# 2$^{nd}$ SMOS SCIENCE CONFERENCE

**25-29 May 2015, ESA-ESAC (near Madrid), Spain**
Jointly organised by ESA, CNES, SMOS-MODE

**Conference summary and recommendations**

## Introduction

In the introduction to the conference S. Mecklenburg gave an overview on the current status and performance of the SMOS mission. Both space and ground segments are in excellent technical conditions with no limiting factor for continued operations, even beyond 2017 (the currently approved time frame for SMOS operations by both ESA and CNES).

The presentation also provided a summary on the potential routes to a SMOS follow-on mission. S. Mecklenburg stressed the fact that requirements for such a follow-on mission will need to be put forward by the scientific or operational users of SMOS data. ESA can provide support through (i) organising workshops and conference or dedicated discussion groups such as the ISSI forum on L-Band continuity in 2014, ii) approaching operational user communities e.g. through dedicated products tailored to their specific needs and training, iii) fostering international collaboration to facilitate knowledge transfer from research to operations and between operational users, and iv) advancing the technology needed for future mission concepts.

However, the main case for continuity of passive microwave L-band measurements from space needs to be made by the user community on the basis of the (evolving) requirements.

## Session 1 - SMOS - What comes next? Status and outlook

In this session, the operational data users' perspective was presented by P. Bauer (ECMWF) and P.-Y. LeTraon (Mercator). These talks were followed by three presentations summarizing the key scientific achievements related to the ocean (N. Reul), the land (Y. Kerr), and the cryosphere (L. Kaleschke). Finally, Y. Kerr and M. Martin-Neira showed future mission concept developments at CNES and ESA, respectively, based on L-band interferometry.

The overview presentations on the key achievements demonstrated the scientific innovations brought by SMOS. Over land, the mission objectives have been met and new application areas and data products have been developed. Operational users are starting to integrate SMOS measurements. Over ocean, the salinity estimates have been continuously improved and are approaching the mission objectives. Following the increasing product quality, the SMOS data have been widely used in a number of different scientific applications over both domains. New products, e.g. hurricane wind speeds, are emerging. For the cryosphere, several products are currently under development, e.g. sea ice thickness, soil frost detection, snow density. The most advanced data set is the Arctic sea ice product that has been used in data assimilation and ship routing applications.

At ECMWF, brightness temperatures are currently being processed in NRT and used over land for the soil moisture analysis. The system is well advanced and pre-operational, i.e. the final implementation is under discretion of ECMWF. In parallel, sea ice and wind speed data are being analysed. P. Bauer reminded the audience of an open action item related to the WMO Implementation Plan for the Evolution of Global Observing Systems: *"Study the benefits brought* *by satellite demonstration missions like SMOS (missions based on low-frequency microwave radiometers) on atmospheric, hydrological and oceanic models, in a quasi operational context, and decide if a similar operational mission can be designed."* The following statements from the WMO (collective user community) perspective were made:

- For microwave observations in L-band, space agencies' plans currently do not provide an adequate response to the "WMO Vision for 2025".
- Problem is worse for salinity than for soil moisture, because of plans for continuity of scatterometers but none for salinity.
- Towards new "WMO Vision for 2040": if Vision 2025 is implemented, which URs remain still unfulfilled and which technologies will be mature in 2040?

P.-Y. Le Traon focused on the requirements from operational users over the ocean, describing first the EU CMEMS (Copernicus Marine Environment Monitoring Service) which provides information on the ocean state and dynamics and marine ecosystems. He then stressed that SSS is a key parameter to constrain operational ocean monitoring systems, and highlighted how SSS assimilation in ocean models can lead to improved description and forecast of the upper layers of the oceans (T, S, currents). Several data assimilation tests with different data versions have been performed, implying significant adaptation of data assimilation schemes to take into account error characteristics. The small impact obtained so far is related to the fact that systems today are already well constrained by in–situ observations (Argo). SMOS provides, however, complementary information (mesoscale, high frequency) to Argo, and results should be revisited with the most recent SMOS reprocessed datasets and in light of several improvements on data assimilation schemes (bias correction, adaptive tuning of errors). SMOS and Aquarius achievements pave the way for the preparation of future operational mission, whose requirements need to be refined based on modelling and data assimilation capabilities and complementarities with in–situ (Argo) and other satellite observations.

M. Martin-Neira and Y. Kerr presented work on future mission concepts performed at ESA and CNES. Although possible, a continuation with exactly the same current mission design is neither desirable nor foreseen. The current technological developments performed at ESA could result in considerable improvements on the measurement accuracy and RFI mitigation, independently of the actual mission concept. Several platform and payload concepts were studied. An evolutionary concept facilitating either a higher spatial resolution or improved radiometric accuracy features a hexagonal baseline shape. Concepts studied at CNES are currently in phase 0 and would not be available for an implementation around 2025.

During the discussion it was stressed that the operational user community will drive continuity and has to be actively involved in the requirement consolidation process. Several routes have been suggested to educate operational users and increase the SMOS data uptake, e.g. a central data dissemination portal for oceanographic data, the NRT soil moisture product, or an International Working Group under the WMO CGMS umbrella. However, it was clearly stated that ESA could only support these activities following requests from the community.

Many user requirements, especially for meteorological applications, have not changed dramatically over the past 10 – 15 years (as reported through WMO OSCAR) and it seems to be technically feasible to address them successfully. From a scientific and technological point of view L-band mission continuity is considered useful and feasible and shall be pursued by space agencies.

**Session 2 - Improvements to Level 1 and 2 retrieval algorithms - land and ocean**

This session opened with three presentations on the status of and the improvements in the current operational processors for Level 1 and Level 2 soil moisture and ocean salinity (M. Martin-Neira, Y. Kerr, J. Font).

The new Level 1 processor (v600) substantially improves the long term stability of the measured brightness temperatures both over ocean and Antarctica. Instrument calibration drifts have largely been compensated for and the seasonal trend over the ocean has been removed. Orbital biases (ascending versus descending passes) were reduced with some non-optimal performances at high latitudes during the eclipse period (November to January) remaining. Spatial biases have been reduced but not to the level that would allow removing the Ocean Target Transformation (OTT) correction necessary for the sea surface salinity retrieval. The land-sea contamination effect in the reprocessed data set, mainly impacting marine applications near the coast, is unchanged with the same level of degradation in the retrieved brightness temperature of the current operational Level 1 processor.

Further information related to Level 1 data included an improved method to precisely geolocate RFI sources using SMOS data (E. Anterrieu), the comparison of the impact of different bias correction techniques on the brightness temperature retrieval (A. Khazaal) and an assessment of the reprocessed Level 1 data set with v620 (J. Tenerelli). A nodal sampling method for an advanced image reconstruction to improve the quality of SMOS data was presented by V. Gonzalez-Gambau.

The new Level 2 soil moisture processor baseline V620 better characterizes auxiliary data files by splitting the values of Tau, roughness and RFI probability for ascending and descending orbits, uses a new/improved soil type characterisation and snow map, improves the soil moisture retrieval in forest areas and improves the computation of RFI probability. Further presentations focussed on improvements to the L-MEB model (J.-P. Wigneron), evaluating the skill of the MODIS IGBP land cover data for the soil moisture retrievals (A. Mahmoodi) and comparing SMOS retrieved optical depth of forest to data sets on forest/tree height and biomass (P. Ferrazzoli/C. Vittucci).

The new Level 2 sea surface salinity processor V620 estimates the Vertical Total Electron Content (VTEC) through Level 1C Stokes-3 measurements for descending passes and uses them in the salinity retrieval, better detects and flags RFI and improves the empirical roughness model #3. An assessment on how to reduce ascending/descending travel direction bias in SMOS salinity was given by C. Banks.

Following the presentations on Level 2 ocean salinity, the validation approach for these data was discussed along with the differences among the three roughness models used. Both points will be discussed at the next Quality Working Group, with the aim to consolidate the suggested standard validation protocol and take a decision on how to reorganize the roughness models slots. The standard validation protocol will be an integral part of the pilot Mission Exploitation Platform on salinity ,currently defined and implemented in 2015/16. This platform will aid the quality assessment and uncertainty quantification for a wider ocean user community and will combine SMOS data, in-situ, auxiliary data files and other ocean relevant datasets (e.g. sea surface temperature, altimetry etc) in one single environment.

**Session 3 - Applications addressing ocean**

This session covered a wide range of applications over oceans which capitalized on the increased lifetime and stability of satellite salinity datasets. It stressed how, in spite of residual inaccuracies in these datasets, it was possible to demonstrate the added value of remotely-sensed salinity in a wider oceanographic context.

Three presentations focused mainly on the characterization of SMOS signals or potential techniques to improve the quality of the datasets. A. Alvera-Azcárate presented a study on the detection and removal on non-physical signals in SMOS data by using the DINEOF (Data Interpolating Empirical Orthogonal Functions) technique. She concluded that DINEOF provides an efficient way to improve the quality of SMOS SSS data, and this is corroborated by the comparison with in situ data, despite systematic biases need to be removed. N. Kolodziejczyk presented preliminary results on a SMOS optimal interpolation scheme targeting a large scale and seasonal bias correction, as well as a noise reduction in the data. He demonstrated how this L4 product can reduce additional coastal and RFI systematic biases while conserving mesoscale signals. E. Tzortzi presented a study on spatial and temporal scales of SMOS variability, studying decorrelation length scales and analysing (zonally and meridionally) the derived correlation coefficients.

Subsequently, two studies on the detection and impact of rainfall in SMOS signal were presented. J. Boutin gave a talk on the imprint of rainfall on SMOS SSS, under the assumptions that SMOS SSS and Rain Rate (RR) are closely related at short temporal scale. A compilation of the various estimates of the slope of the salinity mismatch as a function of RR was presented. In this study, attention was paid at the influence of rain accumulation on SMOS SSS (which showed minor impact), and to the use of CMORPH rain product, which provided consistent results when compared to those obtained with radiometric RR. S. Guimbard provided an overview of the capability of SMOS to observe large-scale rainfall impacts on the Upper Ocean Salinity in the eastern tropical Pacific. He showed how SMOS gives an unpresented characterization of the spatial (~50km) and interannual/seasonal/intraseasonal variability of the East Pacific tropical fresh pool SSS. Synergetic use of SMOS SSS with Argo, RR, currents and wind datasets would enable better quantification of the mechanisms governing the structure and the variability of this fresh pool.

Additionally, the capabilities of SMOS in the biogeochemical context were underlined by two talks. C. Brown demonstrated the potential of using SMOS data, OSTIA SST and ASCAT data in the Tropical Pacific Ocean to estimate high resolution surface ocean pCO2 data and its variability. The method was based on a statistical model linking the SOCAT data to the satellite observations which revealed the impact of different atmospheric forcings (e.g., rain, winds) in the pCO2 variability in different areas of the study region. R. Sabia focused on the topical issue of Ocean Acidification (OA), highlighting the major objectives of the ESA Pathfinders-OA project, a feasibility study whose objective is to quantify the added value of remotely-sensed parameters for OA research. He focused on an identified processing chain which exploits the information content of Ocean Colour data, SST and SSS parameters. A proper merging of these different satellites datasets allows to compute at least two independent proxies among the seawater carbonate system parameters, and through that to infer estimates of the surface ocean pH and aragonite saturation state.

Finally, M. Portabella provided an extensive overview of the achievements of the recently concluded EU SMOS-MODE COST Action, which successfully targeted an increased uptake of SMOS data by a wider ocean community, nurtured additional oceanographic applications using satellite salinity datasets, and promoted capacity building by supporting a number of visiting scientist stages in different labs and by organizing a dedicated Training School.

**Session 4 - Applications addressing carbon**

This sessions was devoted to applications addressing carbon. The SMOS mission was first focused on ocean salinity and surface soil moisture but very quickly other science topic emerged (see for instance cryosphere studies). Right from the onset of the SMOS mission the biomass was a secondary goal and the idea was to infer vegetation water content. Even though most of the attention was on salinity and surface soil moisture during the first years, some studies were initiated to first assess vegetation water content retrievals as well as their relationship with the actual opacity, vegetation Leaf Area Index (LAI) and other such indices. As a consequence this session was organised to assess where we do stand and potential venues.

As vegetation is one of the drivers for carbon fluxes (it represents about 10% of the sources and 28% of the sinks), T. Kaminski presented how to constrain terrestrial carbon fluxes by assimilating the SMOS soil moisture product into a model of the global terrestrial biosphere. Actually, as the uncertainties are large, it is suggested to use assimilation of soil moisture to constrain it better. As water and carbon are intimately coupled, and FAPAR and atmospheric $CO_2$ constrain water fluxes, the variable to assimilate would be soil moisture. From validation on 5 sites and a global analysis, it was shown that adding SMOS soil moisture to atmospheric $CO_2$ concentration could enhance the results significantly (SMOSNEE project). There is a clear potential for SMOS L4 Carbon flux product when SMOS soil moisture is assimilated jointly with $CO_2$ Flask samples.

Another assimilation experiment was provided with the assimilation of SMOS observations for improving evaporation estimates over Australia. In this study presented by D Miralles the goal was to test the use of SMOS for improving terrestrial evaporation. SMOS was shown to give better root zone soil moisture estimates in the GLEAM model and to perform better than AMSR. The impact on ET estimation was more difficult to assess due to lack of data. It was also noted that the SMOS VOD could be improved. This point was addressed in the following talk delivered by T. Zhao who presented an approach for monitoring vegetation and soil moisture from SMOS data. The approach consists in using a fitted curve through the relatively noisy TB measurements. The retrieved vegetation optical depths compare well with above ground biomass and could provide complementary information of global vegetation. The obtained soil moisture estimates compare also well at selected sites.

The following presentation by D. Chaparro relied on the high resolution soil moisture products from SMOS obtained at BEC over Spain. The idea is to analyse how the droughts, monitored from the high resolution maps, could be related to the reduced water availability and in turn to the decline of forests in Catalonia. Results indicate that – depending on species - there is a relationship between SMOS soil moisture and forest decline and that dry conditions impact forest's health especially for broadleaf species, more sensitive to drought. The second part was to analyse how these drought conditions can be related to forest fire risks. And a very good relationship was obtained showing that fire risk maps with four thresholds could be produced and all significant fires were detected with 87% of ignitions predicted.

From the fire risk presentation the audience was then swiftly taken to cold areas as K Rautiainen presented how SMOS is used to provide a global (Northern Hemisphere) daily soil freeze/thaw product. The approached is based on a relationship obtained from ground measurements (ELBARA) and recently accompanied by a stricter modelling of snow emissions validated through ground measurements. The approached has been deployed over the northern high latitude with some success. A demonstration data base of the product will be soon distributed so as to get feedback from potential users with the goal to prepare an operational product.

The last presentation depicted yet another novel application of SMOS data. A. Al Bitar presented how surface water fraction over Tropical areas could be estimated from SMOS data. The approach relies on the quite different emissivities of tropical forest and water. As the two are rather stable with time, any changes can be attributed to variations in fractional surface water cover. The approach gives, for each pixel, the proportion of surface covered by water. The temporal evolution is an excellent tracer of surface water storage and a key for basin hydrology. When compared to data obtained from other sensors (here altimeters), the relationship is quite interesting and should provide a useful piece of information for global water and carbon cycle studies.

The session was devoted to various applications related to the carbon fluxes. Two relied on assimilation to infer CO2 fluxes and ET, two addressed water under various forms (frozen, snow or on the surface) while one addressed directly the impact of water availability on forest decline and fire risks. All those presentation are a clear indication that the SMOS data is now entering the operational use phase with very promising venues.

**Session 5 - Applications addressing cryosphere**

G. Macelloni dealt with the interpretation of SMOS data in the East Antarctic Plateau and central Greenland. SMOS data are first compared to geophysical properties of the ice sheet like surface temperature and ice thickness demonstrating their relationship. An electromagnetic model able to interpret the data is then introduced. The key point of model's simulations is the physical description of the ice sheet. Data and model analysis point out that the TB variability is mainly related to the variation of ice sheet temperature profile (static) which in turns depend on geophysical parameters. The possibility to derive this info from SMOS data is discussed. Finally, a completely new wide band microwave receiver (0.5-2 Ghz), developed within a NASA project, was then presented in order to derive the temperature profile.

L. Kaleschke gave an overview about recent validation campaigns for the SMOS Sea Ice thickness product and its application in a prototype sea ice forecast system for ship routing in ice-infested waters. The decline of Arctic sea ice raises increasing interest in Arctic shipping and the need for operational sea ice forecast systems. Sea ice thickness is one of the key parameters needed for the initialization of forecast models. It can be derived from the freeboard conversion using the CryoSat-2 altimeter or from SMOS. During the SMOS Ice campaign a unique data set over thin ice was collected in the Barents Sea in March 2014. A key finding from the validation campaign was that the ice thickness derived from L-band radiometry agreed well with the independent thickness measurement from an airborne laser altimeter.

C. Gabarró described an algorithm to compute Arctic ice concentration using SMOS brightness temperature measurements from different polarization and incidence angles. It was shown that despite its lower spatial resolution relative to SSMI or AMSR-E, ice concentration data products from SMOS can contribute to complement ongoing monitoring efforts in the Arctic Cryosphere.

T. Pellarin discussed TB data obtained with ground-based radiometer and possible applications to SMOS. Indeed, ELBARA data collected over heterogeneous mountain area in France, reveal a clear sensitivity to snow wetness. The sensitivity is much higher than what observed in other frequencies. A simple theoretical model (HUT) is able to explains the observed trends. The application of the same concept to SMOS data points out the potential of this technique. Future investigation will be devoted to the possibility of deriving new SMOS products.

J. Lemmetyinen discussed the results obtained during an experimental campaign carried out in a snow area of Finland by using a ground-based L-band radiometer (ELBARA). Experimental data shows an unexpected sensitivity to L-band to dry snow if multi-incidence angle observation are used. The sensitivity is much higher in H than in V polarization. A simple e.m. model is able to simulate observed data and preliminary investigations reveal the possibility to retrieve density information using the proposed approach. Further analysis are necessary to assess the method.

A final discussion pointed out that, beyond the “conventional” SMOS application, the availability of L-band data at global scale open the door to new applications in cryosphere domain. Some of them (i.e. ice thickness) are already sufficiently mature and well proven to clearly identify potential products, others are very promising but more investigation is needed. It is then recommended to support these activities in order to consolidate them. This can also provide a good motivation for future activities and need of L-band space-borne radiometer.

**Session 6 - Applications addressing hydrosphere**

The hydrology session comprised a diverse series of interesting talks, ranging from the use of soil moisture and brightness temperatures to improve river runoff, evaporation estimates, or temperature and precipitation forecasts, to validation activities and more innovative uses of the SMOS data to study extreme events or multiannual hydro-climatic variability.

In a set of presentations, J. Muñoz-Sabater, P. de Rosnay and M. Carrera evaluated the potential of SMOS soil moisture and brightness temperatures in Numerical Weather Prediction (NWP) models. From the work by J. Muñoz-Sabater and P. de Rosnay, it becomes apparent that the model estimates of soil moisture from the ECMWF Land Data Assimilation System (LDAS) can be improved by assimilating SMOS observations. Weather forecasts can in principle benefit from these updates through a better initialization of soil moisture prior to a forecast run. Although the impact of the assimilation on temperature and precipitation needs to be further assessed, results are promising even when the soil moisture assimilation is combined with assimilation of screen-level humidity and temperature. Likewise, the results of assimilating SMOS brightness temperatures in the Canadian Land Surface Data Assimilation System (CaLDAS) for the initialization of the soil moisture demonstrate an increased skill in the simulation of soil moisture for both superficial and root-zone layers. This work by M. Carrera suggests again that the positive impact on near-surface air temperature and precipitation forecasts is less unambiguous than when focusing on soil moisture only.

Five presentations were more directed towards improving understanding of the signal, and the quality of the brightness temperatures and soil moisture retrievals, and less based on the final application. N. Rodriguez discussed the results of a number of projects using neural networks to retrieve soil moisture from SMOS brightness temperatures, and demonstrated the potential of these approaches to both assess near-real time soil moisture as well as to conform long-term multi-sensor records. B. Hornbuckle presented a relevant assessment of the penetration depth of SMOS and the implications that this varying depth may have in the context of traditional validation activities, suggesting that vertical representativeness errors may in fact explain part of the recurrent systematic mismatch against in situ measurements of soil moisture. B. Molero presented the disaggregation algorithm DisPATCh, applied to SMOS Level 3 soil moisture retrievals to produce higher-resolution soil moisture maps over semiarid regions. Results over southeastern Australia and the Great Plains showed that the disaggregated soil moisture products might improve correlations and bias against in situ. R. van der Schalie presented the results of applying the Land Parameter Retrieval Model to retrieve soil moisture from SMOS brightness temperatures, and how they compare favorable to those from the official Level 3 SMOS product. Finally, A. Mialon explained the work at the SMOS ground segment (CATDS) towards delivering Level 3 data, including a presentation of the current reprocessing RE03 that became available in Spring 2015.

Subsequently, three presentations were directly focused on the variability and anomalies of hydro- meteorological variables, and the value of SMOS to gain understanding on the dynamics of the hydrosphere. The temporal changes in surface soil moisture and sea surface salinity from SMOS were simultaneously analysed over the five-year period by M. Piles, including an analysis of trends and multi-year cycles, with special emphasis on El Niño/Southern Oscillation (ENSO). Results showed that SMOS data might provide coherent and reliable global temporal variability in agreement with expected climatological dynamics. The soil moisture, runoff and evaporation in the Ouémé catchment (West Africa) were evaluated by D. Leroux using a distributed hydrological model in which SMOS soil moisture is assimilated. Similarly to the conclusions from NWP simulations (see above), the modelled soil moisture seems clearly improved after assimilation, but the positive impact is less obvious when it comes to other diagnostic variables (e.g., evaporation, runoff). Finally, A. Al Bitar explored the potential of SMOS to enhance the monitoring of floods and droughts. He illustrated how the anomalies in the retrievals correspond to the extreme hydrological events over the last few years, and presented two operational Level 4 products: The SMOS Drought Index and SMOS Flood Risk Mapping.

Overall, across the Hydrology session it became apparent that the range of applicability of SMOS for hydrological studies and NWP is broad and that there is room for further activities to exploit the value of the data. Now the concerns remain focused on the long-term continuity of L-band missions, to enable detection of trends in the hydrosphere within the context of global climate change.

**Session 7 - Synergistic use of SMOS measurements with other satellite/in situ data**

The final session made the explicit link between the three L-band missions. G. Lagerloef provided an overview on the recent work, in particular on the new version 4.0 of the Aquarius data, including an improved Geophysical Model Function to mitigate latitude dependent bias. The presentation also provided a first assessment of the potential skill of combined SMOS and Aquarius data for inter-annual trends to assess phenomena such as ENSO. S. Yueh provided an overview on the performance of SMAP after four months in orbit, including first data products. SMAP instrument and spacecraft are meeting their requirements, with several calibration/algorithm issues being worked on.

B. Tranchant summarized current work in assimilating SMOS and Aquarius data into models by Mercator Ocean. Main areas to focus on split into data (e.g. bias correction of the data, a pre-requisite for any assimilation scheme) and model (correction of freshwater fluxes, assimilation of brightness temperatures versus salinity, using 4D error covariances, ensemble approach) related aspects.

Y. Soldo provided a comparison on how SMOS and Aquarius detect RFI. Even though differences in contamination of data exist between the missions, this presentation sparked the discussion on a concerted effort between SMOS, Aquarius and SMAP with regard to dealing with RFI on a more institutional level. Currently the Frequency Allocation in Remote Sensing Technical Committee (FARS-TC), associated with the Geoscience and Remote Sensing Society (GRSS), is building a web-based tool to gather information on RFI. Even though work is in progress at present, this could be used to share information on L-band RFI across missions.

N. Reul provided an overview on the recent severe marine weather studies mainly using SMOS data but also other sensors data. A complete storm database has been generated for the SMOS mission archive which will support the SMOS wind speed data assimilation experiments into UK Metoffice forecasts model to investigate their skill on the storm track and intensity forecasts.

Future work will focus on merging low-frequency radiometer observations such as e.g. SMOS, AMSR-2 and SMAP and GNSS data from CYGNSS to study air-sea interactions in extreme wind conditions, including foam and whitecaps properties, the ocean response to the Tropical Cyclone passage etc.

B. Nardelli presented a multi-dimensional covariance model to combine and interpolate sea surface salinity with sea surface temperature.

**Summary of recommendations (from general discussion and individual sessions)**

Major recommendations/outputs gathered at the conference can be briefly summarized below:

- Need for continuity of L-band data was clearly stressed by users, both to support operational applications and climate research alike. Several avenues to be pursued towards a potential SMOS follow-on were discussed (e.g. taking part in the Sentinel Next Generation consultation). However, user community needs to be more proactive in demonstrating the usefulness and uniqueness of SMOS and L-band data to new communities and relevant stakeholders.
- Merging datasets across SMOS, Aquarius and SMAP will require consolidated cross-calibrated brightness temperatures, also as a pre-requisite for synergistic data use among the three L-Band missions. This is already being addressed by the Inter-Comparison Working Group, but only based on a best efforts basis; a more formal financial and technical support would be desired.
- Given that Radio-Frequency Interference (RFI) has impacted, to different extent, all three missions' data quality, a common RFI working group has been suggested, possibly making use of the recent efforts by FARS-TC. This would strengthen a common L-band position in international organizations and fora such as ITU and WRC.
- An even further effort has to be devoted to consolidate the validation protocol for salinity products, by commonly agreeing on the ground-truth measurements and homogenize the performance metrics of the various salinity products. Part of these efforts will be covered under the umbrella of the forthcoming "Pilot-Mission Exploitation Platform" for SMOS salinity.
- Besides focusing on achieving mission requirements, it is critical to stress and promote applications with a more distinct societal impact (e.g., wind estimation under hurricanes, droughts indexes etc.).