



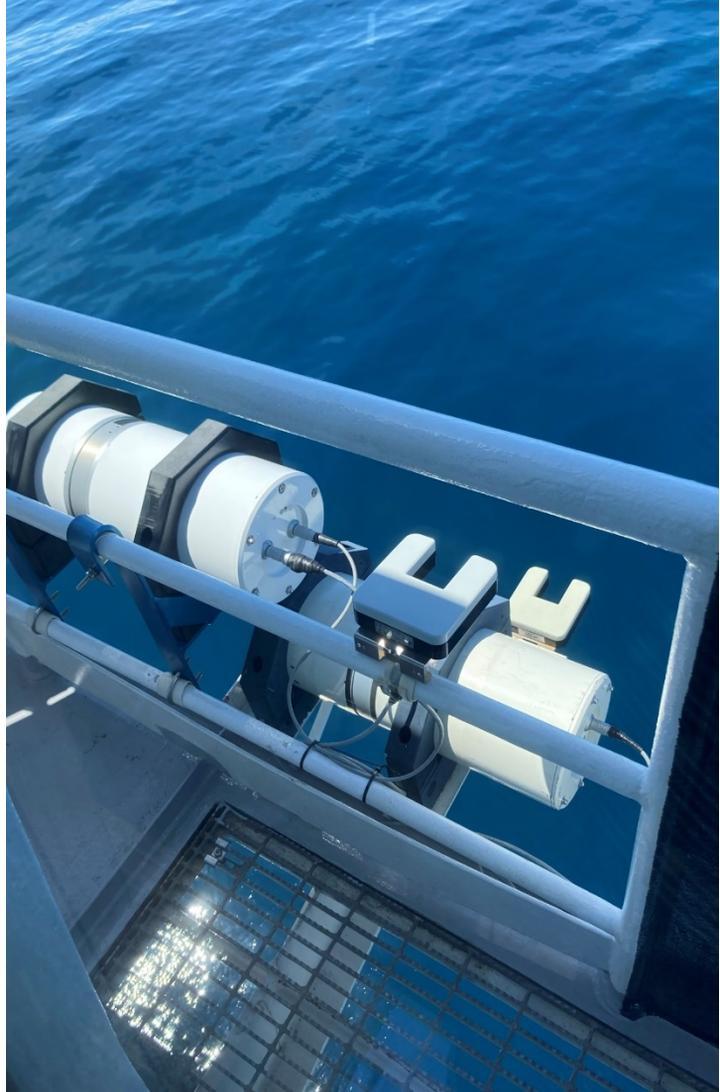
**Australian Government**  
**Bureau of Meteorology**

# ISARs in Australia

ISFRN Workshop

8<sup>th</sup> – 9<sup>th</sup> September 2022

Nicole Morgan, Helen Beggs and Janice Sisson





Australian Government  
Bureau of Meteorology

# ISAR operations in Australia

## **CSIRO**

- Nicole Morgan

## **Australian Bureau of Meteorology**

- Helen Beggs
- Janice Sisson
- Haifeng Zhang

## **Australian Antarctic Division**

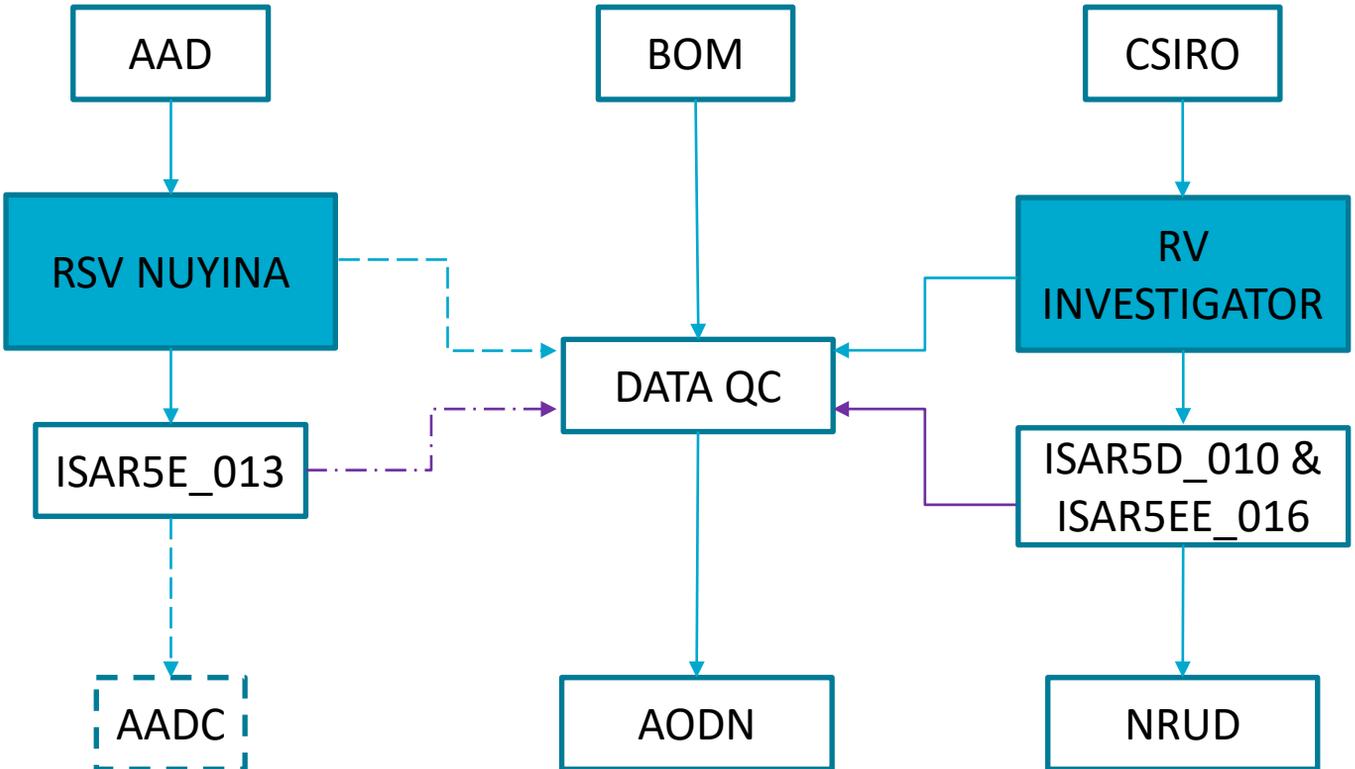
- Dominic Weller

# IN2022\_T01

- ISAR10 & ISAR16 on board
- Comparison post UK workshop
- Reducing samples per angle for ISAR16 and effect on data quality

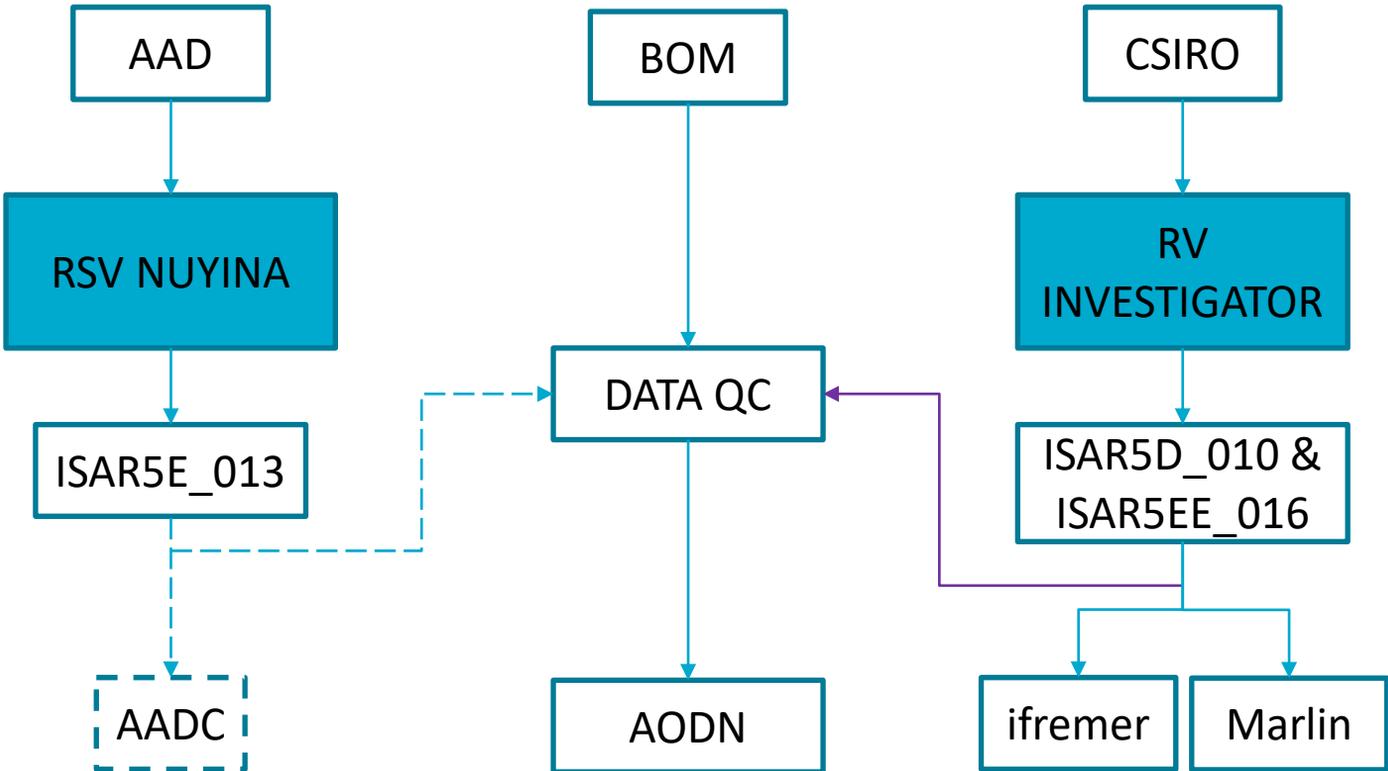


# ISAR operations in Australia (Real-time)





# ISAR operations in Australia (Processed)





# ISAR operations in Australia

## **CSIRO - ISAR5D\_010**

- Installed on RV Investigator since 2014
- Completed 55 voyages to date
- 1131 days of data

## **CSIRO – ISAR5EE\_016**

- Intercomparison with ISAR10 on IN2021\_E02 and IN2022\_T01
- FRM4SST Workshop 2022

## **Australian Antarctic Division (AAD)**

- Installed and system integration completed



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# ISAR data storage

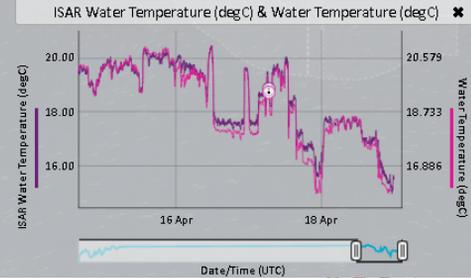
## CSIRO - Realtime

<https://www.cmar.csiro.au/data/underway/>

On Graph

✕ ISAR Water Temperature (degC)

✕ Water Temperature (degC)



https://www.cmar.csiro.au/data/underway/

**Survey** | In2022\_V02

**Live Camera**

Perth

**Region**  
Derwent Estuary; Tasmania coast; Tasman Sea; New Zealand coast; Southwest Pacific Ocean

**Starting location**  
Hobart

**Ending location**  
Hobart

**GPS locations**  
1627

**Temporal Extents**  
2022-03-18 22:23 to 2022-04-19 00:00

**Project Leader(s)**  
Dr Jutzeler (UTAS)

**Contributors**

**Description**  
The aim of this project is to link the behaviour of deep submarine eruptions with the morphology of their deposits. Modelling calculations of sediment mass fluxes will permit the first-ever hazard mapping scheme for submarine volcanoes globally (tsunamis and sediment flows), and provide new ore vectoring strategies for exploration in Australia.

**Position:** 42.90270, 147.36944  
**Time:** 2022-04-19 00:00  
**Wind:** N @ 5.4 knots  
**Distance:** 2171.98 nmi  
**Speed (IG):** 9.10 knots



# ISAR data storage

## CSIRO - Processed

<https://marlin.csiro.au/geonetwork/srv/eng/catalog.search#/metadata/bdf91f86-2968-4711-873e-2761383bb207>



Back to search

Download Views

### RV Investigator ISAR/SST Sea Surface Temperature Data Overview (2014 onwards)

On going

Overview

This record describes the ISAR/SST Sea Surface Temperature data collected on the RV Investigator Voyages from 2014 onwards. The infrared SST autonomous radiometer (ISAR) is a self-calibrating instrument capable of measuring in situ sea surface skin temperature to an accuracy of 0.1 K. The SST Radiometer is mounted on the port bridge wing, approximately 19.593m above the summer load line. The RV Investigator ISAR skin SST data are also supplied both in real-time ([http://thredds.aodn.org.au/thredds/catalog/MOS/SOOP/SOOP-ASF/MLMJ\\_investigator/meteorological\\_sst\\_observations/catalog.html](http://thredds.aodn.org.au/thredds/catalog/MOS/SOOP/SOOP-ASF/MLMJ_investigator/meteorological_sst_observations/catalog.html)) and in delayed mode after reprocessing ([http://thredds.aodn.org.au/thredds/catalog/MOS/SOOP/SOOP-ASF/MLMJ\\_investigator/meteorological\\_sst\\_observations/2016/ISAR-QC/catalog.html](http://thredds.aodn.org.au/thredds/catalog/MOS/SOOP/SOOP-ASF/MLMJ_investigator/meteorological_sst_observations/2016/ISAR-QC/catalog.html)) and [http://thredds.aodn.org.au/thredds/catalog/MOS/SOOP/SOOP-ASF/MLMJ\\_investigator/meteorological\\_sst\\_observations/2017/ISAR-QC/catalog.html](http://thredds.aodn.org.au/thredds/catalog/MOS/SOOP/SOOP-ASF/MLMJ_investigator/meteorological_sst_observations/2017/ISAR-QC/catalog.html)). These reprocessed files will be particularly valuable for satellite SST validation (as the ISAR measures SST at the same depth as measured by satellites) and are currently (2017) being used by EUMETSAT for Sentinel-3 SST validation and to JMA and Oceans University China for Himawari-8 SST validation. Further information can be found in the data and documentation links below.



#### Download

RV Investigator survey information including voyage plans and summaries Download  
**Voyage Reports**

Spatial extent



# ISAR data storage

## IMOS Real time

[http://thredds.aodn.org.au/thredds/catalog/IMOS/SOOP/SOOP-ASF/VLMJ\\_Investigator/meteorological\\_sst\\_observations/catalog.htm](http://thredds.aodn.org.au/thredds/catalog/IMOS/SOOP/SOOP-ASF/VLMJ_Investigator/meteorological_sst_observations/catalog.htm)

### Dataset

📁 2022

IMOS\_SOOP-ASF\_MT\_20220101T000000Z\_VLMJ\_FV01\_C-20220102T040010Z.nc  
IMOS\_SOOP-ASF\_MT\_20220102T000000Z\_VLMJ\_FV01\_C-20220103T040010Z.nc  
IMOS\_SOOP-ASF\_MT\_20220103T000000Z\_VLMJ\_FV01\_C-20220104T040010Z.nc  
IMOS\_SOOP-ASF\_MT\_20220104T000000Z\_VLMJ\_FV01\_C-20220105T040010Z.nc  
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IMOS\_SOOP-ASF\_MT\_20220112T000000Z\_VLMJ\_FV01\_C-20220113T040017Z.nc  
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IMOS\_SOOP-ASF\_MT\_20220114T000000Z\_VLMJ\_FV01\_C-20220115T040017Z.nc



Integrated Marine  
Observing System



# ISAR data storage

## IMOS QC Processed

[http://thredds.aodn.org.au/thredds/catalog/IMOS/SOOP/SOOP-ASF/VLMJ\\_Investigator/meteorological\\_sst\\_observations/20XX/ISAR-QC/catalog.html](http://thredds.aodn.org.au/thredds/catalog/IMOS/SOOP/SOOP-ASF/VLMJ_Investigator/meteorological_sst_observations/20XX/ISAR-QC/catalog.html)  
\*20XX = Year (2015, 2016 etc.)

### Dataset



IMOS\_SOOP-ASF\_MT\_20210507T230100Z\_VLMJ\_FV01\_ISAR-QC\_C-20220622T064744Z.nc

IMOS\_SOOP-ASF\_MT\_20210508T000000Z\_VLMJ\_FV01\_ISAR-QC\_C-20220622T064744Z.nc

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IMOS\_SOOP-ASF\_MT\_20210517T000000Z\_VLMJ\_FV01\_ISAR-QC\_C-20220622T064751Z.nc

IMOS\_SOOP-ASF\_MT\_20210518T000000Z\_VLMJ\_FV01\_ISAR-QC\_C-20220622T064752Z.nc



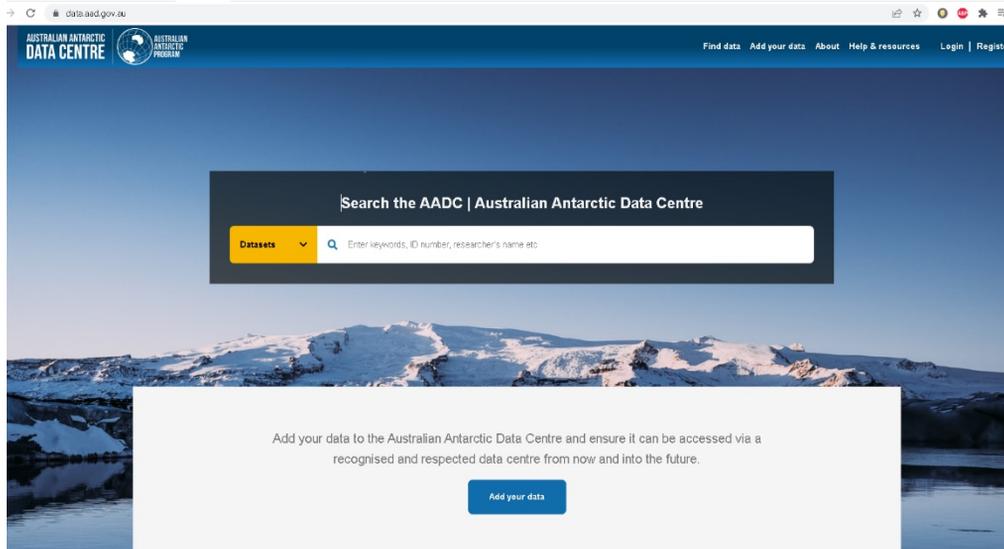


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# ISAR data storage

## AAD Data

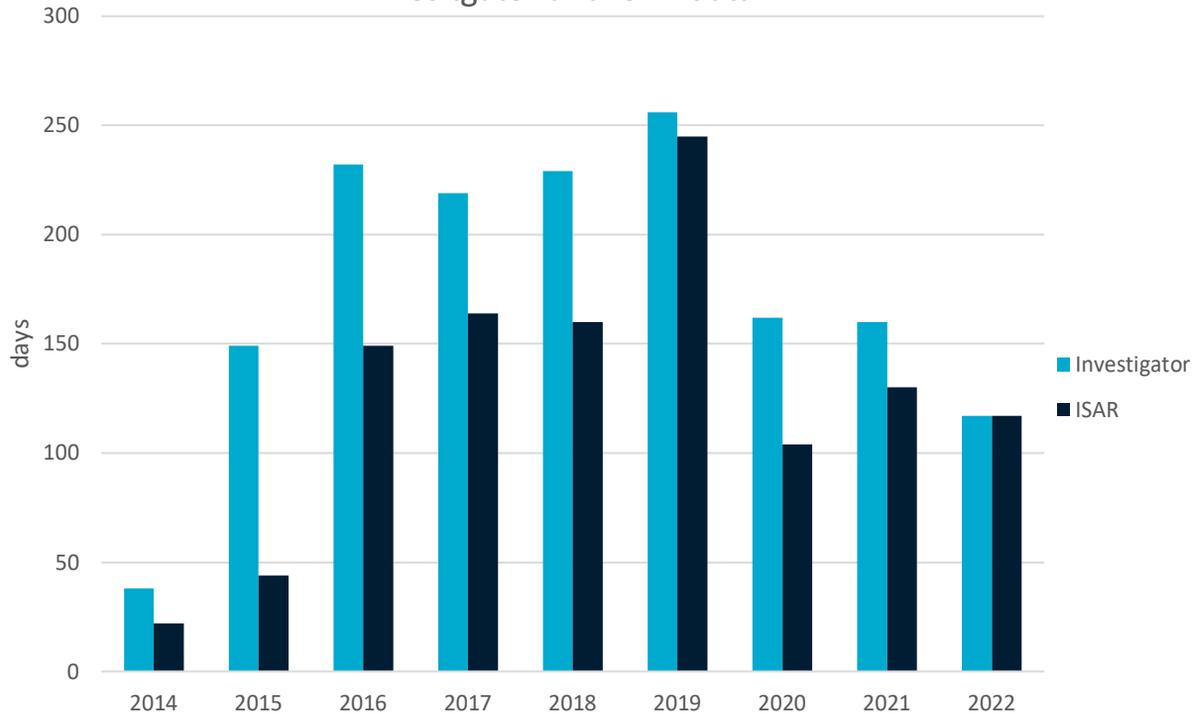
<https://data.aad.gov.au/>





# CSIRO data

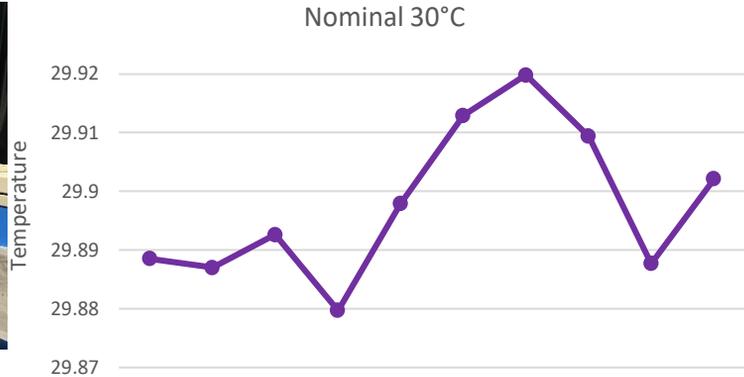
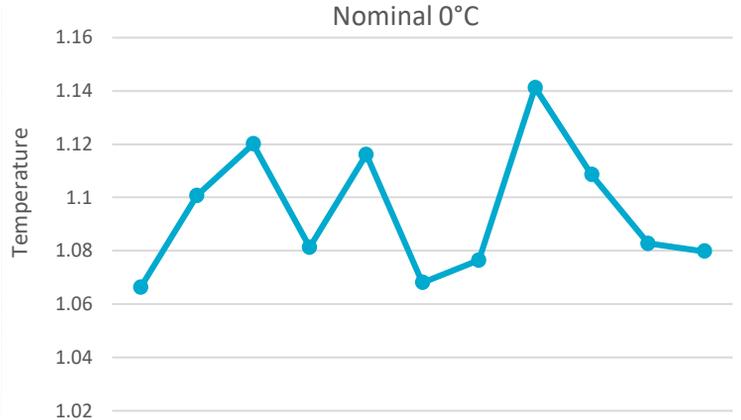
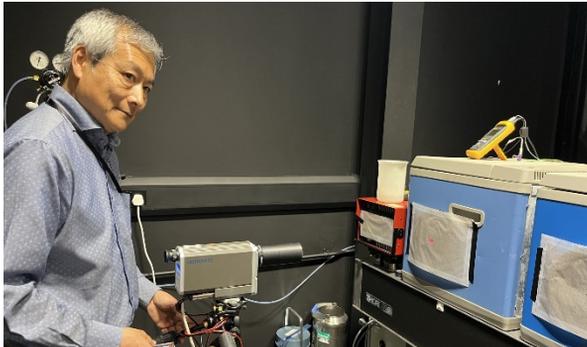
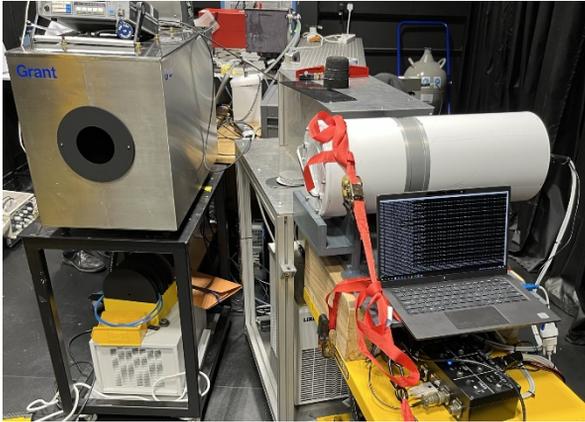
## Investigator and ISAR data





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# CSIRO data – FRM4SST Intercomparison

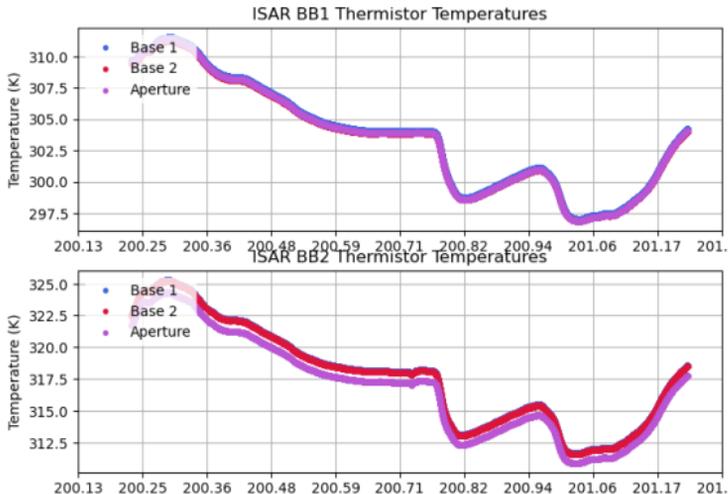




# Australian Antarctic Division

## RSV Nuyina

- Arrived 16<sup>th</sup> October 2021
- Completed resupply 2021/2022 Antarctic season
- Currently in Singapore for maintenance work



# New developments

## Environmental Test Chamber

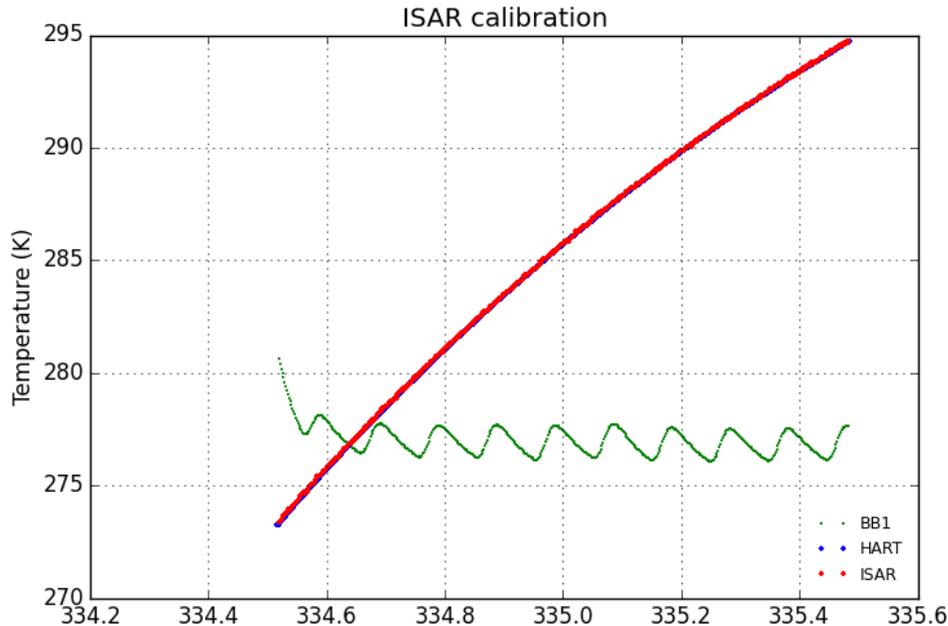
- Designed operation from 1°C
- Modified freezer
- 8 internal fans
- Utilises freezer cooling system
- Three heaters



# New developments

## Environmental Test Chamber

Graph of first control attempt November 2021





# New developments

## ISAR intercomparisons

1. IN2021\_E02                      ISAR10 and ISAR16
2. FRM4SST Workshop              ISAR16
3. IN2022\_T01                      ISAR10 and ISAR16



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# Status of Processed Data

## Write ISAR SST

v3.1 23 completed voyages

v3.8 14 completed voyages

v5.6 5 completed voyages

## To do:

Reprocess all past voyages in v5.6 by end of year

Have new voyage data completed within 12 months of voyage



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# Future plans

- Domestic Collaborations
- National Measurement Institute intercomparisons
- Australian Antarctic Division data



Australian Government  
Department of Industry, Science,  
Energy and Resources

National  
Measurement  
Institute



Australian Government  
Department of the Environment and Energy  
Australian Antarctic Division



**Australian Government**  

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**Bureau of Meteorology**

# Questions?

Nicole Morgan  
Mechatronics Engineer  
National Facilities and Collections

+61 3 6232 5490  
[nicole.morgan@csiro.au](mailto:nicole.morgan@csiro.au)



# IMOS Ship SST Automated QC

- BoM employs an automated QC method based on SAMOS (<http://samoss.coaps.fsu.edu>) QC for all IMOS ship meteorological and SST measurements
- Tests in order of application for VLMJ:
  1. Verify existence of time, lat, lon for every record
  2. Flag data not within physically possible bounds
  3. Flag non-sequential and/or duplicate times
  4. Flag positions where vessel over land
  5. Flag unrealistic vessel speeds
  6. SST and SSPS: Flag data measured when port drop keel not extended
  7. Exhaust contamination test T,RH
  8. True wind test
  9. Flag data failing statistical test: flag step, discontinuity or spike
  10. Climatology test (SST more than 3K above/below Bureau's most recent SST analysis in vessel location – either RAMSSA or GAMSSA)
- Once any datum's flag is changed, it will not be altered by any subsequent test.



## Merge of re-processed ISAR with co-located meteorological data

- ISAR observation time matched to closest meteorological time.
- Upper time-limit of 1 minute for time-match otherwise ship has moved on.
- Manual QC of merged files - flag failed sensors, remove un-navigated observations, de-spike selected meteorological variables.
- QC of re-processed radiometric sea temperature is via total uncertainty.
- Real-time bulk sea temperatures passing all except climatology, statistical tests sent to GTS (FM13 SHIP, FM62 TRACKOB, BUFR proposed). ISAR not sent to GTS.
- Real-time ISAR, bulk SST, meteorological data uploaded to AODN daily.
- Post-cruise, merged re-processed ISAR and meteorological files supplied to AODN.