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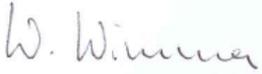
Project : Fiducial Reference Measurements for Sea Surface Temperature

Title : FRM4SST: Project Plan

Abstract : This document contains the Project Plan for the Fiducial Reference Measurements (FRM) for Sea Surface Temperature (SST) Service (FRM4SST).

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**EUROPEAN SPACE AGENCY
CONTRACT REPORT**

The work described in this report was done under ESA contract.
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AMENDMENT RECORD

This document shall be amended by releasing a new edition of the document in its entirety. The Amendment Record Sheet below records the history and issue status of this document.

AMENDMENT RECORD SHEET

ISSUE	DATE	REASON FOR CHANGE
A	15-05-19	Draft for internal review
B	30-05-19	For review by ESA
1	24/07/2019	Finalised following comments and issue of ESA contract
1.1	25/06/2020	Edited to include CCN1 details and change of personnel at DMI



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1. INTRODUCTION

1.1 Purpose and Scope

This document is the Project Management Plan (PMP) for the Fiducial Reference Measurements (FRM) for Sea Surface Temperature (SST) (FRM4SST) project; a service that continues the work of the Ships4sst project in the validation of SLSTR data using *in situ* measurements.

1.2 Structure of the Document

After this introduction, the document is divided into a number of major sections that are briefly described below:

2. PROJECT OVERVIEW

3. PROJECT ORGANISATION

This section describes the consortium members, organisation, and team structure, and explains the team's interactions with the climate research community.

4. MANAGEMENT

This section describes the following: lines of communication, project control, project reviews and meetings, progress reporting, action log, quality management, risk management, document review cycle, travel and meeting plan.

5. ANALYSIS OF RISK FACTORS AND MITIGATION STRATEGIES

This section describes the risks identified when planning the project, and the strategies that can be adopted to mitigate them.

6. WORK PLAN

This section includes the list of deliverable items, the Work Breakdown Structure, and the Work Plan (planning, schedule, milestones, deliverables).

7. QUALITY ASSURANCE

This section includes configuration and document management.

APPENDICES

SCHEDULE

MEETING PLAN

DELIVERABLES

WORK PACKAGE DESCRIPTIONS



2. PROJECT OVERVIEW

This project, which is funded by the European Space Agency (ESA), starts on 1 May 2019, and is due to run for 18 months with an option for an extension for a further year. CCN1 has extended the project for a further 2 months until 31 December 2020, with additional activities as described in section 6 and the Appendix. The aim of this project is **to continue the validation of the Copernicus Sentinel-3A and Sentinel-3B2 SLSTR SST data products using Fiducial Reference Measurements (FRM)** as set up in the Ships4SST contract. This aim will be fulfilled through the collection, processing, analysis, publication and reporting of *in situ* FRM field measurements made using ISAR and SISTeR instruments, that are near-contemporaneous with satellite data from the Sentinel-3A and Sentinel-3B SLSTR instruments.

The objectives for the FRM4SST (Ships4SST) project are:

- **OBJ-1:** Validate satellite SST products to FRM standards
- **OBJ-2:** Maintain and evolve the International SST FRM Radiometer Network (ships4sst) and deploy on a continuous basis Thermal Infrared Radiometers (TIR) FRM and necessary supporting instrumentation to validate SST products.
- **OBJ-3:** Process, archive and quality control FRM4SST data following documented FRM procedures that approve their use for FRM satellite validation.
- **OBJ-4:** Deliver approved FRM4SST data sets and uncertainty budgets to users.
- **OBJ-5:** Prepare and submit peer-reviewed journal articles.
- **OBJ-6:** Conduct communications and outreach material promoting FRM4SST activity.

Providing reliable and timely Fiducial Reference Measurements to support the validation of SLSTR SST involves the use of three unique European activities and data sets:

- Continuation of the English Channel and Bay of Biscay ISAR radiometer deployments, ISAR 002 and 003, involving:
 - ISAR instrument operation on the *Pont Aven* or equivalent ferry,
 - Quality assurance of ISAR data, including pre- and post-deployment laboratory validations,
 - ISAR instrument maintenance.
 - Continuation of SISTeR A deployments on the *Queen Mary 2* liner between Southampton and New York, and round the world, involving:
 - Regular deployments of a single SISTeR radiometer on the *Queen Mary 2* liner to collect radiometric measurements of the sea surface,
 - Validating the radiometric calibrations of the SISTeR radiometers before and after every deployment, following best practice,
 - SISTeR instrument maintenance.
- Note: for continuous deployment, an additional instrument will need to be built, which is outside the remit of this project.
- Continuation on Smyril-line Denmark–Faroe Island-Iceland, ISAR 008, in synergy with the Ferrybox project and instrumentation, involving:

- Regular deployments of the DMI ISAR radiometer on the *Norröna* passenger ferry or equivalent to collect radiometric measurements of the sea surface,
- Validating the radiometric calibrations of the DMI radiometer against a blackbody reference before and after every deployment, following best practice.
- ISAR instrument maintenance.

The SST FRM products will be:

- University of Southampton ISAR data in L2R format with calibrated skin SST and associated uncertainties.
- DMI ISAR data in L2R format containing traceable estimates of brightness temperature, SST and associated uncertainties.
- RAL SISTeR data in L2R format

The work to be carried out by the project team also involves:

- For all instruments: generate formatted products containing traceable estimates of brightness temperature, sea surface skin temperature and associated uncertainties from the radiometric measurements.
- To continue the time series of radiometer measurements started in 2004 by Defra, in order to ensure that sufficient skin SST reference measurements are acquired to reliably tie the SST record from the AATSR to the SST record from SLSTR, involving:
 - Regularly processing of the ISAR and SISTeR data to ISFRN L2R format and update the archive with calibrated skin SST containing traceable estimates of brightness temperature, sea surface skin temperature and associated uncertainties from the radiometric measurements,
 - Processing will be facilitated by French Research Institute for the Exploitation of the Sea (Ifremer), using the Felyx tool to process and generate validation reports,
 - Maintaining an archive of SST radiometer data in a common format (an International SST FRM Database).
- To support a collaborative network that enables other users of ship radiometers worldwide to contribute to the *in situ* SST Reference Database and which disseminates the data to the wider community. This includes maintenance of Fiducial Reference Measurement protocols.
- To plan a CEOS International radiometer inter-comparison exercise, plan and host a second ISFRN Service review meeting and to undertake 2 studies; a study into a next generation radiometer and a study comparing microwave and thermal infrared *in situ* measurements of water temperatures.

In addition, the FRM4SST (Ships4SST) project will maintain an International SST FRM Radiometer Network (ISFRN) website that will make information and data available on all aspects of the radiometer deployments to users and the project team, as appropriate. This includes; a Campaign Implementation Plan (CIP), a Campaign Actions and Risk Log (CARL), the most recent radiometer data and calibrated skin SST with associated uncertainties, validation plots, reports and links to scientific papers, an ISFRN data description and user manual, and details of the ISFRN Service Review Meeting.

3. PROJECT ORGANISATION

3.1 Consortium Members

The project team members are:

- Space ConneXions Limited (SCL) – Project Management
- University of Southampton (UoS) – Contract Management
- University of Southampton (UoS) – ISAR Project Scientist, Technical Lead
- Danish Meteorological Institute (DMI) – ISAR Project Scientist
- STFC (RAL Space) – SISTeR Project Scientist

In addition, Ifremer will continue to make its archive facilities and Felyx tool available to the project, at no cost to ESA. NPL and DTU are also contracted for some work on work packages 60 and 70, respectively.

3.2 Prime Contractor

The University of Southampton (UoS) is the Prime Contractor.

3.3 Organisation Chart

Figure 3-1 shows the team's organisation structure and main lines of communication.

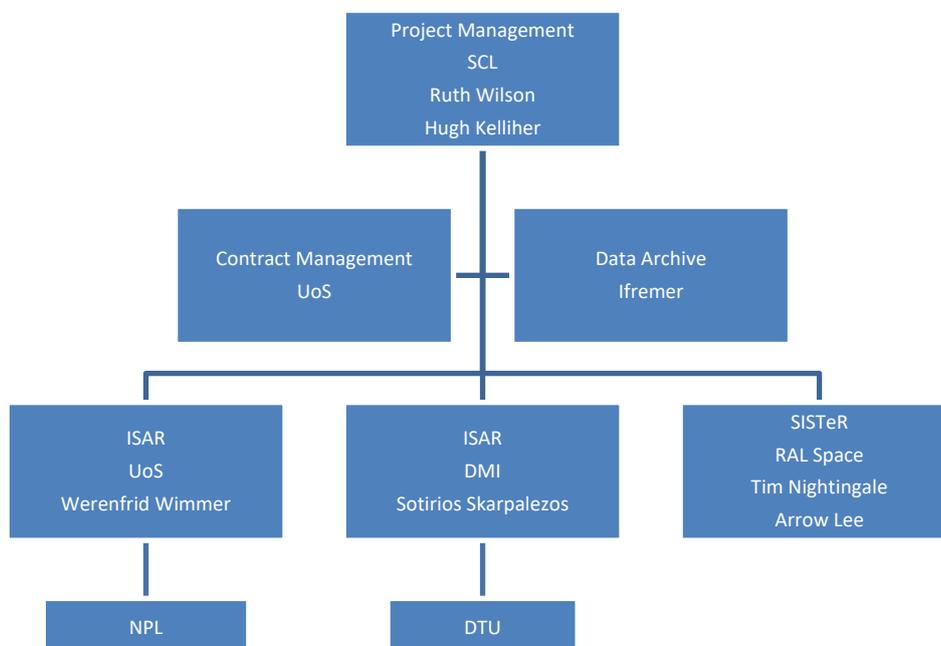


Figure 3-1 - Organisation of consortium, with key personnel

At the top level, the project activities will be co-ordinated by SCL with the University of Southampton handling the contract with ESA. UoS, RAL Space and DMI will each manage their own instruments, whilst Ifremer will store the data the instruments produce and make it available to external users. NPL will be contracted to UoS for 2 days consultancy work on work package 60 and DTU are contracted to DMI for their work on work package 70 (see Annex).

Communications between team members will be facilitated by e-mail, Skype or telephone conference calls, and face to face discussions. In the unlikely event of disagreements occurring within the team, directors or senior staff from the organisations concerned will meet to resolve the issues.

3.4 Team Structure and Staffing

Table 3-1 lists the staff who are undertaking the work, and their roles.

Table 3-1 – Organisation Chart for the Project Team

Role	Organisation	Staff	Role
Prime Contractor	University of Southampton	Werenfrid Wimmer Anita Kraińska	Technical Lead Contracts Officer
Project Management	Space ConneXions	Ruth Wilson Hugh Kelliher	Project Manager ISFRN website manager Deputy Project Manager
Project Scientists	University of Southampton	Werenfrid Wimmer Ray Holmes	ISAR Project Scientist ISAR Project Support
Project Scientists	DMI	Jacob Høyer Sotirios Skarpalezos	ISAR Project Scientist ISAR Project Scientist
Project Scientists	STFC (RAL Space)	Tim Nightingale Arrow Lee	SISTeR Project Scientist SISTeR Project Scientist

3.5 External Services

Ifremer (France) will provide hosting for the radiometer data produced by UoS, RAL Space and DMI, at no cost to the project. Ifremer are experienced in hosting oceanic data at sites such as Coriolis (<http://www.coriolis.eu.org/>) and providing a reliable service to users.

UoS, RAL Space and DMI will continue to store their ISFRN L2R data files at the archive once they become available, which is normally after the post-deployment calibration. The members of the ISFRN will upload their L2R data and documentation to the Ifremer site via ftp. The ISFRN L2R files will be accompanied by calibration information, such as plots and calibration factors from the pre- and post-deployment calibrations. Documentation of the traceability of all calibration equipment will also be stored at the data archive, as well as the ISFRN web portal. Data will be downloaded via the Ifremer web portal using their existing interface.

The data archive is accessible through the ISFRN web portal and provides data to users on request through the web portal. Uploading data from non-project partner groups who collect data to ISFRN standard and submit the data in ISFRN L2R format will be facilitated through the ISFRN web portal. Initially, the archive will be searchable as files (the data will only be stored as files and not in a relational database); this does not allow individual measurements to be extracted. However the files themselves can be indexed in a similar way as satellite files

and it will be possible to get the list of files matching some user criteria (area, time frame, ship id, etc.).

3.6 International SST FRM Radiometer Network (ISFRN)

The project team are involved in daily working with shipborne radiometer colleagues and other climate scientists worldwide. They therefore have useful personal networks within the climate and shipborne radiometer user community, and a deep appreciation of the concerns and perspectives of the radiometer network community regarding *in situ* climate data.

The project scientists will actively engage with the SST climate community during this project. The team will continue to present the results of the SST validation activities at international conferences (e.g. Eumetsat, Living Planet) and at GHRSSST meetings with the aim of encouraging more groups to join the network and contribute match-ups from new regions. The data will be available to professional users via the ISFRN and Ifremer web portals.

The ISFRN, hosted by NOCS at <http://www.shipborne-radiometer.org/> will be maintained and developed during the duration of this project to reflect the ongoing collaboration and active engagement with international scientists and agencies.

The team will look for opportunities to contribute short articles to journals and magazines, including media intended for the general public. One idea under consideration is to provide contributions to the media produced by the ship operators, setting out the environmental benefits of the radiometer deployments.

We will look into the possibility of consolidating instrument processing (e.g. ISAR code, L2R converter), visualisation (e.g. ships4sst Syntool, KML ship track tool), match-up (e.g. Felyx), archive access and other software tools relevant to the FRM4SST using standard version control tools (e.g. GitHub) and the ships4sst website to facilitate their shared use, maintenance and evolution with the FRM4SST.

A Twitter account was set up for the ISFRN network during the ships4sst study. This is linked to the ships4sst website and will continue to be updated with short stories about the activities of the service, as will the news page on the ships4sst.org website.

4. MANAGEMENT

4.1 Lines of communication

Figure 3.1 shows the lines of communications between the members of the consortium. At the top level, the project activities are co-ordinated by Wilson and Kelliher. Within the Project Science Team, a free flow of ideas is encouraged, co-ordinated by Wimmer. In the unlikely event of disagreements occurring within the team, directors or senior staff from the organisations concerned will meet to resolve the issues.

Communications between team members are facilitated by e-mail, Skype or telephone conference calls, availability of approved documentation on the project website and dynamic documents on the project ISFRN website. Project team contact details are maintained in the document, 'Ships4sst Project Directory', which can be edited by the Project manager or individuals as their contact details change.

4.2 Project Control

Management control organisation

The Project Manager (PM) will hold monthly telecons to review progress of all active work packages (WPs). Progress and matters arising, will be reviewed by the PM who will ensure she has adequate grasp of the scientific/technical matters arising, so that this review can be properly informed. Where necessary, the PM will arrange in advance for other team members to participate in the telecon if substantial or complex matters require high-level discussion. Alternatively, the PM will organize topic-specific telecons for these discussions.

In the event of a conflict between achieving science goals and maintaining the project schedule, the Project Manager will liaise with the Technical Lead and the Project Scientists to agree an approach. The proposed approach will then be discussed with the Agency's Technical Officer and iterated with the project team as needed.

The Project Manager will keep ESA's Technical Officer informed of any issues that affect the project deliverables and schedule, supported by the Technical Lead when the issue requires a discussion between the project team and ESA about the scientific content of a deliverable.

Configuration and Document Management

The procedure for naming and controlling configurable items (documents, data sets, etc) are defined in section 7.2.

All documents are peer reviewed by suitably qualified personnel within the team and approved by the Project Manager as drafts for review by the Agency's Technical Officer. The Project Manager ensures that the author(s) of the document respond in a timely fashion to any comments raised by the Agency's Technical Officer. Once the comments have been addressed, the document is accepted by the Agency's Technical Officer, issued formally and loaded onto the project website by the Project Manager.

4.3 Project Reviews and Meetings

Types of Meeting

The following types of meeting will be held during the project:

- Kick-off meeting, via WebEx

- Skype or WebEx progress meetings
- Face to face progress meetings, at contractor premises
- ISFRN Service Review Meeting
- Final meeting, at ESA premises

Meeting Schedule

The meeting schedule will be maintained by the Project Manager in the document, 'Ships4sst Meeting dates', which will be accessible by all members of the project team, including the Agency's Technical Officer, via the ISFRN website.

The meeting schedule is shown in Appendix B.

Arrangements for Meetings

The Project Manager will co-ordinate the arrangements for formal meetings. She will circulate a draft agenda and logistical information at least four weeks in advance. If applicable, data packs for meetings will be circulated at least one week before the meeting, to allow time for review. Dates for all meetings are available on 'Ships4sst Meeting dates'.

The Project Manager is responsible for drafting the minutes of the meeting and issuing the draft within one week of the meeting. Any actions arising from the meeting are recorded in the actions database, which will be maintained in the document, 'Ships4sst Actions'.

Progress Meetings

Progress meetings will cover:

- Progress status of the work and reporting of achievements
- Status of the deliverables
- Identification of current and potential problems
- Consolidation of action plans for the next period of the project

Based on the outcome of the meeting, the project team will make any necessary revisions to its work-plan for the following period.

Conduct of Reviews

It is anticipated that most of the workload associated with reviewing of deliverables will be handled by e-mail and teleconference.

Based on the outcome of the Final Meeting for Phase 1, the project team will make any necessary revisions to its work-plan for Phase 2. This will be reflected in an updated project Management Plan and possibly a Contract Change Notice.

Change Reviews

Change Review Boards will be convened if necessary to consider the management, technical, interface, schedule, contractual and cost issues associated with any Change Proposals that might be raised by ESA or by the project team. Change Review boards will comprise (as a minimum) the Agency's Technical Officer, the Technical Lead, the Project Manager, and representatives from any partner affected by the Change Proposal.

4.4 Progress Reporting

Within the team, formal reporting will take place on a monthly basis. The monthly report provides a basis on which to assess progress against schedule, and to institute recovery plans wherever problems are detected. The report will be collated by the Project Manager at the end of each month and forwarded to the Agency's Technical Officer and to the team members.

The content of each monthly report will be as follows:

- Executive Summary
- Overview of progress by the Project Manager
- Detailed progress by work package, including plans for the next period and any difficulties encountered or anticipated
- Actions status (a list of all open actions)
- Updated project schedule
- Updated meetings status (a list of all forthcoming meetings)
- Deliverables status list

In the event that a problem arises that might have a major effect on the schedule or scope of the work, the Project Manager will inform the ESA Technical Officer immediately via email.

4.5 Actions Log

An actions log, 'Ships4sst Actions', will be maintained online, allowing actions to be reviewed by teleconference participants, and allowing status changes to be made in real time.

'Ships4sst Actions' will be organised in tabular form. Each entry will describe the action, who is responsible, the target date, status (open / closed), and any progress towards completion.

'Ships4sst Actions' will be accessible by all team members at all times. The database format allows information such as open actions to be extracted and copied into monthly progress reports, for example.

The Project Manager will review the status of the open actions at the start of each week and will send out reminders to actionees when the completion date approaches.

4.6 Quality Management

The Project Manager will ensure that quality management procedures are in place and are being observed by the project team. This includes ensuring that:

- Document and configuration control procedures are followed
- Deliverable documents and data sets are reviewed before being issued
- Baseline configurations are defined and observed
- Data security measures (e.g. back-ups) are performed regularly
- Deficiencies in QA procedures are addressed.

Quality Assurance is addressed in section 7 and focuses on two key areas:

- Data quality
- Configuration and document management

4.7 Risk Management

In a project of this nature, the main risks are threats to the continuing operation of the instruments, despite the best endeavours of the team. Another significant risk is that team members with specialised knowledge may become unavailable for one of a number of reasons. A summary of the critical issues identified to date are contained in Section 5. Where further risks are identified, they will be assessed, and significant risks will be documented in the online document, 'Ships4sst Risks' to facilitate tracking and reporting.

For each significant risk, the following is recorded and updated as necessary:

- Description of risk
- Likelihood of occurring (high / medium / low)
- Impact if it does occur (high / medium / low)
- Owner (responsible for monitoring and reassessing)
- Mitigation strategies to be employed.

4.8 Document Review Cycle

Reviewing of documents is scheduled by the Project Manager in consultation with the Agency's Technical Officer and is handled by e-mail and teleconference.

4.9 Travel and Meeting Plan

The table in Annex B summarises the planned meeting schedule for the project. The current version of the meeting schedule is maintained as the online document, 'Ships4sst Meeting Dates'.

5. ANALYSIS OF RISK FACTORS AND MITIGATION STRATEGIES

A summary of the main problem areas/technical constraints and associated mitigation strategies is presented below.

Table 5-1 – Risk Identification and Mitigation Strategies

Problem Area	Description	Mitigation Strategies	Likelihood (H/M/L)	Impact (H/M/L)	Owner
Availability of radiometers	A radiometer may fail onboard a ship for any number of reasons	Ensure a spare radiometer is available to install next time the ship is in its home port. Ensure spare parts are available to quickly repair and test the failed unit. Collect ancillary data to analyse and rectify problems quickly.	L	H	Operator
Availability of ships	Ship owner may decide to no longer support the radiometer or the ship may be decommissioned.	Negotiate an alternative ship for the radiometer.	L	H	Operator
Availability of SLSTR data	Data may not be available	If temporary, wait for data to become available before processing for match-ups. If permanent, switch to processing alternative satellite data.	M	L	Operator
Availability of key personnel	Key personnel may not be available at certain times due to sickness or holiday.	Several team members share relevant knowledge so if one person is away another can temporarily do some work and/or answer questions on their behalf.	M	L	PM
Loss of ship to shore communication	IRIDIUM/satellite link is lost and access to instrument during deployment is lost	Plan for extra maintenance trip, to get data and check on the instrument performance.	L	L	Operator
Loss of key staff	Key staff member may leave job or be made redundant	Use procedures and documentation to train new staff member.	L	M	Operator
Loss of key facilities	Laboratory space dedicated to the project becomes unavailable.	Move to another laboratory space in the same facility.	L	M	Operator
Loss of computing facilities	Key processing software/processing computers becomes unavailable.	Make regular back-ups, ensure hardware is well maintained, transfer to new hardware.	L	M	Operator
Loss of power on ship	The ship's power supply to the instrument may be cut off e.g. due to ship maintenance activities, resulting in loss of data.	Provide a UPS to ensure power is maintained for at least 30 minutes in the event of a temporary loss of ship's power.	M	M	Operator

Failure of weather door on the instrument	The weather door could be stuck either permanently open or permanently closed. If open, rain or salt water could enter the optics and cause mirror degradation. If closed, data will be lost.	Fix weather door on next visit to port. Examine and fix optics, if required. Examine the data and exclude any that are suspect.	M	M	Operator
COVID-19	The Covid-19 disease caused by SARS CoV-2 (commonly known as the Coronavirus) has caused an increase in flu-like illnesses and unprecedented actions to be taken by governments and companies around the world to reduce the pandemic. At time of writing, this includes: working-from-home, restricting national and international travel, banning gatherings of 3 or more people (UK).	Working from home reduces the chances of colleagues becoming ill, so work that is feasible to do at home can continue. This can include: document updates, papers, uploading and analysis of SST data already obtained, planning for future deployments, workshops, conferences and next generation radiometers. Operators will keep in contact with their respective ships of opportunity to keep up-to-date with the latest deployment schedules.	H	H	All

6. WORK PLAN

6.1 Deliverable Items

6.1.1 International SST FRM Radiometer Network (ISFRN)

The ISFRN website will be updated in parallel with the data gathering, processing and validation tasks (deliverable D-10). The site is named <http://www.ships4sst.org/> and provides access to the project data and documentation.

The existing pages of the ISRN website are as follows:

- Home – containing the overall aims and scope of the network.
- Aim – elaborating on the aim of the network
- Instruments – describing ISAR and SISTeR.
- Partners – listing the funding agencies and contractors involved in the network.
 - Members - providing password protected access to information restricted to ISFRN members
- Documents – this page provides access to the documents produced under the ships4sst contract and to be produced under this contract (ARCH deliverable D-40).
- Services - This page describes the FRM4SST service. It includes pages for the Campaign Management Plan, Data Access, Tools and Links to Other Sites.
 - Tools – this will be updated with more information and links to generic software tools and instrument-specific tools.
 - Links to other sites of interest will be added to the ‘Links to Other Sites’ page.
- The CIP (deliverable D-20) and CARL (deliverable D-30) are hosted over several sections of the website.
- Instruments - This includes 3 sets of pages; instruments, deployments and instrument intercomparisons, with a log of data collected, links to sites showing the ships’ current positions, satellite data match-ups and validation results for each deployment (QC deliverable D-50). Links to the data portal at Ifremer will be provided. Historical deployments will also be added. Dedicated pages for other international projects falling under the ISFRN banner will be added as and when they are available. These will contain a description of the project and links to the project websites. Potential examples include ISARs deployed in China, Japan, USA and Australia, and M-AERI. Any such pages will require the approval of the organisation concerned.
- Links to a Twitter account are on the home page.
- News – this page has been set up for news stories. The aim is to provide a new story each month. It includes a page dedicated to the ISFRN Workshop and a page lists the contract meetings.

The ISFRN website will be maintained for the duration of the project.

The ISFRN website links to the service data and documentation portal hosted by Ifremer. All data acquired by the radiometers will be delivered directly to the Ifremer site by the radiometer operators.

6.1.2 ISFRN Service Review Meeting Deliverable

An ISFRN Service Review meeting (REVIEW deliverable D-130) will be hosted by NOCS over a two day period. Due to the COVID-19 pandemic, the meeting will be held virtually.

SCL will organise the meeting in conjunction with UoS and ESA. Such arrangements will be agreed with the ESA Technical Officer.

The proceedings of the review meeting (PROC deliverable D-140) will be submitted as a report to the ESA Technical Officer.

6.1.3 Software Deliverables

The software deliverable consists of a full copy of all the processed FRM data used for validation activities (FRMDATA deliverable D-70) and a full copy of all satellite data used for validation activities (EODATA deliverable D-80), both to be available via ftp.

The Agency's requirements concerning the format, standard and content of project data sets will be observed.

At the end of phase 1, all the document and data deliverables will be consolidated into a Technical Data Package (TDP deliverable D-170), provided by ftp and online.

6.1.4 Documentation Deliverables

The list of documentations deliverables is shown at Annex C and a summary is shown below.

- Campaign Implementation Plan (CIP): this will be an on-line electronic set of web pages within the ISFRN website and will include information covering:
 - campaign management and planning approach;
 - a master schedule of all campaign activities;
 - ship tracks and current position;
 - instrument operation timeliness and compatibility with the service objectives;
 - the procedure used to procure the satellite data to be validated;
 - matching satellite overpasses with ship tracks;
 - technical information on the instruments;
 - calibrating the instruments;
 - operating the instruments;
 - protocols and procedures for evaluating instrument uncertainties;
 - processing software;
 - logistics issues;
 - contact details;
 - and description of validation process.
- Campaign Actions and Risk Log (CARL): tracks the risks that the project might face in meeting its goals and proposes mitigation strategies to minimise them.
- ISFRN Data Description and User Manual (TR-1): a handbook for use of the ISFRN L2R data will be stored alongside the data giving a description of the L2R format and usage examples.
- Two papers will be delivered based on the activities and results obtained during the service.
- Service Roadmap (SR): will build on the Ships4sst SR. The SR will:



- provide a critical analysis of the feedback from participants and institutions working in the service, including feedback from the ISFRN Service meeting;
 - articulate all lessons learned during the service;
 - identify potential strategies for integrating the service outcomes into existing initiatives and operational institutions;
 - identify priority areas to be addressed in potential future activities to support SLSTR validation activities.
-
- ISFRN Service Review Meeting Proceedings
 - An inter-comparison preparation report
 - A characterisation report for C-band radiometer
 - Revised protocols for radiometer deployments
 - A case study report for a next generation radiometer
 - Final Report (FR): a 30-40 page “glossy” document suitable for non-technical audience, to explain the reasons for *in situ* SST FRM measurements, describing the deployments and presenting the significant results into the wider community.

Routine project management deliverable items have not been included in the summary above and the table in Appendix C.

The status of the deliverables is maintained in the document, ‘Ships4sst Deliverable Status’, which in addition to the items in the table, lists the due date, completion date and acceptance date of each deliverable, as well as comments on its status.

All deliverable documents will be made publicly available after acceptance by the Agency.

6.1.5 Project Management Deliverables

The Project Manager is responsible for the following deliverables:

- Project Management Plan (to be updated at the start of each phase)
- Project control information (e.g. schedule and actions, to be reviewed monthly)
- Monthly reports, based on information solicited from the team
- Progress meeting reports, based on information solicited from the team.

The monthly reports (see Section 4.4) provide the Agency with regular updates on the status of the project.

The project FTP site will be used to store project management data such as:

- Actions database, ‘Ships4sst Actions’
(ID, description, actionee, target date, open/closed flag, date closed, comments)
- Schedule, ‘Ships4sst Schedule’
The current project schedule, in PDF format
- Deliverable items status, ‘Ships4sst Deliverables Status’
(ID, description, target date, date submitted, date accepted, comments)



- Meetings and telecons, ‘Ships4sst Meeting Dates’ (dates, times, venues, etc)
- Project directory, ‘Ships4sst Project Directory’ (contact information for team members)
- Risk register, ‘Ships4sst Risk Register’
- Acronyms, ‘Ships4sst Acronyms’
- Reference Documents, ‘Ships4sst Reference Document List’

6.2 Communications

Communications channels with other radiometry projects, with the wider science community, and with the general public are supported via the ISFRN website, the ISFRN Service review meeting and personal contact with project team members.

The main channel of communications is the project’s website, which hosts deliverable documents (after acceptance by the Agency).

Talks and presentations, such as at GHR SST meetings and similar workshops, recognise the Agency’s funding support and display an Agency-supplied project logo.

Standard documentation and presentation templates will be used by team members.

6.3 Work Breakdown Structure

The Work Breakdown Structure (**WBS**) is presented below. Detailed Work Package Descriptions (**WPDs**) are provided in Appendix D.

Table 6-1 – Work Breakdown Structure

Task	WP	Description	WP Leader
1	10	International Collaboration	SCL
2	20	Data Collection and Archive	UoS
	21	UoS Data Collection	UoS
	22	DMI Data Collection	DMI
	23	RAL Data Collection	RAL
	24	CIP and CARL	SCL
3	30	Data Processing and Validation Analysis	UoS
4	40	Data Delivery and Publication of Results	UoS
5	50	Management and Reporting	SCL
	51	Final Reporting	SCL
6	60	Plan a CEOS international TIR inter-comparison exercise	UoS
7	70	Preparation of MW/TIR experiments	DMI
8	80	Study for a next generation radiometer	RAL

6.4 Planning

6.4.1 Work Plan

The logic of the envisioned work is shown in Figure 6-1. SST data is currently being collected routinely by the shipborne radiometers operated by UoS, RAL Space and DMI on their respective ships and routes (Task 2). These data are periodically delivered to the data archive, which for this contract, is hosted by Ifremer at no additional cost to the project. The times when the data can be delivered depends on the schedule of the ships and the need for removal of the radiometers from the ships for post-deployment calibration.

The SST data in the archive are periodically compared to SST data derived from SLSTR-A and SLSTR-B using the Felyx tool at Ifremer and sets of match-ups between the radiometer data and satellite data are generated. These are then processed by software provided by UoS to create statistics on the performance of the SLSTRs compared to the *in situ* measurements. The data and the statistics associated with each radiometer are then validated by UoS, RAL Space and DMI, as appropriate (Task 3).

The data, match-ups and validated statistics are all then made available via the ISFRN website, which will point to the Ifremer website and perhaps others that may host relevant data (Task 4).

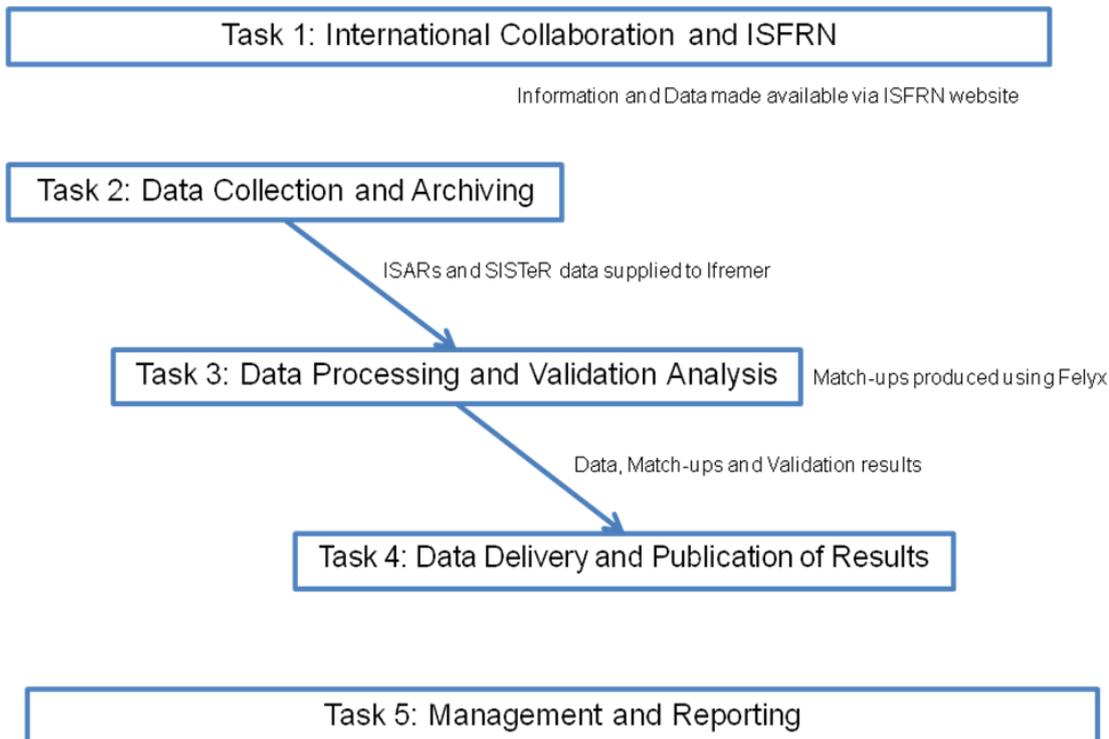


Figure 6-1: Project Workflow

The ISFRN website will be updated in parallel with the data gathering, processing and validation tasks (Task 1). The site will be a development of the existing site at <http://www.ships4sst.org/> and provides access to the project data and documentation. Task 1 also includes outreach activities such as conferences and GHRSSST Science Team meetings.

The project management activities (Task 5) will run continuously for the duration of the project. Towards the end of Phase 1, the project management team will organise an ISFRN Service Review Meeting.

6.4.2 Milestones

Phase 1 of the project is planned to run from 1 May 2019 to 31 December 2020.

Table 6.2 shows the proposed milestones, identifying the relevant documents for each milestone. The documents are referred to by their acronym plus a number which indicates which of three reprocessing cycles the document is most relevant to. Not all documents are relevant to every reprocessing. The milestones are based on the milestone table defined in the SOW and the draft Contract.

Table 6-2 – Contractual Milestones

Date	Milestone	Milestone Description
KO + 3 01-08-19	M1	Delivery and acceptance of: Draft D-10 (FRM4SST), D-20 (CIP) v1.0 and D-30(CARL)
KO + 12 01-05-20	M2	Delivery and acceptance of updated documents: <ul style="list-style-type: none"> D-10 (ISFRN), D-20 (CIP), D-30 (CARL), D-40 (ARCH), D-50 (QC), D-60 (TR-1), D-70 (FRMDATA), D-80 (EODATA)
KO + 18 30-10-20	M3	Delivery and acceptance of the documents: <ul style="list-style-type: none"> D-120 (REVIEW), D-130 (PROC), D-140 (SR), D-170 (MPRs)
KO + 20	M4	D-90 (Paper 1), D-100 and D-110 (merged Paper 2), D-150 (FR), D-160 (TDP), D-180 (CCS), D-190 (IRC), D-200 (CBR), D-201 (PRD) , D-202 (NGR)

The milestone plan for Phase 2 will be agreed with ESA once Phase 2 is approved.

6.4.3 Schedule

The figures in Appendix A show the project schedule.

The start date is 1 May 2019. The duration of the project is 18 months plus 2 month CCN extension, with a possible further extension. The bars reflect the fact that many of the activities are continuous and ongoing.

All work packages are continuing activities funded until now by the ships4sst contract; these are shown continuing from 1 March 2019 with a break in funding of 1 month between 30 March and 1 May 2019.

7. QUALITY ASSURANCE

7.1 Data Quality

Quality issues relating to the data will be handled as part of the relevant Work Package.

7.2 Configuration and Document Management

The Project Manager is the main point of contact for quality assurance issues relating to configuration and document management.

The Project Document Library (PDL) is stored on the Project website, and all documents approved by ESA are available for download.

Standard document templates have been produced for commonly used documents.

7.2.1 Document Filenames and Reference Numbers

The procedure for naming and controlling configurable items (documents, data sets, etc) is defined below.

Document reference numbers will adhere to the following format:

FRM4SST_-aaa-bbb-2nn with a separate field for e.g. **“Issue 1”** or **“Draft A”**

Document filenames will adhere to the following format:

FRM4SST_-aaa-bbb-2nn_[date]_issue/draft-x-[signed]

where: aaa = document type
bbb = company code (UOS, DMI, RAL, SCL, ESA)
2nn = sequential number (starting with 2 indicates a Phase-II document)
date = date in format yyyy-mm-dd e.g. 2014-02-28 [only for use with MPRs]
issue/draft-x = 'Issue' and a number (1, 2, 3, etc) e.g. Issue-1 or
'Draft' and a single letter (a, b, c, etc) e.g. Draft-A
[signed] = 'signed', to indicate when a document has been approved by ESA

The document types are:

ARCH	Archive of service data and documentation
CARL	Campaign Actions and Risk Log
CCS	Contract Closure Summary
CIP	Campaign Implementation Plan
FR	Final Report
TDP	Technical Data Package
TR-1	ISFRN data description and user manual
MIN	Minutes of Meeting
MPR	Monthly Progress Report
PMP	Project Management Plan
PROC	ISFRN service review meeting proceedings



SR	Scientific Roadmap
TN	Technical Note

All documents will be peer reviewed by suitably qualified personnel within the team and approved by the Project Manager as drafts for review by the Agency's Technical Officer.

As a document goes through the preparation, various drafts will be produced, for example:

FRM4SST_CIP-SCL-201_Draft-A	- draft issue for internal comment
FRM4SST_CIP-SCL-201_Draft-A (initials)	- reviewed copy of Draft A
FRM4SST_CIP-SCL-201_Draft-B	- draft issue for ESA review

The Project Manager will ensure that the author(s) of the document respond in a timely fashion to any comments raised by the Agency's Technical Officer on the draft document. Once the comments have been addressed, the document is accepted by the Agency's Technical Officer, issued formally and a signed pdf copy will be loaded onto the project website by the Project Manager.

The acceptance cycle will include various issues, for example:

FRM4SST_CIP-SCL-201_Issue-1	- first issue for signature
FRM4SST_CIP-SCL-201_Issue-1-signed	- signed and approved first issue



APPENDIX A SCHEDULE

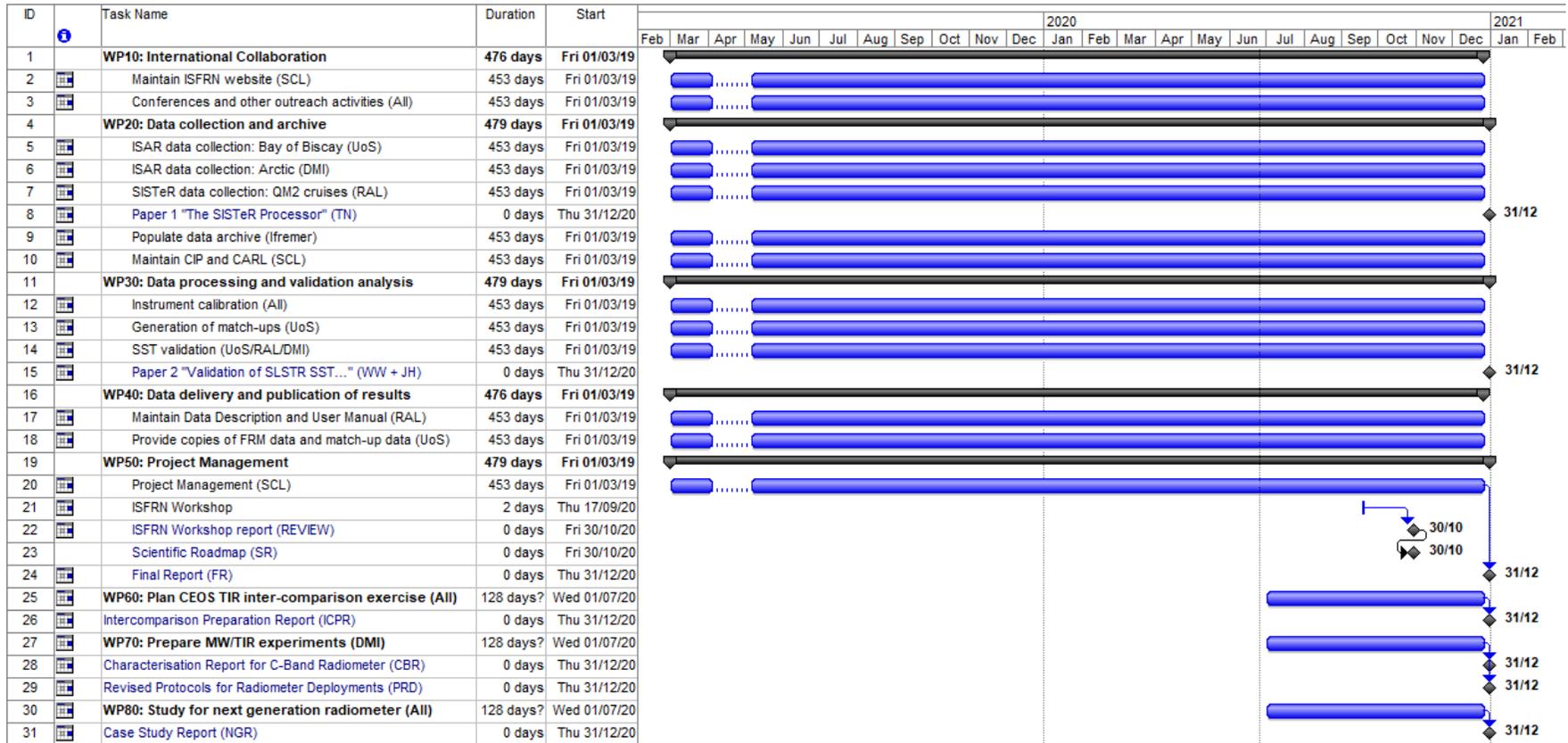


Figure A-1: Project Schedule for FRM4SST Phase 1 including CCN1

APPENDIX B MEETING SCHEDULE

The table below shows the formal meetings to be attended by team members in Phase-1.

Milestone	Meeting	Venue	When	Days	Date	Deliverable
	KO	Webex	KO	0.5	6/5/19	N/A
M1	PM-1	Webex	KO + 3	0.5	8/8/19	Draft D-10 (FRM4SST), D-20 (CIP), v1.0 D-30 (CARL)
	PM-2	Webex	KO + 6	0.5	14/11/19	N/A
	PM-3	Webex	KO + 9	0.5	6/2/20	N/A
M2	PM-4	NOC	KO + 12	0.5	7/5/20	D-10 (FRM4SST), D-20 (CIP), D-30 (CARL), D-40 (ARCH), D-50 (QC), D-60 (TR-1), D-70 (FRMDATA), D-80 (EODATA)
	ISFRN Workshop	NOC	KO + 16	2	9-10/9/20	N/A
M3	N/A	Webex	KO + 18	0.5	30/10/20	D-120 (REVIEW), D-130 (PROC) and D-140 (SR).
M4	FM	ECSAT	KO + 20	1	15/12/20	D-90 (Paper 1), D-100 and D-110 (merged Paper 2), D-150 (FR), D-160 (TDP), D-180 (CCS), D-190 (IRC), D-200 (CBR), D-201 (PRD), D-202 (NGR)

APPENDIX C DELIVERABLES

The following table lists the deliverable items and their associated work package.

ID	Description	Lead	WP	Due date
D-10	International SST FRM Radiometer Network (ISFRN) web portal	RW	10	KO + 3 Monthly updates
D-20	Campaign Implementation Plan (CIP) on the web	RW	24	KO + 3 Monthly updates
D-30	Campaign Actions and Risk Log (CARL) on the web	RW	24	KO + 3 Monthly updates
D-40	Service data and document archive (ARCH) on the web	WW, JH, TN	21, 22, 23	KO + 12 Progress meetings
D-50	Update ARCH and ISFRN web pages with data and log entries (QC)	WW	30	KO + 12 Progress meetings
D-60	ISFRN data description and user manual (TR-1) on the web	WW	40	KO + 12
D-70	A full copy of all processed FRM data used for validation activities (FRMDATA)	WW	40	KO + 12 Monthly updates
D-80	A full copy of all satellite data used for validation activities (EODATA)	WW	40	KO + 12 Monthly updates
D-90	Paper 1	TN	51	Contract End
D-100	Merged Paper 2 and Paper 3	WW	51	Contract End
D-110		JH	51	Contract End
D-120	ISFRN service review meeting (REVIEW)	RW	51	KO + 18
D-130	ISFRN service review meeting proceedings (PROC)	RW	51	KO + 18
D-140	Scientific Roadmap (SR)	RW	51	KO + 18
D-150	Final Report (FR)	RW	51	KO + 18
D-160	Technical Data Package (TDP) – via ftp	RW	51	KO + 18
D-170	Executive monthly progress report and actions database (MR)	RW	51	Monthly
D-180	Contract Closure Summary (CCS)	RW	51	Contract End
D-190	Inter-comparison Preparation Report (ICPR)	WW	60	Contract End
D-200	Characterisation Report for C-band radiometer (CBR)	JH	70	Contract End
D-201	Revised Protocols for Radiometer	JH	70	Contract End

ID	Description	Lead	WP	Due date
	Deployments (PRD)			
D-202	Case Study report for next generation radiometer (NGR)	TN	80	Contract End



APPENDIX D WORK PACKAGE DESCRIPTIONS

WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 10														
WP Title: International Collaboration																
Contractor: SCL		Sheet: 1 of 1														
Start Event: KO		Issue: 2														
End Event: End of Contract		Date: 22-05-2020														
WP Manager: Ruth Wilson		Effort: 137 hours														
Summary of Effort:																
<table border="1"> <thead> <tr> <th>Name</th> <th>Total hrs</th> </tr> </thead> <tbody> <tr> <td>Werenfrid Wimmer</td> <td>33.75</td> </tr> <tr> <td>Tim Nightingale</td> <td>10</td> </tr> <tr> <td>Arrow Lee</td> <td>20</td> </tr> <tr> <td>Jacob Hoyer</td> <td>15</td> </tr> <tr> <td>Ruth Wilson</td> <td>58.5</td> </tr> <tr> <td>Totals</td> <td>137</td> </tr> </tbody> </table>			Name	Total hrs	Werenfrid Wimmer	33.75	Tim Nightingale	10	Arrow Lee	20	Jacob Hoyer	15	Ruth Wilson	58.5	Totals	137
Name	Total hrs															
Werenfrid Wimmer	33.75															
Tim Nightingale	10															
Arrow Lee	20															
Jacob Hoyer	15															
Ruth Wilson	58.5															
Totals	137															
Aims:																
<ul style="list-style-type: none"> • Co-operate with international scientists and groups to promote an SST FRM radiometer network. • Create and maintain the International SST FRM Radiometer Network (ISFRN). • Promote the results of the project through meetings and media. 																
Inputs:																
<ul style="list-style-type: none"> • Proposal • Information and results from WPs 20, 30 and 40. 																
Tasks:																
<ul style="list-style-type: none"> • Co-operate with other scientists involved in SST validation using shipborne radiometers. • Co-operate with SST groups e.g. GHRSSST and Sentinel-3 groups e.g. S3VT • Evolve and maintain the International SST FRM Radiometer Network (ISFRN) website. • Present the project results at meetings and in the media, as opportunities arise 																



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 10
WP Title: International Collaboration		
Outputs: <ul style="list-style-type: none">• ISFRN web portal (D-10)• Contributions to monthly reports (D-170) and progress meetings		



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 20												
WP Title: Data Collection and Archive														
Contractor: University of Southampton		Sheet: 1 of 1												
Start Event: KO		Issue: 2												
End Event: End of contract		Date: 22-05-2020												
WP Manager: Werenfrid Wimmer		Effort: 64 hours												
Summary of Effort:														
<table border="1"> <thead> <tr> <th>Name</th> <th>Total hrs</th> </tr> </thead> <tbody> <tr> <td>Werenfrid Wimmer</td> <td>33.75</td> </tr> <tr> <td>Jacob Hoyer</td> <td>15</td> </tr> <tr> <td>Tim Nightingale</td> <td>10</td> </tr> <tr> <td>Arrow Lee</td> <td>5</td> </tr> <tr> <td>Totals</td> <td>64</td> </tr> </tbody> </table>			Name	Total hrs	Werenfrid Wimmer	33.75	Jacob Hoyer	15	Tim Nightingale	10	Arrow Lee	5	Totals	64
Name	Total hrs													
Werenfrid Wimmer	33.75													
Jacob Hoyer	15													
Tim Nightingale	10													
Arrow Lee	5													
Totals	64													
Aims:														
<ul style="list-style-type: none"> • Coordinate DMI, RAL and UoS deployment strategy and protocols 														
Inputs:														
<ul style="list-style-type: none"> • DMI, RAL and UoS instruments and ship routes • Protocols and procedures for the collection traceable SST measurements 														
Tasks:														
<ul style="list-style-type: none"> • Plan deployments to avoid overlaps and ensure maximum coverage • Have regular teleconferences to discuss data collection status and any issues. 														
Outputs:														
<ul style="list-style-type: none"> • Reports from the teleconferences. • Update protocols and deployment manuals where appropriate • Updates to the ISFRN web page. • A full copy of the satellite data used for validation activities (D-80) 														



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 21								
WP Title: UoS Data Collection										
Contractor: University of Southampton		Sheet: 1 of 1								
Start Event: KO		Issue: 2								
End Event: End of contract		Date: 22-05-2020								
WP Manager: Werenfrid Wimmer		Effort: 801 hours								
Summary of Effort:										
<table border="1"> <thead> <tr> <th>Name</th> <th>Total hrs</th> </tr> </thead> <tbody> <tr> <td>Werenfrid Wimmer</td> <td>208.6</td> </tr> <tr> <td>Ray Holmes</td> <td>592.5</td> </tr> <tr> <td>Totals</td> <td>801</td> </tr> </tbody> </table>			Name	Total hrs	Werenfrid Wimmer	208.6	Ray Holmes	592.5	Totals	801
Name	Total hrs									
Werenfrid Wimmer	208.6									
Ray Holmes	592.5									
Totals	801									
Aims:										
<ul style="list-style-type: none"> • Ensure ISAR operation and data collection is maintained on the <i>Pont Aven</i> or similar ferry 										
Inputs:										
<ul style="list-style-type: none"> • ISAR instruments 002 and 003 • UoS facilities at NOCS • Continued access to the <i>Pont Aven</i> or equivalent ferry to install and operate an ISAR. • Protocols and procedures for the collection traceable SST measurements 										
Tasks:										
<ul style="list-style-type: none"> • Monitor ISAR instrument operation on the <i>Pont Aven</i> or equivalent ferry • Liaise with deck officers and engineers on <i>Pont Aven</i> or equivalent ferry • Quality assurance of ISAR data, including pre- and post-deployment lab validations • ISAR instrument maintenance • Regularly process the ISAR data to ISFRN L2R format and update the Archive with calibrated skin SST with associated uncertainties. 										
Outputs:										
<ul style="list-style-type: none"> • Calibrated, quality controlled and traceable SST skin data records in L2R format (D-40 and D-70) • Instrument documentation and reports • Input to reports and scientific papers • Updates to the ISFRN web page. 										



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 22						
WP Title: DMI Data Collection								
Contractor: DMI		Sheet: 1 of 1						
Start Event: KO		Issue: 2						
End Event: KO + 18 months		Date: 22-05-2020						
WP Manager: Jacob Høyer		Effort: 318 hours						
Summary of Effort:								
<table border="1"> <thead> <tr> <th>Name</th> <th>Total hrs</th> </tr> </thead> <tbody> <tr> <td>Høyer</td> <td>317.5</td> </tr> <tr> <td>Totals</td> <td>318</td> </tr> </tbody> </table>			Name	Total hrs	Høyer	317.5	Totals	318
Name	Total hrs							
Høyer	317.5							
Totals	318							
Aims:								
<ul style="list-style-type: none"> • Deploy the ISAR radiometer on the Smyril Line passenger ferry from Denmark to Iceland to collect high quality, traceable radiometric measurements of the sea surface • Derive traceable estimates of the sea surface skin temperature and associated uncertainties from the ISAR radiometric measurements • Deliver formatted and quality controlled SST products to the data archive 								
Inputs:								
<ul style="list-style-type: none"> • DMI ISAR instruments 008 • Access to Smyril Line ferry, M/S Norröna • Consortium proposal "FRM4SST" (this document) • Protocols and procedures for the collection traceable SST measurements [FRM4STS, Zibordi et al.,2014] 								
Tasks:								
<ul style="list-style-type: none"> • Carry out regular deployments of the DMI ISAR radiometer on the Norröna passenger ferry or equivalent to collect radiometric measurements of the sea surface. • Validate the radiometric calibrations of the DMI radiometer against a blackbody reference before and after every deployment, following best practice. • Generate formatted products containing traceable estimates of brightness temperature, sea surface skin temperature and associated uncertainties from the radiometric measurements. • Quality control the data products, to include checking of the formats, science variables and flags. • Deliver quality-controlled, traceable SST products to the data archive in a timely fashion. 								



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 21
WP Title: UoS Data Collection		
<ul style="list-style-type: none"> • Report on the status of ISAR 008 deployment and datasets, as required. • Maintain the ISAR 008 radiometer to ensure reliable, traceable operation. • Maintain the ISAR data processor and auxiliary files to ensure the generation of traceable SST products. • Maintain and update instrument documentation as required, including data formats, protocols and procedures. <p>Outputs:</p> <ul style="list-style-type: none"> • Calibrated, quality controlled and traceable SST skin data records in L2R format (D-40 and D-70) • Operational ISAR 008 instruments and processor • Instrument documentation and reports <p>References:</p> <p>Zibordi, G., Donlon, C. J., & Parr, A. C. (2014). <i>Optical radiometry for ocean climate measurements</i> (Vol. 47). Academic Press.</p>		



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 23								
WP Title: RAL Data Collection										
Contractor: STFC		Sheet: 1 of 1								
Start Event: KO		Issue: 2								
End Event: KO + 18 months		Date: 22-05-2020								
WP Manager: Tim Nightingale		Effort: 330 hours								
Summary of Effort:										
<table border="1"> <thead> <tr> <th>Name</th> <th>Total hrs</th> </tr> </thead> <tbody> <tr> <td>Arrow Lee</td> <td>210</td> </tr> <tr> <td>Tim Nightingale</td> <td>120</td> </tr> <tr> <td>Totals</td> <td>330</td> </tr> </tbody> </table>			Name	Total hrs	Arrow Lee	210	Tim Nightingale	120	Totals	330
Name	Total hrs									
Arrow Lee	210									
Tim Nightingale	120									
Totals	330									
Aims:										
<ul style="list-style-type: none"> • Deploy the SISTeR instrument on the <i>Queen Mary 2</i> liner to collect high quality, traceable radiometric measurements of the sea surface • Derive traceable estimates of the sea surface skin temperature and associated uncertainties from the SISTeR radiometric measurements • Deliver formatted and quality controlled SST products to the data archive 										
Inputs:										
<ul style="list-style-type: none"> • Consortium proposal “FRM4SST” (this document) • Protocols and procedures for the collection traceable SST measurements 										
Tasks:										
<ul style="list-style-type: none"> • Carry out regular deployments of a SISTeR radiometer on the <i>Queen Mary 2</i> liner to collect radiometric measurements of the sea surface • Validate the radiometric calibrations of the SISTeR radiometers before and after every deployment, following best practice • Generate formatted products containing traceable estimates of brightness temperature, sea surface skin temperature and associated uncertainties from the radiometric measurements • Quality control the data products, to include checking of the formats, science variables and flags • Deliver quality-controlled, traceable SST products to the data archive in a timely fashion • Report on the status of SISTeR deployments and datasets, as required 										



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 23
WP Title: RAL Data Collection		
<ul style="list-style-type: none"> • Maintain the SISTeR radiometers to ensure reliable, traceable operation • Maintain the SISTeR data processor and auxiliary files to ensure the generation of traceable SST products • Maintain and update instrument documentation as required, including data formats, protocols and procedures <p>Outputs:</p> <ul style="list-style-type: none"> • Operational SISTeR instruments and processor • Quality-controlled and traceable SST products (D-40 and D-70) • Instrument documentation and reports 		



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 24										
WP Title: CIP and CARL												
Contractor: SCL		Sheet: 1 of 1										
Start Event: KO		Issue: 2										
End Event: End of Contract		Date: 22-05-2020										
WP Manager: Ruth Wilson		Effort: 108 hours										
Summary of Effort:												
<table border="1"> <thead> <tr> <th>Name</th> <th>Total hrs</th> </tr> </thead> <tbody> <tr> <td>Werenfrid Wimmer</td> <td>25</td> </tr> <tr> <td>Jacob Hoyer</td> <td>25</td> </tr> <tr> <td>Ruth Wilson</td> <td>58</td> </tr> <tr> <td>Totals</td> <td>108</td> </tr> </tbody> </table>			Name	Total hrs	Werenfrid Wimmer	25	Jacob Hoyer	25	Ruth Wilson	58	Totals	108
Name	Total hrs											
Werenfrid Wimmer	25											
Jacob Hoyer	25											
Ruth Wilson	58											
Totals	108											
Aims:												
<ul style="list-style-type: none"> • Make information and data available on all aspects of the radiometer deployments to users and the project team, as appropriate. 												
Inputs:												
<ul style="list-style-type: none"> • Proposal • Information and results from WPs 20, 30 and 40. 												
Tasks:												
<ul style="list-style-type: none"> • Evolve and maintain the Campaign Implementation Plan (CIP) on the ISFRN website. • Evolve and maintain the Campaign Actions and Rick Log (CARL) on the ISFRN website. 												
Outputs:												
<ul style="list-style-type: none"> • Campaign Implementation Plan (D-20) • Campaign Actions and Risk Log (D-30) 												



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 30										
WP Title: Data Processing and Validation Analysis												
Contractor: University of Southampton		Sheet: 1 of 1										
Start Event: KO		Issue: 2										
End Event: End of contract		Date: 22-05-2020										
WP Manager: Werenfrid Wimmer		Effort: 186 hours										
Summary of Effort:												
<table border="1"> <thead> <tr> <th>Name</th> <th>Total hrs</th> </tr> </thead> <tbody> <tr> <td>Werenfrid Wimmer</td> <td>89.38</td> </tr> <tr> <td>Nightingale</td> <td>55</td> </tr> <tr> <td>Høyer</td> <td>41.88</td> </tr> <tr> <td>Totals</td> <td>186</td> </tr> </tbody> </table>			Name	Total hrs	Werenfrid Wimmer	89.38	Nightingale	55	Høyer	41.88	Totals	186
Name	Total hrs											
Werenfrid Wimmer	89.38											
Nightingale	55											
Høyer	41.88											
Totals	186											
Aims:												
<ul style="list-style-type: none"> • Ensure ISFRN L2R data is processed in a timely manner and submitted to the archive • Produce the Validation analysis and report on a regular basis 												
Inputs:												
<ul style="list-style-type: none"> • ISAR and SISTeR L2R data • Felyx MDB generation instance • UoS Felyx MDB analysis software 												
Tasks:												
<ul style="list-style-type: none"> • Regularly process the ISAR data to ISFRN L2R format and update the Archive with calibrated skin SST with associated uncertainties. • Process Felyx MDB and generate validation reports 												
Outputs:												
<ul style="list-style-type: none"> • Felyx MDB files (part D-50) • Validation plots and report (part D-50) • Input to reports and scientific papers • Updates to the ISFRN web page (part D-50) 												



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 40										
WP Title: Data Delivery and Publication of Results												
Contractor: University of Southampton		Sheet: 1 of 1										
Start Event: KO		Issue: 2										
End Event: End of contract		Date: 22-05-2020										
WP Manager: Werenfrid Wimmer		Effort: 290 hours										
Summary of Effort:												
<table border="1"> <thead> <tr> <th>Name</th> <th>Total hrs</th> </tr> </thead> <tbody> <tr> <td>Werenfrid Wimmer</td> <td>89.38</td> </tr> <tr> <td>Nightingale</td> <td>45</td> </tr> <tr> <td>Høyer</td> <td>155.63</td> </tr> <tr> <td>Totals</td> <td>290</td> </tr> </tbody> </table>			Name	Total hrs	Werenfrid Wimmer	89.38	Nightingale	45	Høyer	155.63	Totals	290
Name	Total hrs											
Werenfrid Wimmer	89.38											
Nightingale	45											
Høyer	155.63											
Totals	290											
Aims:												
<ul style="list-style-type: none"> • Ensure all campaign data is submitted to ESA • Produce the ISFRN data description and user manual (TR-1) 												
Inputs:												
<ul style="list-style-type: none"> • ISAR and SISTeR L2R data • Felyx MDB files • ISAR and SISTeR instrument documentation and procedures 												
Tasks:												
<ul style="list-style-type: none"> • Produce a copy of the SISTeR and ISAR data on Ifremer • Produce a copy of the SLTSR/Felyx data on Ifremer • Update the ISFRN data description and user manual • Produce scientific papers 												
Outputs:												
<ul style="list-style-type: none"> • Hard disks with data (D-60 and D-80) • ISFRN data description and user manual (TR-1) • Scientific papers (D-90, D-100, D-110) 												



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 50														
WP Title: Management and Reporting																
Contractor: SCL		Sheet: 1 of 1														
Start Event: KO		Issue: 2														
End Event: End of Contract		Date: 22-05-2020														
WP Manager: Ruth Wilson		Effort: 381 hours														
Summary of Effort:																
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Name</th> <th style="width: 30%;">Total hrs</th> </tr> </thead> <tbody> <tr> <td>Werenfrid Wimmer</td> <td style="text-align: center;">50</td> </tr> <tr> <td>Tim Nightingale</td> <td style="text-align: center;">35</td> </tr> <tr> <td>Jacob Hoyer</td> <td style="text-align: center;">40</td> </tr> <tr> <td>Ruth Wilson</td> <td style="text-align: center;">225.5</td> </tr> <tr> <td>Hugh Kelliher</td> <td style="text-align: center;">30</td> </tr> <tr> <td>Totals</td> <td style="text-align: center;">381</td> </tr> </tbody> </table>			Name	Total hrs	Werenfrid Wimmer	50	Tim Nightingale	35	Jacob Hoyer	40	Ruth Wilson	225.5	Hugh Kelliher	30	Totals	381
Name	Total hrs															
Werenfrid Wimmer	50															
Tim Nightingale	35															
Jacob Hoyer	40															
Ruth Wilson	225.5															
Hugh Kelliher	30															
Totals	381															
Aims:																
<ul style="list-style-type: none"> • Ensure successful running of the project. 																
Inputs:																
<ul style="list-style-type: none"> • Proposal • Contract • Information from WPs 10, 20, 30, 40, 60, 70 and 80. 																
Tasks:																
<ul style="list-style-type: none"> • Maintain project management interface to ESA and to all team members. • Monitor work schedules of team members, and compile and issue monthly reports (MR). • Schedule, prepare for and attend all meetings, and produce minutes. 																
Outputs:																
<ul style="list-style-type: none"> • Monthly progress reports (D-170) 																



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 51												
WP Title: Final Reporting														
Contractor: SCL		Sheet: 1 of 1												
Start Event: KO + 15		Issue: 2												
End Event: KO + 18		Date: 22-05-2020												
WP Manager: Ruth Wilson		Effort: 197 hours												
Summary of Effort:														
<table border="1"> <thead> <tr> <th>Name</th> <th>Total hrs</th> </tr> </thead> <tbody> <tr> <td>Werenfrid Wimmer</td> <td>25</td> </tr> <tr> <td>Arrow Lee</td> <td>20</td> </tr> <tr> <td>Ruth Wilson</td> <td>122</td> </tr> <tr> <td>Hugh Kelliher</td> <td>30</td> </tr> <tr> <td>Totals</td> <td>197</td> </tr> </tbody> </table>			Name	Total hrs	Werenfrid Wimmer	25	Arrow Lee	20	Ruth Wilson	122	Hugh Kelliher	30	Totals	197
Name	Total hrs													
Werenfrid Wimmer	25													
Arrow Lee	20													
Ruth Wilson	122													
Hugh Kelliher	30													
Totals	197													
Aims:														
<ul style="list-style-type: none"> • Consolidate the service outcomes and review findings • Convene the second ISFRN Service Review meeting. 														
Inputs:														
<ul style="list-style-type: none"> • Proposal • Information and results from WPs 20, 30 and 40. 														
Tasks:														
<ul style="list-style-type: none"> • Write a Service Roadmap (SOR). • Consolidate the deliverables in a Technical Data Package (TDP) • Convene an ISFRN Service Review meeting (REVIEW) • Produce proceedings of the ISFRN Service Review meeting (PROC) • Produce a Final Report (FR). 														
Outputs:														
<ul style="list-style-type: none"> • ISFRN Service Review meeting (D-120) 														



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase :	WP N°: 51
WP Title: Final Reporting		
<ul style="list-style-type: none">• ISFRN Service Review meeting proceedings (D-130)• Scientific Roadmap (D-140)• Final Report (D-150)• Technical Data Package (D-160)• Contract Closure Summary (D-180)		



WORK PACKAGE DESCRIPTION

Project:	FRM4SST	Phase	1	WP N°:	60
WP Title:	Plan a CEOS international TIR inter-comparison exercise				
Contractor:	University of Southampton			Sheet:	1 of 1
Start Event:	01-07-2020			Issue:	3
End Event:	31-12-2020			Date:	11-06-2020
WP Manager:	Werenfrid Wimmer			Effort:	437 hours
Summary of Effort:					
Contractor	Name	Effort / hours	Comment		
UoS	Wimmer	175	Includes 2 days consultancy by NPL		
STFC	Nightingale + Lee	135			
DMI	Høyer	15			
SCL	Wilson	112			
	Totals	437			
Aims:					
<ul style="list-style-type: none"> Plan an IR radiometer inter-comparison exercise 					
Inputs:					
<ul style="list-style-type: none"> Experience and Reports from the last inter-comparison Instrumentation, facilities, field campaign 					
Tasks:					
<ul style="list-style-type: none"> Talk to NPL about hosting / use of facilities for an inter-comparison Invite potential participants and agree dates for inter-comparison Review and update the inter-comparison protocols from 2016. Organise the SST and ICE field campaigns – consider SST on AMT. 					
Outputs:					
<ul style="list-style-type: none"> Report on activity, including agreed location and invitation list (D-190 - ICPR) Contributions to monthly reports (D-170) and progress meetings 					

WORK PACKAGE DESCRIPTION

Project:	FRM4SST	Phase	1	WP N°:	70
WP Title:	Preparation of MW/TIR experiments				
Contractor:	DMI with DTU as subcontractor			Sheet:	1 of 1
Start Event:	01-07-2020			Issue:	2
End Event:	31-12-2020			Date:	22-05-2020
WP Manager:	Jacob Høyer			Effort:	300 hours
Summary of Effort:					
Contractor	Name	Effort / hours	Comment		
DMI	Høyer	248	DTU hours are additional to this.		
UoS	Wimmer	52			
	Totals	300			
Aims:					
<ul style="list-style-type: none"> To refurbish a microwave radiometer and conduct a land-based MW and TIR inter-comparison pilot study 					
Inputs:					
<ul style="list-style-type: none"> Second DMI ISAR instrument, DTU microwave radiometer instruments, C and X band Protocols and procedures for the collection of traceable SST measurements [FRM4STS, Zibordi et al., 2014] 					
Tasks:					
<ul style="list-style-type: none"> Review protocols and procedures for the collection of radiometer observations with respect to deployment of microwave radiometers. Renovate the MW instruments and prepare the instruments for deployment. This includes <ul style="list-style-type: none"> Order replacement parts Preparation of C-Band radiometer Preparation of X-Band radiometer C-band Instrument characterization Construction of a rack for the second DMI ISAR radiometer Conduct a static inter-comparison for short period (~1 day) of simultaneous IR and MW observations. Calibrate and characterize 2-D thermal imager on UAV using the CASOTS-II observations 					
Outputs:					
<ul style="list-style-type: none"> A fully functional and characterized C band radiometer, dual polarization H and V (DTU) Characterization report for C-band radiometer, including results from pilot inter- 					



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase 1 :	WP N°: 70
WP Title: Preparation of MW/TIR experiments		
<p>comparison (D-200 - CBR)</p> <ul style="list-style-type: none">• Functioning X-band radiometer (DTU)• Revised version of the protocols for radiometer deployments (D-201 – PRD)• Contributions to monthly reports (D-170) and progress meetings <p>References:</p> <p>Zibordi, G., Donlon, C. J., & Parr, A. C. (2014). <i>Optical radiometry for ocean climate measurements</i> (Vol. 47). Academic Press.</p>		



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase	1	WP N°: 80
WP Title: Study for a next generation radiometer			
Contractor: STFC		Sheet: 1 of 1	
Start Event: 01-07-2020		Issue: 1	
End Event: 31-12-2020		Date: 11-06-2020	
WP Manager: Tim Nightingale		Effort: 391 hours	
Summary of Effort:			
Contractor	Name	Effort / hours	Comment
STFC	Nightingale + Lee	165	
UoS	Wimmer	150	
DMI	Høyer	38	
SCL	Wilson	38	
	Totals	391	
Aims:			
<ul style="list-style-type: none"> • Consolidate requirements for a new instrument. • Generate an instrument specification 			
Inputs:			
<ul style="list-style-type: none"> • Experience with existing instruments • Survey of literature 			
Tasks:			
<ul style="list-style-type: none"> • Consolidate instrument requirements, including: <ul style="list-style-type: none"> ○ drivers (validation, heat and gas exchange, ...) ○ measurement regimes (bulk, infrared, microwave; sea, ice, land ...) ○ data products ○ accuracy ○ traceability ○ number of instruments and coverage • Review existing instruments (ISAR and SISTeR) identifying: <ul style="list-style-type: none"> ○ problems experienced in operational use ○ subsystems most in need of redesign ○ new capabilities needed to meet the consolidated instrument requirements • Generate an outline specification for an improved instrument, identifying the tasks that need to be done to transition from the existing ISAR and SISTeR instruments. 			



WORK PACKAGE DESCRIPTION

Project: FRM4SST	Phase 1 :	WP N°: 80
WP Title: Study for a next generation radiometer		
Outputs: <ul style="list-style-type: none">• Case study report for next generation radiometer, including the consolidated instrument requirements, review of existing instruments and outline specification for an improved instrument (D-202 - NGR)• Contributions to monthly reports (D-170) and progress meetings		

