

EARTH SCIENCES DIVISION (EOP-FS)
DIRECTORATE OF EARTH OBSERVATION PROGRAMMES

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8 May 2002	EOP-FS/0640/MB-dr	Page 1 of 14
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Subject:	Minutes of the 9th SMOS SAG Meeting held at ESA-ESTEC, Noordwijk, The Netherlands, 16 & 17 April 2002	

Dear Colleague,

Enclosed you will find the minutes of the ninth SMOS SAG meeting held at ESA-ESTEC, Noordwijk, The Netherlands, 16 and 17 April 2002.

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

I would like to ask you to mark the dates for our next SAG meeting which will take place at ESTEC, **11-12 July 2002.**

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
NINTH
SOIL MOISTURE AND OCEAN SALINITY (SMOS) MISSION
SCIENCE ADVISORY GROUP MEETING
16 & 17 April 2002
ESA-ESTEC, Noordwijk, The Netherlands**

Participants: Y. Kerr, J. Font, M. Peichl, N. Skou, P. Ferrazzoli, P. Viterbo, P. Waldteufel

Excused: M. Hallikainen, G. Lagerloef, T. Jackson, D. LeVine

ESA: A. Hahne (part time), J. Benveniste (part time), M. Drinkwater (part time),
N. Floury (part time), S. Ribo, M. Martin-Neira (part time), H. Rebhan,
M. Berger

1. Welcome and Introduction – Objectives of the Meeting

M. Berger welcomed the SMOS SAG members to their 9th meeting.

M. Hallikainen, G. Lagerloef, T. Jackson and D. LeVine were excused. The US colleagues had other important commitments (ESSP site review preparation, SMEX campaign preparation, ESTAR refurbishment).

The objectives of the meeting were:

- to discuss priorities of scientific study requirements for Phase-B.
- to review the status of the SMOS Science Report.

2. Approval of Draft Agenda

M. Berger introduced the draft agenda.

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

3. Actions from the Last Meeting / Review of SAG Recommendations

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
6.2	ITU issues	To provide documents related to RFI	GL	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	on-going
7.5	Simulator	To obtain more SSS simulations from OS req. study team	HR/YK	15/11	open
7.8	Cal/Val	To draft cal/val definitions for further discussions	MMN	31/10	closed
8.1	SEPS	To find out possibilities to organise a SEPS training at ESTEC	MB	31/1	closed
8.2	SEPS	To distribute the SEPS acceptance test plan to the SAG	AS	31/1	closed
8.3	GS	To review the GS processing scheme drafted by Y. Kerr and to provide comments to Y. Kerr	SAG	15/1	open
8.4	GS	To provide inputs for a possible study on the GS processing scheme to A. Hahne	YK/Ph W	15/2	pending
8.5	Cal/Val	To provide A. Hahne with names and coordinates of potential experts of a subgroup reviewing the error budget	SAG	15/2	Re-issued
8.6	Cal/Val	To draft a calibration scheme and a validation plan	YK	31/10	pending

8.7	Faraday	To provide correlation statistics on TOPEX observations and TEC models	DLV	15/2	closed
8.8	Faraday	To provide Y. Kerr with a copy of the updated Faraday correction method	NS	15/2	closed
8.9	Campaigns	To check ESA support for European scientists participating in the SMEX campaign	MB	15/2	closed
8.10	Campaigns	To further discuss science objectives of a possible Greenland campaign with cryosphere experts	NS	31/3	open
8.11	Campaigns	To contact D. Cavalieri for his plans in Greenland	DLV	31/3	closed
8.12	Studies	To provide M. Berger with inputs for a possible image reconstruction study	MP/NS	28/2	closed
8.13	Science Report	To submit for draft of the Science Report to M. Berger	SAG	1/3	open
8.14	Promotion	To put the SAG minutes and TNs on the CESBIO SMOS web pages	YK	1/4	open
8.15	Promotion	To distribute various SMOS logos used to the SAG	MB	1/4	open
8.16	SAG	To announce the date for the next SAG meeting combined with the final presentation of the OS requirement study	MB	15/1	closed

Remarks:

- Action 1.17:** The SAG was asked to review the campaign document and to provide input to N. Skou. A summary of all campaigns should be included.
- Action 3.9:** Layout and text for the general part has been done by Y. Kerr. P. Viterbo and G. Lagerloef were asked to provide inputs to Y. Kerr.
- Action 6.10:** The MRD will be eventually updated after the small WS on OS requirements and data products.
- Action 7.5:** H. Rebhan agreed to provide simulated scenes within the next 2 weeks.
- Action 8.3:** The SAG was urged to provide inputs to Y. Kerr as soon as possible.

The recommendations of the SAG were reviewed. It was agreed to re-phrase recommendation R1.1a and to delete R1.1b, R4.1, R4.2, and R5.1. The updated list of recommendations is given below:

List of Recommendations:

- R 1.1a:** The SAG recommends speeding-up releasing scientific support studies.
- R 1.2:** The SAG recommends including higher level data processing in the data exploitation plan.
- R 2.1:** The SAG recommends establishing a close collaboration with US scientists.
- R 8.1:** The SAG strongly recommends not following the idea of using active sources on ground for calibrating SMOS.

4. SAG Membership / Terms of Reference

M. Berger reported that the SAG membership and its terms of reference were reviewed at the beginning of Phase-B. It was agreed to stick to the current membership with one exception

and this is to include P. Waldteufel as a full SAG member. It is expected that formal letters of invitation with the SAG terms of reference attached will be mailed soon.

5. Phase-B Activities

Industrial Phase-B activities:

A. Hahne reported on the status of the project. The bridging phase addressing critical issues identified at the PRR was kicked-off on April 10. It will last for about 12 months. Preparation for Phase-B is currently on-going. This includes the initiation of studies related to the development of the ground segment. A Level-1 processor development study, with restricted competition in Portugal, is expected to be issued in June. This activity includes the general ground segment architecture and its interfaces, an assessment of the image reconstruction methods and a review of the algorithms used for SEPS.

A vacancy notice for the SMOS Project Manager has been issued recently. It is expected that the full project team is in place after the summer vacation.

MDPP-1:

The MDPP-1 demonstrator was assembled and successfully checked-out for health and main functions by EADS-CASA. The hardware was then sent to HUT where the electrical test campaign has started and is half way through. The anechoic chamber tests are expected to be carried out at TUD in May.

MDPP-2:

The mechanical ground support equipment for the deployment demonstration is ready and has been installed in a clean room. The tests are expected being performed in July. MDPP-1 hardware is needed for this test.

The image validation test plan has been completed and reviewed by ESA. The mechanical ground support equipment is ready. Tests are expected being performed in July. MDPP-1 hardware is needed for this test.

The Preliminary Design Review of NIR was successfully passed. The detailed design is being done.

The Preliminary Design Review of DICOS-2 was successfully passed. The detailed design is being done.

The Band Pass Filter - two are being plated and soon will be tuned. Delivery is expected by June.

Image Validation Test 3B:

Preliminary results of the Image Validation Test 3B were presented. The aim of this test was to obtain with the LICEF1 receivers and DICOS3 correlator a Modified Brightness Temperature Map of the night sky with the Moon. The Moon could not be imaged as the cold ambient temperature during the measurement produced a failure of the receivers.

A 'fringe measurement' was carried out instead, consisting on measuring one single baseline many times for different positions of the Moon. An almost constant change of phase of the measured visibility was expected from one measurement to the next. This measurement produced very noisy data due to thermal instabilities of the receivers during the measurement. The low signal of the Moon was of the order of magnitude of the quantisation noise of the digital correlator DICOS3, and this could be seen in the measurements.

This fringe measurement was repeated also for the Sun, producing a very good result. An imaging test of the Sun (8 elements per arm) was also carried out, resulting in a very good image where the main lobe and secondary lobes of the punctual noise source could be observed.

HUT-2D:

A new generation of receivers has been manufactured with improved shielding. Tests on the first 4 units will be carried out in April. If shielding is successful a tower-test will be attempted with the 4 units.

The FPGA correlator is ready and the software final tests will be carried out during April.

Scientific support requirements (image reconstruction, SEPS validation, etc.):

The ESAC recommendations, following the Phase-A review, were used to discuss study priorities for Phase-B. It was stressed that smaller and faster studies focussing on particular aspects are considered of more use than larger and longer study activities, in particular taking into account budget constraints and time pressure. It was concluded that studies for the cryosphere are on-hold as long as the community has not formulated clear requirements. N. Skou agreed to ask his colleague Leif Toudal Pedersen to iterate with the community on this. He could be invited to the forthcoming SAG meeting to present the ideas. In addition, A. Hahne will contact the Canadians asking for potential interest in the cryosphere objectives of the mission.

It was agreed that the first priority are a SEPS validation and an image reconstruction study. Furthermore, a study on the use of the full polarimetric mode for the salinity retrieval and a study on SMOS data assimilation are considered important. P. Viterbo will provide a short summary on what could be done in a first assimilation study.

A. Hahne informed the SAG that minor SEPS improvement could be implemented in the current contract with industry. The SAG was asked to provide inputs within one week. The full-polarisation is considered as an add-on for a future SEPS update.

Involvement of Portugal:

A. Hahne reported that Portugal expressed strong interest in the SMOS mission. Currently a study providing first insights of a Level 1b processor development are being discussed as a Phase-1 activity. An image reconstruction study could be included into this activity. M. Berger, N. Skou, M. Peichl and Y. Kerr agreed drafting the scientific work which should be performed within this activity.

In parallel with the Portugal Phase-1 activity, a stronger involvement of the science community in Portugal is encouraged. Activities could be supported by a specific budget established for fostering Portuguese integration into ESA EO activities. A full-polarisation salinity retrieval study and a SMOS data assimilation study could be initiated within this framework. In addition, N. Floury and H. Rebhan will provide a list of topics of scientific activities needed for the ocean salinity objectives for consideration to be followed within the same framework. P. Viterbo will provide coordinates of potential Portuguese institutes. In addition, it was agreed to organise a workshop/SMOS information day in Portugal. This could be combined with the EuroSTARRS/WISE workshop or the SMOS yearly workshop (see AOB: SMOS WS).

6. Update on Campaign Activities*EuroSTARRS 2002:*

The EuroSTARRS data review meeting took place March 26. First results are very encouraging. The Tb measurements follow the model results. A calibration problem of one beam was reported. In addition, the TIR readings are set to 0 for surface temperature below 0 which cannot be recovered anymore. This software problem will be corrected for future STARRS campaigns over land. More depth analysis is expected at a workshop which will be organised together with a WISE workshop. Currently different options for the date and place are being discussed (see AOB: SMOS WS).

WISE:

J. Font presented recent results of the WISE experiment which confirm the Hollinger measurements. Various publications outlining the activity and showing preliminary results were prepared. These publications are available for downloading on the SMOS ftp site. It is being planned to organise a final workshop together with the EuroSTARRS workshop (see AOB: SMOS WS).

LOSAC:

N. Skou reported on recent findings of the LOSAC data analysis. The 2K ripples within the data apparently are not linked to scale since flights at different altitude show the same effect for at least the altitudes (hence pixel sizes) used in the experiment. The variation seems to be

largest at circle flight with 35-45 incidence angle and minor at straight flight legs. Typical values are: 4K for I, 3K for Q, 2K for U and 1K for V. Small scale roughness variations could be an explanation. An answer to this question could be given by a dedicated campaign activity (circle flights at no wind and smooth surface, circle flights over a well characterised site). The SAG recommended to use the flight hours originally planned for autumn last year to perform these tests if suitable *in-situ* measurements are performed.

Toulouse, Avignon:

Y. Kerr reported on the status of the Avignon data analysis and the preparation of the Toulouse experiment. Data analysis of the Avignon site is on-going but calibration coefficients are still outstanding. N. Skou took the action to clarify the status.

Concerning the CESBIO radiometer which is planned to be used during the Toulouse experiment, Y. Kerr reported that the delivery has been delayed because of a malfunctioning amplifier. It is expected that the instrument will be delivered soon. In addition to the L-band radiometer, VNIR and TIR radiometers, financed by CNES and CNRS, will be used during the campaign. Currently the platform for the instrument is being erected at the Fauga test site. It is expected that measurements will start this summer.

Dome-C:

In the discussion of the use of DOME-C as a potential vicarious calibration site, it was concluded that there are currently no pressing arguments for a campaign. This is mainly associated to the uncertainties of the spatial and temporal homogeneity of the site at L-band, its spatial extend and the unknown ionospheric effects. Contacts to organisations and groups who follow similar ideas will be kept alive.

7. Status Reports of ESA Support Studies

Soil Moisture Requirements Study:

The Soil Moisture Requirement Study had a progress Meeting on March 27 consecutive to the EuroSTARRS data review meeting. The Mid Term Review (MTR) is scheduled for May 7.

The study is conducted in two phases. Phase-1 includes the analysis of the user community requirements, the forward modelling and measurement sensitivity assessment, the development of retrieval schemes and the definition of campaigns to provide data for case studies and impact assessment studies which are planned to be conducted in Phase-2. The MTR marks the end of Phase-1 activities.

Forward simulations besides high-resolution subsets were completed. Different retrieval methods (statistical retrievals based on indices, model inversion and NN) were tested. Preliminary results show that statistic methods based on local regression methods provide better results than methods based on global regressions.

A detailed report of all results will be provided for the MTR.

Soil Moisture Retrieval Study:

The evaluation of the proposals received in response to the ITT is not yet closed. Kick-off is being expected within the next 4 weeks.

Salinity Requirement Study:

The study is nearing its completion. A final presentation, planned consecutively to this SMOS SAG meeting, had to be postponed due to non-availability of study team members. The final presentations will now take place on May 2. The place and date for a small workshop on OS requirements and data products, originally planned to be organised together with the final presentation, will be announced in due time.

Salinity Data Processing Study:

The second progress meeting of this study took place on 5 April. The study will end in Summer 2002. An advanced emission model based on Small Slopes Approximation has been developed and validated as far as possible using WISE 2000 data. Direct retrieval studies are being conducted. They are based on a neural network approach. The effects of system parameters (available incidences, realistic sensitivities), auxiliary data (errors, biases) and *a priori* information are being analysed. The analysis of issues such as the effects of inhomogeneities within a resolution cell, potential calibration-validation areas, and correlation between auxiliary data has started.

8. Science Report

The status of the SMOS Science Report was reviewed. Only one input was received up to now. M. Berger stressed the importance of the document and asked again all book captains to provide inputs latest by end of May. It was agreed to use the forthcoming SAG meeting as a writing meeting. SAG members were asked to bring their laptops along to this meeting. For the cryosphere subchapter it was agreed to use the text of the MRD as long as no further inputs are available from the cryosphere community. The list of contents of the Science Report and their responsible book captains (underlined) are:

Introduction	<u>YK</u>
Scientific Objectives and Mission Requirements:	
- Introduction	
- Soil Moisture	<u>YK</u> , PV, PF
- Ocean Salinity	<u>JE</u> , NS, GL
- Cryosphere	<u>MH</u> , YK
Mission and System Overview:	<u>AH</u> , PS
Instrument Concept:	<u>AH</u> , PS, MMN
Characterisation and Calibration:	<u>AH</u> , PS, PW, MMN

Data Processing, Data Products and Validation:

Image Reconstruction

AH, MP, PW, YK

Soil Moisture

AH, YK, PF

Ocean Salinity

AH, JF, GL, NF**Concluding Remarks:**YK, JF**9. AOB***4th SMOS WS / EuroSTARRS WS / WISE WS:*

Different options for a combined organisation of the 4th SMOS workshop, the EuroSTARRS workshop, the WISE workshop and a Portuguese information day were discussed.

One option could be to organise the SMOS workshop as originally planned at the Technical University of Denmark (tentative date: 20-22 Nov.) combined with a SAG meeting and to organise the EuroSTARRS and WISE workshops in Portugal beginning of next year together with an information day in order to draw interest of the Portuguese science community. M. Berger will check with the campaign unit if the EuroSTARRS / WISE workshops could be postponed until beginning of next year. If not possible an alternative option would be to organise the EuroSTARRS and WISE workshops as originally planned in Toulouse (tentative date: 4-6 Nov.) and to organise the yearly SMOS workshop at the beginning of next year in Portugal.

A. Hahne will provide coordinates for logistical support in organising a workshop in Portugal. The different options are currently being evaluated. A decision should be made within the next few weeks.

Faraday rotation – summary by N. Skou:

N. Skou presented a summary of different options to correct for Faraday rotation using the L-band observations only. These are: the use of the rotational invariant first Stoke parameter in the retrieval, the use of full-polarimetric data, and the use of dual-pol. data together with an polarisation ratio which allows an estimation of the Faraday rotation as long as wind speed is known with good accuracy and *a priori* salinity is estimated with reasonable accuracy. A paper describing the techniques in detail has been submitted and is currently under review.

Assessment of noise source for salinity retrievals – N. Flourey:

N. Flourey presented considerations on sky emission at L-band, its fluctuations in time and the accuracy of the models / observations available so far, compared with the accuracy necessary for the retrieval of ocean salinity. Lower atmosphere (dry and wet parts), cosmic and galactic emission can contribute to the error budget through their direct and reflected contributions, and ionosphere has to be taken into account mainly because of Faraday rotation. In addition, the variations of the reflection coefficient of the surface may also have to be accounted for. The conclusions were that further investigations are needed to (1) quantify the accuracy of

auxiliary data required to correct the L-band signal and (2) evaluate the accuracy of data so far available for this purpose.

11. Date and Place of the Next Meeting

The next SAG meeting was scheduled for **11 and 12 July** at ESTEC (backup date: 16-17 July). It was agreed to use the forthcoming meeting as an editorial working meeting for the SMOS Science Report.

12. Summary and Conclusion

Y. Kerr and M. Berger thanked the SAG for the fruitful discussions.

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 – PV and GL to provide inputs	YK/PV /GL	20/6	open
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		on-going
7.5	Simulator	To obtain more SSS simulations from OS req. study team	HR/YK	15/11	open
8.3	GS	To review the GS processing scheme drafted by Y. Kerr and to provide comments to Y. Kerr	SAG	15/1	open
8.4	GS	To provide inputs for a possible study on the GS processing scheme to A. Hahne	YK/Ph W	15/2	pending
8.5	Cal/Val	To provide A. Hahne with names and coordinates of potential experts of a subgroup reviewing the error budget	SAG	1/5	Re-issued
8.6	Cal/Val	To draft a calibration scheme and a validation plan	YK	31/3	pending
8.10	Campaigns	To further discuss science objectives of a possible Greenland campaign with cryosphere experts	NS	31/3	open
8.13	Science Report	To submit for draft of the Science Report to M. Berger	SAG	31/5	open
8.14	Promotion	To put the SAG minutes and TNs on the CESBIO SMOS web pages	YK	1/4	open
8.15	Promotion	To distribute various SMOS logos used to the SAG	MB	1/4	open
9.1	Camp. Doc	To provide N.S with a summary of all campaign activities performed so far	PW/M B	15/5	
9.2	Cryosphere	To ask his colleague to review MRD text on cryosphere and to discuss/outline requirements with the community	NS	1/5	
9.3	Studies	To draft requirements for an assimilation study	PV	1/5	
9.4	SEPS	To provide inputs for improvements to AH	SAG	1/5	
9.5	Portugal	To provide coordinates of potential institutes in Portugal	PV	1/5	
9.6	Studies	To provide AH with a list of topics of OS studies after the final review of the OS req. study	NF/HR	3/5	
9.7	Studies	To draft scientific work which should be performed for an image reconstruction/ SEPS validation study	MB/NS /MP/Y K	15/5	
9.8	Campaigns	To check status of calibration data for the Avignon experiment	NS	1/5	
9.9	WS	To inform the SAG about the date and place of the WS on OS requirements and data products	HR	15/5	
9.10	WS	To provide coordinates of assisting personal to organise a WS in Portugal	AH	15/5	
9.11	WS	To discuss different options for the WISE/EuroSTARRS WS with the campaign unit	MB/P W	1/5	
9.12	Portugal	To provide list of participants of the Portuguese Altimeter WS to YK and MB	JB	1/5	

9th SMOS SAG Meeting**16th / 17th April 2002****ESA-ESTEC, Fresnel-1 (16th) & Fr413 (17th), starting 16th April, 09:00**

1. Welcome and Introduction - Objectives of the meeting
2. Approval of draft agenda
3. Actions from the last meeting
4. SAG membership / Terms of reference
5. Phase-B activities
 - Industrial Phase-B activities
 - MDPP + LICEF validation tests (Test 3B)
 - HUT-2D
 - Scientific support requirements (image reconstruction, SEPS validation)
 - Involvement of Portugal
6. Update on campaign activities:
 - EuroSTARRS, WISE, LOSAC
 - Toulouse, Avignon
 - Others (DOME-C)
7. Status reports of ESA support studies:
 - Soil Moisture Requirement Study
 - Soil Moisture Retrieval Study
 - Salinity Requirement Study
 - Salinity Data Processing Study
8. Science Report
9. AOB
 - 4th SMOS WS
 - Faraday rotation – summary by N. Skou
 - Assessment of noise sources for salinity retrievals – N. Floury
10. Date and place of next meeting

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