ships4sst

shipborne radiometers for sea surface temperature

Experiences : ISAR - UoS

Werenfrid Wimmer

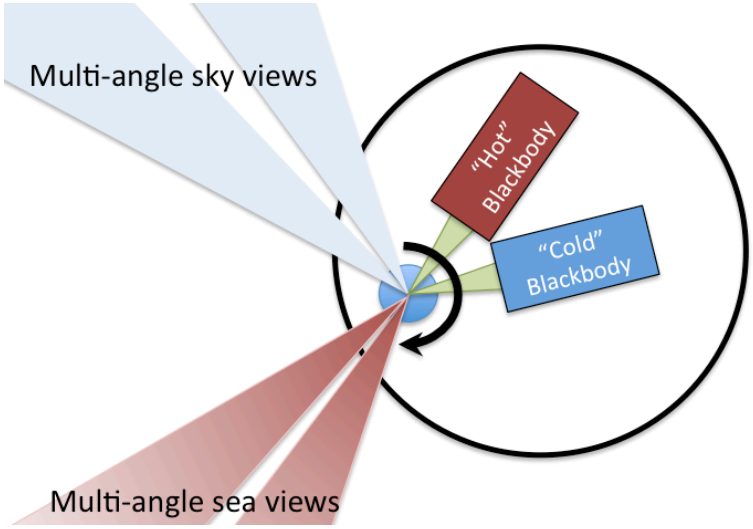
Raymond Holmes, Ian Robinson, Craig Donlon, Gary Fisher, Kelvin Aylett, Ray Collins, ..

Overview

- ISAR
- Bay of Biscay and English Channel deployments
- Other deployments and projects
- Summary

ISAR

- Infrared Sea surface temperature Autonomous Radiometer

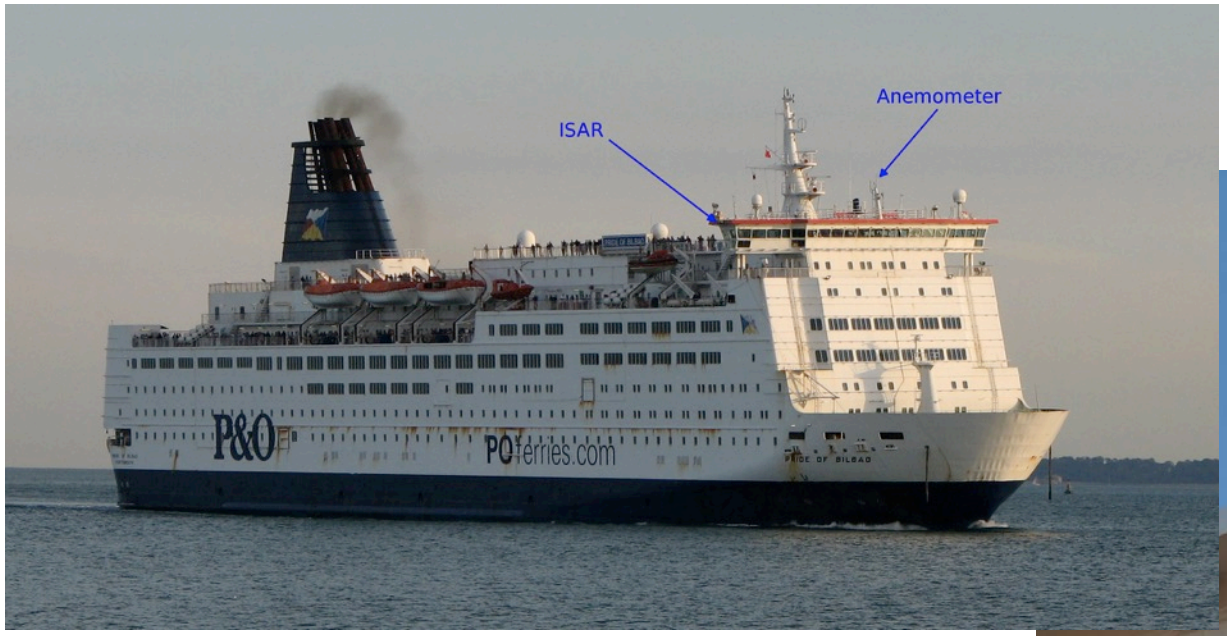


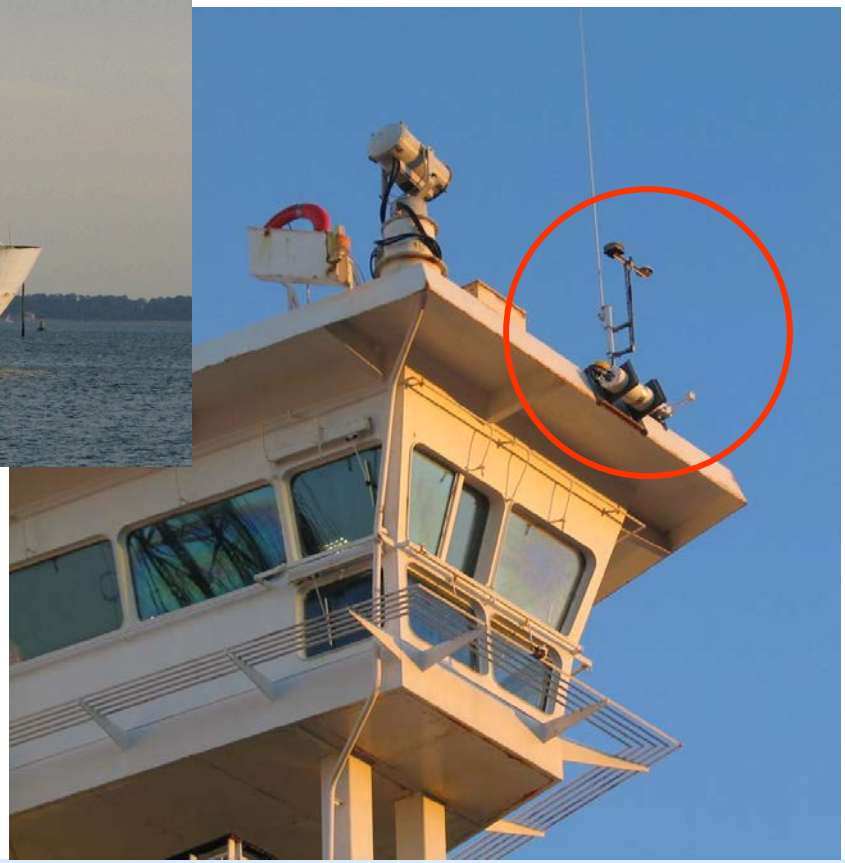
Donlon, C., Robinson, I., Reynolds, M., Wimmer, W., Fisher, G., Edwards, R. and Nightingale, T. (2008), '***An infrared sea surface temperature autonomous radiometer (ISAR) for deployment aboard volunteer observing ships (VOS)'***, *J. Atmos. Oceanic Technol.* 25, 93–113.

FRM4SST: ISFRN workshop – Expeditions, ISAR UoS

ISAR installed on *Pride of Bilbao*

- 2004 - 2010





- Ancillary instrumentation;
  - Anemometer
  - Short- /Long wave Radiation
  - Hull temperature (5m)
  - Air temperature, Humidity
  - FerryBox, CPR

ISAR installed on *Cap Finistere*

- 2010 - 2012

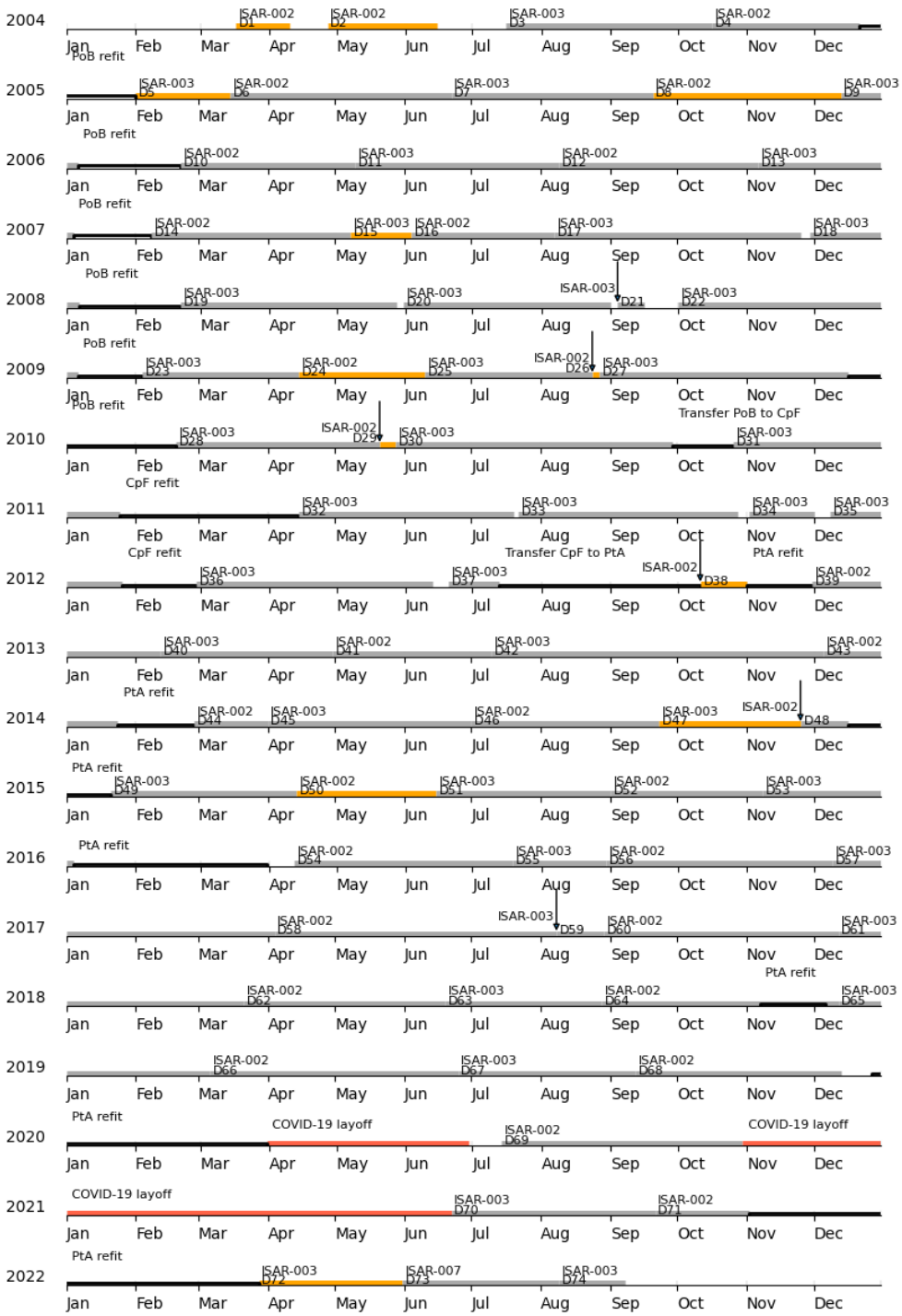
FRM4SST: ISFRN workshop - Expeditions, ISAR UoS

ISAR installed on *Cap Finistere*

- 2012 - ongoing

ISAR deployments

- Bay of Biscay and English Channel
  - 74 deployments
  - ~ 5000 days at sea
  - ~ 1 million SST measurements
  - ~ 200 SST /day
  - 12 failures:
    - 6 electronics issues,
      - 3 related to new electronics trails, 1 thermistors
    - 4 shutter failures
    - 2 configuration issues
      -

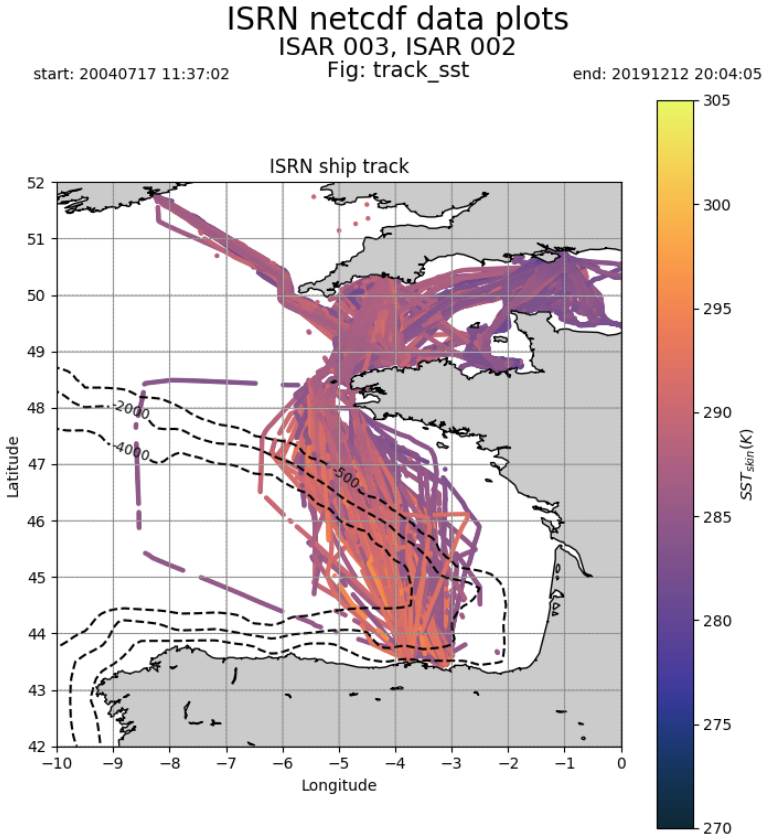


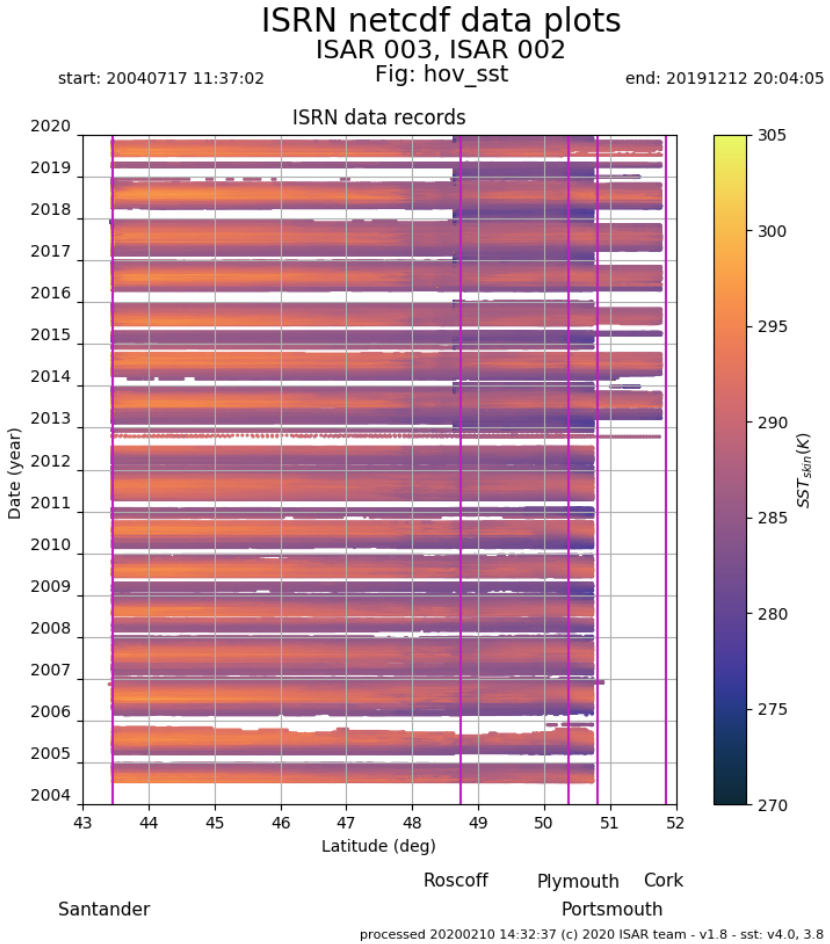
esa

RAL Space

ISAR deployments

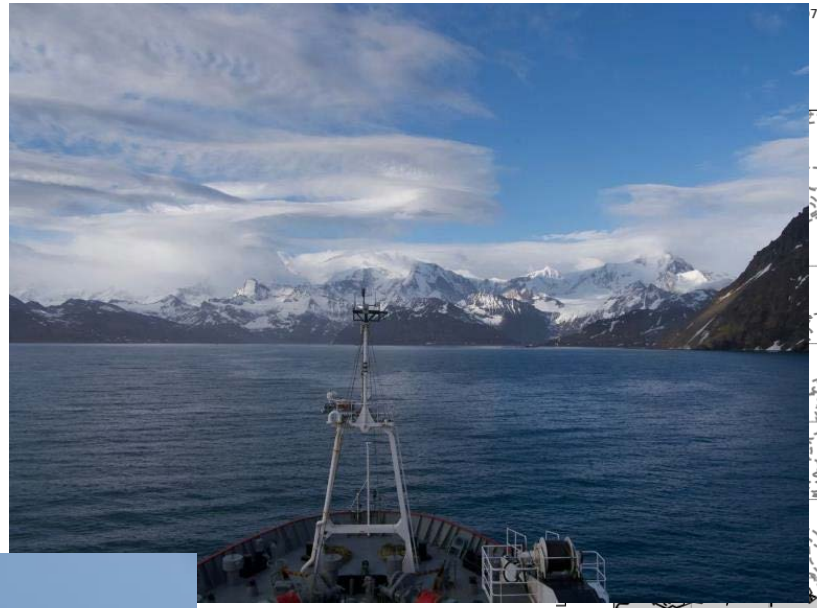
- Bay of Biscay and English Channel data

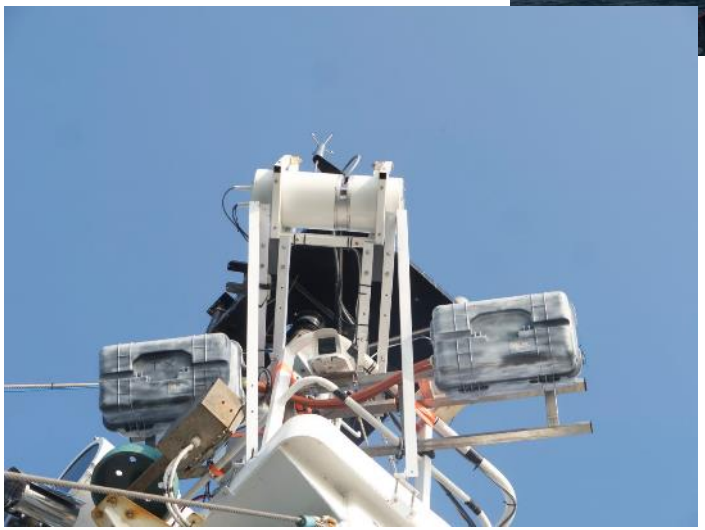


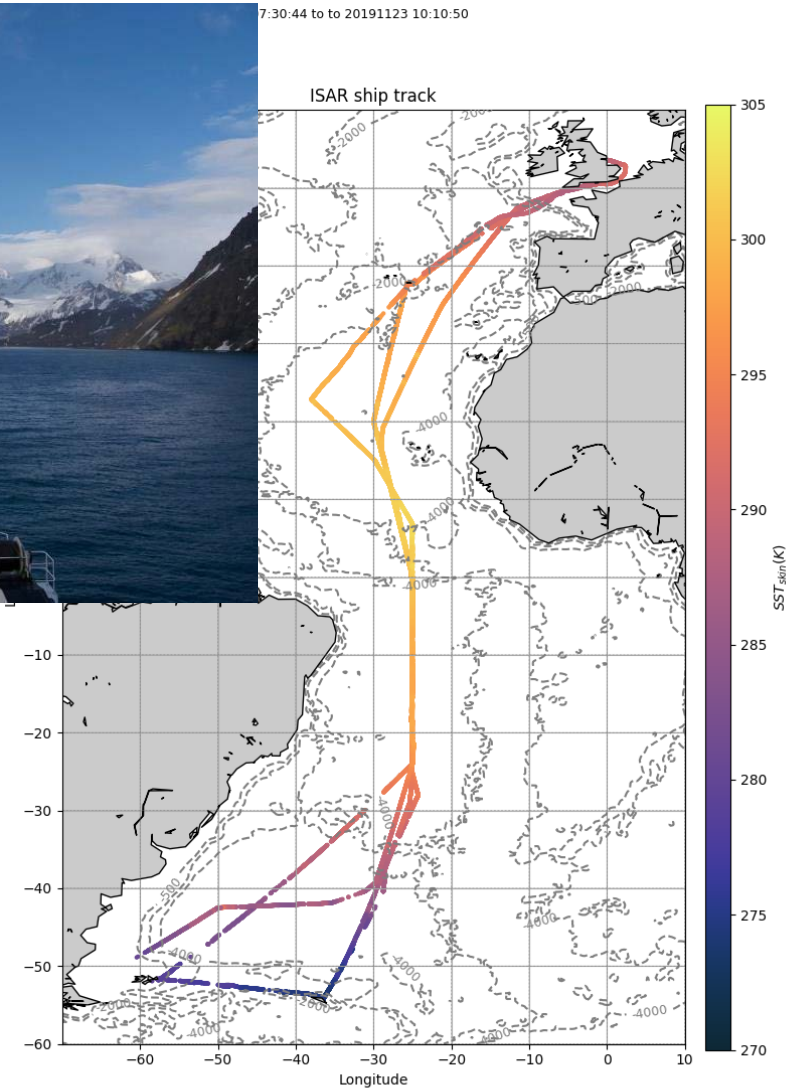


ISAR deployments

- AMT
  - 4 cruises
    - 2016, 2017, 2018, 2019
  - 166 days
  - ~ 40 000 SST
  - ~ 250 SST /day
  - ISAR side by side comparison

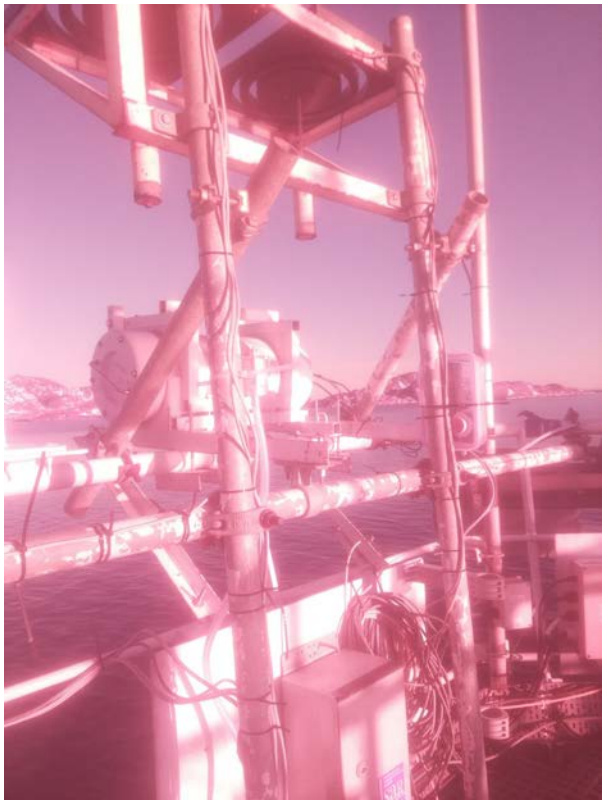


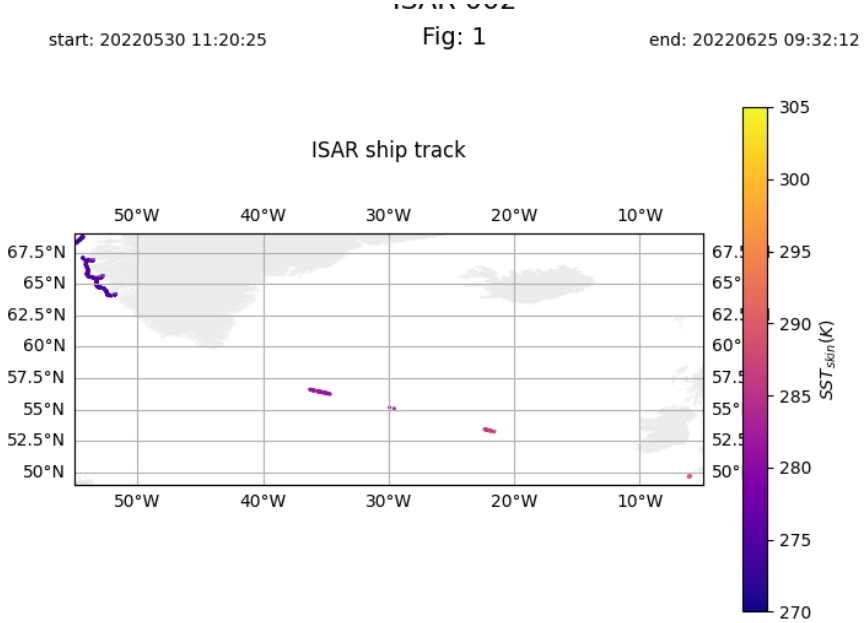




ISAR deployments

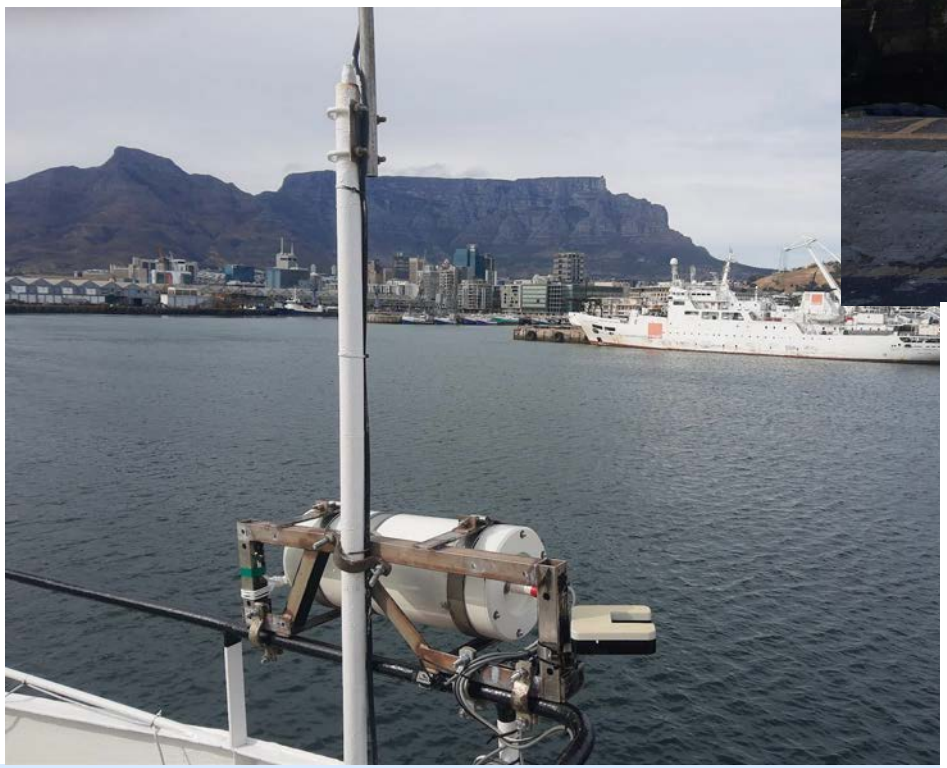
- AMT like
  - DY151
  - Instruments only, some issues due to COVID protocols and instrument access
  -

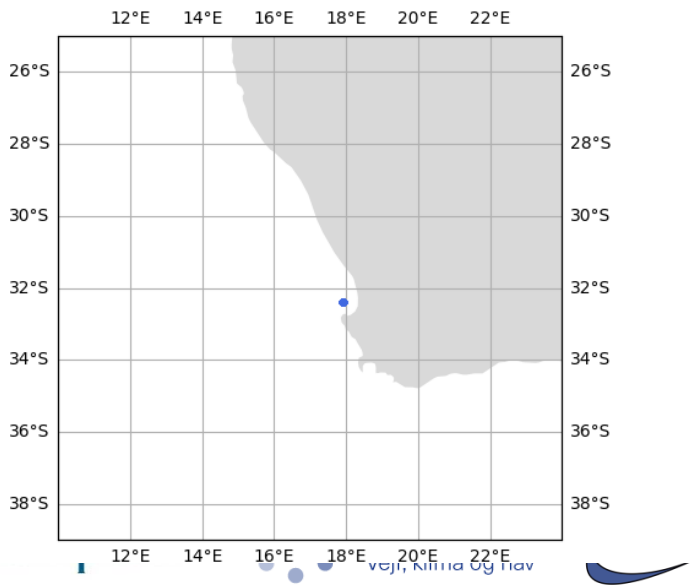




ISAR deployments

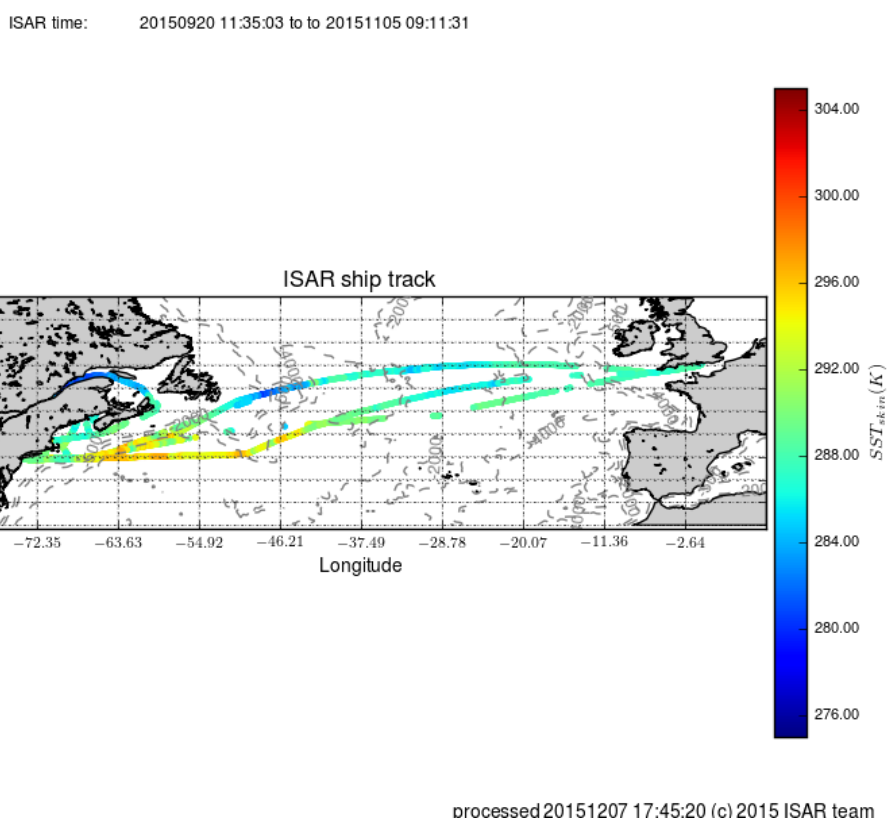
- S/A Algoa / BENFLUX
  - December 2021 protocols and instrument access

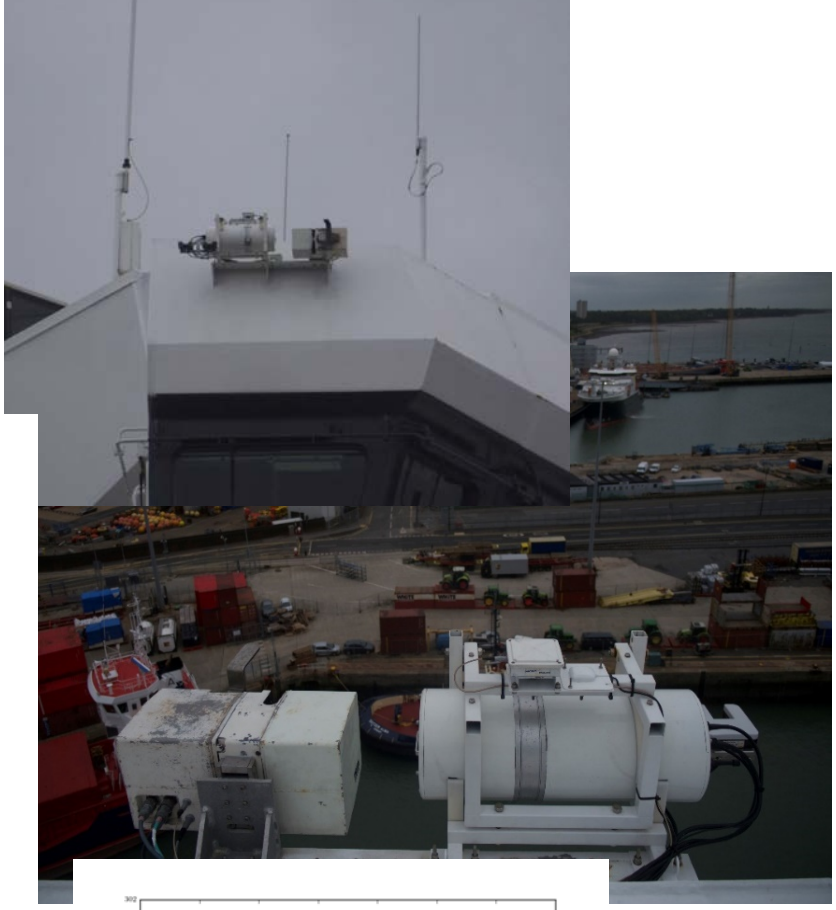


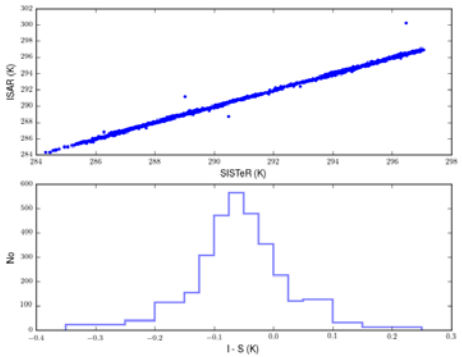


ISAR deployments

- QM2
  - ISAR – SISTeR side by side inter-comparison
    - 2015

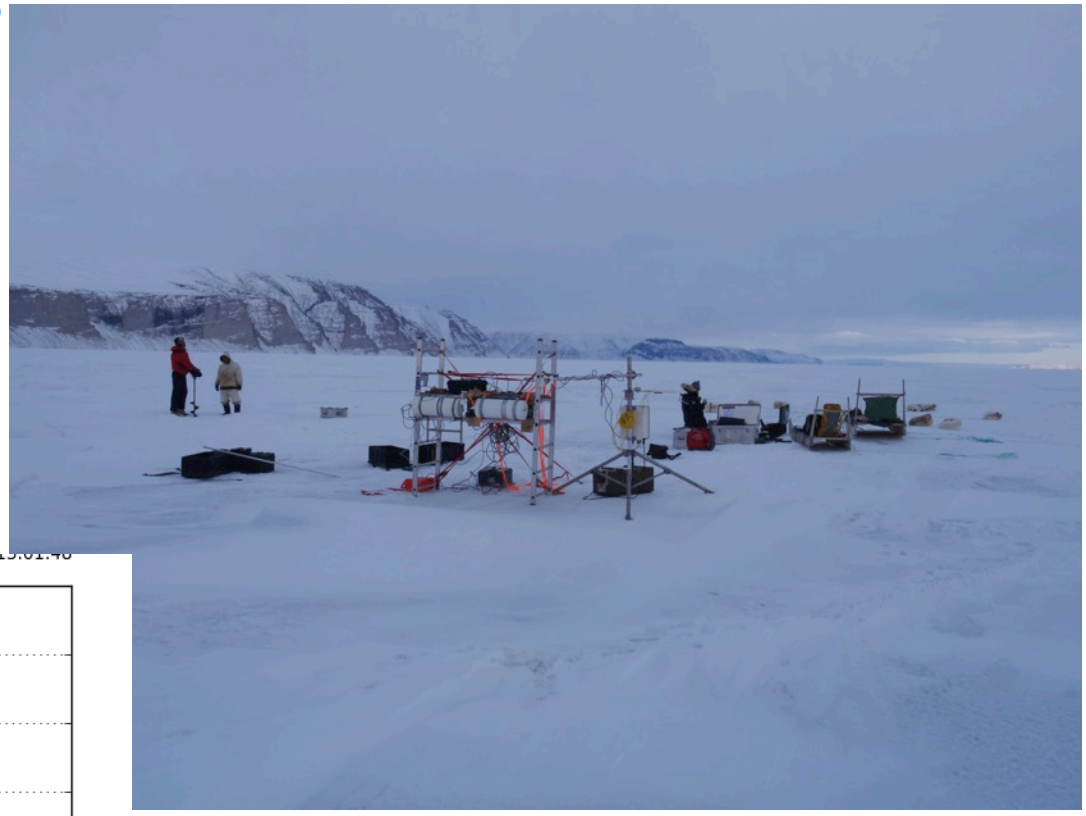


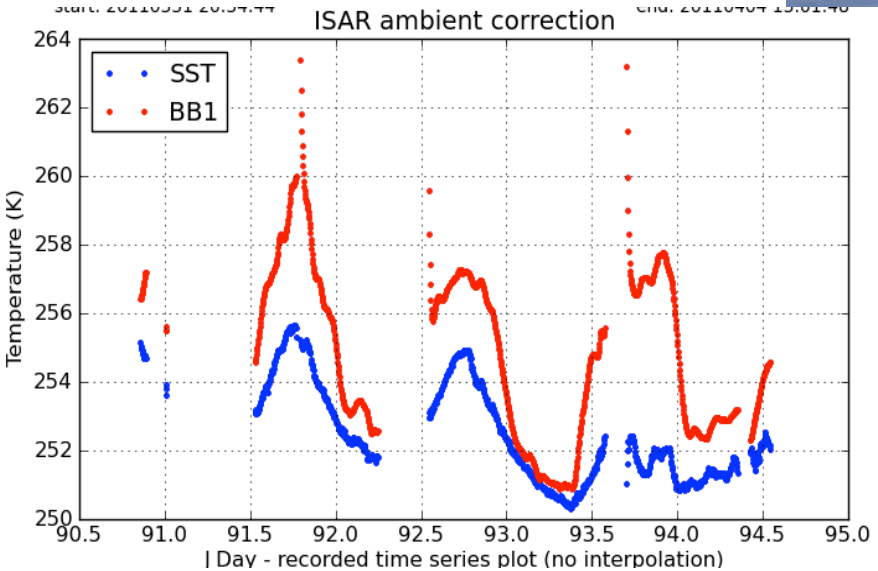




ISAR deployments

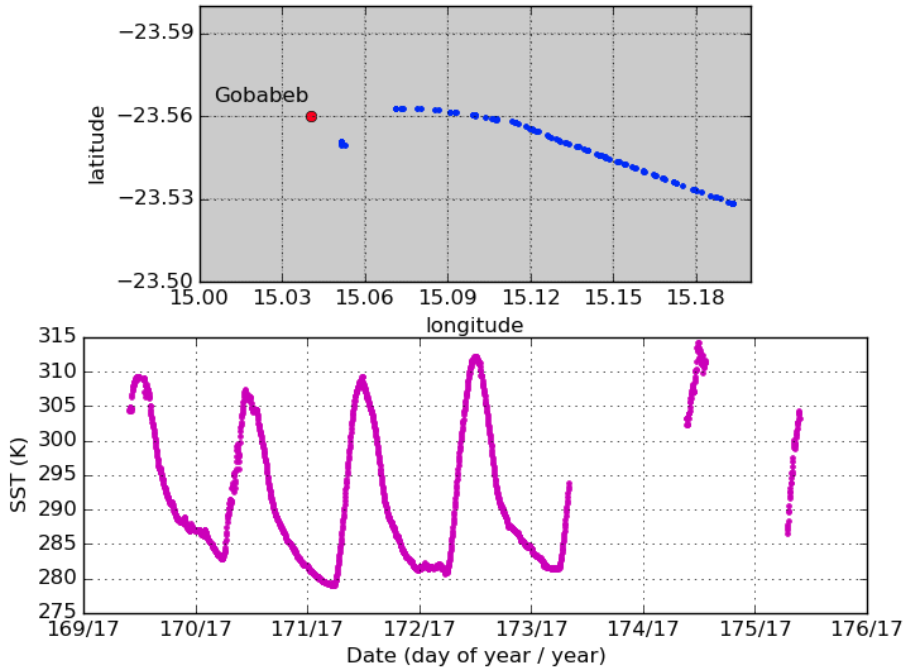
- FRM4STS – ICE
  - ISAR inter-comparison
  - 2016, (2011)





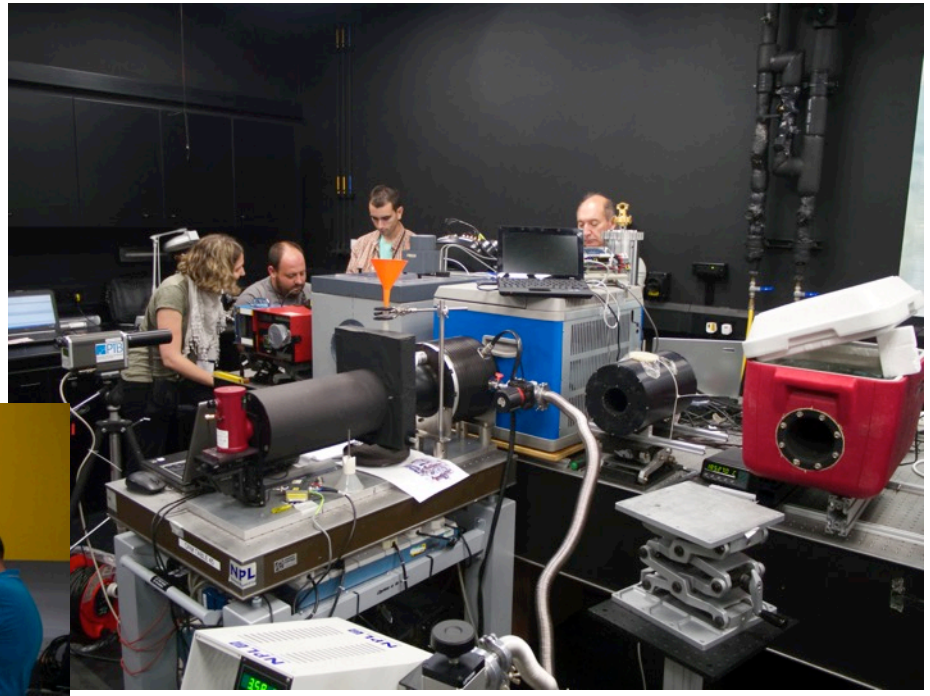
ISAR deployments

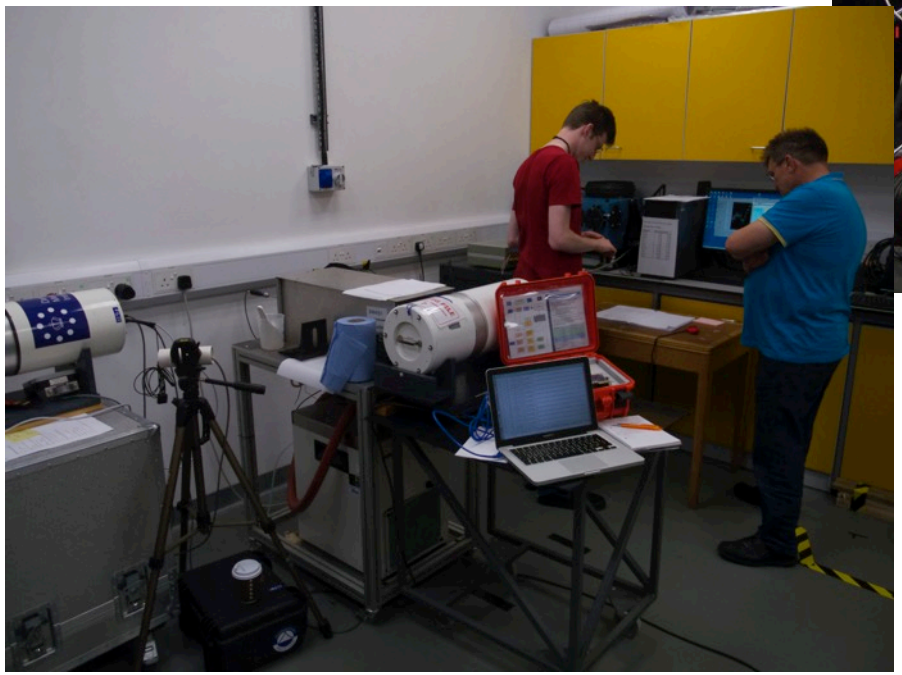
- FRM4STS – Land
  - 2017



ISAR deployments

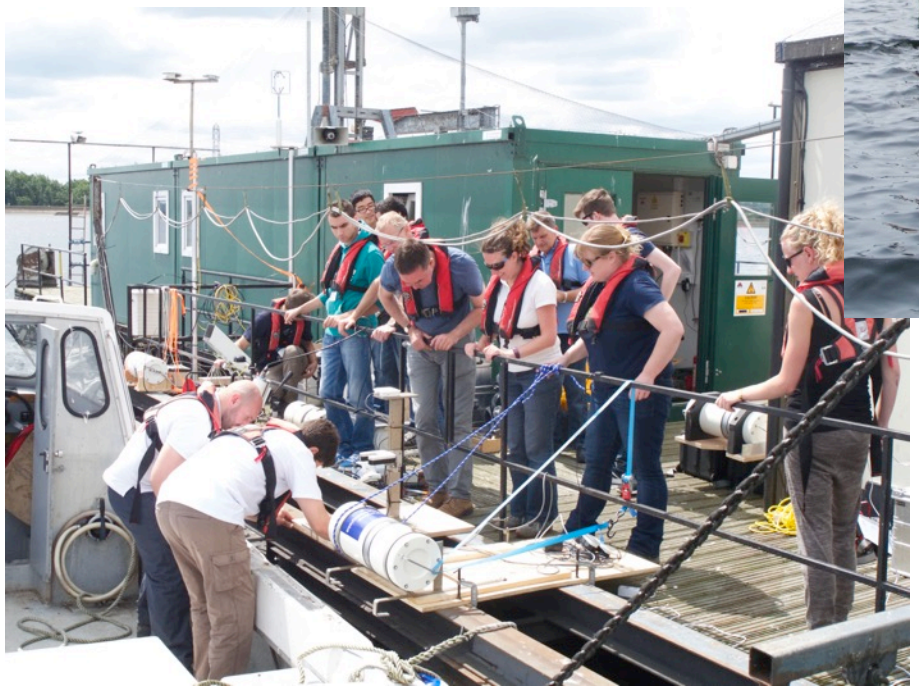
- FRM4STS – NPL
  - 2016

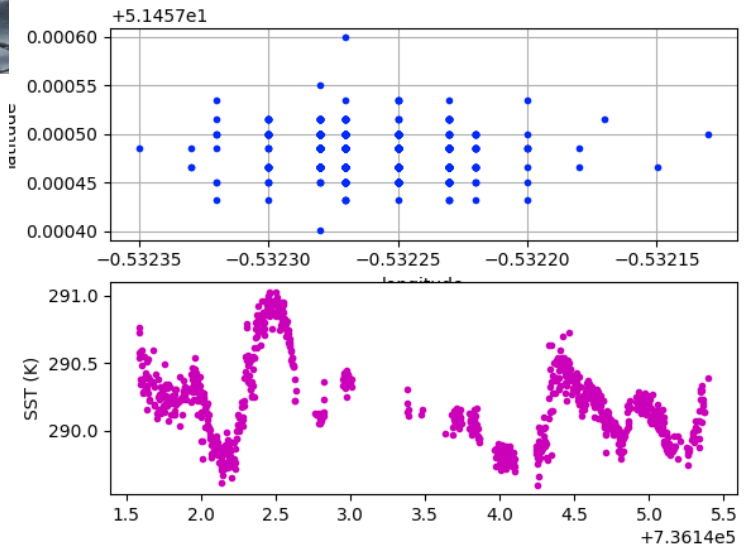




ISAR deployments

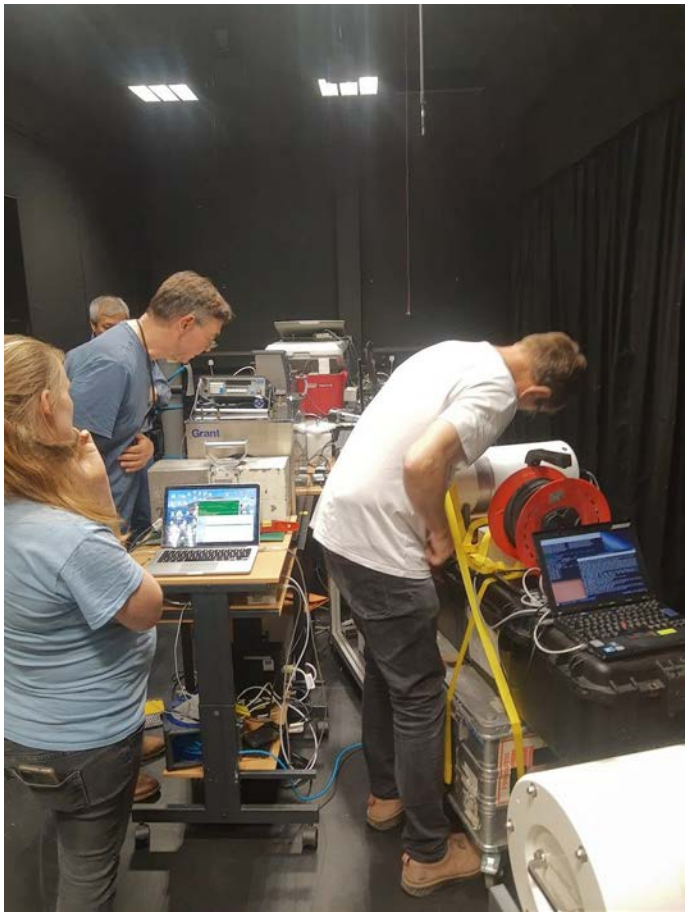
- FRM4STS – SST
  - 2016

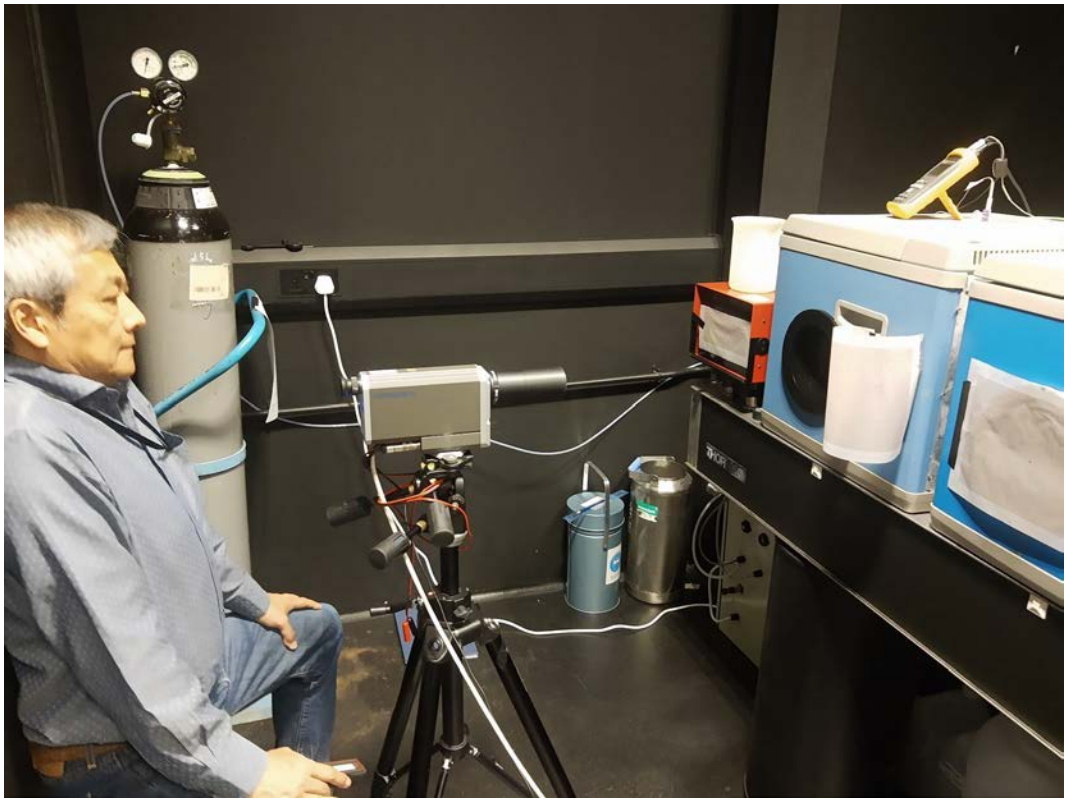




ISAR deployments

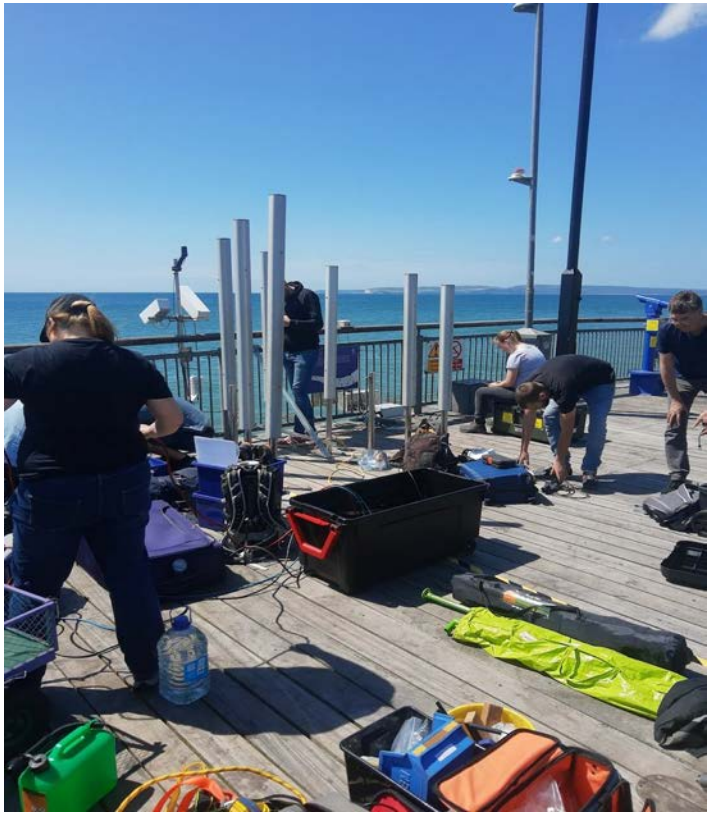
- Intercomparison – NPL
  - 2022

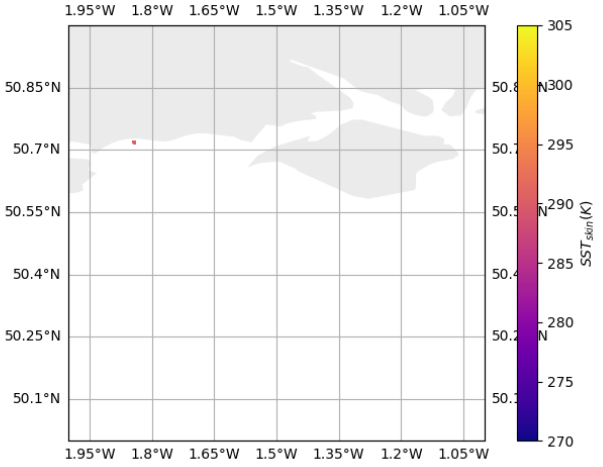


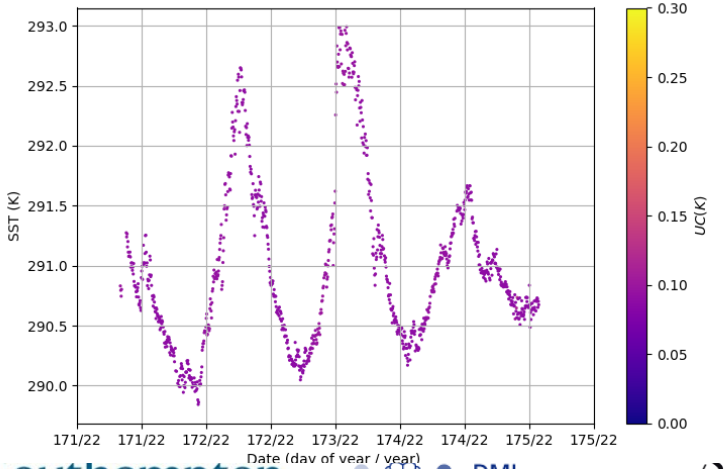


ISAR deplo

- Intercomparison
  - SST
  - 2022
  - Boscombe

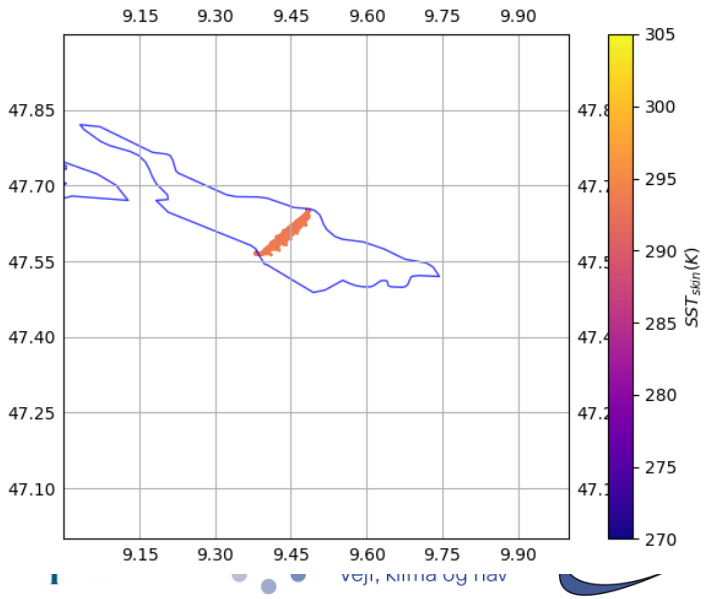




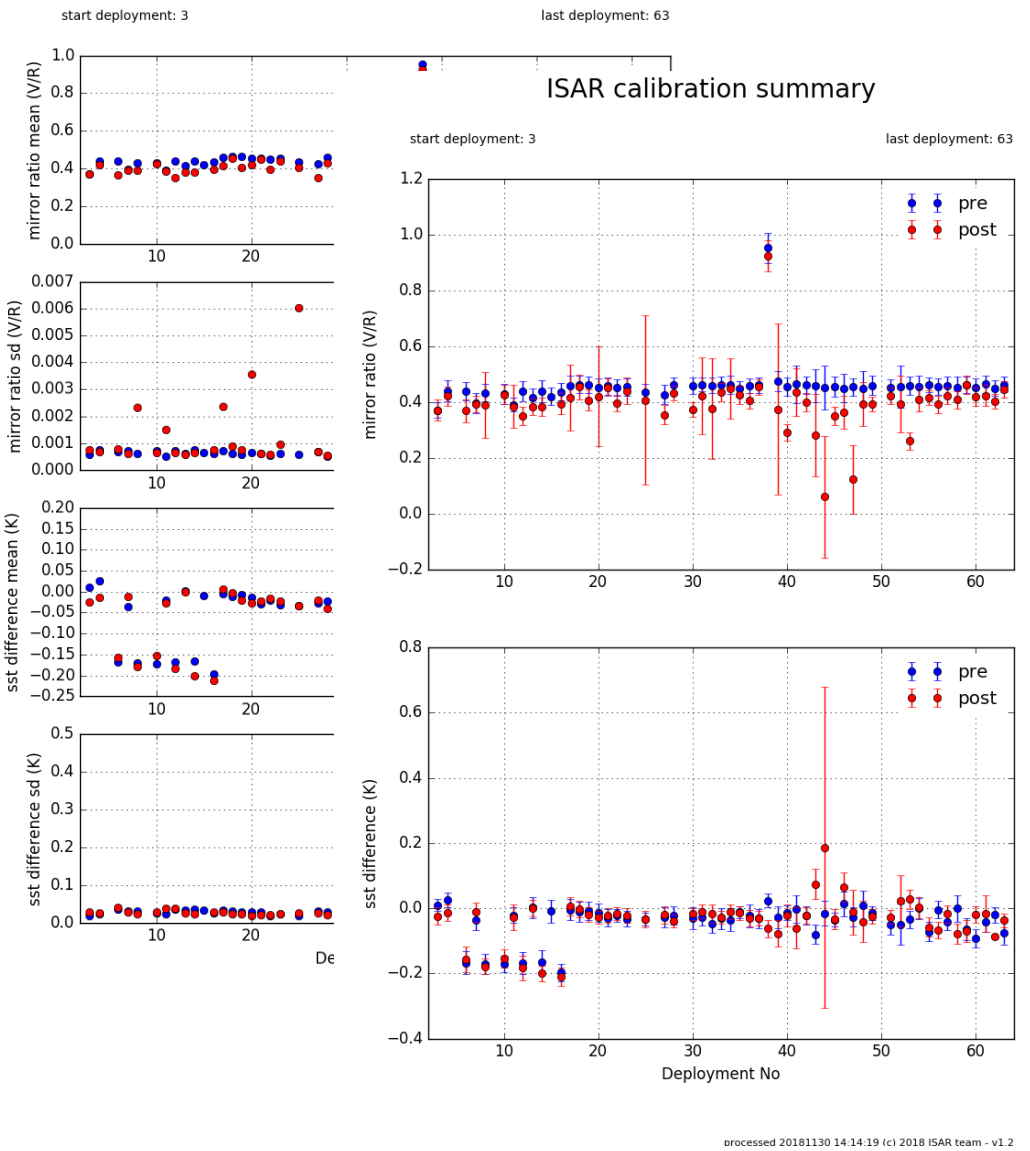


ISAR deployments

- EUMETSAT LWST
  - Lake Constance
  - ISAR – KT15 inter-comparison
  - 01.09.2020-23.09.2020



ISAR experience



ISAR

Infrared Sea Surface Temperature Autonomous Radiometer

ISAR post processing manual

ISAR sea surface temperature post processor version history

This is the version history for main ISAR PP processor, which is used by a number of tools in the ISAR PP software suite.

1. CHANGELOG

Version v4.0- 14.11.2018

- Bug fixes to v3.9:
  - *__CalcEmissvityUncertainty*, angle_roll = self.c_ufMissing, self. was missing.
  - *ShutterState* added fix for ISAR5D shutter disabled codes 10 and 11).
- Astral location() initialisation has been moved from __SetNCFlags to __init__ to speed up the processor. Minor speed improvements in the uncertainty estimation routines.
- Deployment.cfg changes:
  - Config file ('deployment.cfg') is now command line configurable
  - New function *SetDepInfoDefault* for default (UOS) values in case they are not defined in deployment.cfg.
  - bSeaSkyViewOverRide has new value 2, which allows for angels instead of array positions for the sea and sky view angles. Added new function *GetSkySeaViewIndex()* to convert angles to index in the processing.
  - No deployment.cfg reader in the write_isar_sst_v4.0.py anymore, all configuration values are read inti isar_v40.py.
  - New variables for three skyviews*: SkyViewUpper, SkyViewLower* and SeaWaterEmissivity. These override ISAR header information.
- Actual Skyview and Seaview angle added to the L2R file.
- *write_isar_sst_v4.0.py* can process multiple sky angles in one step. To achieve this new variables in deployment.cfg, see above.

Version v3.9- 20.08.2018

- Bug fixes to v3.8:
  - Fix to to BB thermistor differences for Engineering plots so plotting still works by not resetting sample[0,1] number to zero in *calcSSTskin_from_i5*.
- Changed *view_angles* and *target_sample* field size from 10 to 20 in *isar_struct_ua* for isaros v2.6.2 20 scan samples update.

Version v3.8 - 30.04.2018

- Bug fixes to v3.7:
  - solar_azimuth_isar was -360 to 400 degrees is now -180 to +180 relative to ISAR position.

ISAR Procedures Manual v1.02

W. Wimmer
Ocean and Earth Science
National Oceanography Centre Southampton
University of Southampton Waterfront Campus
European Way, Southampton, SO14 3ZH, U.K.

Reference:	Procedures_manual_v1.02
Issue:	01
Date of issue:	November 2013
Document type:	Procedure Manual

ISAR User Manual v2.05

W. Wimmer
Ocean and Earth Science
National Oceanography Centre Southampton
University of Southampton Waterfront Campus
European Way, Southampton, SO14 3ZH, U.K.

Reference:	ISAR-User-Manual-v2.05
Issue:	2.05
Date of issue:	March 2018
Document type:	User Manual

Date: 05.08.2004 No.: IS-IP-001

AR 002 shutter failure

failed on the 15.06.2004, which left the shutter jammed in
e 1 shows the
Pride of Bilbao
er could not be
lable and it was
trument off and
lbao. Because
e ISAR off the
3 people the
on 18.06.2004.
ess the shutter
e scan mirror
ie cold internal
the recovery a
were carried
brations in the
acilities at the
aphic Centre
f the instrument behaviour under deployment temperature
ach was done for the ambient temperatures of 10, 15 and

Figure 1: Image of the jammed shutter on the Pride of Bilbao as found on 15.06.2004.

2 was jammed in an half open position (see figure 1).
atory showed that under certain conditions the shutter
ys got jammed in the position shown in figure 1. This
be overcome with helping to push the shutter along from
thorough investigation of the problem the instrument had to
as the next step.

d that the sprocket which drives the drive belt and
ad some of broken off teeth (see figure 2). Furthermore it
had worn down quite substantially because of the wear
ket. As a result of the wear and the broken off teeth the
luminium dust and some bigger parts form the teeth (see
h was used on the sprocket drive belt interlink collected all
drive belt and consequently increased the wear on the

o a certain extent able to drive through these particles,
ight tolerances on the shutter door the amount of torque
st by the motor indefinitely. This eventually led to the
rrent limiting electronics on the shutter motor limited the
way that the shutter motor could not provide the torque
riction (Note that the shutter motor suffered no harm).

1 of 2

ISAR experience

- 16 years of near continuous operations
  - English Channel and Bay of Biscay
- Lots of high quality data
- One of the longest SST skin data records
  - More than 1000000 SST measurements
- Autonomous instrument, works in most environments
  - However needs careful maintenance
- Expansion to other areas – AMT
- Protocols for installation
  - Instrumentation
  - Ship owners
- Failures
  - Design changes (shutter, mirror, electronics)
  - Improved maintenance and pre-deployment checks

ISAR customers

- University of Miami
- Ocean University China
- JAXA
- Royal Navy
- Danish Metrological Institute
- WHOI
- CSIRO
- Seoul National University
- Vaisala (Australian Antarctic Division)
- National Ocean Technology Center of China
- MetNo