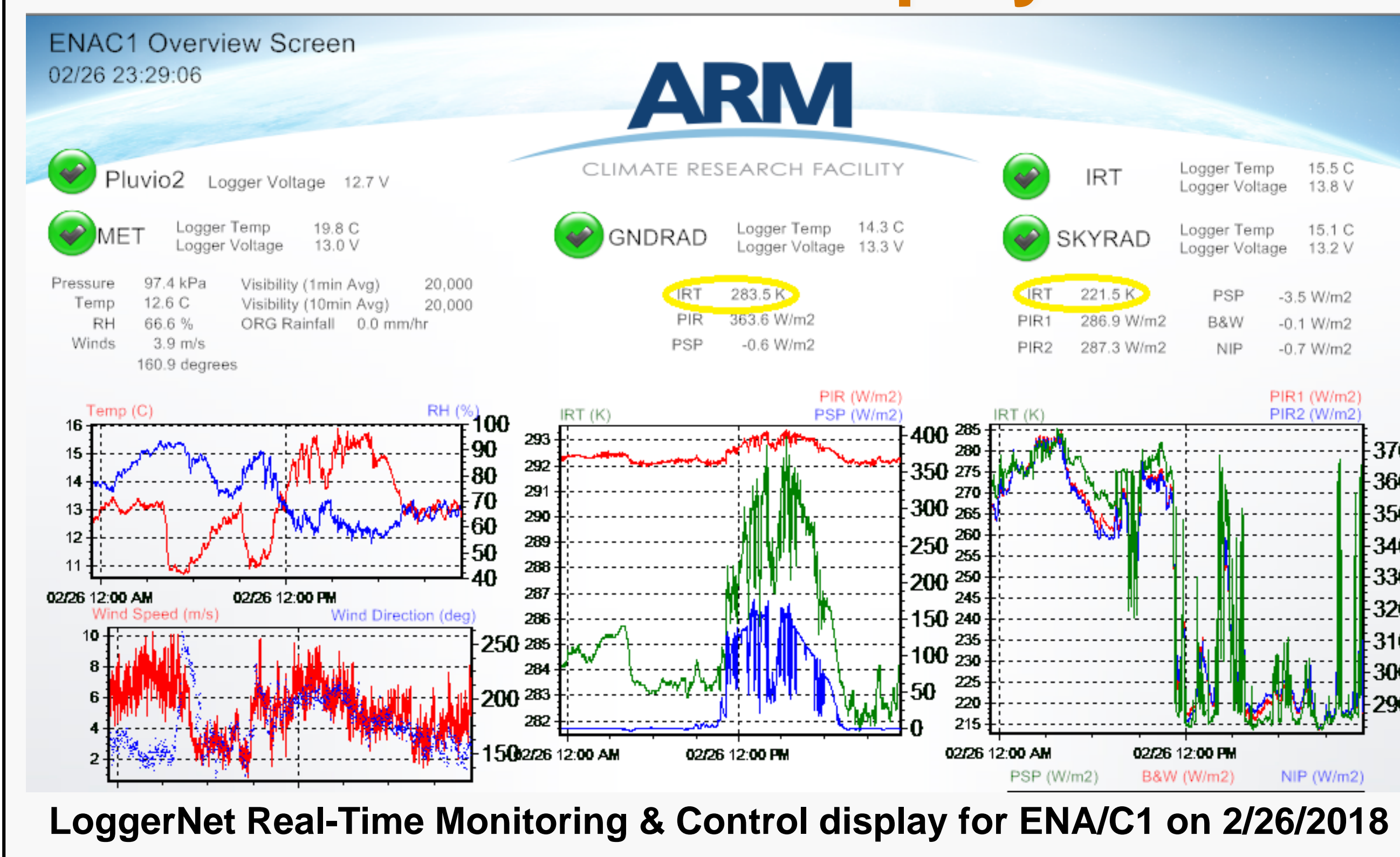
Data available from ARM Archive Data Discovery Tool (www.archive.arm.gov/discovery).

- ▶ irt200ms: 5-Hz instantaneous sky/cloud temperature (sky_irt200ms)
- ▶ irt: 1-min average sky/cloud temperature (sky_irt), internal reference temperature, and logger diagnostics
- ▶ gndirt: 1-min average surface temperature (sfc_irt), internal reference temperature, and logger diagnostics

IRT Reconfiguration



Site Data Display



Acknowledgements

Mike Ritsche of ANL for instrument engineering management.
 Brian Ermold of PNNL for data collections, ingest, and reprocessing guidance.
 Jenni Kyrouac of ANL for LoggerNet data collection and RTMC data display configuration.

Reference

Morris VR. 2018. Infrared Thermometer (IRT) Instrument Handbook. Ed. by Robert Stafford, ARM Climate Research Facility. DOE/SC-ARM-TR-015.

Summary

- ▶ IRT data acquisition system designed, assembled, and programmed
- ▶ SKYRAD and GNDRAD IRTs reconfigured at ENA and AMF2 sites
- ▶ Datastreams irt200ms, irt, and gndirt developed and released
- ▶ IRT Instrument Handbook updated and published

Deployment Schedule

The IRTs are currently being reconfigured by moving the signals from the SKYRAD and GNDRAD dataloggers to the new, dedicated data acquisition systems.

- ▶ ARM Mobile Facility 2: May 2017 – Currently operating as IRTSST in MARCUS campaign
- ▶ Eastern North Atlantic: June 2017 – Completed prior to start of ACE-ENA campaign
- ▶ ARM Mobile Facility 1: April 2018 – In preparation of CACTI campaign
- ▶ ARM Mobile Facility 3: June 2018 – In preparation of POPEYE campaign
- ▶ North Slope Alaska: June 2018 – In preparation of POPEYE campaign

Engineering Accomplishments

- ▶ Engineering Change Request (ECR-00990) to resolve IRT duel collections, at request of Reprocessing Advisory Board, was approved on 4/15/2013
- ▶ Solicited comments to proposed design options for Engineering Change Order (ECO-00990) reached consensus on 1/29/2016
- ▶ Design review for Engineering Change ENG0000990 was approved on 2/17/2016
- ▶ Review of components list (TSK0020169) was completed on 7/5/2016
- ▶ Procurement of components (TSK0020175) was completed on 8/31/2016
- ▶ Development and testing of new systems (TSK0020179) was completed on 3/3/2017
- ▶ Instrument Readiness Review Request and installation plan submitted on 5/3/2017
- ▶ Reconfiguration of SKYRAD and GNDRAD IRTs (PRJ0010204) began on 5/25/2017
- ▶ Update of IRT ingest (EWO0016168) was released on 8/15/2017
- ▶ Update of IRT Handbook (TSK0053906) was published on 1/9/2018
- ▶ Update of SKYRAD and GNDRAD ingest (EWO0021411) was released on 1/18/2018