



fiducial reference  
temperature  
measurements



**esa**

## Fiducial Reference Measurements for validation of Surface Temperature from Satellites (FRM4STS)

ESA Contract No. 4000113848\_15I-LG

# D-50: Web stories for Fiducial Reference Measurements for validation of Surface Temperature from Satellites

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**D-50: WEB STORIES FOR FIDUCIAL REFERENCE MEASUREMENTS FOR  
VALIDATION OF SURFACE TEMPERATURE FROM SATELLITES**

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### 08.07.16 NPL HOST ESA FUNDED INFRARED RADIOMETER AND BLACKBODY INTERCOMPARISON

From the 24 June to 8 July, NPL hosted the Infrared radiometer and blackbody intercomparison.



**Figure 1:** FRM4STS Partners

FRM4STS is an ESA funded project, to establish and maintain SI traceability of global Fiducial Reference Measurements (FRM) for satellite derived surface temperature product validation. The project will facilitate international harmonisation and interoperability through organisation of a set of inter comparisons under the [Committee on Earth Observation Satellites](#) (CEOS) and its Working Group on Calibration and Validation (WGCV).

Taking place for the fourth time, these experiments are used as a comparison for both methodology and metrology, inviting research institutions from around the world to take part. The three weeks are made up of three types of validation: Controlled laboratory testing, Water surface temperature (WST) measurements and land surface temperature measurements, all useful for validation of satellite temperature data.

Both the lab and land measurements took place on site at NPL, while the WST measurements took place aboard the NPL research raft on the Wrasbury reservoir.

### 03.10.16 FRM4STS AT NEW SCIENTIST LIVE



**Figure 2:** NPL provide demonstrations at New Scientist Live

NPL featured a unique demonstration of satellite technology at [New Scientist Live](#), a large festival of science held between 22 and 25 September featuring exhibits, talks and demonstrations on a range of different subjects including FRM4STS.

NPL's stand featured a miniaturised 3D-printed satellite model that contained a spectrometer. Visitors could move the spectrometer between a range of materials that mimicked different types of landscapes, such as vegetation, bare soil, sand and inorganic material (plastic grass). Additionally, the stand featured a demonstration of a thermal imaging camera.

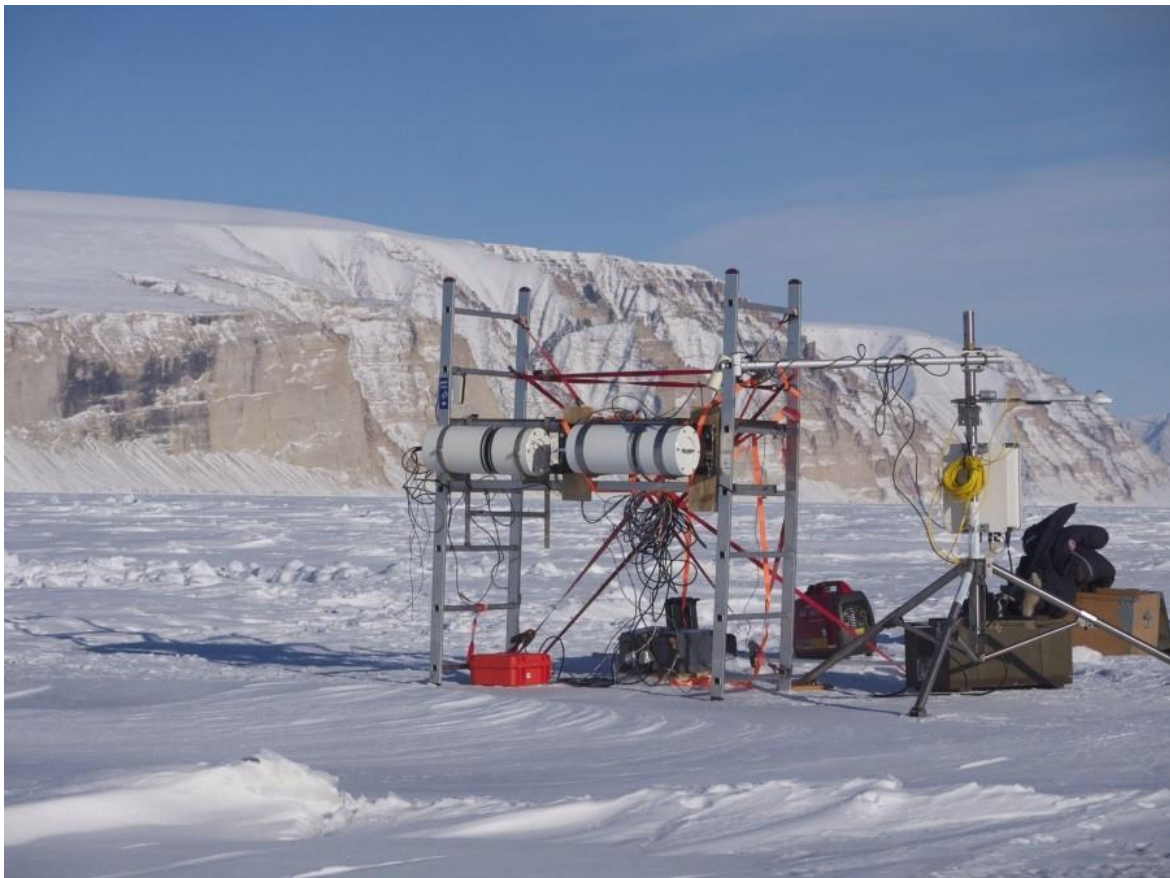
Our exhibit and activities at New Scientist Live was developed through the [Metrology for Earth Observation and Climate](#) project, which is part of the [European Metrology Research Programme](#) (EMRP). Also led by NPL, this project aims to develop new calibration methods for Earth observation satellites and to enhance the accuracy of their measurements.

#### 24.10.16 A SCIENTIFIC AND TECHNICAL WORKSHOP ON TRACEABILITY OF DRIFTER SST MEASUREMENTS

A report by David Meldrum on the meeting hosted at Scripps on 13-14 October 2016 under the auspices of the ESA FRM4STS initiative can now be found here: [A scientific and technical workshop on traceability of drifter SST measurements](#), and also at our Project Documents page in the Meetings section.

You can also find copies of the presentations within the workshop agenda here: [A scientific and technical workshop on traceability of drifter SST measurements](#)

#### 14.03.17 FIELD INTER-COMPARISON EXPERIMENT (FICE) OF ICE SURFACE TEMPERATURE



**Figure 3:** The spatial variability experiment was performed by dragging a sledge with mounted radiometers.  
Photo provided by W. Wimmer

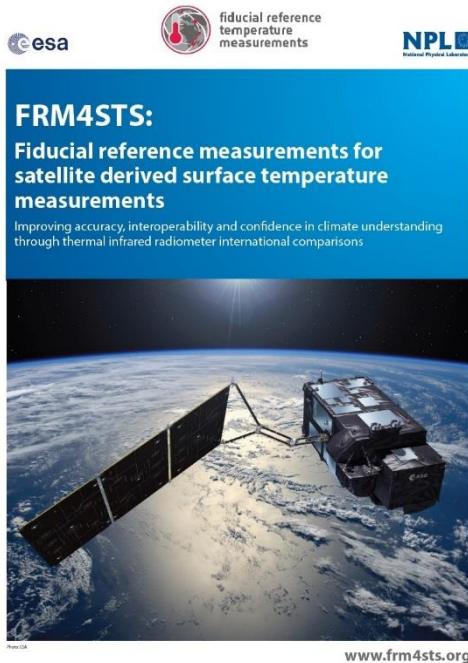
Jacob Høyer (DMI) and Werenfrid Wimmer (University of Southampton) have provided details regarding a successful field inter-comparison experiment over sea ice that was conducted in March-April 2016 on the sea ice off Qaanaaq, in Northwest Greenland.

The site is well suited for conducting a field campaign on the sea ice and for measuring the ice surface temperature with radiometers. It is well within the high Arctic at 77°N with a dry Arctic atmosphere and cold temperatures in April.

Three different research groups (DMI, Met Norway and University of Southampton) participated with six different thermal infrared radiometers in the inter-comparison, the first of its kind over sea ice, including two Fiducial Reference Measurements Thermal Infrared Radiometers.

For further detail on the field inter-comparison experiment, please visit: [Phase 2C: Ice Surface Temperature, Greenland.](#)

### 17.03.17 A BRIEF GUIDE TO FRM4STS



The FRM4STS Project has produced a brochure regarding its work to establish and maintain SI traceability of global Fiducial Reference Measurements (FRM) for satellite-derived surface temperature product validation.

Please visit [FRM4STS: Improving accuracy, interoperability and confidence in climate understanding through thermal infrared radiometer international comparisons](#) – for a copy.

For other papers and presentations, please visit the [Project Documents](#) page.

**Figure 4:** The FRM4STS Project brochure

### 01.06.17 SATELLITE VALIDATION INTERNATIONAL WORKSHOP

*Validating Copernicus Sentinel data using Fiducial Reference Measurements; 20th – 21st June 2017, Plymouth, UK*

Dr Andrew Banks – Senior Research Scientist at NPL will be speaking about the FRM4STS project at the The Copernicus Sentinel Atlantic Meridional Transect Fiducial Reference Measurements workshop in June.

The workshop will serve as a forum for discussing the performance of Sentinel -1, -2 and -3 at retrieving ocean colour, sea surface temperature in the open ocean and coastal environments. It will also identify potential strategies for the validation of Sentinel missions in the future. The workshop will address four main themes:

1. Fiducial Reference Measurement methods and protocols
2. Ocean Colour validation
3. Sea Surface Temperature validation
4. Validation of upper ocean dynamics

The workshop should be beneficial to anyone with an interest in the validation of satellite data. For more information, please visit: [http://amt4sentinelfrm.org/International Workshop](http://amt4sentinelfrm.org/International_Workshop)

### 16.10.17 FRM4STS INTERNATIONAL WORKSHOP



**Figure 5:** Partners at the FRM4STS International Workshop

From the 16 – 18 October, NPL are hosting the FRM4STS International Workshop. FRM4STS is an ESA funded project, to establish and maintain SI traceability of global Fiducial Reference Measurements (FRM) for satellite derived surface temperature product validation. The project will facilitate international harmonisation and interoperability through organisation of a set of inter comparisons under the [Committee on Earth Observation Satellites](#) (CEOS) and its Working Group on Calibration and Validation (WGCV).



**Figure 6:** (Top) Chris Merchant of the University of Reading presenting Satellite-Based Sea Surface Temperature Climate Data Records. (Bottom) Delegates come together in breakout sessions to discuss and work towards an FRM4STS Roadmap.



The FRM4STS International Workshop is now underway – if you are unable to attend the workshop, please visit the [Workshop page](#) where you can find many of the presentations.

**01.11.17 SST-DRIFT 2017: SCIENTIFIC AND TECHNICAL WORKSHOP ON  
TRACEABILITY OF DRIFTER SST MEASUREMENTS, 13 NOVEMBER 2017,  
PLOUZANE, FRANCE**

The SST-Drift 2017 workshop will review progress since the workshop on traceability of drifter SST measurements held in October 2016 and reach consensus on the way forward for drifter SST measurements and the establishment of best practice for the community.

Help develop best practice for future drifter SST by registering your interest – contact David Meldrum [davidmeldrumltd@gmail.com](mailto:davidmeldrumltd@gmail.com). A draft agenda can be found [here](#).

**02.11.17 TOWARDS IMPROVED DRIFTER SST – A COLLABORATION BETWEEN THE  
SATELLITE COMMUNITY AND THE DATA BUOY CO-OPERATION PANEL**

David Meldrum presented a paper on the SST aspects of FRM4STS to the EUMETSAT conference in Rome on 2 October 2017.

The presentation; *Towards improved drifter SST – A collaboration between the satellite community and the Data Buoy Co-operation Panel* is now available under Presentations on our [Project Documents](#) page. A poster of the same topic is also available under Posters on our Project Documents page.