



## The Soil Moisture and Ocean Salinity (SMOS) Science Advisory Group

### Minutes of the Twenty-Third Meeting

21-22 May 2008

ESA-ESTEC, Noordwijk, Netherlands

Chair: Y. Kerr

Officer: C. Bouzinac (EOP-SM)

#### Participants:

SAG Members: E. Anterrieu (EA), I. Corbella (IC), M. Drusch (MDru), J. Font (JF),  
T. Jackson (TJ), Y. Kerr (YK), M. Peichl (MP), N. Reul (NR), N. Skou (NS),  
D. Stammer (DS), P. Waldteufel (PW), J. Grandell (JG)

ESA:

K. McMullan (KM)	EOP-PSP
M. Brown (MB)	EOP-PTR
J. Benveniste (JB)	EOP-SER
C. Bouzinac (CB)	EOP-SM
M. Drinkwater (MD)	EOP-SM
M. Martin-Neira (MM)	TEC-ETP
N. Floury (NF)	TEC-EEP
S. Mecklenburg (SM)	EOP-GM
F. Martin (FM)	TEC-EEP
A. Colliander (AC)	TEC-ETM
A. Zurita (AZ)	EOP-SME
S. Delwart (SD)	EOP-PEL

Guests: K. Rautiainen (KR), U. Stoehlker (US), F. Conen (FC)

Excused: P.Y. Le Traon, D. Le Vine, G. Lagerloef, W. Wagner, C. Mätzler,

#### Distribution List:

All meeting participants

ESA: V. Liebig (D/EOP), S. Briggs (EOP-S), E-A. Herland (EOP-SA),  
M. Doherty (EOP-SE), G. Kohlhammer (EOP-G), H. Laur (EOP-GM), R.  
Zobl (EOP-P)

EOP-SM-SMOS-SAG-MIN-0023  
(EOP-SM/????/CB-dw)

### 1. Introduction (YK)

YK welcomed the participants and the agenda was agreed but adopted in its sequence according to the availability of meeting participants (see Agenda in Annex 1).

All presentations are available at <ftp.estec.esa.nl> in the folder SAG23.

Login: smos-sag Password: MIRAS69-3

### 2. Old Actions Review (CB)

CB reviewed the past actions (closed in the last six months or still open).

Action	No	Actionee	Status
To coordinate RFI related activities	19.10	D. LeVine & N. Skou	ongoing
To provide evidence of RFI to D.Levine&N.Skou	19.11	All	ongoing
Give range of value for 4 <sup>th</sup> Stokes parameter at antenna level from measurements done over various surfaces and/or direct to people who have reliable numbers	21.1	N. Skou	Open
To provide a technote to state what is used as frame/reference at the antenna level by the project regarding angles for L1 processor and send it to SAG	21.2	Y. Kerr, M. Zundo, P. Waldteufel and B. Duesmann	Ongoing (the draft version is ready and currently under revision)
Give specific SMOS information regarding RFI issues and possible implications and resolutions	21.7	N. Skou (C. Ruf)	Ongoing (a preliminary doc is available but will be updated)
Flights data over the mountains during the Cal-Val campaigns should be made available for analysis of the 3 <sup>rd</sup> Stokes parameter to look at topography effects (eurostarrs + rehearsal campaigns)	22.2	P. Wursteisen (flights) & D. Levine (analysis)	Ongoing (done for eurostarrs data over the Pyrenees)
Write conclusions on galactic contributions and send to SAG	22.3	D. Levine	Open
Ask official ESA permission to use Reich team galactic map and data	22.5	S. Delwart & N. Flourey	ongoing

From an old action still open on information on galactic map, a new action is created: get E. Dinnat work on galactic map and distribute to SAG (CB; action 23.1).

### 3. Satellite AIT and ground segment status (KM)

The new official launch date is 15 april 2009.

MM was asked about the interference of the nominal transmitter. The question is whether one can know, using information included in the X-band data, if the data were acquired while the transmitter was in stuffing mode or not (with the obvious objective to flag it). No. Unfortunately one cannot know from the ancillary packets if the transmitter is in stuffing or transmitting data. You can only detect if the TX is on or off. Since one can know whether the TX is ON or not, can one know how many seconds of stuffing the TX is sending before going to data transmission after switch-ON ? In principle, yes, although the processor does not know anything related to previous epochs so it cannot flag it itself since it does not know when it actually was switched on .... This should be more a task for one of the

tools in the Calibration Expert Centre (CEC), offline so that a report is produced and everybody can have access to it. We will also be able to know the time in stuffing after data transmission by detecting the TX off and going backwards. Time is fixed. This closes the action 23.2 for MM: there is no possibility to flag the stuffing mode unless we issue a report using the CEC tools.

Regarding the status of the ground segment, MM informed the SAG that there are still problems with the data processing in Villafranca due to X-band instability in the Level-1 processing. No problems have been reported with the Near Real Time processing chain established at Svalbard.

#### **4. COSMOS 2006 last results (NR)**

NR pointed out that a narrower antenna beam would be better to study the effect of galactic and solar glints and validate the models.

#### **5. Summary of the validation rehearsal campaign (CB)**

YK confirmed that CESBIO will simulate SMOS data over the area between Salamanca (W), Munich (E), Juelich (N), Valencia (S). He is trying to set up a campaign in Australia for 2009. KR thinks that it is probable that TKK will extend the contract with ESA to use the Skyvan aircraft in 2010 (at the moment, this contract is scheduled to end in nov 2009). NS pointed out that HUT2D can only fly on the Skyvan so it is very important to have this aircraft available for the validation campaign (recommendation 23.3). TJ is setting up a large validation campaign in spring 2010 mainly in Oklahoma. He is also planning to participate to the validation campaign of Jeff Walker in Australia, providing an active (radar) instrument. CAROLS (Gulf of Biscay) is shifted to early 2010. AMIRAS receiver is not repaired. DLR has an L-band radar which might be useful (as an active component) for the future campaigns in Europe. MP should contact them to see the availability of this instrument (MP; action 23.4).

The SAG recommends to have a limited campaign in 2009 in Europe with HUT2D on the Skyvan aircraft and a main campaign in 2010 in Australia with a local aircraft. For the limited campaign in 2009, TJ recommends small flights over a same pixel at several altitudes (recommendation 23.4). The more uniform the pixel, the better.

The next DOMEX campaign organised by IFAC in Antarctica is scheduled between January and November 2009. The last tests on the radiometer at the Galileo testing facility showed a good thermal stability inside the radiometer protection box. Radiometric data from the tests are being analysed now at IFAC.

#### **6. RFI observation with EMIRAD during the rehearsal campaign (NS)**

There was a lot of Radio Frequency Interferences (RFI) during the transit between Valencia and Marseille over the Catalan Sea, and in the south of France. The times of radiocommunication of the pilot during the flights should be checked as this could be a source of RFI (NS; action 23.5). RFI over the Catalan Sea and over the south of France should be mapped, reported and investigated (recommendation 23.5). The mapped RFI should be reported to the frequency offices of ESA and CNES.

NS thinks that narrower filter on the radiometer to exclude RFI is not a good solution.

David Levine proposed a simple approach to detect RFI. His poster or paper should be sent to the SAG and the SMOS project team (CB; action 23.6). This approach should be validated further for generalisation and implementation in the level 1 or in the monitoring facility at ESAC (recommendation 23.6). It might be applied and tested with AMIRAS and HUT2D data.

#### **7. Available data sets and processing/viewing tools (CB)**

SD pointed out that the ECMWF forward model for SM is very useful and well maintained and it would be nice to implement the equivalent for SSS. JF is going to think about this possibility at the Barcelona processing centre.

SD asked if the sea-ice extent flag in the processor is still necessary. MD answer is yes as the flags are required for vicarious calibration and the flagging algorithm should come from the sea-ice study output.

#### **8. 8a. AMIRAS data results (FM)**

The analysis of AMIRAS data over Finland in June 2006 is very difficult due to the lack of ground information. KR will provide land use and meteorological information (specially rain events) to help FM work (NF; action 23.7). However, the data have been fully processed and are now available for further analysis.

#### **8b. HUT2D data results (KR)**

KR committed to deliver the HUT2D processed data from the demonstration campaign (august 2007) by July 2008. The format of these data should be exactly the same as the format of the AMIRAS level 1C provided by FM.

#### **9. Radioactivity use for SM measurement (US and FC)**

US and FC presented the concept of using radioactivity measurements for soil moisture (SM) retrievals. The methodology is based on Gamma Dose Rate observations, which have been performed on a regular basis since 1988. Approximately 1000 stations exist in Germany with an average horizontal spacing of 21 km. There are roughly 3600 sites in Europe. At these stations different probes are used so that measurements have to be harmonized to obtain spatially distributed fields. JRC at Ispra is the leading centre and is collecting the data; other sites mirroring the archive exist.

The observed gamma dose rate depends on atmospheric and soil parameters. Rain results in a peak and is visible in a time series for approx. 30 minutes. Once precipitation is filtered out spectroscopy provides the contribution from the soil and the atmosphere. Water in the soil generally reduces the soil contribution. First studies show that the retrieved soil moisture represents the top 20 cm layer of the soil. The sensitivity of the measurement is ~ 4 % vsm / 1.6 nSv. Measurements at an individual site contain information from an area with a 100 m radius, 80 % are coming from an area characterized by a 10 m radius. It was suggested to infer soil moisture for a 70 km x 190 km area around Dresden. However, the SAG felt that US and FC should contact Alexander Loew to see whether a collaboration is possible over the Upper Danube Catchment validation area (CB; action 23.8).

#### **10. 10a. ELBARA AO results (SD)**

For the AO proposal by DS at FINO, it was decided to reuse EMIRAD-1 with a new antenna horn. The procurement for this EMIRAD-1-Piket horn is ongoing, no problems have been reported.

#### **10b. ELBARA contract status (MM)**

The first unit for demonstration will be available end of July 2008. The delivery of the three radiometers should be in summer 2009.

#### **11. Commissioning Phase (CP) plan (MB)**

Final inputs from cal/val PI to MB for the CP time plan are necessary by mid 2008 (SD and CB; action 23.3). ESL should be clearly linked to the CEC and DPGS in the CP schemes (recommendation 23.1). During the CP, weekly change between dual and full polarisation modes is preferred (recommendation 23.2). This half/half preference is strongly supported by the sea surface salinity (SSS) community because they need a lot of data in full polarisation. It is also better for RFI analysis during the CP.

The release dates of level 1 and level 2 data to cal/val PI during the CP have been discussed. During the first two months the observations will be of limited value for the science community due to various instrument tests. In general, the SAG felt that any data available should be made available to the cal/val PIs as soon as possible together with an indication of their quality. However, Level 2 data will not be produced operationally during the CP because the processor will most likely not be ready in time. Level 2 data will only be produced by the Expert Support Laboratories (ESL). MD pointed out that Level 2 data will not be released to data AO PIs until some quality is reached.

## **12. Future Workshops (SD)**

22 October 2008 : SM workshop in the US

A workshop to review all the results and problems from the validation rehearsal campaign is scheduled in November 2008: 3 days at ESTEC

The next AQUARIUS workshop will be the first week of December 2008 in Argentina.

The SVRT workshop purpose before launch is to check the availability and use of simulated data and tools. This workshop can be merged with the next International Soil Moisture Working Group workshop organised by TJ, Peter van Oevelen and Pedro Viterbo at the Portuguese Meteorological Institute in March 2009.

## **13. Next SAG Meeting**

It is decided to hold the next SAG meeting after the rehearsal workshop, on the 20<sup>th</sup> and 21<sup>st</sup> of November 2008 in Noordwijk.

### **14a. SMAP Update (TJ)**

TJ informed the SAG that SMAP and IceSat2 are in Phase I as fast track missions with an envisaged launch date in 2012. SMAP is a NASA directed mission with JPL as the leading centre. Key personnel are Jared Entin (at Head Quarters), Eni Njoku (at JPL) and Dara Entekhabi (at MIT) leading the science team. The choice of orbit for SMAP is still being discussed. YK pointed out that having SMOS, AQUARIUS and SMAP with the same 6AM/6PM equator crossing time would be very good for having a homogeneous multi-year time series.

### **14b. AQUARIUS Update (JF, presentation prepared and provided by Gary Lagerloef)**

The AQUARIUS is now planned for 2010. DS wondered whether it is worth to wait this launch for SSS validation with drifters. YK answered that we should focus on SMOS as launch dates can never be sure so much in advance.

### **14c. New version of Altimeter Corrected Elevations (ACE) model (JB)**

DS pointed out that the coastline resolution of 90m can be very valuable for SMOS. However, JB explained that the coastline is still under validation for the next two months.

### **14d. Altimeter data for SM estimation over arid areas (JB)**

Philippa Berry, the PI of this project is already in contact with Jeff Walker (SM cal/val PI) to work on a semi-arid area in Australia. PW pointed out that altimetric backscatter could be used more routinely for the characterisation of the soil surface roughness for SM purpose.

### **14e. SMOSops Update (MM)**

NS should provide proposals for RFI removal solutions in SMOSops.

### **14f. OceanObs09 Promotion (JB and DS)**

JB promoted the future symposium OceanObs09, which will take place in Venice, Italy, and recommended an active participation from SMOS.

## **Closure of Meeting**

YK thanked the SAG and ESA members for their active contribution.

**Recommendations**

No	Description
23.1	ESL should be clearly linked to the CEC and DPGS in the commissioning phase schemes.
23.2	During the commissioning phase, the dual and full polarisation modes should be equally used with a weekly change.
23.3	The SAG recommends the availability of the Skyvan aircraft for the validation campaigns in Europe.
23.4	During the validation campaign, it is better to perform short flights over the same pixel at several altitudes.
23.5	RFI over the catalan sea and the southern France should be mapped, reported and investigated.
23.6	David Levine approach to detect RFI should be validated (with AMIRAD and HUT2D data if possible) for generalisation and implementation in the level 1 processor or into the monitoring facility.

**New Action Items**

Action	No	Actionee	Status
get E. Dinnat work on galactic map and distribute to SAG	23.1	C. Bouzinac	Closed (sent to the SAG on 29 may 2008)
there is no possibility to flag the stuffing mode unless a report is issued using the CEC tools	23.2	Manuel Martin Neira	closed
Final inputs from cal/val PI to Mike Brown for the CP time plan are necessary by mid 2008	23.3	C. Bouzinac	Open
DLR has an L-band radar which might be useful (as an active component) for the future campaigns in Europe. Contact DLR to see the availability of this instrument.	23.4	M. Peichl	Open
The times of radiocommunication of the pilot during the rehearsal campaign flights should be checked as this could be a source of RFI.	23.5	N. Skou	Open
David Levine proposed a simple approach to detect RFI. His poster or paper should be sent to the SAG and to the SMOS project team.	23.6	C. Bouzinac	closed
KR to provide land use and meteorological information (specially rain events) to help FM analysis of AMIRAS data	23.7	N. Floury	Open
US and FC should be put in contact with Alexander Loew to see whether a collaboration is possible over the Upper Danube Catchment validation area	23.8	C. Bouzinac	Ongoing (contact via mail was established in may 2008)

**ANNEX 1**

**23rd SMOS SAG Meeting Agenda**

**21-22 May 2008**

**ESCAPE Dance Room, ESTEC, Noordwijk, Netherlands**

1. Welcome and Introduction (Yann Kerr)
  - Objectives and approval of the draft agenda
2. Actions from the previous meeting (Catherine Bouzinac)
3. Overview of on-going activities (Kevin McMullan for Achim Hahne)
  - AIT and ground segment status
4. Update on COSMOS 2006 analysis (Nicolas Reul)
5. Summary of rehearsal campaign (Catherine Bouzinac for Patrick Wursteisen)
  - Impact of new launch date on validation campaign
  - Link with CAROLS
6. Overview of EMIRAD RFI from the rehearsal campaign (Niels Skou)
7. Overview on datasets and processing tools (Catherine Bouzinac)
8. Airborne interferometric instrument results
  - AMIRAS results (Fernando Martin and Nicolas Floury)
  - HUT2D results (Kimmo Rautiainen)
  - discussion on data format and scientific analysis with feedback from users
9. SM from Radioactivity measurement (Ulrich Stoehlker, University Freiburg)
10. Report on ELBARA
  - AO results (Steven Delwart)
  - Project and status (Manuel Martin Neira)
11. Commissioning plan presentation (Mike Brown)
  - discussion on instrument modes during CP and operations
12. Workshops (Steven Delwart and all)
  - Date/Place/Objectives of next campaign workshop
  - Date/Place/Objectives of SVRT workshop
13. Date/Place/Objectives of next SAG meeting (all)
14. AOB:
  - a. SMAP update (Tom Jackson)
  - b. Aquarius update (J. Font for G. Lagerloef)
  - c. Altimetry Corrected Elevation model (J. Benveniste)
  - d. Radar Altimeter Backscatter for SM over dry areas (J. Benveniste)
  - e. SMOSops update (M. Martin-Neira)
  - f. OceanObs 09 (J. Benveniste and D. Stammer)