



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

Minutes of the Twenty-Second Meeting

31 October-1 November 2007

ESA-ESRIN/Hotel Antica Colonia, Frascati, Italy

Chair: Y. Kerr

ESA Executive Officer: P. van Oevelen (EOP-SML)

Participants:

SAG Members: E. Anterrieu (EA), I. Corbella (IC), M. Drusch (MD), J. Font (JF),
T. Jackson (TJ) (1st day), Y. Kerr (YK), G. Lagerloef (GL),
P-Y. LeTraon (PYL), D. LeVine (DL), M. Peichl (MP), N. Reul (NR),
N. Skou (NS), D. Stammer (DS), W. Wagner (WW),
P. Waldteufel (PhW)

ESA:	A. Hahne (AH)	EOP-PS
	J. Benveniste (JB)	EOP-SER
	P. v. Oevelen (PvO)	EOP-SML
	M. Drinkwater (MD) (1 st day)	EOP-SM
	M. Martin-Neira (MM)	TEC-ETP
	C. Bouzinac (CB)	EOP-PYM
	R. Crapolicchio (RC)	EOP-GQ
	S. Pinori (SP)	EOP-GP
	P. Wursteisen (PW)	EOP-SMS
	S. Mecklenburg (SM)	EOP-GM
	S. Delwart (SD)	EOP-PEL

Guests: N/A

Excused: J. Grandell, C. Mätzler, N. Floury

Not present:

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-0022
(EOP-SM/1748/CB-dw)

Introduction

Y. Kerr welcomed the participants to the 22nd SMOS SAG meeting held at ESA-ESRIN, Frascati (continued on the second day at Hotel Antica Colonia, Frascati).

Adriaan van de Griend has stepped down as member of the SMOS-SAG due to retirement. It was recommended not to replace him by a new member (Recommendation 22.1).

Due to the limited time available the Agenda was quickly reviewed and prioritized.

Cryosphere

Mark Drinkwater presented what has been done with respect to Cryosphere studies and what is on-going and planned. The discussion on the use for SMOS for Cryospheric purposes already started in 1999. There is a Cryosphere splinter report available from the 2001 SMOS Workshop. Studies that have been done include:

- 1) DOMEX-1
- 2) DOMEX-2
- 3) SMOS Sea-Ice study

Some of the outstanding science issues relate to, a) loss factor of snow/ice/firn at L- band, b) seasonal fluctuations of the L-band radiometric signal, c) in-situ spatial covariance in L-/C-/Ku-band, d) effect of multi layering on depolarisations and e) temporal survey of the ionosphere at high latitudes. For the latter it is suggested to add a GPS receiver at DOME-C tower.

The German Sea-Ice study will help to understand the L-band signal from different types of sea-ice. The seasonal and spatial stability of the signal at Dome-C must be confirmed by DOMEX-2 and TEC must be monitored.

Mark Drinkwater made the following recommendations:

- Send letters of recommendation to NASA and NSF for proposed PLMR and AESMIR additions to airborne campaign dimension at DOMEX-2
- Pursue possibility of additional GNSS experiment on Dome-C tower (GPS experiment)

Steven Delwart asked if Dome-C should be used as calibration site for vicarious calibration. To use it as part of the monitoring facility, some additional fund is needed. Achim Hahne added that PALSAR data and study should be included in a contract change for DOMEX.

Based upon the above the SMOS SAG made the following recommendation: Since Dome-C seems to be a stable target it should be used pending final checking of the signal stability. It is also necessary to make sure that TEC information will be collected (Recommendation 22.2).

Campaigns

Patrick Wursteisen presented the plans for flight campaigns related to SMOS. In total about 30 flight hours will be available (excluding transit) for 2009. Steven Delwart suggested that since the instruments are switched on all the time it is a good opportunity to look at RFI. Furthermore, it was recommended to add a video camera to the instruments, because it was deemed very useful. This was agreed but as it is not complicated or costly it did not result in a specific action item.

Patrick Wursteisen asked for comments on his campaign plan presented during the workshop. To this, Yann Kerr asked what was to be achieved exactly by these campaigns so as to derive what has to be done and make them efficient. This led, after a long discussion, to the following action for Peter van Oevelen and Catherine Bouzinac: What has to be achieved has to be discussed within the next few weeks. Catherine Bouzinac and Peter van Oevelen will coordinate the inputs to come up with a draft plan on what needs to be done for the flight campaigns (Action 22.1)

It was also discussed to take advantage of flights over the mountains (e.g. Vercors site of Thierry Pellarin) to acquire and analyse data. YK expressed that during EUROSTARRS this was performed over the Pyrenees without any significant return. However as it does not involve any extra effort or cost it was agreed to proceed. It led to an action item for Patrick Wursteisen and David LeVine: Action: Transit flight data over the mountains should be provided to D. Levine who will analyse them (in particular the 3rd Stokes vector to look at topography **(Action 22.2)**).

Furthermore it is noted that Tb maps will be provided and not soil moisture and SSS maps that will be done by the Cal/Val teams themselves. Campaigns data are collected by ESA and made available through the ESA EO campaigns web portal when the campaign final reports are ready.

Tom Jackson pointed out that any validation pixel for soil moisture has to be regularly spatially sampled.

SMOS Calibration and Validation

Data from SMOS and Cal/Val campaigns for ocean is available at IFREMER. Similarly data for Soil Moisture will become available at the Meteorological Institute in Portugal. Philippe Waldteufel gave a short presentation on his views regarding Calibration and Validation.

The Monitoring Facility is to be used to retrieve Coriolis data and should have algorithms made available. It was suggested to make SMOS data available for those regions around the ocean buoys data points. More generally, tools for Cal/Val from PIs should be provided to the Monitoring Facility, in particular the tools for statistics from Chris Ruf method.

Gary Lagerloef suggested to keep it simple and use metrics that show stability and drift for large scale ocean Tb statistics, similarly to what Chris Ruf has proposed.

Airborne demonstrators

Manuel Martin-Neira said that HUT2D and AMIRAS L1C data will be available at the beginning of 2008 on the ESA SMOS FTP server. HUT2D antenna phase patterns are not very good. AMIRAS H Polarization is noisier than V Polarization.

For AMIRAS and HUT-2D the data is now being processed and made available for the flights that have been executed so far. There is confidence in HUT-2D on amplitude but not phase. Airborne data have to be distributed to the users as geolocated Tb, at antenna level.

Patrick Wursteisen presented the planned flights for HUT-2D as of now. The AMIRAS will not be available before spring 2008.

SMAP and common studies with US

Tom Jackson gave an overview on Soil Moisture Active Passive (SMAP, a HYDROS follow on) and a quick overview on the CLASIC experiment held this year which was unusually wet during the experimental period.

Gary Lagerloef explained the SMAP heritage which relates to Aquarius which offers passive and active capabilities and relates to SMOS which offers similar resolution at L-band. The Near Real Time (NRT) requirement for ECMWF is 3 hrs; what will this be for SMAP? Aquarius data will only come available after 24 hrs.

Galactic Contributions

A very brief discussion was held on galactic contributions which resulted in the following action items:

Action Item: David Levine write up conclusions regarding Galactic Contributions: ready draft beginning of 2008 and send to SAG (in particular to N. Reul) **(Action 22.3)**

Action item: Send notes on galactic map or at least where it can be found (Action on S. Delwart) **(Action 22.4)**

Action Item S. Delwart will ask official ESA permission to use Reich team galactic map/data **(Action 22.5)**.

Action Item: Ask C. Mätzler about the Sun L-band measurements in Switzerland and see if this SMOS team can get access to that data and how? **(Action 22.6)**

SMOS Data Hosting Study

The SMOS Data hosting study, executed by the Portuguese Meteorological Institute, was presented briefly by Peter van Oevelen. (The SAG should recommend the SM database to all Cal/Val PIs. **Recommendation 22.3**)

Neural Networks, my Ocean and Argo

Pierre Yves Le Traon gave a presentation on these three activities. Euro-Argo is the contribution from Europe to Argo (Global Array of 3000 Floats available now) with yearly 250 floats being replaced. SMOS Cal/Val is one important application of Argo. The SMOS community should be active in promoting Euro-Argo (at national and European level). Recommendation: At one stage when needed SMOS Project will be asked to provide rational to Euro-Argo member states (**Recommendation 22.4**).

G. Lagerloef gave a short presentation of two new salinity-measuring devices on buoys to get measurements closer to the surface (<5m to surface). The lifetime of the sensors on the buoys is about one year (fouling).

Regarding the Neural Network algorithms for SSS in both direct and inverse approaches it is suggested to use more realistic data than currently done and specifically regarding the noise that is inserted.

My Ocean is a project for the European GMES "Marine Core Service". Its products can be inputs to SMOS data processing systems (e.g. in-situ, SST, wind).

Commissioning Phase and selection of Dual versus Full polarization

The question posed is how to deal with the selection of dual versus full polarimetric mode during Commissioning Phase. Switching between modes is not desirable for several reasons however, it is agreed that datasets of both modes should become available to research. Achim Hahne suggested that the default mode would be dual pol, with only a few orbits acquired in full pol. Gary Lagerloef proposed to reiterate a TOPEX-Poseidon approach which proved very successful. It consists in having regular change at fixed epochs (e.g. 3 days a month Full pol. the rest Dual pol.). It was noted that the internal calibration stays the same for both modes. Finally it was recommended that 50% of both modes in units of 1 month will be taken during the commissioning phase (**Recommendation 22.5**).

Some questions were also raised about the content of the commissioning phase so Steven Delwart should send the draft commissioning phase plan to the SMOS SAG for comments and suggestions **(Action 22.7)**.

Surface Tb

Steven Delwart gave a presentation on behalf of B. Picard (CLS) on sensitivity study of surface Tb. A SMOS Bottom of Atmosphere (BOA) Tb is a useful product for Cal/Val, raw input is useful for empirical methods and it matches the requirements however, TEC is the key parameter for the quality.

It is recommended to put this Surface Tb algorithm in the L2 Prototypes both from surface to antenna and vice versa (**Recommendation 22.6**).

Synergy Study

A summary of the study will be sent to the SAG by Peter van Oevelen (**Action 22.8**).

HOBE Initiative

Hydrology OBServatory & Experimentarium (HOBE) is a Danish initiative in a catchment and is presented by Niels Skou. The EMIRAD will be deployed during this experiment.

For Processing 24 hrs to wait for extra aux data

Steven Delwart gave overview on the rationale of delaying the processing by 24 hours. The choice is between processing the data as quickly as possible using aux data as is available or wait a certain time period (24 hrs) for more reliable or higher quality aux data.

Wait for 24hrs to get better aux data for the processing. (**Recommendation 22.7**)

Antenna pattern effects on SSS

Nicolas Reul gives short presentation on the effect of antenna patterns (anisotropy) on SST and SSS. He concluded that variations owing to these effects are not negligible compared to SST and SSS variations (hence will result for example in biases when doing flight “wags”). At least for the retrieval, the full antenna pattern, including anisotropic and cross-pol gains, must be taken into account if we want to accurately analyse the data sets (valid for all types of antennas).

SM network measurements as part of Hydrology SAF

Wolfgang Wagner gives a presentation on H-SAF led by the Italian Meteorological Service. He makes 3 recommendations:

- strong support for international soil moisture network
- joint effort of ESA and EUMETSAT over Europe to point out the lack of SM data over Europe
- implementation of a European soil moisture validation and data assimilation experiment

In view of the SAG, the last two recommendations should be combined. Matthias Drusch will ask H-SAF to invite SMOS to present at the next H- SAF meeting.

ELBARA "choices"

AO is open only to SVRT members. Can the SAG recommend where to prioritize given the list of proposals. A rough analysis of the proposal allowed to state that wetlands and mountains were probably of higher priority than forest and that sites already covered were not at all to be considered. It was also obvious that a boreal site was missing and if possible should be added.

Try to find a group willing and able to do measurements in boreal or high latitude regions (e.g. Canada, no problem from campaigns point of view). (**Recommendation 22.8**)

To have the SAG give a better idea of the proposals that seems most worthwhile the following 2 actions will be undertaken: Steven Delwart makes ELBARA proposals regarding wetland and mountainous region available to SAG land surface for commenting. (**Action 22.9**)

Catherine Bouzinac checks the availability of radiometer at IFAC (Firenze) to be employed. (**Action 22.10**)

Short presentation by Detlef Stammer on FINO-1 experiment and tower data, question is if ELBARA or EMIRAD-1 will be used (depends on angle). RFI can be an issue and EMIRAD-1 can detect that (which ELBARA cannot). Suggestion to borrow another (narrower beam) antenna to be put on EMIRAD-1. Patrick Wursteisen to contact Adriano Camps if LAURA could be used for this as well. If not then Niels Skou should ask Christian Mätzler on the availability of an antenna (**Action 22.11**)

TEC Correction

Phillipe Waldteufel said that clarification is needed on what is actually done in L1 -> reprocessing. How TEC (using University of Bern forecasts) is estimated is already described in the ATBD and in the technote by N. Flourney.

Action Item: Ask N. Flourney to send the latest item on TEC. **(Action 22.12)**

Test of RFI impact on SMOS like instruments

Marcus Peichl made a very brief comment regarding different approaches to deal with effect of RFI on SMOS like instruments. They need to be considered and studied. N. Skou is doing theoretical study to come up with approaches. S. Delwart stated that there will be a RFI High Risk map based upon measurements. Given the current resources and other –more urgent-matters that need more attention the suggestion by M. Peichl is considered valid but not given the highest priority.

Various

Regarding the cooperation with NASA, the SAG should get more systematically info on what has been achieved by cooperation between ESA and NASA albeit informal. Action item for YK to do just that. **(Action 22.13)**

Whoever has information on whatever has been done with respect to Ruf method (vicarious calibration) to SMOS project to make sure that technical assumptions are correct. **(Action 22.14)**

Closure of Meeting

YK and PvO thanked the SAG and ESA members for their active contribution and SM and JB for their help in organising the SAG. It was also said that one day was definitely too short to cover all the aspects even with a workshop just before.

Finally YK thanked PvO for his last contribution as a secretary for the SAG and wishes him the best in his new position where links with SMOS will continue.

Date/Place/Objectives of next meetings

Due to absence of most people at the end of meeting, Y. Kerr took the initiative to select a date for the next SMOS SAG meeting.

**The NEXT SAG (23) will take place at
ESA-ESTEC
on May 21-22, 2008**

Old Action Items

Action	No	Actionee	Status
To coordinate RFI related activities	19.10	D. LeVine, N. Skou	reiterated
To provide evidence of RFI to D.Levine/N.Skou	19.11	All	Reiterated/ongoing (no inputs received)
Give range of value for 4 th Stokes parameter at antenna level from measurements done over various surfaces and/or to direct to people who have reliable numbers	21.1	N. Skou	Open/reiterated (no inputs received)
To provide a technote to state what is used as frame/reference at the antenna level by the project regarding angles for L1 processor	21.2	Y. Kerr, M. Zundo, P. Waldteufel and B. Duesmann	Open
Technote to be written on how to obtain Tb at surface from Tb at antenna which is fundamental problem	21.3	N. Reul, P. Waldteufel, S. Delwart	Closed
Separate Cal-Val measurements in absolute necessary and useful measurements	21.4	SAG, (S. Delwart, C. Bouzinac, P. Wursteisen)	Open
CEC team raised various questions to SAG what to address. Get PPT and get the specific questions within next month if possible	21.5	All	Closed
Gather radiometer measurements on the sun and provide to N. Reul	21.6	N. Skou, Y. Kerr	Closed
Next SAG give specific SMOS information regarding RFI issues and possible implications and resolutions	21.7	N. Skou, C. Ruf	Open
ESA (PW) should contact the French regarding activities with ATR42/CAROLS and other national activities and coordinate for rehearsal and Cal-Val activities	21.8	P. Wursteisen	Closed
To give update on TEC what is there	21.9	R. Crapolicchio	Closed
N. Flourey send P. van Oevelen Technote regarding TEC	21.10	N. Flourey	Open (reiterated, send latest version)
SMOS Toolbox changed to BEAM refurbishing under responsibility of probably P. Regner and will require funding from SMOS Mission Manager. Status needs to be clarified	21.11	Changed to S. Delwart	Closed (S. Delwart will send PvO email regarding outcome)
Have P. Viterbo give an presentation on the SMOS Soil Moisture Network activity at next SMOS SAG 22	21.12	P. van Oevelen (P. Viterbo)	Closed

Recommendations

No	Description
22.1	Adriaan van de Griend will not be replaced by a new SAG member.
22.2	Since Dome-C seems a stable target it should be used for SMOS Cal-Val pending final checking of the signal stability. It is necessary to collect TEC information as well.
22.3	Soil moisture database should be used by all SMOS Cal-Val team members dealing with SM.
22.4	When needed the SMOS project should provide rationale to EURO-ARGO member states (when asked).
22.5	50% of both modes (Dual vs Full pol.) in units of 1 month will be taken during the commissioning phase.
22.6	The Surface Tb algorithm should be put in the L2 prototypes both from surface to antenna and vice versa.
22.7	It is recommended to wait 24 hrs to get better aux data for the processing.
22.8	It is recommended to find a group that is willing to do measurements in boreal or high latitudes with ELBARA.

New Action Items

Action	No	Actionee	Status/due date
Draft plan on what needs to be done for flight campaigns	22.1	P. van Oevelen/C. Bouzinac	Open 15/12/2007
Flights data over the mountains during the SMOS Cal-Val campaigns should be made available for analysis of 3 rd Stokes vector to look at topography effects	22.2	P. Wursteisen (flight) / D. Levine (analysis)	Open After flights
Write conclusions on galactic contributions (draft begin 2008) and send to SAG	22.3	D. LeVine	Open 15/1/2008
Send note to SAG on galactic map and where it can be found	22.4	S. Delwart	Open 1/12/2007
Ask official ESA permission to use Reich team galactic map/data	22.5	S. Delwart	Open 15/1/2007
Ask C. Matzler about Sun measurement in Switzerland and see if the SMOS team can get access to this data and how	22.6	C. Bouzinac	Open 31/1/2008
A draft of the commission phase plan should be sent to the SMOS SAG for comment and suggestions	22.7	S. Delwart	Open 15/11/2007

Action	No	Actionee	Status/due date
Synergy study summary should be sent to the SMOS SAG	22.8	P. van Oevelen	Open 15/12/2007
Make the ELBARA proposals regarding wetlands and mountainous regions available to the SAG Land Surface members for commenting	22.9	S. Delwart	Open 15/11/2007
Check availability of radiometer at IFAC (Firenze) to be employed	22.10	C. Bouzinac	Open 15/11/2007
Contact A. Camps if LAURA can be used. If not Niels Skou should ask C. Matzler on the availability of the antenna	22.11	P. Wursteisen/N. Skou	Open 15/11/2007
N. Flourey should send last item on TEC to SAG	22.12	N. Flourey	Open 15/1/2008
Get more systematically information on what has been achieved by cooperation between ESA and NASA	22.13	Y. Kerr	Open continuous
Provide information on anything that is relevant to SMOS with respect to the Ruf method (vicarious calibration) to make sure the technical assumptions are correct	22.14	All	Open 15/3/2008