



# **RAL ATSR PLS Report to 13th ATSR Core Group Meeting**

*Covering the period 1st October until 31st December 1998*

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## **1. PROGRESS SUMMARY**

Progress has been good again during the last quarter, and several significant milestones have been achieved. The first revision of the ATSR User Guide has been completed and published via the ATSR WWW pages, a successful ATSR User Meeting has been organised and took place in December, and plans for the International ATSR User Meeting have advanced significantly in collaboration with ESA. RAL supported the successful deployment of SISTER on the BAS Cruise to the Antarctic, but this has impacted the schedule for the completion of the SISTER-2 instrument. A major review and upgrade of the ATSR WWW pages is underway which will enhance the service to users, and progress towards SST and cloud algorithm upgrades continues, work on the ABT merging tool has been brought forward, and significant progress has been made in the developments necessary for the generation of an ATSR/buoy intercomparison data set.

## **2. INSTRUMENT STATUS**

### **2.1 ATSR-1 STATUS**

ATSR-1 is powered off, and only the basic monitoring activities necessary to check basic health and safety and keep the microwave radiometer in operation are being maintained.

### **2.2 ATSR-2 STATUS**

ATSR-2 has operated nominally throughout most of the reporting period. However, there was a temperature rise in the scan mechanism during one day, an ESA planning error resulted in the loss of H-rate coverage for five days, a planned shut-down of ATSR-2 operations during the Leonids, and some loss of data due to anomalies that occurred during the restart after this shutdown.

## **Reports on Individual Work Packages**

### **2.3 WP 1000 SCIENCE EXPLOITATION**

#### **2.3.1 WP 1100 Scientific Planning and Project Management**

Regular meetings have been held of the ATSR PLS Project team to progress all aspects of the ATSR Post Lunch Support Programme.

#### **2.3.2 WP 1200 Scientific Support**

Revision 1 of the ATSR User Guide was produced in line with the two sets of comments received from ACG members.

The UK ATSR User Group meeting was organised by the project team and took place at RAL on the 2nd to 3rd December. The meeting went well, some extremely interesting work was presented, and all the issues that the ACG wished to raise with the User Group were discussed. Feedback will be provided at the ACG Meeting. A bound set of the viewgraphs presented is being prepared for distribution.

Following the discussions that took place at the User Group Meeting the date and venue for the International User Group Meeting has been settled. The meeting will take place at ESRIN from June 23rd to 25th, and will be a joint venture between ESA and RAL. Planning for the meeting has started, and suggestions from the ACG members for the programme would be most welcome.

Discussions have taken place between RAL and the Met. Office concerning the way forward with the ATSR intercomparison project. As a result of this, and following discussions with the ACG Chairman, the work to build a tool to formulate the necessary request files to generate the intercomparison data set was kicked-off. Progress on this tool is reported under work package 5200. Once the first request file has been run through the processing system it will be possible to assess the resource impact of processing a whole year's ATSR data this way. It is planned to run this test as soon as a suitable test buoy data set is made available by the Met. Office.

The work on updating the VISCAL LUTs and SST algorithms has continued.

### **2.3.3 WP 1300 Underpinning Physics**

Work continues on the ongoing items listed in table 3 of the attached Progress Summary. Progress is steady but the need to support the User Guide updates, the organisation and running of the User Group Meetings, and the knock-on effects of the holiday period have delayed items in this work package. The science support area of the programme would benefit from an increase in staff resource allocated to it.

### **2.3.4 WP 1400 Management Interfaces**

The Project Scientist has maintained regular management level contact with ESA counterparts. Discussions are underway concerning the International User Group Meeting.

### **2.3.5 WP 1500 Promotion**

An abridged version of the RAL Progress Report to the last ACG was produced for web publication, and an update of the ATSR User Guide following ACG members comments was completed as reported under WP1200.

The ATSR World Wide Web pages have been maintained and some new additions made at the request of the ACG. Abridged versions of the ACG reports and the RAL progress report have been put on line, together with the ATSR User Guide and Draft ATSR Reference Handbook.

Significant progress has been made towards upgrading the ATSR WWW pages to include new information requested by users. Test versions of the new pages are available on the project's private web server, and will be moved onto the updated public server over the next two months. These new pages will include instrument status information, processing status information, the H-rate coverage plots for each cycle, the despoising for each cycle, the details of the areas covered by the MRF, monthly ASST maps and animations, the User Guide in HTML and PDF, and ACG information.

The article for EOS will be completed by mid-February.

## **2.4 WP 2000 IN-FLIGHT OPERATIONS**

### **2.4.1 WP 2100 System Management**

The software, hardware, and data links necessary to support the ATSR-1 and 2 instruments have been maintained throughout the period.

### **2.4.2 WP 2200 Instrument Operations**

#### **ATSR-1**

Nothing to report. ATSR-1 is powered off, and only the basic monitoring activities necessary to check basic health and safety and keep the microwave radiometer in operation are being maintained.

#### **ATSR-2.**

The instrument has continued to run nominally except for the anomalies and incidents reported below.

##### **1. 6th October 1998 - SMU temperature rise**

For the first time since the 12th May 1998, an increase in temperature of approximately 2°C was noted at about 10:45 UTC. The temperature slowly fell back to nominal values over the next 24 hours. At the same time the average power to drive the SMU rose by a noticeable amount (0.5W). No noticeable increase in the level of scan jitter was observed and it is believed that the scan mirror bearing may have created a new “track” in the race and that this took the next few hours to “run-in” - hence the power spike.

##### **2. 22nd - 27th October - ESA planning error**

Due to an ESOC Mission Planning error, associated with the AMI instrument, no AMI WIND mode was selected, this had the knock on effect of not allowing any ATSR-2 H-rate data during the day side over land. Hence, the instrument operated in L-rate flexible mode throughout the period. At this time of year the H-rate acquisition amounts to nearly 25% of total data collection time.

##### **3. 25th October - Power spike**

An isolated 67.4W spike in the mechanism power was recorded at 23:02:22 UTC this was correlated with a 2002 pixel event. This event and that of 6th October continue to remind us that although the scan mirror continues to run smoothly, problems could still arise.

##### **4. 17th - 19th November - Leonids shutdown**

As with other space agencies spacecraft (i.e. CNES-SPOT, NASA-SOHO/ACE) ESA decided to reduce the activities on ERS-1 and ERS-2 during the expected Leonids Meteor Storm. The ERS-1 and -2 spacecraft payload were all powered off to reduce risk of damage. To this end ATSR-2 was down from 17th at 13:00 UTC until 19th at 16:55 UTC.

##### **5. 23rd November - Gain loop anomaly restart**

After the restart of the ATSR-2 from cold on the 19th at the end of the Leonids shutdown, it was noticed that the IR channel auto gain/offset loops were frozen. An ICU reset had to be scheduled, this involved setting both the MWR and GOME instruments to Stand-by during the time of the reset, and subsequent reconfiguration approx. 7 hours of data were lost (between 11:30 and 18:00 UTC).

The reason for this problem, despite the inclusion of an extra reset command being issued during the

instrument start-up this time, is unknown.

The restart of the Scan Mirror motor in both stoppages on the 17th and the 23rd was uneventful.

The long-term trend plots produced just before the Christmas break show the expected perihelion temperature rises, and for most of the ATSR-2 units this rise peaked during the 2nd week of December. In previous years scan mirror anomalies have occurred during this period. This year for the first time there have been no noticeable problems with the scan mirror, and it has remained smooth running since mid-May.

Most instrument temperatures have shown a gentle rise in their mean value during the mission, and up until now this has also been the case with the SMU. However, since May we have been seeing a fall in the mean SMU temperature compared to the long term trend. This may be indicative of a change to a smoother (i.e. less power hungry) running characteristic since May.

During the whole period ATSR-2 VISCAL data has been processed routinely from three orbits/day and results from this are available on:

**[http://www.atsr.rl.ac.uk/html/calibration\\_table.html](http://www.atsr.rl.ac.uk/html/calibration_table.html)**

Support from ESOC for ATSR-2 continues to be excellent.

#### **2.4.3 WP 2300 Monitoring**

For ATSR-2 the usual close level of monitoring has been maintained in case the scan anomaly recurs, whereas for ATSR-1 only a basic health and safety check is being maintained

#### **2.4.4 WP 2400 Troubleshooting and Diagnostics**

Fortunately, no action has been required under this work package this quarter apart from what is listed above.

#### **2.4.5 WP 2500 On-board Software and High-level Documents**

No work required during this period.

#### **2.4.6 WP 2600 ATSR-2 X-band EDS development and Maintenance**

There has been no further work in this reporting period.

#### **2.4.7 WP 2700 Maintenance of the S-Band EDS-1/2**

The S-band system continues to function nominally with no problems to report.

### **2.5 WP 3000 CALIBRATION AND VALIDATION**

#### **2.5.1 WP 3100 Calibration and Validation Planning**

Further deployments for 1998/99 are being planned.

#### **2.5.2 WP 3200 Infrared Calibration and Validation**

RAL supported the deployment of SISTeR on the recent BAS cruise to the Antarctic, and a further useful validation data set was obtained from the instrument.

Work is progressing on the completion of SISTeR-2. However, progress has been delayed more than expected by the need to use key staff to support the deployment of the SISTeR instrument and take part in the validation cruise. Urgent action has been taken to address this slippage and additional staff have been made available to provide support for Tim Nightingale and to progress components to ensure the SISTeR-2 schedule is maintained.

Work on analysing the SISTeR data set is proceeding, however the priority for the period has been to support the campaigns and the completion of SISTeR-2.

### **2.5.3 WP 3300 Visible Calibration and Validation**

Work on the long term monitoring of the visible channel calibration and the inter-comparisons with other sensors continues.

## **2.6 WP 4000 ALGORITHMS**

### **2.6.1 WP 4100 Algorithm Management**

### **2.6.2 WP 4200 Algorithm Development**

Reported under Science support, as the current work relates to improvements in the algorithm coefficients and a review of the cloud algorithm and its performance.

### **2.6.3 WP 4300 Algorithm Maintenance**

Other than those reported above, no significant maintenance activities have been required during this reporting period.

## **2.7 WP 5000 DATA PROCESSING SOFTWARE**

SADIST-2 has now been installed in the DERA's West Freugh ground station, and could, in principle, be used to provide a near real time service to NERC users, though currently it is utilised only for MoD customers.

### **2.7.1 WP 5100 Software Requirements**

The modifications to SADIST necessary to support the archived LRDAF tapes are currently being developed and implemented. The design of a catalogue for the new AIT-based ATSR-1 raw data archive is complete. Modifications to the SADIST-2 preprocessor and tape-archiver to allow the new catalogue to be used will begin in the New Year as their design is already substantially complete.

Following the suggestion, in the previous report, that the future development of the SADIST-2 processor should not be considered in isolation, but that there should be some harmonisation of the AATSR Reference Processor and SADIST-2, the matter has not yet been discussed. The Core Team is asked to consider how this should be taken forward. The RAL ATSR-series software team would be pleased to present the key technical issues to the Core Team or any delegated subgroup. This also raises NERC/DETR collaboration issues, of course.

### **2.7.2 WP 5200 Software Maintenance**

In early November Jack Abolins and John Wright (RAL) met with Andy Harris (Met Office) to discuss the requirements for generating GBT/GSST buoy-match-up products needed as part of the ATSR Inter-comparison data set. New software to automatically identify match-ups and prepare SADIST-2 request files and command lines has been developed and is undergoing extensive testing prior to starting the processing in January. The new software has re-used existing modules wherever possible to minimise

costs. In order to test the software, IDL-based tools have been developed to allow visualisation of the ATSR ground-track and swath superimposed on global or regional maps of buoy positions. These tools will also be useful for other similar ATSR overpass-seeking tasks. In particular, they could be re-used as the basis of an improved, interactive SADIST-2 request-generation program. *(This was a new task not shown in the management plan and schedule. It has been undertaken so that efficient use can be made of the spare processing capacity that continues to be available as a result of the continuing delays in the delivery of the ATSR-1 LRDAF tapes from ESA, and the knock-on effect this is having on the start of ATSR-1 reprocessing).*

An ABT product visualisation utility is now available and will be placed on the RAL ATSR server. This utility superimposes the orbit swath from any of the seven ATSR channels on a global map in any of the common projections. It is available in UNIX- and VMS-compliant versions.

Work on the code to produce the consolidated, co-located ABT product has been brought forward is underway. Software to reformat the basic SADIST-2 ABT product will be used early in the New Year to create a consolidated, co-located ABT database intended as the starting point for ASST reprocessing, when required. The reformatted ABT database could be based upon ERS ascending-node crossing (ANX) to ANX orbits, as opposed to the existing ERS tape-dump "orbit" files. This is currently under consideration.

A considerable number of the existing ATSR-1 LRDTF tapes have been shown to contain raw data files with non-compliant ATSR identifiers (i.e. the tapes do not match the ESA specification) which lead to them being rejected by the SADIST-2 system. The preprocessor has been equipped with logic to overcome this problem and process these non-standard tapes.

The testing of SADIST-2 to ensure it is Y2K compliant has started. Code inspections suggest that it is, but hard tests must be performed. Note that SADIST-2 uses ESA's ERSORB software for orbit propagation and that RAL has no access to this code. ESA have agreed to test the ERSORB modules in situ, using their ESRIN SADIST-2 installation. In addition, ESRIN have undertaken to supply RAL with an LRDTF tape simulating data acquired over the 1999/2000 cross-over. Y2K testing will restart when this tape arrives.

No new Software Problem Reports have been received.

## **2.8 WP 6000 DATA HANDLING**

### **2.8.1 WP 6100 Data Management**

The transfer of orbit state vector information and time correlation data from ESRIN to RAL has now been switched from the FTAM protocol to IP and the FTAM link switched off.

### **2.8.2 WP 6200 Archive Improvements and Population**

The jukebox access and control software is now available, although some scripts remain to be written to tailor the operating environment. This work is not time critical and will be completed once the archive becomes available and can be used for testing.

See below for the status of re-transcribed ATSR-1 data.

#### **2.8.2.1 WP 6201 Data Archive Maintenance**

A major audit of the archive of ATSR-2 data identified those orbits of data which were missing from the RAL data set and were known to be available in the ESA archive. Sustained co-operation between the RAL and ESA has now reduced this number of missing orbits to only 7. Work continues with the aim of having a complete ATSR-2 data set early in 1999.

The missing orbits within the ATSR-1 data set will be addressed through the LRDAF retranscription. The ATSR Project is still waiting for the arrival of re-transcribed data from ESA, these tape are now expected to start arriving in February, 1999 (i.e. there is a significant further delay).

### **2.8.3 WP 6300 Primary Mission Processing**

All the ATSR-2 data received by RAL has been processed and the products made available to users via magnetic media or FTP.

A WWW page to advertise the ATSR-2 with SST maps for each month of the mission is close to completion. This page will be regularly updated as new data is processed, and it includes animations of the ATSR-2 SST data sets. and will be available, via the ATSR Home page, early in January. The ASST products are also available via anonymous FTP.

A WWW page devoted to describing the areas covered by the MRF is also at an advanced stage and will be available via the ATSR home page at the end of January.

#### **2.8.3.1 WP 6301 Browse Population and Operation**

The ABF has been populated in line with the MRF schedule. A few further minor problems with the ABF have been identified, such as compatibility with Netscape V4.0, and EOS will be approached in the New Year with a view to providing solutions to these problems under the maintenance agreement between EOS and NERC.

### **2.8.4 WP 6400 Full Resolution Data Processing for the NERC Community**

The ATSR Data Services section continues to provide a high quality service to the ATSR community. Currently, there is only one outstanding request for data which has been accepted and not started. This request will be completed early in January, 1999

### **2.8.5 WP 6500 Reprocessing**

The ATSR-1 reprocessing with SADIST-1 for the Met. Office to the ASST/ABT product was completed 2 months ahead of schedule.

The ATSR-1 MRF processing with SADIST-2 will commence when the LRDAF tapes start to arrive in February 1999.

### **2.8.6 WP 6600 Order Handling and Distribution**

See reports under above work packages.

## **3. WP 7000 HIGH LEVEL MANAGEMENT**

### **3.1 WP 7100 OVERALL RAL PROJECT MANAGEMENT**

Regular progress meetings with the Project Scientist and the EO Data Group Leader have been held to progress work.

## **4. PLANS FOR THE NEXT QUARTER**

The specific milestones for the next quarter are given in Table 3 of the attached progress summary, plus the following list of standing activities:

- Continued operational support for the ATSR-1 and -2 instruments.
- Continued ATSR image product service.

- Continued routine ATSR-2 ASST processing.
- Continued routine ABF population and image generation through the Master Request File.
- Continued support for routine ABF operations to users.
- Completion of the ATSR-1 reprocessing algorithm.
- Updating of the ATSR Web pages