RAL ATSR PLS Report to 15th ATSR Core Group Meeting

Covering the period 1st April 1999 until 30th June 1999

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1. PROGRESS SUMMARY

Progress has been good again during the last quarter, and many milestones have been achieved. The update to the User Guide has been completed together with further upgrades of the ATSR WWW page, progress towards SST and cloud algorithm upgrades continues, work on the ABT merging tool has completed and 3-months of match-up data processed, the EOS article has been accepted for publication, and the project team has helped organise and presented material at the ATSR Workshop in ESRIN.

Also, a significant amount of ATSR-1 reprocessing has been completed using raw data from the old ATSR-1 archives.

Furthermore, Y2K testing has taken place, and a considerable amount of effort has been put into the evaluation of the recently delivered LRDAF tapes and reporting the problems found to ESA. On the operations side the Project Team has supported a reactivation of the ATSR-1 instrument for a 2-day test period.

2. INSTRUMENT STATUS

2.1 ATSR-1 STATUS

Through most of the period ATSR-1 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. However, on the 28th and 29th April there was very successful special re-activation of ATSR-1 to check its health (further details of this are given later in the report).

2.2 ATSR-2 STATUS

ATSR-2 has operated nominally throughout most of the reporting period, as usual there have been a few occurrences of high power spikes.

3. REPORTS ON INDIVIDUAL WORK PACKAGES

3.1 WP 1000 SCIENCE EXPLOITATION

3.1.1 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.

3.1.2 WP 1200 Scientific Support

The Project Team arranged and supported a meeting of the ATSR Product Control Board. An oral report of this meeting will be presented at the ACG. (Minutes of the meeting will be tabled at the ACG meeting).

The detailed planning for the ATSR-2 SST CD-ROM and ABT consolidation is now underway. The scope of this task has grown considerably as a result of the discussions that took place at the PCB. It was originally planned to produce a simple consolidation of the ATBs from which the SST CD-ROM would be produced, however is now clear that to produce data sets that can be easily used by the community several different sub-set of this data need to be produced in addition to what was originally planned. Each of these sub-sets need to be match the requirements of particular sections of the community (i.e. land, ocean, cloud etc.), and there is still some work required to define exactly what is needed. Also further discussions need to take place on how to distribute these very large ABT data sets to users.

A small amount of effort has be expended on the evaluation of data from the ATSR NRT system in Tromsø, and to simplify the use of this data a new version of the IDL code for reading GBT files that can handle the NRT files has been developed. This will be put on the ATSR WWW site during the next month once testing is completed.

RAL has been working with RSI to ensure that the means to read ATSR data as a supported file format is in the next release of ENVI. This facility will be in the next version of ENV,. however RAL has yet to receive a beta test version of the software to test that this works correctly.

3.1.3 WP 1300 Underpinning Physics

Work continues on the ongoing items listed in Table 2 of the attached Progress Summary.

The major activities continuing are: a) the revision of the ATSR-1 algorithms to account for the effects of detector temperature rise during the mission on the results from the 12μm channel, b) the upgrade of the algorithms to make them aerosol robust, and b) a review of the cloud algorithms.

A preliminary version of the algorithm including a) and b) now exists, and is being made available to users via the WWW project web pages (part of this work was undertaken by Dr. Chris Merchant while under contract to RAL). Further upgrades of the RAL atmospheric model are underway to include the latest spectroscopy, and ECMWF analysis data. Currently, there is some uncertainty about the corrections that need to be applied to the pre-launch test data to account for the detector warm-up, and the heritage of the corrections that are in use at the moment. It is thought that the current information is directly from the generic test detector and has not been corrected for the known differences from the flight item. Once this has been confirmed work on generating the final coefficient set will be completed.

Work on the review of the cloud algorithms continues using the new tools, however progress is limited by the amount of manpower available for this activity.

3.1.4 WP 1400 Management Interfaces

The Project Scientist has maintained regular management level contact with ESA counterparts at ESA-HQ, ESTEC, ESRIN and ESOC. User Group Meeting.

3.1.5 WP 1500 Promotion

The draft article for EOS has been accepted subject to some minor modifications to meet the publication's "House" style. There is a limit of 4 figures per article, so some hard editorial decisions will be necessary.

Final revision of the ATSR User Guide has been completed and it was placed on-line on the 15th June, prior to the ESRIN Workshop.

The upgrade of the ATSR Web pages has continued and more updated pages added, including some links to research being undertaken using ATSR data. The pages concerning the visible calibration of the ATSR-2 instrument have been significantly upgraded, and now include calibration tables corrected for the long term drifts in the visible calibrator and each of the visible channels, as well as the original tables that did not include these drifts.

The normal updates to ATSR World Wide Web pages have been maintained, and abridged versions of the ACG reports and the RAL progress report have been put on-line as requested.

Six members of the ATSR Project Team from RAL supported the ATSR Workshop, and 5 of them made presentations. The contributions made at the Frascati workshop by RAL ATSR project team members are detailed below.

Chris Mutlow		Status report Chairing sessions
Phil Watts	Poster	The retrieval of cirrus cloud microphysical and bulk properties from ATSR-2.
	Paper	Optimal estimation of cloud parameters from visible and infrared ATSR-2/AATSR measurements.
Dave Smith	Poster	Pre-Launch calibration of AATSR.
	Paper	Calibration of the ATSR-2 visible/near infrared channels.
Jo Murray	Poster	Application of hierarchical estimation techniques to SST's from ATSR.
Andrew Birks	Poster	The impact of 12 micron detector temperature on ATSR-1 data processing.
	Paper	The ENVISAT AATSR processing algorithms and data products

An oral report on the Frascati workshop will be given at the ACG meeting.

3.2 WP 2000 IN-FLIGHT OPERATIONS

3.2.1 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.

The DECNET link over which all the daily engineering data is transferred is under threat again due to network rationalisation within ESA. It now seems very likely that, despite all the repeated assurances we have previously received from the ERS Project, the removal of this connection is imminent This is potentially very serious as we rely heavily on this link for the daily collection of the information we use to monitor both ATSR instrument's health. Considerable effort and testing will be required to switch the system to use a different networking protocol.

3.2.2 WP 2200 Instrument Operations

ATSR-1

ATSR-1 was reactivated as a special health check on 28/29th April. Normally the ATSR IRR has not been cooled in de-hibernations since the December 1997 spacecraft power anomaly. In this instance, the reactivation was extended slightly in duration to keep within ERS-1 power budgets but to include an ATSR-1 cool-down.

This happened very successfully on 28th April, the cooler working well and the FPA achieving a temperature several degrees lower than that experienced at the end of normal ERS-1 operations, when the satellite as a whole was significantly warmer.

The 10.8 and 1.6μm channels produced good image data. The 12μm channel autogain-offset did not servo correctly. It remained unlocked. The locked up 11μm channel produced about 1640 counts difference, with the required count/signal curves being very similar for both channels, it has been concluded therefore that the 12μm channel was doing very well for gain, consistent with the lower FPA operating temperature. The conclusion is that the ATSR-1 scan mirror, cooler and working detectors are all in good health.

The 12μm auto-gain offset has proved temperamental in its locking up in the past, however starting from approximately the right values has previously solved this problem. This was not attempted during the health check. A communications problem meant that only faxed ESOC data was available, and the hints of the behaviour in faxed ESOC data was too sparse to form the basis of commanding flight hardware safely. During the early afternoon on 29th the network fault was fixed by an ESOC communications man.

Therefore, if it were possible, re-running the 28/29 April reactivation procedure late in 1999 with a view to locking up the 1.6 and 12μm autogain-offset loops would be very profitable. It would then be possible to confirm unambiguously what now seems very likely, namely that ATSR-1 is hibernated in a state from which it could be reactivated to function nominally.

ATSR-2.

The instrument has continued to run nominally except for some “seasonal” scan mirror current variations, however these do not impact on the quality of the data.

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

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

3.2.3 WP 2300 Monitoring

ATSR-1: Basic health and safety check has been maintained over the period.
Detailed monitoring was carried out during the special health check period.

ATSR-2: Detailed daily monitoring has been maintained in case the scan anomaly recurs.

3.2.4 WP 2400 Troubleshooting and Diagnostics

No action has been required during this quarter.

3.2.5 WP 2500 On-board Software and High-level Documents

No work required during this quarter.

3.2.6 WP 2600 ATSR-2 X-band EDS development and Maintenance

There has been no further ATSR-2 work in this reporting period. Some utility software was prepared to help investigate the 12μm channel problem experienced during the ATSR-1 re-activation.

3.2.7 WP 2700 Maintenance of the S-Band EDS-1/2

The S-band system continues to function nominally with no problems to report. RAL is awaiting input data from ESOC before Y2K testing of the S-band system can begin.

The withdrawal of the DECNET link will require the expenditure of several man-months of effort to re-build and test a new version the EDS-1/2 and data-link software.

3.3 WP 3000 CALIBRATION AND VALIDATION

3.3.1 WP 3100 Calibration and Validation Planning

The situation regarding the forthcoming campaigns is under review, an update will be given to the ACG meeting.

3.3.2 WP 3200 Infrared Calibration and Validation

SISTeR instrument re-work was completed and the instrument deployed on NAURU'99 cruise, June and July in the north equatorial Pacific.

Whilst on the NAURU'99 Campaign Tim Nightingale will start upgrading the ground station interface in order to allow easier operation of the instrument by third parties.

Work on Sister no. 2 (BETH) is progressing well. New electronics boards for the PSU, thermometry, signal channel and mechanical drive are completed. The scan mirror and chopper mechanisms have new motors and gearboxes. Work on the filter wheel assembly is ongoing, this requires modifications to the housing in order that opto sensors can be used instead of the existing hall effect sensors. Once the work on the mechanisms is completed and the wiring loom has been modified integration and testing of the new electronics can begin.

3.3.3 WP 3300 Visible Calibration and Validation

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

3.4 WP 4000 ALGORITHMS

3.4.1 WP 4100 Algorithm Management

3.4.2 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.

3.4.3 WP 4300 Algorithm Maintenance

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

3.5 WP 5000 DATA PROCESSING SOFTWARE

At the April 1999 Gore Group Meeting, a decision was taken, regarding the ATSR SST Intercomparison Kit, to generate a sample 3-month data set consisting of only those products where the buoy location is flagged as cloud free, as opposed to all products (as previously requested). To this end, the QA software used in the validation of the buoy-overpass products has been modified to select only products where the pixels nearest to the buoy location are cloud-free. This 3-month data set is now complete,

together with a catalogue describing it. The period covered was April, May and June of 1997. In total there were 4267 buoy overpasses within the 1 hour time criterion, of which 704 passed the SADIST-2 cloud-flagging algorithms. These 704 GBT and GSST products are now ready for distribution. Monthly maps showing the buoy locations for these products are also available.

The ABT co-location/consolidation software is now ready for pre-operational use. To keep the co-located ABT products to a more manageable size than the original, there have been some format changes; in particular there are now two files - one for infrared channels (1.6, 3.7, 11 and 12μm) and one for reflectance channels (0.56, 0.67, 0.86 and 1.6μm). Each record within a product now contains both nadir and forward views whenever both are available. The software also generates a range of statistics describing the content of the input ABT products. Co-located ABT product samples, together with their format documentation, are now ready and could be made available on the ATSR WWW pages. These products should be assessed by interested end-users before proceeding to operational use of the software. A visualisation tool is now being prepared.

3.5.1 WP 5100 Software Requirements

There has been no further work in this reporting period.

3.5.2 WP5200 Software Maintenance (SADIST-2 V300)

The SADIST-2 Preprocessor has now been enhanced to handle the re-transcribed ATSR-1 LRDAF tapes. Operational delivery of the LRDAFs is now underway. The software team have studied the first shipments of these and have prepared a report for ESA summarising their findings. The following conclusions were made and questions asked:

1. The LRDAF tapes inspected to date and detailed [in the report] can be processed by the SADIST-2 system at RAL.
2. The RATSR files on each tape are in good time/orbit order, making this re-transcribed data set far more manageable than its LRDTF predecessor.
3. Some orbits appear to have been omitted. Since, from the RAL perspective, the primary raison d'etre for this re-transcription is to provide data from all acquired orbits and especially those previously never supplied, a list of those orbits which ESA consider are now lost/spoilt seems essential.
4. Even in this small sample, some orbits previously received by RAL are omitted from the re-transcription. As yet we do not know why these data are missing, and whether this is intentional or not.
5. No major differences in the processed data from LRDAF and LRDTF sources have been discovered to date, but only ad hoc testing has been carried out so far.

Now that ESA have provided the necessary input data, Y2K testing is underway. To date only one problem has occurred. This affects the SADIST-2 Preprocessor, Processor and Archiver. In SADIST-2 products, dates after 0000h on January 1, 2000 appear with year "19100" as opposed to "2000". This has been traced to a single, common string-handling function and is easily corrected. Testing will continue in July. All Y2K problems encountered will be corrected in a single SADIST-2 upgrade to be released in Autumn 1999.

3.6 WP6000 DATA HANDLING

3.6.1 WP6100 Data Management

The State Vector information from ESRIN continues to be received successfully.

3.6.2 WP6200 Archive Improvements & Population.

As a result of a joint effort between RAL and ESRIN, there are now no ATSR-2 orbits missing from the RAL archive. However, raw data tapes have continued to fail and these are being replaced by ESRIN on a regular basis.

3.6.2.1 WP6201 Data Archive Maintenance.

The ATSR-1 retranscription in the form of LRDAF tapes has started operationally. These tapes are currently being assessed by RAL. Once accepted, the tapes will be archived to be followed by the consolidation process onto high volume storage in the Autumn. By the end of the LRDAF retranscription, the whole of the ATSR-1 dataset should be contained in just 75 8mm tapes!

3.6.3 WP6300 Primary Mission Processing.

ATSR-2 processing has continued up to and including April 1999 with ASST and high-resolution products distributed or made available via FTP.

However, continuing problems with the ABF have meant that ingestion into the ABF has not been possible thus products have been stored temporarily on tape. These will be ingested as soon as the ABF ingestion is operational once again.

The WWW page describing the areas covered by the MRF has been placed on-line as part of the recent upgrade to the ATSR WWW pages.

3.6.3.1 WP6301 Browse Population & Operation.

The ABF continues to be available via the WWW.

Population of the ABF has been suspended until a solution has been found for the latest problem. This is now thought to be a hardware problem with the CD-ROM jukebox and an engineer should visit RAL in the near future. This problem has caused a substantial amount of downtime in terms of population (4 months) partly through the difficulty of isolating the problem between the different parties involved (EOS, K-PAR, RAL) but partly because the need to put in place suitable maintenance contracts. The contracts are now in place which should mean that any future problems can be addressed with greater expedience.

The high-level audit of the data within the ABF is still required to investigate possible missing products.

3.6.4 WP6400 Full Resolution Data Processing for the NERC Community.

During the second quarter of 1999, 15 requests for high-resolution data have been received and over 22,000 products distributed (compared with 14 requests received and 25,000 products in the first quarter of 1999).

31 requests have been received in the first half of this year, compared to 35 in the whole of 1998. Therefore the number of requests has risen, almost to the levels of 1997 (73 requests).

Non of the outstanding requests requires further input from the ACG.

Furthermore, the section has processed the data for a 3-month period and generated over 8,000 products to satisfy the drifting-buoy match-ups.

3.6.5 WP6500 Reprocessing.

Reprocessing of ATSR-1 data has started from the existing tapes and currently all (ATSR-1) data for 1994 has been processed to ASST, ABT, and GBROWSE. The ASSTs have been made available via FTP and the ABT products stored on tape and issued to the Hadley Centre. Some of the GBROWSE products have been ingested into the ABF, but most are stored on tape awaiting the solution of the latest problem with the ABF.

Because of the sudden increase in ATSR requests and the drifting buoy processing, the schedule as published on the WWW is not being met. Furthermore, ESA have indicated that they will not be able to meet the time scale of having supplied the remainder of the ATSR-1 raw data before the deadline of the end of summer 1999. In view of this, a revised schedule will be published on the WWW once ESA has been able to indicate the projected date of the completion of the LRDAF retranscription.

The next period should see an increase in the throughput of the system as older hardware is retired (in the course of the normal upgrade cycle) to be replaced with newer hardware with greater processing

3.6.6 WP 6600 Order Handling and Distribution

See reports under above work packages.

Listed below are a list of customers and their institutions that have been supplied data this year. This information will be supplied with all future reports in order to allow the Core Group to see who has been requesting data, and to assist with identifying who else may potentially benefit from ATSR data.

Name	Institute	Country	Requests
Phil Watts	RAL	UK	2
Mark Slater	Univ. of Dundee	Uk	4
Peter Minnett	RSMAS-MPO, Miami	USA	1
Sarah Watts	Univ. of Oxford	UK	1
Fred Prata	CSIRO	Australia	2
Ian Barton	CSIRO	Australia	4
Tim Smythe	Plymouth Marine Lab.	UK	1
Adam Ross-Bryant	Kings College, London	Uk	1
Steve Plummer	ITE	UK	1
Chris Merchant	Univ. of Edinburgh	UK	1
Neil Peacock	Univ. College London	UK	1
Aleksei Romanov	Russian federal Institute of Fisheries and Oceanography	Russia	1
Chris Mutlow	RAL	UK	1
S.Bacon	SOC	UK	1
Nick Mountford	Plymouth Marine Lab	UK	1
Dave Smith	RAL	UK	1
Phillip Cooper	Univ. of Leicester	UK	1
David Cromwell	SOC	UK	1
Peter North	ITE	UK	1
Fredrico Gonzalez-Alonso	INIA, Madrid	Spain	1

4. WP 7000 HIGH LEVEL MANAGEMENT

4.1 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.

5. 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