

MISSION EXPERTS DIVISION (EOP-SM)
DIRECTORATE OF EARTH OBSERVATION PROGRAMMES

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Subject: Minutes of the 15th SMOS SAG Meeting held at ESA-ESTEC, Noordwijk, The Netherlands, 1 & 2 July 2004		

Dear Colleague,

Enclosed you will find the minutes of the fifteenth SMOS SAG meeting held at ESA-ESTEC, Noordwijk, The Netherlands, 1 and 2 July 2004. Please note that this document will also be available in PDF format for downloading on the SMOS SAG ftp server containing the presentation viewgraphs used during the meeting.

The next SAG meeting will take place 2 & 3 December at ESRIN, Frascati, Italy, combined with the 5th SMOS Workshop. The main objectives of our next meeting are to re-cap on the findings of the workshop and to discuss soil moisture and ocean salinity assimilation schemes. Experts on these topics are invited to prepare presentations to stimulate the discussions. In case you would like to give a presentation or in case you have additional topics please let me know in time.

Yours sincerely,

Dr. M. Berger
Land/Surfaces Unit
Mission Experts Division

MINUTES OF THE
FIFTEENTH
SOIL MOISTURE AND OCEAN SALINITY (SMOS) MISSION
SCIENCE ADVISORY GROUP MEETING
1 & 2 July 2004
ESA ESTEC, Noordwijk, The Netherlands

Participants

- SAG: Y. Kerr (YK), J. Font (JF), P. Waldteufel (PhW), M. Peichl (MP), N. Skou (NS), E. Anterrieu (ErA), W. Wagner (WW), I. Corbella (IC), N. Reul (NR), C. Mätzler (CM), J. Grandell (JG)
- Excused: T. Jackson (TJ), A. van de Griend (AvdG), M. Drusch (MDr), P.Y. LeTraon (PYT), B. van den Hurk (BvdH)
- ESA: A. Hahne (AH) (part time), E. Attema (EA) (part time), Patrick Wursteisen (PW) (part time), B. Duesmann (BD) (part time), M. Zundo (MZ) (part time), M. Suess (MS), S. Delwart (SD), J.-P. Huot (JH) (part time), N. Wright (NW), J. Benveniste (JB) (part time), M. Martin-Neira (MMN), M. Drinkwater (MD) (part time), H. Rebhan (HR) (part time), E. Dinnat (ED) (part time), M. Rijkeboer (AMR) (part time), N. Floury (NF) (part time), M. Berger (MB)

List of Recommendations:

No :	Description/description
R15.1	<i>The SAG recognizes the importance of the ERS-SCATT data continuation in order to study seasonal trends in the water cycle. A continuation and seamless data provision is considered important for climate change studies. Furthermore it was noted that an overlap of ERS- and METOP-SCATT observations would support the product accuracy assessment and thus allowing improving retrieval schemes accounting for differences in system characteristics of ERS-SCATT and METOP-SCATT.</i>
R15.2	<i>The SAG recommends to keep strip-adaptive and non-strip-adaptive processing (L1b -> L1C) for further assessment. In case both options are not feasible then non-strip-adaptive processing is being preferred.</i>

List of Actions:

description/description	action/action	due date/date butoir
To organise a CoSMOS exp. meeting – timeframe autumn 2004	15.1: PW	Sept / Oct
To comment on the SMOS User Model as distributed by AH	15.2: SAG	9 July
To provide test data to be transformed to the ISEA/Snyder grid / To send the transformed data to the SAG for further analysis	15.3: NR/MZ	15 July
To analyse the test data and to report to ESA	15.4: SAG	15 Sept
To analyse impact of 30 deg beamwidth for CoSMOS	15.5: YK/PhW	30 Aug
To provide feedback on the sun-correction processing scheme	15.6: SAG	30 Sept
To provide information on the FIN SM measurement network	15.7: JG	1 Aug
To provide point of contacts in Africa for the SMOS validation	15.8: JG	1 Aug
To provide information on the NILU database to the SAG	15.9: PW	30 Aug
To provide the contact points of key scientists responsible for major measurements networks (to be added to the SMOS WS distribution list)	15.10: WW	1 Aug

1. Welcome and Introduction – Objectives of the Meeting – Approval of Draft Agenda

MB, YK and JF welcomed the SAG to their 15th meeting.

Objectives of the meeting were:

- to report on the PDR findings,
- to discuss the strip-adaptive processing and to have a second thought on the SMOS grid,
- to discuss requirements for consolidating the SMOS cal/val plan,
- to prepare for the SMOS workshop, and
- to update the group with the status of the CoSMOS campaign.

The draft agenda was agreed with minor timetable modifications accounting for the availability of participants involved in ‘side-meetings’. The agenda is attached below.

2. Actions from the Last Meeting

Actions from the last meeting were reviewed and their status updated:

<i>description/description</i>	<i>action/action</i>	<i>due date/date butoir</i>
Provide a download link to most relevant SMOS publications on the ESA SMOS web pages	14.1: HR, MB	1.6
Resend SMOS logo to new SAG members	14.2: MB	1.5
To send the mini-WS report to the SAG	14.3: MB	1.5
To provide SMEX'04 web address to download the experimenters plan	14.4: TJ/DLV	1.5
To present ESA's data policy at the Aquarius/Hydros/SMOS science team meeting end of April	14.5: HR	1.5
To provide the CryoSat cal/val AO as an example	14.6: MD, JB	1.5
To distribute HUT 2D poster as presented at the microRad Meeting in Rome	14.7: MMN	1.5

Remarks:

- Action 14.1:** A list was compiled and will be published with the updated SMOS web page.
Action 14.4: DLV will provide the link to the SAG.
Action 14.6: MD sent the example during the meeting.
Action 14.7: The poster is available for downloading on the SAG ftp site.

3. Project Status – PDR-M, GS Prep. Activities, MDPP, and HUT-2D

AH reported on the status of the project, the outcome of the PDR on mission level (PDR-M), ground segment prep. activities, and technical support activities.

The payload Phase C/D contract was officially signed in June. The implementation agreement with CNES was endorsed by ESA Council.

The ground segment discussion with CDTI is still stalled which is of high concern and considered critical. However, negotiations with industry for a development approach compliant with ESA needs in terms of development schedule, operations cost, etc. have started together with internal preparations for issuing ITTs for the development of the level-2 processor prototypes.

At the PDR-M no new issues were discovered. In order to define the ground segment requirements it was recommended to develop a SMOS User Model which categorises the user community in different groups with different requirements. AH presented a first draft to the SAG for further comments (**AI: 15.2**).

The mass budget of the payload provides insufficient margin and is still of high concern. Various options to reduce mass are being studied.

HUT-2D is now in the manufacturing phase. It is expected that the instrument is ready for first test flights this autumn.

MDPP-3 with the objective to integrate the MIRAS Demonstrator Hardware into an airborne demonstrator with one NIR and 4 LICEFS on three arms will have its CDR next week.

4. Strip-adaptive Processing

MS and ErA presented the analysis of the strip-adaptive processing performed by DEIMOS and ErA. The analysis shows that windows exist which fulfil the spatial (50 km resolution) and radiometric (main beam efficiency comparable with Blackman window) requirements.

Following the presentation a detailed discussion outlining pros and cons of strip-adaptive and non-strip adaptive processing took place. Issues like spatial degradation and interpolation errors were discussed vis-à-vis level-2 processing issues, direct assimilation of brightness temperatures, etc. Finally it was concluded that, with the knowledge at hand, none of the two options could be recommended as a baseline processing. Considering that it is likely easier to implement strip-adaptive processing at a later stage while it seems unfeasible to go back to non-strip-adaptive processing at a later stage the following SAG recommendation was made:

R15.2: *The SAG recommends to keep strip-adaptive and non-strip-adaptive processing (L1b -> L1C) for further assessment. In case both options are not feasible then non-strip-adaptive processing is being preferred.*

5. Second Thoughts on Level-2 Sampling Grid

MZ presented the final grid recommendation made by DEIMOS. The ISEA/Snyder grid with 15 km resolution is recommended. It was emphasised that this grid would be the basic storage grid of SMOS data and a toolbox which allows the transformation to common used grid could be provided to the user community. In this context interpolation issues and the associated errors were discussed. The

SAG asked for a test data set for further analysis. NR will provide MZ with test data for transformation and distribution to the SAG (AI: 15.3 / 15.4).

6. Needs to Consolidate the Cal/Val Plan

MB informed the group that a study to consolidate the SMOS validation plan is planned for the second half of this year. In order to address open issues for the validation a discussion, splitting OS validation issues from SM issues, was stimulated. In the discussion it was recommended to consult the GPM validation plan and to coordinate as closely as possible with this community. JG will provide contact points of African and Finnish measurement networks (AI: 15.7 / 15.8). It was also noted that a validation database with links to other existing databases would be very helpful. For this the NILU database, established for the Envisat validation, could be suitable. PW agreed to provide details on the NILU database to the SAG (AI: 15.9). The structure of the SMOS validation database and its integration into the Envisat database could be part of the planned validation study. It was also noted that key-scientists of measurement networks suitable for the SMOS validation should be invited to the forthcoming SMOS workshop. WW will provide contact points (AI: 15.10).

7. Studies & Campaigns:

The status of the various study and campaign activities was given by the technical officers/study managers.

DOMEX:

MD reported on the status of the DOMEX preparations. Recently the Concordia Steering Committee approved the logistical support. In addition, the Italian Antarctic Programme conformed the field personnel and additional field equipment. The radiometer is currently being calibrated. A thermal test and absolute calibration is planned for July. It is being expected that the instrument will be ready for shipping by November.

CoSMOS:

NS presented his analysis of the CoSMOS airborne instrumentation and aircraft options. A refurbished EMIRAD instrument is recommended. Two horn antennae, one looking nadir and the other one 40 degrees off nadir, were proposed. A 3 dB beamwidth of 30 degrees would be compatible with available holes in aircrafts. The scatterometer option was assessed too. However, the time constraint for development of a scatterometer in parallel to the refurbishment of EMIRAD was emphasised. Considering technical aspects and availability the Do-228 aircraft operated by DLR and the CV580 aircraft, operated by Environment Canada, were recommended. The option to split CoSMOS into an OS and SM campaign was noted. In the discussion it was emphasised that a detailed assessment of the beamwidth is still outstanding. A trade-off analysis of the beamwidth, incidence angles provided vis-à-vis radiometric accuracy/ stability need to be assessed. Furthermore, it was emphasised that a scatterometer, not necessarily at L-band but e.g. C-band or if available at multi-frequency would be an asset in particular for the OS campaign in order to study sea state correction schemes. Furthermore, cost implication on splitting the campaign into two parts needs to be assessed.

Based on the assessment and the discussion, AH made the following recommendations:

- Assess financial impact of splitting CoSMOS into two campaigns: CoSMOS-1 and CoSMOS-2 dedicated respectively to SM and OS measurements;
- Re-focus mission requirements;
- YK/PW to assess impact of 30 deg beam-width – if ok implement;
- NS to proceed with Radiometer only but keep space/features for retrofit of scatt option;
- Go to spring 2005;

- Go for CV580 (well suited for land, and reasonable priced);
- Ensure availability;
- Make installation according at TUD a requirement;
- Request option for 2nd campaign;
- ESA to gather schedule for HUT and MDPP3;
- Plan CoSMOS-2 for autumn 2005;
- Options:
 - HUT-2D / HUT
 - MDPP2 / HUT
 - EMIRAD + SCATT / CV580;
- Team-up with NASA.

IR Study:

ErA reported on the status of the Image Reconstruction Study which had a progress meeting in June. First assessment of the two new G-Matrix based image reconstruction methods were presented. Of concern is still the integration into SEPS and the computing time needed. The new version of SEPS (SEPS-light) which is much faster in speed (it uses an FFT instead of integration assuming that all receivers behave similar) is obviously not suited to assess different image reconstruction techniques. Other options to solve the problem are currently being assessed.

CCN SM Retrieval Study – OS Retrieval:

The Salinity Retrieval Study (CCN to Soil Moisture Study) will extend the SMOS retrieval simulator software with modules for salinity retrieval algorithm. The team presented the retrieval concept for selection of different model and regression approaches at the first progress meeting however, the arguments will need some closer analysis and discussion within their documentation. The team prefers an iterative fitting scheme as baseline for the further algorithm implementation.

OS Synergy Study:

The Synergy and Auxiliary Data Concepts Study provided a first analysis of the requirements of SST and sea state parameters for different retrieval schemes. Most of this analysis was performed with the new version of SEPS which will be further exploited for this study.

SM Synergy Study:

MB reported on the status of SM Synergy study, which was planned to be kicked-off in the first half of this year. Due to ESA internal problems the release of the ITT is on-hold. It is being expected that the study could be released within the next few weeks.

8. AOB:*ERS-SCATT Continuation:*

EA reported on the problems of the ERS-SCATT continuation on behalf of the ERS Mission Manager, W. Lengert. Scientific issues such as the need to assess seasonal trends in the water cycle and also the overlap of ERS-SCATT and METOP-SCATT (different characteristics, cross-calibration, model parameterisation) were discussed. Following the discussion the SAG made the following recommendation:

R15.1: *The SAG recognizes the importance of the ERS-SCATT data continuation in order to study seasonal trends in the water cycle. A continuation and seamless data provision is considered important for climate change studies. Furthermore it was noted that an overlap of ERS- and METOP-SCATT observations would support the product accuracy assessment and thus allowing improving retrieval schemes accounting for differences in system characteristics of ERS-SCATT and METOP-SCATT.*

Air-to-Soil Transition Model for L-Band:

CM presented a study on small scale roughness (sub-wavelength range) effects at L-band and a possible correction based one-dimensional wave propagation model treating the soil surface as a transition layer with a certain thickness (dielectric constant increases with depth due to the fractional increase of the soil composition with depth). First model validation using data acquired with the ELBARA instrument looks promising and further validation exercises are planned.

Sun in NIR:

NS presented his assessment of the Sun effect in the NIR. MZ outlined different correction scenarios. The presentations were followed by a detailed discussion. Of main concern is the Sun within the alias-free field of view due to the Gibbs phenomena. The sun glint effect on the retrieval is currently being assessed by NR. The reflected Sun due to the Gibbs phenomena could be corrected by using a self-correction scheme performing an image reconstruction twice, one time without accounting for the Sun, measuring the reflected Sun, followed by an image reconstruction which accounts for the measured Sun. The impact on the polarisation (the reflected Sun is polarised and the polarisation depends on the sea state) remains open. As a first guess a mean global wind field could be used for accounting for the sea state condition. Furthermore, the temporal variability of solar activities (bursts, flares) is unknown. Data from institutes which monitor the Sun at L-band are needed for further analysis. The SAG was asked to comment on the corrections scheme (an updated document was distributed to the SAG by MZ) **(AI: 15.6)**.

Summary of the Miami Workshop / Status of follow-on Activities:

DLV reported on the Miami Workshop. A report written by G. Lagerloef et al. was made available to the SAG. In summary the workshop was considered useful bringing together for the first time the science teams of Aquarius, SMOS and HYDROS. However, it was also noted that the huge number of participants did not allow detailed discussions and a more 'symposium-like-style' had to be followed. It was recommended that it would be useful to organise similar events about once per year.

5th SMOS Workshop:

The setting and framework of the 5th SMOS Workshop was discussed. Some SAG members noted that the workshop possibly should be opened to a wider community. However, in order to be more efficient in discussion open issues a smaller group (max size of 100 participants) is being preferred. The 'wider community' will get involved when the AO for cal/val is being released (planned for 2005). JB showed the WS web page, which will allow also on-line registration, to the SAG.

SMOS Brochure:

MB reported that the SMOS brochure has been completed and currently is being printed. Right after the meeting the prints were made available and have been sent by mail to SAG members.

9. Date & Place of Next Meeting

It was agreed to combine the 16th SMOS SAG meeting with the forthcoming SMOS WS. The SAG meeting will take place 2 & 3 December at ESRIN, Frascati, Italy. Furthermore, it was noted that the tentative date for the 17th meeting is likely too close to the previous meeting. MB will review the meeting dates of forthcoming meetings and look for an appropriate date in the timeframe March/April.

10. Summary and Conclusion

MB and YK thanked the SAG for the participation. It was agreed to discuss assimilation issues at the next meeting. SAG members with expertise in the field are invited to prepare presentations in order to stimulate the discussions.

15th SMOS SAG Meeting**1-2 July 2004****ESA-ESTEC, Noordwijk, The Netherlands****starting 1 July at 09:00, Newton-2****Agenda**

1. Welcome and Introduction – objectives of the meeting - approval of draft agenda
2. Actions from the last meeting
3. Project status – PDR-M, GS prep. activities, MDPP, and HUT-2D (A. Hahne)
4. Strip-adaptive processing (M. Suess)
5. Second thoughts on the level-2 sampling grid (M. Zundo)
6. Needs to consolidate the cal/val plan
7. Studies & Campaigns:
 - CoSMOS status quo and next steps (N. Skou)
 - Dome-C status quo (M. Drinkwater)
 - overview and status of study activities (techn. officers / contractors)
8. AOB
 - ERS SCAT continuation
 - Air-to-Soil Transition Model for L-Band (C. Mätzler)
 - Sun in NIR (N. Skou)
 - Summary of the Miami WS/status of follow-on activities (G. Laegerloef/Y. Kerr)
 - 5th SMOS WS
 - SMOS brochure
9. Date & Place of next meetings:
 - 16th SMOS SAG: **2/3 Dec'04** combined with the 5th SMOS WS at ESRIN
 - 17th SMOS SAG: **19/20 Jan'05**
 - 18th SMOS SAG: **13/14 April'05** combined with the CoSMOS exp. meeting

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