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

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from M. Berger (EOP-FSL)

Telephone: +31 71 565
Fax: +31 71 565 5675
e-mail:
Michael.Berger@esa.int

to Members of the SMOS Science Advisory Group (distribution list attached)

Dr. P. Waldteufel, ISPL, F Fax: (33) 1 3925 4822

Dr. G. Lagerloef
Earth and Space Research, Seattle, WA, USA Fax: (1) 206 726 0524

Dr. D. Le Vine,
NASA GSFC, Greenbelt, MD, USA Fax: (1) 301 614 5558

Dr. T.J. Jackson
USDA ARS Hydrology Lab, Beltsville, USA Fax: (1) 301 504 8931

c.c.:

| | |
|---|---|
| ESA HQ: | J. Achache (D/EOP) |
| ESRIN: | S. Briggs (EOP-A), W. Lengert (EOP-AM), J. Benveniste (EOP-AEU) |
| ESTEC: | A. Ginati (EOP-F), E.A. Herland (EOP-FS), A. Tobias (EOP-FP), P. Silvestrin (EOP-FPP), M. Rast (EOP-FSL), E. Attema (EOP-FSS), N. Floury (TOS-EEP), M. Borgeaud (TOS-EEP), P. Wursteisen (EOP-FSS), M. Martin-Neira (TOS-ETP), P. Baptista (TOS-EEP), H. Rebhan (EOP-FSO), A. Hahne (EOP-PN), M. Drinkwater (EOP-FSO), S. Ribo (TOS-ETP), R. Bock (EOP-PN), A. Schoenenberg (EOP-FPP) |

Subject: **Minutes of the 8th SMOS SAG Meeting held at DLR, Oberpfaffenhofen, Germany, 13 & 14 December 2001**

Dear Colleague,

Enclosed you will find the minutes of the eighth SMOS SAG meeting held at DLR, Oberpfaffenhofen, Germany, 13 and 14 December 2001.

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, **16-17 April 2002**. This meeting will be organised back-to-back with the final presentation of the ocean salinity requirement study scheduled for 18 April followed by small workshop on OS requirements and OS SMOS data products. Invitations will be sent to you in due time.

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**

**EIGHTH**

**SOIL MOISTURE AND OCEAN SALINITY (SMOS) MISSION SCIENCE ADVISORY GROUP MEETING**

**13 & 14 December 2001**

**DLR, Oberpfaffenhofen, Germany**

| | |
|---|---|
| Participants: | Y. Kerr, J. Font, M. Peichl, N. Skou, G. Lagerloef (part time), D. LeVine, T. Jackson (part time), P. Waldteufel (part time) |
| Excused: | M. Hallikainen, P. Ferrazzoli, P. Viterbo |
| Guests: | M. Greiner |
| ESA: | A. Hahne (part time), A. Schoenenberg, J. Benveniste, H. Rebhan, M. Berger |

## *1. Welcome and Introduction – Objectives of the Meeting*

M. Berger welcomed the SMOS SAG members to their 8th meeting and thanked DLR for hosting it.

M. Hallikainen, P. Ferrazzoli and P. Viterbo were excused.

A. Schoenenberg from ESTEC who will be managing the industrial bridging phase study introduced himself to the SAG.

The objective of the meeting was:

- to discuss the outcome and findings of the 3rd SMOS Workshop.

The meeting was organised back-to-back with the 3rd SMOS Workshop.

## *2. Approval of Draft Agenda*

M. Berger introduced the agenda. The agenda was adapted to the availability of participants. Not all members could attend the full meeting because of flight schedules.

It was agreed to skip agenda items on the MDPP and HUT-2D since M. Hallikainen and M. Martin-Neira were not available for this meeting.

Further it was agreed to focus discussions under agenda item 4, 8 and 9, on issues not presented at the workshop. The status of the programme and on-going study and campaign activities were presented and intensively discussed during the workshop.

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 |
| 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 | closed |
| 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 | obsolete |
| 6.6 | SMOS WS | To encourage key scientists of the cryosphere community to attend the WS | MD | 31/8 | obsolete |

| | | | | | |
|---|---|---|---|---|---|
| 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 | closed |
| 7.2 | Camp. Doc. | To provide NS information on planned US campaigns | GL/TJ | 15/11 | closed |
| 7.3 | Faraday | To provide NF contact point of UK expert on Antarctic short term szintillisation | MD | 15/11 | closed |
| 7.4 | SMOS WS | To distribute SMOS WS information to the cryosphere community | MD | a.s.a.p. | closed |
| 7.5 | Simulator | To obtain more SSS simulations from OS req. study team | HR | 15/11 | open |
| 7.6 | Phase-A review | To distribute summary of Phase-A activities written by YK and PhW | MB | 31/10 | closed |
| 7.7 | Data products | To draft definition of data products for further discussions | YK | 3/12 | closed |
| 7.8 | Cal/Val | To draft cal/val definitions for further discussions | MMN | 31/10 | pending |
| | | | | | |

Remarks:

**Action 6.2:** D. LeVine and G. Lagerloef will provide data/documents on RFI detected during various US experiments.

**Action 6.10:** The results of the OS requirement study will be used to update the MRD. It is planned to combine a small workshop with the final presentation of this study to further discuss the requirements with the community.

**Action 6.11:** Intensive discussions on data requirements and the processing procedure took place. Y. Kerr agreed to provide a clarification note to A. Hahne, including inputs for a possible upcoming study addressing requirements for the ground segment.

**Action 7.7:** A draft document was circulated by. Y. Kerr. The SAG agreed to provide comments on this document by mid January.

**Action 7.8:** M. Martin-Neira circulated cal/val definitions to the SAG. Since he was not available for this meeting the discussion on the definition was shifted to the next SAG meeting.

## *4. Status of the Project and Next Steps*

***Phase-A Review (PRR, ESAC) and PB-EO decision:***

Various presentations outlining the PRR, the ESAC assessment and the PB-EO decision were given.

ESAC recommended SMOS for full implementation at its meeting in Granada. The following critical issues were emphasised in the assessment report:

- Full proof-of-concept (image reconstruction accounting for calibration)

- Development of adequate soil moisture retrievals accounting for pixel size, shape and orientation and effects such as topography and mixed pixels
- Use of the full polarimetric capability for ocean salinity retrievals
- Use of SMOS data for data assimilation
- Definition of deliverables
- Cryosheric studies should be initiated.

Some of the issues are already followed by on-going activities. More emphasis is required to define an adequate calibration/validation concept and SMOS deliverables, and for studies on the cryosphere.

At the November meeting of the PB-EO the decision for the SMOS implementation was postponed to the next PB-EO meeting which will take place end of January. The reason was mainly due to the unclear financial situation.

***SEPA and SEPS:***

A. Schoenenberg summarised the PRR. He informed the SAG that updated documents could be downloaded from the PRR ftp server.

He further informed the SAG about a continuation of the SEPA study, which is called COSEPA. COSEPA will bridge SMOS Phase-A and Phase-B industrial activities. Kick-off is planned for beginning 2002. The study will last for 8 months with a progress meeting foreseen every two months. In particular the study will concentrate on:

- Further system performance evaluation
- Performance simulation work
- System and subsystem definition
- Consolidation of interfaces with the PROTEUS platform.

An updated SRD is expected at the end of this study.

In addition, the procedure for the acceptance test for SEPS was discussed. In the discussion it was emphasised that training on the simulator would be very helpful. M. Berger agreed to find out possibilities to organise such training at ESTEC. A. Schoenenberg agreed to distribute the foreseen acceptance test plan to the SAG.

## *5. Summary of the Soil Moisture SAG Review*

M. Berger summarised the findings of the soil moisture review of the previous SAG meeting. Most critical items identified are:

- Signal dependence (polarisation and view angle) on vegetation characteristics (type, optical thickness)
- Surface heterogeneity/mixed pixels (land cover, urban, open water)
- Topographic effects
- Soil freezing
- Physical temperature

- Dew/litter
- Assimilation.

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

The freeze/thaw condition was briefly discussed. It was noted that this issue would be followed closer with HUT-2D available.

## *6. Discussion on Ground Segment and Data Products*

Intensive discussions on the ground segment design and the data products took place. It is still unclear how level-1b data should look like (e.g. antenna frame or ground projected Tb maps). It was also indicated that the visibility functions together with auxiliary calibration information should be achieved as the last reversible data product. The SAG was asked to carefully review the SMOS processing scheme drafted by Y. Kerr. A. Hahne noted that a study would be required to size more precisely the figures needed to design the ground segment. Y. Kerr and Ph. Waldteufel agreed to provide inputs for the statement of work.

## *7. Cal/Val Issues*

A. Hahne introduced the idea to establish a SAG subgroup comprising SAG and external experts to review the instrument error budget as provided by the industry. The SAG welcomed this. It is planned that this group meets on an ad-hoc basis. SAG members were asked to provide names and coordinates of potential members to A. Hahne.

In the discussion the SAG noted that calibration performed at instrument level and at ground level should be kept separate. Y. Kerr agreed to draft a note on a possible calibration scheme including a validation plan for further discussions. A list of definitions used in this document will be attached. G. Lagerloef agreed to assist on this.

Further, the SAG strongly recommends not following the idea of using active sources on ground for calibrating SMOS because of the protected band and the implications as discussed in previous meetings.

The Faraday effect was also discussed. D. LeVine agreed to provide information on statistics on correlations of TOPEX/POSEIDON measurements and TEC models as a function of latitude. N. Skou reported on an update of his Faraday correction method. He is currently preparing a paper which he will provide to Y. Kerr. At the time writing the minutes the paper is already available on the CESBIO SMOS web pages.

## *8. Campaigns – Future Requirements*

*EuroSTARRS 2002:*
The US STARRS instrument will be in Europe also in 2002. This would enable the SMOS community to buy some extra flight hours for a follow-on of the EuroSTARRS campaign. In

the discussion it was agreed to first await the outcome of the data review meeting of the previous campaign. This meeting is scheduled for end of March.

*DOME-C:*
The candidature of DOME-C, Antarctica, as a suitable external calibration/validation site for SMOS is still under consideration. N. Floury and M. Drinkwater are preparing an IGARSS paper containing preliminary results which compare historical V and H polarised SMMR and SSM/I observations (at 6.8, 10, 19, 37 GHz) with forward model results.

Dome-C simulation results have recently been augmented with the addition of errors caused by Faraday rotation (using typical measured values of diurnal TEC variability from EISCAT radar data at a similar latitude of 70 deg. N). Results indicate that the Global Magnetic Field index, Ap, can also be used as a predictor of the quiescent auroral activity which causes additional effects superimposed upon the diurnal TEC cycle at high latitudes. Errors due to hourly variability in the Faraday rotation angle, particularly during vigorous, high frequency fluctuations from auroral precipitation events, can still amount to 0.5 K - and thus auroral activity needs to be considered in addition to simply TEC. Notwithstanding this conclusion, the errors due to Faraday angle are negligible during quiescent periods, particularly during the high latitude winter, thereby allowing assessment of the stability of the radiometer.

The principal problem which remains is that there are no L-band radiometric data with which to currently characterise the response of Dome-C. An in-situ radiometer campaign could be envisaged, in which summer station measurements are used to characterise the spatio-temporal stability of the target. A DORIS beacon may also be situated at Dome-C by the French, thus allowing characterisation of TEC on timescales corresponding to overpasses of polar orbiting satellites during the period leading up to SMOS launch. In the near-term, data from the base Dumont D'Urville, the French Antarctic base (-66° 40' 140° 00'), should be acquired and investigated. Further, since the seasonal variation in L-band emission is driven by surface temperature forcing, another proposal is to implant a thermistor string for logging near-surface firn temperatures during the SMOS mission.

*Dielectric constant measurement:*
The US colleagues reported on the status of the dielectric constant measurement at L-band. The cavity has been built and the measurement design is ready. Measurements are expected to be performed soon.

*Foam experiment:*
M. Berger and J. Font reported on A. Camps' plan to set-up a foam experiment measuring the brightness temperature at L-band under controlled conditions. It was noted that a similar experiment is planned in the US but that the financing is still unclear. In the discussion it was emphasised that such an experiment would be very useful but that the US decision should be awaited first.

*SMEX:*
T. Jackson reported on the US campaign SMEX which was established for AMSR on AQUA validation. A European contribution, flying the HUT-2D would be appreciated for the SMEX campaign foreseen in 2003. Collaboration for the 2002 campaign is welcomed, too. M. Berger agreed to check with the campaign unit at ESTEC possible ESA support for European ground teams.

*Greenland – Sea Ice:*
N. Skou reported on the idea to conduct a campaign in Greenland to measure sea ice at L-band. A possible date would be spring 2003. The SAG welcomed the idea but clear science objectives need to be defined. N. Skou will further discuss the idea with M. Hallikainen and other experts on the cryosphere. D. LeVine agreed to contact D. Cavalieri to find out about his activities in Greenland.

N. Skou also reported on the possibility to mount EMIRAD together with the HUT-2D on the SkyVan aircraft. The SAG considers this an excellent idea to acquire collocated measurements.

## *9. Support Studies – Future Requirements*

In the discussion about future study requirements a study on image reconstruction combined with a validation of the simulator is recommended. N. Skou and M. Peichl agreed to provide M. Berger with inputs for the statement of work.

M. Peichl initiated a discussion about the use of the ful-pol mode and the decaying signal at the edge of the swath. The SNR in this region might be so low that high resolution data is of no use. Different apodisation windows might be required. It was agreed this needs to be followed with HUT-2D available.

Further study requirements will be discussed after the workshop report is available at the next SAG meeting.

## *10. AOB*

*SMOS Science Report:*
The deadline for the first draft could not be met due to other commitments. It was therefore agreed to postpone the deadline to the beginning of March. The book captain should provide their writing teams with templates. J. Benveniste further indicated that examples of science reports could be downloaded from the Envisat web pages.

*4th SMOS Workshop:*
The SAG provided feedback about the workshop to Y. Kerr. Ideas on improvements were discussed. The workshop was judged as very useful. Many fruitful discussions evolved. Keynotes at the splinters are considered worthwhile to initiate the discussions. For the next workshop it was recommended that no progress meetings should be organised during the workshop distracting participants. If at all, additional meetings should be organised back-to-back to the workshop. Further, larger time slots should be provided to the presentations. This could be achieved by prolonging the first day to a full workshop day already starting in the morning. An option would be also to organise the SAG meeting as a one day meeting before the workshop, covering general SAG business and one day following the workshop, for detailed discussions on the outcome of the workshop. In the discussion it was further indicated that Denmark would be an option as the venue place for the 4th SMOS workshop.

*SMOS logo and web page:*
M. Berger invited the SAG members to visit the ESA SMOS web page and to provide feedback for improvements. Direct link to the CESBIO SMOS web pages are present. Y. Kerr reported that he would put the SAG minutes and technical notes on the CESBIO SMOS web pages. J. Benveniste reported on a free service at ESRIN to re-format text and images. This might be useful for uploading documents to the web pages.

Different logos are being used in the community. It was emphasised that a common logo should be agreed on. M. Berger would distribute various logos used to the SAG for further discussions.

*Synergisms with Aquarius and Hydros:*
It was reported that an information note outlining possible synergisms with Aquarius and Hydros was prepared for the PB-EO.

Under AOB J. Benveniste also presented DEMs generated from altimeter data.

## *11. Date and Place of the Next Meeting*

It was agreed to organise the next SAG meeting consecutive to the final presentation of the OS requirement study. M. Berger will provide dates in January.

At the time writing the minutes the next SMOS SAG meeting has been scheduled for the **16 and 17 April at ESTEC.** It will be followed by the final presentation of the OS requirement study scheduled for 18 April.

## *12. Summary and Conclusion*

M. Berger thanked the SAG for the fruitful discussions and DLR for hosting the workshop and SAG meeting.

### *List of Recommendations:*

**R8.1:** The SAG strongly recommends not following the idea of using active sources on ground for calibrating SMOS.

### *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 |
| 6.2 | ITU issues | To provide documents related to RFI | GL | 31/8 | 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 | 24/9 | open |
| 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 | pending |
| | | | | | |
| 8.1 | SEPS | To find out possibilities to organise a SEPS training at ESTEC | MB | 31/1 | |
| 8.2 | SEPS | To distribute the SEPS acceptance test plan to the SAG | AS | 31/1 | done |
| 8.3 | GS | To review the GS processing scheme drafted by Y. Kerr and to provide comments to Y. Kerr | SAG | 15/1 | |
| 8.4 | GS | To provide inputs for a possible study on the GS processing scheme to A. Hahne | YK/PhW | 15/2 | |
| 8.5 | Cal/Val | To provide A. Hahne with names and coordinate of potential experts of a subgroup reviewing the error budget | SAG | 15/2 | |
| 8.6 | Cal/Val | To draft a calibration scheme and a validation plan | YK | 31/3 | |
| 8.7 | Faraday | To provide correlation statistics on TOPEX observations and TEC models | DLV | 15/2 | |
| 8.8 | Faraday | To provide Y. Kerr with a copy of the updated Faraday correction method | NS | 15/2 | done |
| 8.9 | Campaigns | To check ESA support for European scientists participating in the SMEX campaign | MB | 15/2 | done |
| 8.10 | Campaigns | To further discuss science objectives of a possible Greenland campaign with cryosphere experts | NS | 31/3 | |
| 8.11 | Campaigns | To contact. D. Cavalieri for his plans in Greenland | DLV | 31/3 | |
| 8.12 | Studies | To provide M. Berger with inputs for a possible image reconstruction study | MP/NS | 28/2 | |
| 8.13 | Science Report | To submit for draft of the Science Report to M. Berger | SAG | 1/3 | |
| 8.14 | Promotion | To put the SAG minutes and TNs on the CESBIO SMOS web pages | YK | 1/4 | |
| 8.15 | Promotion | To distribute various SMOS logos used to the SAG | MB | 1/4 | |
| 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 | done |

# 8th SMOS SAG Meeting

# 13-14 December 2001

# DLR, Oberpfaffenhofen, Germany

## *Agenda*

1. Welcome and Introduction - Objectives of the meeting
2. Approval of draft agenda
3. Actions from the last meeting
4. Status of the project and next steps
   - Phase-A Review (PRR, ESAC) and PB-EO decision
   - SEPA and SEPS
5. Summary of the SM SAG review
6. Discussion on ground segment and data products
7. Cal/Val issues
8. Campaigns - future requirements
9. Support studies – future requirements
10. AOB
    - SMOS Science Report
    - 4th SMOS WS
    - SMOS logo and web page
    - Synergisms with Aquarius and Hydros
11. Date and place of next meeting

# Members of the SMOS Science Advisory Group

| Name | Company/Department | Fax |
|---|---|---|
| Ferrazzoli, Paolo Dr. | Universita' Tor Vergata, Dipartmento di Informatica, Sistemi e Produzione, Facolta di Ingegneria | (39) 06 7259 7460 |
| Font, Jordi Dr. | Institut de Ciències del Mar CMIMA-CSIC, Physical Oceanography Group | (34) 93 230 95 55 |
| Hallikainen, Martti Prof. | Helsinki University of Technology, Laboratory of Space Technology | (358) 9 451 2898 |
| Kerr, Yann Dr. | CESBIO | (33) 5 61 558500 |
| Peichl, Markus Dr. | DLR, Institute of Radio Frequency Technology | (49) 8153 281135 |
| Skou, Niels Mr. | Technical University of Denmark, Department of Electromagnetic Systems | (45) 45 931634 |
| Viterbo, Pedro Dr. | ECMWF | (44) 118 9869 450 |