

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

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20 May 2005	EOP-SM/1314/MB-dr	Page 1 of 16
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Subject:	Minutes of the 17th SMOS SAG Meeting held at ESA-ESTEC, Noordwijk, The Netherlands, 5 & 6 April 2005	

Dear Colleague,

Enclosed you will find the minutes of the seventeenth SMOS SAG meeting held at ESA-ESTEC, Noordwijk, The Netherlands, on 5 and 6 April 2005. Please note that this document is also available in PDF format including the viewgraphs used during the meeting for downloading on the SMOS SAG ftp server.

The next SAG meeting is scheduled for 10 & 11 October 2005 at ESTEC with the objectives to review the ATBDs and to discuss the outcome of the Cal/Val AO. Also issues related to ocean assimilation will be presented at this meeting.

In case you have additional topics which you would like to discuss with the group, please inform me in-time.

For the time being I would like to remind you to complete agreed actions in particular actions related to the draft ATBD discussion, the SMOS product definition and the SMOS Science Report.

Yours sincerely,

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

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

5 & 6 April 2005

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), I. Corbella (IC), N. Reul (NR), J. Grandell (JG), T. Jackson (TJ), A. vd. Griend (AvdG), P.Y. LeTraon (PYT) (1st day), D. LeVine (DLV), D. Stammer (DS)
- Excused:** W. Wagner (WW), C. Mätzler (CM), G. Lagerloef (GL), M. Drusch (MDr), B. vd. Hurk (BvdH)
- ESA:** A. Hahne (AH), P. Wursteisen (PW) (part time), M. Zundo (MZ) (part time), S. Delwart (SD) (part time), N. Wright (NW) (part time), J. Benveniste (JB) (part time), H. Rebhan (HR) (part time), R. Crapolicchio (RC) (part time), P. v. Oevelen (PvO) (part time), M. Rast (MR) (part time), M. Drinkwater (MD) (part time), M. Rijkeboer (part time), M. Suess (part time - MS), J. Kainulainen (part time - JK), M. Martin-Neira (MMN), B. Duesmann (part time), M. Berger (MB)
- Guests:** A. Mahmoodi, F. Petitcolin, J. Boutin, S. Zine, JL Vergely, R. Jha, Ph. Richaume (all part time for ATBD presentations/discussions)

List of Recommendations:

No :	Description/description
Note!	<i>Re-phrasing of R14.1 was discussed during the meeting. It was agreed to continue the discussion via email. It may eventually conclude in a new recommendation -> R17.1 which would make R14.1 obsolete</i>

List of Actions:

description/description	action/action	due date/date butoir
to distribute the technical note describing the Flat Target Transformation Technique	17.1: MMN	June
to distribute draft ATBDs/VGs as presented by the L2 prototype team	17.2: MB	10 April
to provide comments on the retrieval concept as presented by the OS L2 prototype team	17.3: NS, DS, PYL, DIV, GL	20 April
to provide comments on the draft ATBDs as presented by the SM L2 prototype team	17.4: TJ, AvG, MDr, JG, WW, BdH, CM	20 April
to review the dielectric constant product as presented by PhW and to provide comments on its usefulness	17.5: SAG	20 April
to check accessibility of NREN and GEANT backbone network	17.6: SAG	Mai
to generate a table summarising the baselines of the different SMOS products and to distribute it together with the detailed product definition document to the SAG	17.7: MB, MZ	15 April
to provide feedback on the Level-1c/Level-2 multiangular Tb product (see also recommendation 14.1)	17.8: SAG	20 April
SMOS Science Report (SSR): to fulfil actions as defined at the 16th SMOS SAG meeting	17.9: all	22 May
to contact the HYDROS team to find out the status of the prep activities for the next joint WS	17.10: YK	August

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

MB, YK and JF welcomed the SAG to their 17th meeting.

Objectives of the meeting were:

- to update the group on the status of the project and the ground segment development,
- to review the draft ATBDs.

The draft agenda was modified and is attached below. It was agreed to postpone the OS assimilation presentation and discussion to the next SAG meeting.

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>
send draft ATBDs to the SAG	16.1: ESLs	April
to provide preliminary results of the IVT-4 to the SAG	16.2: MMN	asap
to clarify Biscay flight pattern and ship tracks – and to optimise flight plan for cosmos	16.3: PW	asap
to assess the time needed for data preprocessing of radiometer and scatterometer data obtained during cosmos	16.4: NS	15 Jan
to distribute the draft SMOS validation document to the SAG	16.5: ESA	31 Jan
to forward SMOS AO schedule to higher management and to seek coordination with NASA program managers	16.6: ESA	28 Feb
to include calib sequence as an agenda point at the next SAG meeting – to discuss F. Cabot's assessment	16.7: MB	31 March
to send IC MTR reports of the IR study	16.8: MB	done
to draft IR chapter	16.9: IG	31 Dec
to provide feedback on chapter 1-4	16.10: YK/JF	31 Dec
to finalise draft of chapter 5	16.11: MB/HR	31 Dec
to distribute SSR content list	16.12: MB	asap
to draft chapter 8	16.13: AH	31 Dec
to draft chapter 9	16.14: NW	31 Dec
to draft chapter 10	16.15 YK/MB	31 Dec

description/description	action/action	due date/date butoir
to check ECMWF wind field spatial resolution as expected by 2007	16.16 MDr	31 Jan

Remarks:

Action 16.7: obsolete

Action 16.11, 16.3, 16.15: SMOS Science Report (SSR) -> see **Action 17.10** -> the SAG was asked again to complete open actions related to the SSR by 22 May at the latest.

3. Project Status, Cal/Val AO and IVT-4

AH updated the group with the status of the project.

The agreement with CDTI is now in place and the contractual implementation with the Spanish industrial consortium is in preparation. Requirements for the VILSPA facility upgrade have been established.

IPC has endorsed the Eurockot launcher procurement. It is expected that the formal contract signature will take place soon.

The overall schedule has been revised taking into account the satellite Phase C/D, launcher and data ground segment issues, resulting in a new proposed launch date (19 September 2007) which still needs to be confirmed by all partners involved.

The functional and EMC testing of an EM model is planned for June 2005. The integration of the structural / thermal model is at full swing and it will be shipped to ESTEC for testing around end of April.

Some subsystems of the FM are already under production. The delivery date for the full tested FM is October 2006.

A satellite preliminary design review is currently on-going. No severe critical issues have been detected up to now.

The Ground Segment Phase-B activities are completed. A RFQ to INDRA for the next phases is in preparation. The proposal evaluation is planned for May this year.

Two contracts for the development of the L2 prototype processor were kicked-off. These activities include the support of ESLs for the generation of the ATBDs.

Further, AH mentioned that the Cal/Val AO was released end of January. Deadline is the 15 of April followed by a science review. Outcome of the AO will be discussed in detail at the forthcoming SAG meeting.

Concerning the airborne instrument development, AH mentioned that the HUT-2D is in the final assembly stage and for MIRAS-A the LICEF vibration test successfully passed the aircraft qualification.

MMN reported on the Image Validation Test 4 (IVT-4) which had the objective to image the cold sky in order to verify the Corbella equation. Several measurement results and check-outs in order to rule out other causes as external interference were presented that showed clearly the experimental confirmation of the equation. The main conclusion from this IVT test was presented, being the scaling of the errors in the image, coming mainly from the antenna patterns, with the temperature difference between the target and the instrument. While the radiometric accuracy inside the Maxwell EMC chamber was presented to be good, large ripples were present in the cold sky images, in perfect accordance with the Corbella equation. As a result of this experience the Flat Target Transformation (FTT) was devised as a means to make SMOS more robust against system imperfections (see also AOB).

4. *SMOS Ground Segment Development, Draft ATBDs, Data User Model, Real-Time Requirements*

The industrial consortia running the L2 prototype processor development presented the retrieval schemes as outlined in the draft ATBDs. Both, OS and SM retrievals, foresee to implement an iterative minimisation of a model run in forward mode. Details on submodels used, flagging issues related to nominal cases/not nominal cases, were addressed. Besides a retrieval scheme based on physical models, a statistical retrieval based on a neural network is foreseen for estimating OS fields. The SM-ESL confirmed that they also plan to implement a statistical retrieval scheme based on indices in parallel to the model based retrieval.

In this context also the definitions of the SMOS products were addressed again. The discussion was in particular focussed around the question if a L1c (TOA Tb), a L2a (Tb at ground), and a Browse product (Tb at only one incidence angle) would be needed at the same time. Since the discussion was not conclusive the SAG was asked to continue the discussion using email and to provide feedback to ESA. MZ and MB took the action to update the SAG with the latest product definitions.

NR presented in detail the draft Data User Model. In this context also the near-real time requirements and close-to-real time requirements as recently requested by ECMWF were discussed.

It was emphasized that the current baseline requirement (worst case scenario) states that SMOS products should be provided to the user community within 1 week after data acquisition. On average a turnover duration of 3 days is being estimated. The bottleneck is the location and available infrastructure of the Villafranca receiving station and L2 processing

centre, which has to be used due to programmatic reasons. There are about 5 satellite contacts per day at Villafranca and out of the five, two will be used for data download. Other overpasses will be used for data acquisition since simultaneous data transmission and acquisition is impossible because of interferences. This means that data will be about 12 hours old in the worst case when received at Villafranca. First analysis suggest a processing speed of 36 hours of full-polarisation data acquisition within 24 hours and 60 hours of dual-polarisation data acquisition within 24 hours resulting in a L2 product available at Villafranca about 20 hours after sensing (in the worst case!). It was indicated that there is still room to improve the processing speed but the financial implication would need to be assessed. Furthermore, it was emphasised that there is no dedicated high-speed link available at Villafranca which will further delay the product turn-over time. The implementation of a dedicated high speed link would be a severe cost driver, which is out of scope within the current SMOS budget.

5. Studies and Campaigns

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

DOMEX:

MD presented the preliminary results from the recent campaign at Dome-C, Antarctica. The Antarctic austral summer DOMEX field Campaign was successfully completed in January 2005. Co-located L- and C-band, and thermal infrared radiometer ice-sheet surface brightness temperature measurements were acquired continuously from a 30m tower mounted system developed and operated by IFAC-CNR, Florence, Italy (ESA Contract 18060/04/NL) over a period of a few weeks. Combined 10m depth in-situ temperature, dielectric and snow physical properties observations were made such as to interpret the variability in the measured brightness temperatures on diurnal and longer timescales. Preliminary results demonstrate extremely stable L-band brightness temperatures over the period of observations, and prove the potential of the high elevation ice-sheet site as an external calibration monitoring location for SMOS and other microwave radiometers. The field demonstration, at temperatures down to -30 degree C indicates the feasibility of robust, autonomous long-term operation of a winterised radiometer. Uninterrupted, round-the-clock measurements were achieved at variable incidence and azimuth angles using a motorised antenna and instrument mount. A radio communications data link to the local Concordia Station accommodation, and high-rate satellite relay link potentially facilitate near-real time data transfer to Europe.

Following the presentation various options for a follow-up field experiment were discussed, also considering a potential long-term instrument deployment at Dome-C. The SAG concluded that further actions should also be justified by a Cal/Val proposal and supported by recommendation in the final report of the DOMEX study.

CoSMOS:

PW reported on the status of the CoSMOS campaign preparation. Early April, Environment Canada (EC) informed ESA that the aircraft was not ready for the planned campaign start of 15 April. At the SAG meeting NS reported on the experience of his team in Canada anticipating further delays.

Following the SAG meeting further investigations were initiated by the SMOS Project Manager. It became apparent that EC would not commit to any campaign start date and consequently, the campaign had to be postponed. This year's activities will be redirected in order to maximise the benefit of investments done for the CoSMOS preparation. Various options to recover most of the original CoSMOS objectives are currently being assessed.

IR Study:

The IR study had its final presentation in February. MP gave a summary of the conclusions. Due to private reasons EA could not attend the final presentation to present the CERFACS techniques. His presentation has been scheduled for the day after the SAG meeting. Following this the Project will decide which of the algorithms will be implemented in the L1 processor. At the time when writing the minutes the following decisions were taken. The UPC algorithms will be implemented as the default algorithm and the CERFACS algorithms will be implemented in parallel for cross-check and monitoring purposes. UPC and CERFACS will act as image reconstruction ESLs for CASA/Deimos in developing the L1 processor.

CCN SM Retrieval Study – OS Retrieval:

MB reported briefly from the CCN of the SM Retrieval Study (in short SMOS Retrieval Study) which had its final presentation the day prior to the SAG meeting. The retrieval scheme developed during this study activity is now being fine tuned and translated into an ATBD for the L2 prototype processor development. In addition, the SMOS Retrieval Software (SRS version 2.1) is available as a retrieval tool for the science community.

OS Synergy Study:

NR and HR reported on the status of the OS Synergy study. The mid-term meeting took place in January. First simulation results of SEPS (SMOS instrument simulator) have been presented to assess the impact of auxiliary data such as SST and surface wind. Since the first results have not yet been consolidated and show a certain divergence, further simulation results are being produced for evaluation in April.

SM Synergy Study:

MB reported that the SM Synergy Study had a successful negotiation meeting. A study kick-off beginning of May has been agreed. The study will last for 2 years.

6. AOB

GEWEX

PvO gave a short overview on the structure of GEWEX, the role foreseen in the future and its relation to other projects and programmes dealing with climate and global change. The relationship with the SMOS mission is clear looking at the inputs used for the simulation of brightness temperatures and other descriptions of the Earth's surface needed for mission preparation. The ISLSCP project, which runs under GEWEX, has contributed significantly in this area.

Flat target transformation

MMN, JK and MS presented the theory of the Flat Target Transformation, and its optimum application to image reconstruction, including several simulations.

From the theoretical point of view the formulation of the Flat Target Transformation included all antenna pattern aspects, that is, both polarisations as well as co- and cross-polar components. Two algorithmic implementations of the theoretical FTT formulation were presented. The first one using a strictly flat target during the calibration measurement provides a correct reconstruction of the alias region. The second presented algorithm was an extension of the first one including the use of 'not completely' flat but well known targets during the calibration measurement. The simulation results presented in the following were based on the second algorithm.

To confirm the functionality of the proposed FTT algorithms and to have practical estimations of their performance the SEPS-simulator was used. As expected results confirm the algorithms and that the FTT has the ability to reduce noise level of the reconstructed images with smaller improvements in the alias region compared to the region within the field view.

AMMA

In the discussion of possible recovery actions for CoSMOS AMMA was mentioned. AMMA is a GEWEX super site for studying the West African Monsoon, and involves a huge international measurement campaign, partially financed via the EC and partially financed via national programmes. It was emphasised that AMMA could become one of the SMOS validation reference sites and therefore a cooperation with already on-going activities is recommended.

Time and space scales in AMSR-E SST fields

DS presented research work analysing space and time variations of SST fields as derived from AMSR-E and TMI daily observations. Given the SMOS requirements (and also considering that the AMSR-E time series are relatively short) emphasis was put in particular to the high-frequency variations. Estimated space and time scales are provided as a function of geographic positions (see attached presentation viewgraphs).

Status of the SMOS Science Report

MB reported on the status of the SMOS Science Report (SSR) and expressed his disappointment about the feedback received for the drafting of the report so far. The SAG was asked again to complete all open actions related to the science report. MB indicated that he would be prepared to receive inputs by May 22 at the latest. After this date he would start the reproduction process and adopting the authorship of the report according to the inputs provided up to this date.

7. Date & Place of Next Meeting

It was agreed to have the 18th SMOS SAG meeting at ESTEC on 10 and 11 October 2005. The main objectives of this meeting would be to discuss the outcome of the Cal/Val AO and to further discuss the ATBDs.

17th SMOS SAG Meeting**5-6 April 2005****ESA-ESTEC, Noordwijk, The Netherlands****starting 5 April at 09:00, room EINSTEIN*****Final Agenda***

1. Welcome and Introduction - Objectives, approval of the draft agenda
2. Actions from the last meeting
3. Project Status (A. Hahne)
 - Status report
 - Cal/Val AO
 - IVT-4
4. SMOS GS development
 - Level 1/2 processor development status (M. Zundo/S. Delwart)
 - Draft ATBDs (S. Delwart)
 - Data User Model (N. Wright)
 - Real Time Requirements
5. Studies and Campaigns
 - CoSMOS status (P. Wursteisen)
 - First results of Dome-C (M. Drinkwater)
 - Study activities (SRS, Synergy, IR Study, Assimilation Study)
6. AOB
 - GEWEX (P. v. Oevelen)
 - Flat target transformation (M. Martin-Neira, M. Suess, J. Kainulainen)
 - AMMA
 - Time and space scales in AMSR-E SST fields (D. Stammer)
 - Status SMOS Science Report
7. Date/Place of next meetings

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