



ISFRN Workshop

<http://ships4sst.org/>

SISTeR



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The SISTeR radiometer

- SISTeR (the Scanning Infrared Sea surface Temperature Radiometer) is a chopped, self-calibrating infrared filter radiometer
 - Capable of measuring infrared brightness temperatures to high accuracy, typically 30 mK or so
 - Black body thermometer calibrations traceable to ITS--90 (NPL)
 - Measurements taken with a 10.8 μm filter matching the (A)ATSR filter shape
 - Measures upwelling radiance from the sea surface and corrects for the reflected sky component with measurements of the downwelling sky radiance
 - Is autonomous – it can operate continuously without supervision and can protect itself against bad weather when required
- SISTeR was designed in 1994, made its first deployment in 1997, and has been deployed regularly from 2006 on the *Color Festival* and *Ragnhild* ferries (Skagerrak) and from 2010 on the Cunard *Queen Mary 2* liner (north Atlantic and annual world cruise).

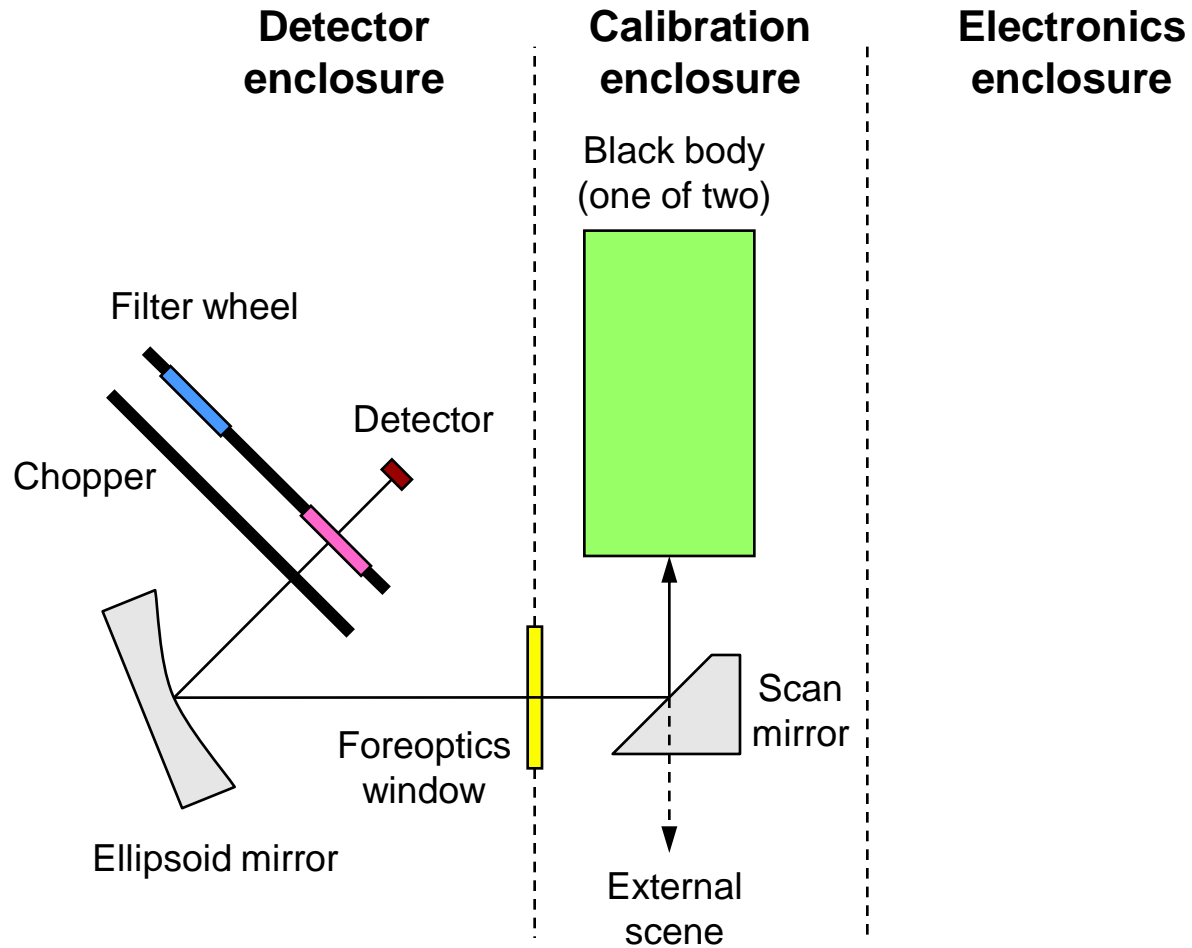
Traceability

- Scene radiances are referred to two on-board black bodies
 - Great care taken with the choice of thermometer, thermometer calibrations, and readout electronics
 - Thermometers re-calibrated periodically against an SPRT maintained by Oxford University. Re-calibration activities will move to RAL once a new calibration rig has been commissioned
 - Principal traceability route (to NPL realisation of ITS-90)
- Instrument calibration is validated against an external CASOTS black body before and after every deployment
 - Secondary traceability route (to NIST realisation of ITS-90)
- SISTeR participates periodically in radiometer round-robins organised by the national metrology laboratories to validate the calibration chain. None planned during the contract period.
- SISTeR has made direct in-situ intercomparisons with the UoS ISAR. This could potentially be extended to other instruments. Discussing further joint deployments, but none planned during the contract period.

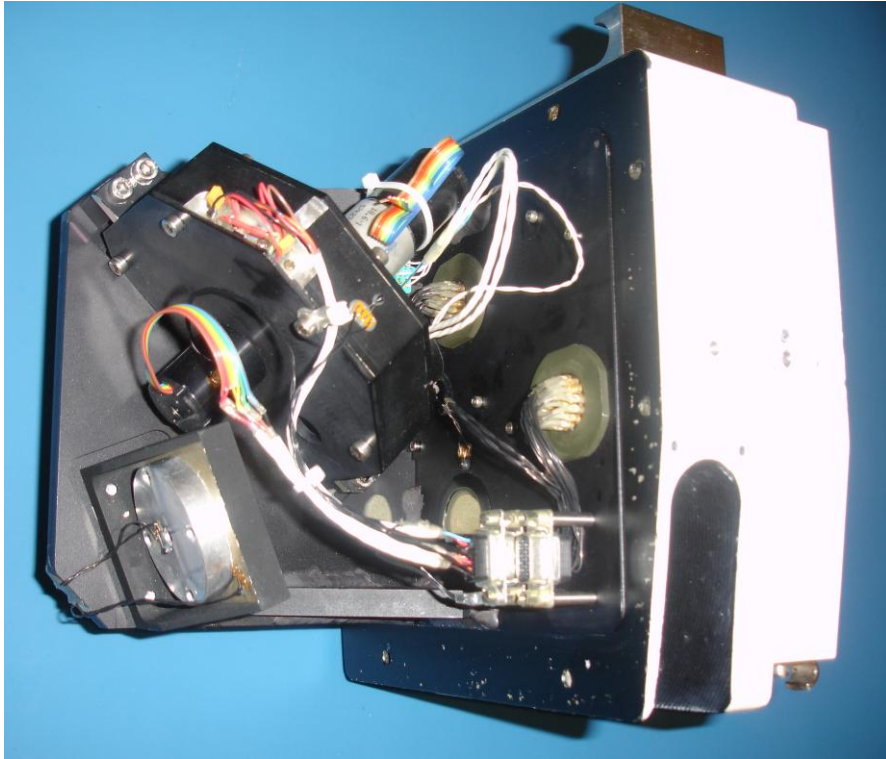
SISTeR black bodies



SISTeR layout



SISTeR



Processor and datasets

- SISTeR generates level 0 data – binary data packets containing snapshots of the complete instrument state which are stored by an external laptop data logger
- The SISTeR processor is coded in IDL
 - Unpacks the data
 - Extracts the appropriate calibration coefficients and other relevant information from a series of XML aux files
 - Applies these to the level 0 data to generate both level 1 (brightness temperature) and level 2 (sea surface temperature) products
 - Propagates random and systematic uncertainties through the instrument and SST equations, in parallel with the core BT and SST quantities
 - Calculates level 2 products directly from level 0 data, not via the level 1 product, to avoid double counting of uncertainties
 - Calculates averaged level 3 summary products from the level 1 and level 2 data
- All higher level products are encoded in netCDF. Level 2 and level 3 SST products follow the L2R in-situ radiometer data format.

Queen Mary 2 deployments

- SISTeR has been deployed since 2010 on the Cunard Line *Queen Mary 2* liner
- Mounted on a dedicated platform above the starboard bridge wing
- Support equipment (UPS, power supplies, data logger, USB and serial repeaters) installed in an internal cabinet and an external weatherproof box
- Data logger laptop connected to ship's Ethernet network. Emails daily level 0 products back to the UK.
- From May to January, the QM2 operates a regular service between Southampton and New York, with occasional side-trips
- Makes a round-the-world cruise from January to May
- Currently on its 16th cruise (due to end on 10th May)
- QM2 deployments planned through to the end of the contract and (hopefully) beyond.

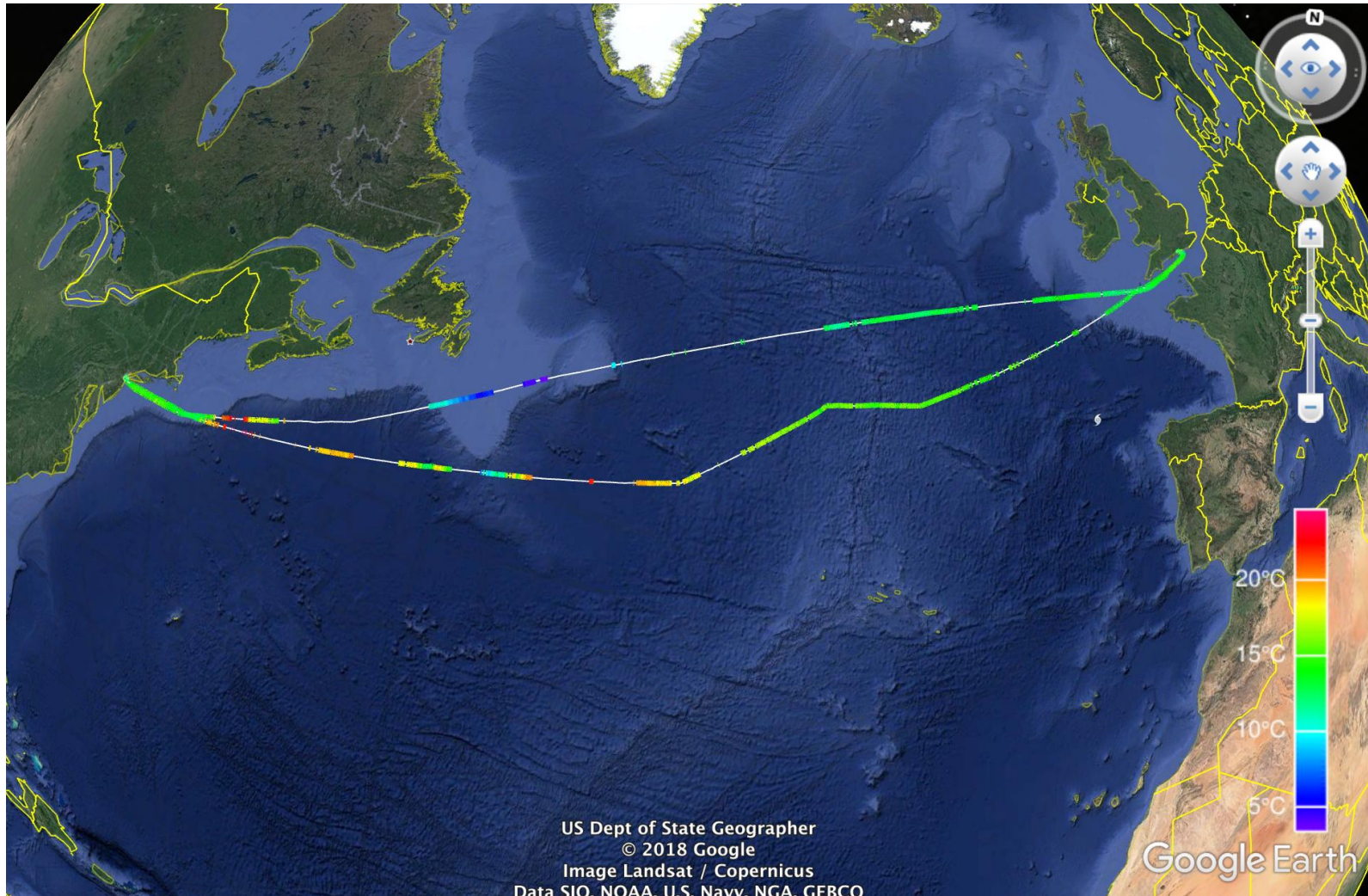
SISTeR on the Queen Mary 2



SISTeR on the Queen Mary 2



Cruise 15: 05/11/2017 – 19/11/2017



Cruise 16: 10/01/2018 – 10/05/2018

