



## **Satellite based Sea Surface Temperature (SST) measurement validation using the SISTeR (Scanning Infrared Sea Surface Temperature Radiometer) instrument from the Queen Mary 2**

Hugh Mortimer, Tim Nightingale, and Wayne Tubby

Science and Technology Facilities Council, Rutherford Appleton Laboratory, Oxfordshire, United Kingdom  
(hugh.mortimer@stfc.ac.uk)

Sea surface temperature (SST) is considered one of the essential climate variables and is critical in the understanding of how oceans exchange energy with the atmosphere. Not only are SST's important in understanding climate change but they are also used as input parameters to the meteorological models which are in turn used to generate accurate weather forecasts.

A partnership between the Science and Technology Facilities Council (STFC) and the Carnival Group UK (Cunard's parent company) has culminated in an instrument developed by RAL Space being installed on the Queen Mary 2. The Sea Surface Temperature monitoring instrument, SISTeR (Scanning Infrared Sea Surface Temperature Radiometer), is a project aimed at validating satellite measurements and improving climate records.

The SISTeR is a compact chopped self-calibrating filter radiometer. It has been designed to be robust and autonomous. It is able to maintain its calibration over extended periods in a maritime environment and using the ships own telecommunications network return data on a 24 hour basis.

The SISTeR measurement sequences contain repeated measurements of its two internal black bodies. In addition, to calculate the skin SST, the SISTeR is programmed to make measurements both of upwelling radiances from the sea surface and complementary downwelling sky radiances. In the SISTeR longwave channels, the measured noise temperature for a 1 second sample at typical SSTs is less than 30mK.

Global measurements of SST are performed by satellite borne radiometers that detect the thermal radiation emitted from the "skin" of the sea. To ensure that the satellite measurements are accurate, SISTeR is used to provide a calibrated validation. The ground truthing is provided when the satellite and SISTeR measurements coincide and the SST is recorded at the same location by both instruments.

The Queen Mary 2 is the largest ocean liner in the world and provides the ideal platform from which to perform these measurements. SISTeR is positioned at the prominent vantage point, high on the starboard bridge wing, giving a perfect view of unbroken water. The mixture of transatlantic crossing, (from Southampton to New York) and tropical round the world cruises give an ideal combination of hot and cold water measurements which can be used to validate satellites over the wide variety of Sea Surface Temperatures.