

EARTH SCIENCES DIVISION (EEM-FS)
DIRECTORATE OF EARTH AND ENVIRONMENT MONITORING FROM SPACE

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12 October 2001	EEM-FS/0508/MB-dr	Page 1 of 14
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Subject: **Minutes of the 7th SMOS SAG meeting held at ESTEC,
24 & 25 September 2001**

Dear Colleague,

Enclosed you will find the minutes of the seventh SMOS SAG meeting held at ESTEC, 24 and 25 September 2001.

Please note that this document is also available in PDF format for downloading on our ftp server.

The next SMOS SAG meeting is scheduled for 13 & 14 December 2001 at DLR, Oberpfaffenhofen, Germany, consecutive to the 3rd SMOS Workshop.

Should you have any questions concerning the minutes, please feel free to contact me.

Yours sincerely,

Dr. M. Berger
Land/Surfaces Unit
Earth Sciences Division

**MINUTES OF THE
SEVENTH
SOIL MOISTURE AND OCEAN SALINITY (SMOS) MISSION
SCIENCE ADVISORY GROUP MEETING**

24 & 25 September 2001

ESTEC/ESA, The Netherlands

Participants: Y. Kerr, M. Peichl, N. Skou, E. Lopez-Baeza (representing J. Font),
P. Waldteufel, P. Ferrazzoli, G. Lagerloef, P. Viterbo.

Excused: J. Font, M. Hallikainen, T. Jackson, D. LeVine

Guests (25th): L. Simmonds, C. Calvet, B. v.d. Hurk., M. Drusch, A. Griend

ESA: P. Silvestrin (part time), M. Martin-Neira (part time), S. Ribo (part time),
M. Rast (part time), M. Drinkwater, M. Borgeaud (part time), M. Berger.

1. Welcome and Introduction – Objectives of the Meeting

M. Berger welcomed the SMOS SAG members to their 7th Meeting.

M. Hallikainen, T. Jackson and D. LeVine were excused. J. Font was represented by E. Lopez-Baeza.

The objectives of the meeting were:

- to discuss the soil moisture objectives of the mission, and
- to review related activities.

The meeting was organised back-to-back with the 2nd progress meeting of the soil moisture requirement study and EuroSTARRS pre-campaign meeting.

2. Approval of Draft Agenda

M. Berger introduced the updated agenda.

It was agreed to cover the following topics under AOB:

- Status of the SMOS Science Report
- Status of the preparation of the 3rd SMOS WS
- SMOS logo and web pages
- CEOS MWS subgroup – cal/val definitions
- Update on US activities.

The agreed agenda is attached to these minutes (Annex A).

3. Actions from the Last Meeting

No.	Category	Subject	to	due	Status
1.17	Camp. Doc	To keep master copy/ circulate updates	NS		On-going
1.26	Promotion	To provide planned promotion activities/publications to MB	all		On-going
3.5	Faraday	To simulate Faraday effects over DOME-C	NF		On-going
3.6	Faraday	To analyse short-scale Faraday effects	NF		On-going
2.15	Instrument	To draft requirements for short term stability	PW	20/6	deleted
3.9	Promotion	To draft GEWEX article	YK/PV /GL	20/6	open
4.2	Calibration	To contact C. Ruf and asked him about the status of the calib. document	NS		closed
5.1	Campaigns / Collaboration	To contact Joe Comiso for an outline of the Antarctica campaign planned for 2003 and to check possible collaboration	DV, MD, MMN	20/6	open
6.1	Reconstruction	To present simulated scenes at the next SAG	MP	24/9	closed
6.2	ITU issues	To provide documents related to RFI	GL	31/8	open

6.3	Promotion	To circulate updated SMOS logo	YK	31/8	closed
6.4	Simulator	To provide PS with improved simulated land scenes	YK	asap	closed
6.5	Campaigns	To further update the SAG on the ESTAR Trans-Atlantic flight	DV	24/9	open
6.6	SMOS WS	To encourage key scientists of the Cryosphere community to attend the WS	MD	31/8	On-going
6.7		To circulate WS information to the SAG (special session on salinity)	GL	27/7	obsolete
6.8	SMOS WS	To draft WS agenda and send out invitations	YK/M B	asap	closed
6.9	Promotion	To circulate format instructions for the Science Report to the SAG	MB	31/8	closed
6.10	MRD	To update MRD on OS requirements	JF/GL	31/8	open
6.11	Data Products	To analyse required number and locations of incidence angles for level 1b data product	PhW	24/9	open

Remarks:

- Action 1.17:** E. Lopez-Baeza will provide inputs for EuroSTARRS campaign. T. Jackson and G. Lagerloef will provide inputs for US planned activities. Updates on WISE, LOSAC, Avignon etc. should be provided by the responsible campaign coordinators.
- Action 4.2:** Copies of the document were circulated at the SAG meeting. Since the status of the publication is unclear it was agreed to keep it confidential.
- Action 5.1:** M. Drinkwater and M. Martin-Neira will also follow this action. M. Martin-Neira expects to get more information on the US plans at the forthcoming Specialist Meeting on Microwave Remote Sensing, which will take place in Boulder, USA beginning of November.
- Action 6.3:** Y. Kerr provided an updated logo to M. Berger who will circulate it to the SAG
- Action 6.10:** The importance of completing this action for the Phase-A review was stressed

4. EOEP, ESA organigram, Phase-A review

M. Berger updated the SAG with recent development concerning the scientific Phase-A review. The SMOS approval for the coming project phases was shifted from the Feb 2002 to the November 2001 PB-EO meeting. Therefore the ESAC review has to take place already at its meeting in Granada following the Granada 2001 User Consultation Meeting. The SMOS review is on the agenda for Friday afternoon, the 2nd of November. An ESAC Peer Review Panel has been established. A draft assessment report should be ready a week before the Granada Meeting. Various documents were made available to the panel. In addition, Y. Kerr and Ph. Waldteufel produced a summary of the scientific Phase-A activities, which was forwarded to the panel. M. Berger will distribute the summary to the SAG.

In addition to this, M. Berger presented the ESA organigram and the elements of ESA's Earth Observation Envelope Programme. The different departments involved in the various stages of a mission were outlined. In particular the importance of the next Council meeting for the

Envelope Programme and the next ESAC and PB-EO meeting for the approval for SMOS for the next phases was emphasised.

5. Status of the Project and Next Steps

SEPA and SEPS:

P. Silvestrin summarised the status of SEPA which had its 4th progress meeting on the 20 September. CASA currently is working on final refinements for the Preliminary Requirements Review (PRR), mainly on refinements of the thermal modelling. Platform and interfaces support work performed at CNES and Alcatel Space Industries has been consolidated. Results will be presented at the PRR. The PRR will take place on 15 and 16 October at ESTEC.

The mechanical design foresees 9 ‘hot’ redundant receivers, which are always powered-on and will increase the sensitivity by about 10%. There are now 2 NIR as it was identified as a single point failure during the PCR. Over each pole the NIR will perform on-board calibration using correlated and un-correlated noise. The electrical design is consolidated. X-band downlink is now the baseline. Two transmitters, of which one is used as a ‘cold’ redundant transmitter, will be provided by CNES.

An open question remains the sampling strategy. Industry proposed to integrate over 1.2 s for H and V polarisation each (a total of 2.4 s) without interlacing. Interlacing is foreseen only for the full-polarimetric mode with an interval of 0.1 s. In the discussion it was noted that polarisation smearing is expected to be larger using interlacing techniques. 1.2 s corresponds to about 8 km on ground, 2.4 s to about 16 km. The interlacing issue is not yet defined and possibly D. LeVine could provide more inputs.

In addition reliability issues were discussed. Concern was expressed for a centralised oscillator design versus a local oscillator design. P. Silvestrin noted that there are additional single point failures. The industry is currently assessing reliability and results will be presented at the PRR. P. Silvestrin agreed to summarise the procedure and findings at the next SAG meeting.

SEPS β -version was delivered and circulated to SAG members who showed interest. It was emphasised that any feedback is appreciated. A final version is expected towards the end of this year.

MDPP and LICEF image validation test 1

S. Ribo and M. Martin-Neira reported on the image validation test 1 (IV-1) experiment and various MDPP activities:

LICEF Image Validation Test 1

The IV-1 was performed the first week of September at Dwingerloo (ASTRON Stichting), the Netherlands, a very good location for radiometric measurements at L-band. A small

version of MIRAS, 6 elements per arm, was simulated by positioning manually 2 LICEF receivers along the array to measure all baselines. The signals were monitored continuously during the whole measurement, which took about 3 hours. Different scenes were measured: day sky, night sky, both with and without 'shielded horizon'. A tracking of the Sun was performed during daylight data acquisition. LICEF-1 receivers showed good signal stability. Low performance of the input switch and a possible internal load mismatch were observed. Image processing of the measurements will take place during the following weeks.

LICEF-1

After the image validation test 1 the two units were shipped to Astrium-Toulouse for final end-to-end tests. The final presentation of LICEF-1 will take place at ESTEC towards the end of this year.

DICOS-3

DICOS-3 performed successfully during the IV-1 test. The unit will now be shipped to the Polytechnic University of Valencia for IV-2 test.

MDPP-1

The final subsystems review was held at ESTEC on 19 September 2001. Various tests have been performed at component and subsystem level for LICEF, MOHA, CAS and the mechanical mechanisms and deployment. Worthwhile noting are the embedded antenna tests, the LICEF noise figure tests and the CAS noise injection network stability. Antenna coupling, cross-polarisation and matching parameters are well within specifications for most cases, and only in a few instances marginally. In summary, excellent and promising results were obtained. Noise figure of LICEF is now in 1.8-2.0 within 0-50 degrees, below the goal of 2 dB. CAS stability is shown to be good and within specifications. Intensive thermal tests of LICEF and CAS were performed in order to feed real data back into the stability analysis of SMOS Phase-A, primarily for OS requirements. These extensive tests have induced a delay in LICEF and CAS. In particular, the anechoic chamber tests at the TUD facilities are not feasible to be performed in November as originally planned. The tests will likely take place in March next year. The changes imply a 3 month effective delay in the activity calendar.

MDPP-2

Progress Meeting 2 was held at ESTEC on 21 September 2001. The detailed design of the mechanical ground support equipment for both, the image validation and the deployment demonstration tests is ready. The draft image validation test plan was presented to ESA. The preliminary design of the noise injection radiometer is progressing. The kick-off of DICOS-2 and the BPF-2 was at the same date.

HUT-2D

M. Martin-Neira also reported on the status of the HUT-2D.

The manufacturing of the equipment for the tower-based image validation test at HUT premises is in progress. The new antenna design has been measured with satisfactory results. Nine receiver boards are now populated and well under test. Their performance is good enough for proceeding into the integration with the IF and digitising boards, which are ready. The correlator board is being populated and FPGA software is in progress. The structure for the test is ready. There is a slight delay of 2 weeks with respect to the schedule for the ground test.

6. Summary of the OS SAG Review

M. Berger summarised the findings of the SAG ocean salinity review. Most critical items identified are:

- Discrepancies of Tb models
- Azimuthal dependence
- Foam
- Faraday rotation
- Natural variability
- Cal/Val scheme
- Higher level data products
- Impact assessment.

All issues are currently addressed or will be followed by on-going and planned study and campaign activities.

7. Discussion on Data Products

M. Berger stressed that data products, including level-1B is still very unclear. Discussions on the grid size, on possible projections and the consequences for subsequent processing of higher level data product in terms of accuracy degradation were addressed. It was emphasised that the issue is more complicated for a 2-D interferometer than for other instruments. Therefore, it is considered essential to cover higher data products within the programme (see also SAG recommendation R2 – minutes of the 1st SMOS SAG meeting). Y. Kerr will draft data product specifications according the ESA data product definitions for further discussions.

8. Campaigns

WISE

Preparations for the second WISE campaign are on schedule. Overflights covered by LOSAC and EuroSTARRS are foreseen. A final coordination meeting is planned to take place mid October in Barcelona.

LOSAC

N. Skou reported on extension flights planned for the second part of the LOSAC campaign. Fine-tuning will take place at the WISE/LOSAC coordination meeting.

Others

It was stressed to establish contact to the US colleagues involved in the Antarctica campaign plan to assess a possible collaboration (see action 5.1). M. Martin-Neira will try to get more information at the Specialist Meeting on Microwave Remote Sensing in Boulder.

9. Support Studies

Update on the Salinity Data processing Study

The study was kicked-off in July and a first progress meeting is scheduled for November. The status of the study will be presented at the next SAG meeting.

Update on the Salinity Requirement Study

The study is on-going. Further results are being expected for the 3rd SMOS workshop.

Update on the Soil Moisture Retrieval Study

No proposals were received in response to the ITT. The reason is likely due to non-availability of possible study team members because of the vacation period. It was therefore decided by ESA to re-issue the ITT.

10. AOB

SMOS Science Report

The book captains were reminded to submit a first draft by 15 November which will be discussed in detail at the next SAG meeting.

Preparation of the 3rd SMOS WS

Y. Kerr reported that a tentative agenda was distributed. Not all proposed presenters have yet confirmed their presentations. SAG members were reminded to register and arrange accommodation/travel in time if not already done so.

SMOS logo and web pages

Y. Kerr updated the SMOS logo which will be distributed by M. Berger to the SAG for further comments. M. Berger reported on the new ESA web portal (www.esa.int). Material was provided to the company responsible for the web design. A draft version of the SMOS pages will be circulated to the SAG for further comments as soon as available.

CEOS WGCV Microwave Sensor Subgroup – cal/val definitions

M. Martin-Neira outlined the objectives of the new established CEOS WGCV Microwave Sensor Subgroup who will meet at the Specialist Meeting on Microwave Remote Sensing. In addition definitions for the calibration and validation were discussed. M. Martin-Neira agreed to draft a list of definitions for further discussions.

Update on US activities

G. Lagerloef updated the SAG with recent developments concerning the ESSP proposal. The announcement of the step 1 result was delayed due to the terror attack in the US (at the time writing these minutes the assessment results were made public and both, the AQUARIUS and the HYDROSS concept have been recommended for step 2 proposals). G. Lagerloef further reported on initiatives performing sky measurements and pond measurements with PALS, which show excellent stability. First results are probably already available at the forthcoming SMOS workshop. He also noted that the initiative of measuring the di-electric constant is furthering and that similar measurements in Europe would be appreciated.

11. Date and Place of the Next Meeting

The next SAG meeting will take place on 13 and 14 December at DLR, Oberpfaffenhofen, Germany.

12./13. Review of the Soil Moisture Objectives / Discussions

Various presentations (see attached agenda) were given by the LI and the study and campaign teams. Main points discussed were the signal dependence (polarisation and view direction) on vegetation characteristics (optical thickness, vegetation type) referred to as the τ - ω -problem, surface heterogeneity and mixed pixels, topographic effects, physical temperature, soil freezing, forest models and assimilation methods. Significant progresses were made on retrieval of both soil moisture vegetation water content and root zone soil moisture, due to the experiments now taking place and the work done in the framework of the soil moisture requirement study. An algorithm for forest canopy is available now which is very similar to the τ - ω model used for low vegetation (but is more related to the branches' water content. These models and a parameterisation of the atmosphere will be used to simulate L-band emission over the globe.

The physical temperature could be modelled to an accuracy of about 2 K and does not pose a problem for the retrievals. The τ - ω -problem is being followed by various study and campaign activities. In particular, the Avignon experiment was established to gain more insights in the signal dependence but due to calibrations problems no results are yet available (issue to be followed by CESBIO and TUD). Until the calibration is sorted out, it will be difficult to analyse the polarimetric signal over land. Further results are being expected from EuroSTARRS and the FAUGA experiment.

First results of the soil moisture requirement study are encouraging. Within this activity a forest model for L-band was developed which shows that effects from branches dominate. The model still has to be validated. Appropriate test sites were selected for the EuroSTARRS campaign. This campaign should also provide very useful information on urban signatures, topographic effects and polarimetric signature (TUD instrument). The study will also deliver very soon global maps of both the variables/parameters necessary to estimate L-band brightness temperatures over the whole globe at SMOS resolution for 2 years and at SMOS overpass time. The study will also deliver TOA brightness temperatures at several angles.

11. Summary and conclusion

M. Berger thanked the study and campaign teams for their effort and the presenters for their excellent presentations. It was agreed to summarise the findings at the forthcoming SAG meeting because of the time pressure at the end of the meeting.

List of Actions:

No.	Category	Subject	to	due	Status
1.17	Camp. Doc	To keep master copy/ circulate updates	NS		On-going
1.26	Promotion	To provide planned promotion activities/publications to MB	all		On-going
3.5	Faraday	To simulate Faraday effects over DOME-C	NF		On-going
3.6	Faraday	To analyse short-scale Faraday effects	NF		On-going
3.9	Promotion	To draft GEWEX article	YK/PV /GL	20/6	open
5.1	Campaigns / Collaboration	To contact Joe Comiso for an outline of the Antarctica campaign planned for 2003 and to check possible collaboration	DV, MD, MMN	20/6	open
6.2	ITU issues	To provide documents related to RFI	GL	31/8	open
6.5	Campaigns	To further update the SAG on the ESTAR Trans-Atlantic flight	DV	24/9	open
6.6	SMOS WS	To encourage key scientists of the Cryosphere community to attend the WS	MD	31/8	On-going
6.10	MRD	To update MRD on OS requirements	JF/GL	31/8	open
6.11	Data Products	To analyse required number and locations of incidence angles for level 1b data product	PhW	24/9	open
7.1	Camp. Doc.	Send short description of EuroSTARRS to be included in the campaign doc to NS	E. L-B	15/11	
7.2	Camp. Doc.	To provide NS information on planned US campaigns	GL/TJ	15/11	
7.3	Faraday	To provide NF contact point of UK expert on Antarctic short term szintillation	MD	15/11	
7.4	SMOS WS	To distribute SMOS WS information to the cryosphere community	MD	a.s.a. p.	
7.5	Simulator	To obtain more SSS simulations from OS req. study team	HR/YK	15/11	
7.6	Phase-A review	To distribute summary of Phase-A activities written by YK and PhW	MB	31/10	
7.7	Data products	To draft definition of data products for further discussions	YK	3/12	
7.8	Cal/Val	To draft cal/val definitions for further discussions	MMN	31/10	

7th SMOS SAG Meeting**24-25 September 2001****ESTEC, Noordwijk, The Netherlands****Room Copernicus (24th) and Newton-2 (25th), starting on 24th at 10:00*****Agenda***

1. Welcome and Introduction – Objectives of the meeting
2. Approval of draft agenda
3. Actions from the last meeting
4. EOEP, ESA organigram, Phase-A review
5. Status of the project and next steps
 - SEPA and SEPS
 - MDPP and LICEF image validation test-1
 - HUT-2D
6. Summary of the OS SAG review
7. Discussion on Data Products
8. Campaigns
 - WISE
 - LOSAC
 - Others (DOME-C characterisation)
9. Support studies
 - Salinity Requirement Study
 - Salinity Data Processing Study
 - Further requirements
10. AOB
 - Status of the SMOS Science Report
 - Status of the preparation of the 3rd SMOS WS
 - SMOS logo and web pages
 - CEOS MWS Subgroup – cal/val definitions
11. Date and place of next meeting
12. Review of the soil moisture objectives
 - Scientific rationale, SM mission objectives and requirements Y. Kerr
 - Retrieving SM and veg. Water content Y. Kerr/ J.P. Wigneron
 - Status of the soil moisture requirement study L. Simmonds/ C. Calvet
 - Root zone soil moisture C. Calvet
 - Emissivity models for forests P. Ferrazzoli
 - EuroSTARRS E. Lopez-Baeza
 - Considerations on assimilating SM P. Viterbo
 - Anticipating on SMOS in the EU ELDAS project B. v.d. Hurk/M. Drusch
13. Discussions
14. Summary and conclusion