SMOS Data Assimilation Study
Phase-2 teleconference 27 02 2014

Date: 27February 2014.
Participants:
ESA: Matthias Drusch (MD), Susanne Mecklenburg (SM)
ECMWF: Patricia de Rosnay (PdR), Joaquín Muñoz Sabater (JMS), Lars Isaksen (LI)

Minutes and project status:
https://software.ecmwf.int/wiki/display/LDAS/SMOS+Project+Documents

Objectives of the teleconference:
- ECMWF to give an update on the current contract status
- ECMWF and ESA define the next contract content, schedule and list of actions for its preparation.

Status of the current contract (4000101703/10/NL/FF/fk)
PdR presented the status of the contract. In the original contract, all WPs are completed (WPs 1000, 1100, 1200, 1300, 1400, 1500, 1600, 2000, 2100, 2200, 2300). The CCN WPs 3100, 3200, 3300 are also completed. Remaining CCN WPs to be completed by the end of June are WPs 3401 and 3402 (B-matrix cycling and 3D error structures).
In terms of reports, three reports were completed in the last three months and three reports remain to be written and provided by the end of June. So, since the last PM in November there was a significant effort produced by JMS to catch up on delayed WPs and reports. The work to be completed in the next four months (WPs 3401 and 3402) will be very important to improve the SMOS DA system performance.

MD was concerned by evaluating SMOS DA compared and/or combined to ASCAT DA. He proposed to run quick DA experiments to compare ASCAT and SMOS DA. PdR proposed to include a proper ASCAT and SMOS DA impact study in the next contract, but not to do a quick study and not before the current contract WPs are completed. It is crucial that the next four months are entirely devoted to complete the current contract WPs on B-matrix and 3D error structure. Comparing ASCAT and SMOS DA before would lead unreliable results and most probably erroneous conclusions. LI pointed out that there is no competition between ASCAT and SMOS and ECMWF is interested in the synergy between ASCAT and SMOS, as explained in the letter sent by PdR, JMS and LI last week (provided in annexe of these minutes). MD and SM agreed not to include ASCAT DA as a quick additional activity in the next four months and they agreed to propose a dedicated WP in the next contract.
Discussion on the next contract content and schedule

The content of the next contract was discussed. As proposed in November, the contract will include 24 PM from July 2014 to December 2015, plus 6 PM for a VS research study on SMOS NN soil moisture product DA:

- Monitoring and continuous activity (4 PM)
- Land Applications (8 PM)
- Ocean Application (12 PM): 6 PM on sea ice
- VS on NN soil moisture data assimilation (6 PM)

Concerning Land applications, there will be 3 PM on SMOS and ASCAT DA and 5 PM on the NRT NN soil moisture production. Land applications will start immediately in July with SMOS ASCAT DA running in parallel to the development of near real time NN product definition suite. The production suite will be developed at the script level. It will rely on the SMOS converted grib files, the IFS outputs and the NN coefficients provided by LERMA and it will dissemination to UKMO. To avoid any delays in the production PdR proposed to immediately make the request for new mars parameters for the new NN soil moisture product.

Ocean Applications will start in January 2015, with the first six months devoted to sea ice and the second half of the year on wind applications.

For the VS study it was agreed that PdR will contact Filipe Aires (LERMA) to define the VS period and person. Ideally the VS should start as soon as possible in summer 2014.

MD will prepare the statement of work and send a preliminary version to ECMWF by the end of March. PdR will prepare the RfQ in April. By the end of April the SoW and RfQ will be completed.

List of Actions:

PdR: request new mars parameter for the NN soil moisture product
PdR: Contact Lerma (Filipe Aires) to set up the VS study

MD: draft the SoW by the end of March
PdR: draft RfQ as soon as preliminary version of SoW is available
MD and PdR: Complete by end of April SoW and RfQ.
Annexe:
Email dated 17 February on ECMWF SMOS activities, from PdR, JMS and LI to MD and SM.

-------- Original Message --------
Subject: Re: ECMWF-ESA telecon date changed to 27 February
Date: Mon, 17 Feb 2014 11:47:35 +0000
From: Patricia De-Rosnay <Patricia.Rosnay@ecmwf.int>
To: Matthias.Drusch@esa.int,  Susanne.Mecklenburg <Susanne.Mecklenburg@esa.int>
CC: Joaquin Munoz <Joaquin.Munoz@ecmwf.int>,  Lars Isaksen <lars.isaksen@ecmwf.int>

Dear Matthias, Dear Susanne,

We take note of our telecon on Thursday 27 February at 12:00 (NL/IT time).

We thought it would be relevant to comment on our SMOS assimilation activities at ECMWF before the telecon. It is a fairly long email, however we found it is useful to clarify our objectives before the telecon.

There is no message at all coming such as "SMOS will not be assimilated because of negative impact".

On the contrary we believe there is a lot of useful information in the SMOS TB and we are determined to improve SMOS TB data assimilation with the goal to obtain a positive impact on both soil moisture and near surface weather parameters. Results we obtained in the past when we implemented the EKF showed that it is possible to improve consistently T2m, RH2m and soil moisture. The results you saw in Frascati are based on a single data assimilation experiment for summer 2010. So it is very important not to draw any quick conclusions from this single case using early SMOS data. The results are interesting, they show that the problems which we had last year in the implementation are definitely fixed. They show positive results in the Southern hemisphere and negative in some Northern hemisphere regions. They show a significantly improved agreement between observations and CMEM model equivalents. This raise several interesting questions and point towards required areas of investigation. We are planning in particular to investigate the systematic negative increments over North America (systematic increments should not happen) and to run DA experiments for summer months of recent years with better SMOS data quality. The next immediate step is also to improve the errors specification and it is expected to largely influence the performance of the SMOS data assimilation system.

After these investigations we believe there is still large potential concerning improvements in quality control (for example, using RFI probability from CESBIO would likely be very beneficial) or bias correction (variational-like or running-mean-like methods would be worth investigating as well). Other areas of improvements concern the link with the model. For example the model team will start looking at finer vertical resolution, and a new soil texture data base is under development and it may have a significant positive impact on the model soil moisture range and dynamics. Soil texture can have a large role on the SMOS DA impact. But continuous developments require thorough investigation and in depth analysis, which take time with limited resources. In other institutes, Level2 algorithms are still improving, even more than four years after launch, based on many years research by relatively big teams working at CESBIO, INRA etc. It is absolutely fair to keep developing the algorithms several years after launch. It is the same at ECMWF, we keep improving the SMOS DA system, which start reaching now a good level of maturity. And it is important to look at the details and understand the processes that control the DA impact.
We believe it is crucial to persevere in making the most of SMOS soil moisture. Looking at other topics (wind, sea ice) is also interesting and we are happy to spend time to investigate these applications as discussed during the last PM. However our core SMOS activity should remain focused on thorough soil moisture continuous developments, which is the primary objective of SMOS, and for which SMOS provides very valuable information compared to the other satellites. We believe it is vital for the success of the SMOS mission that ESA allows ECMWF to spend significant time of the SMOS funded activities on ensuring we resolve the issues mentioned above which would make an implementation of SMOS in our operational assimilation system more likely. If ECMWF scaled these activities down other NWP centres would question a possible implementation.

From the NWP point of view it should not be viewed as a competition between ASCAT and SMOS. In 4D-Var we do use several sensors for the atmospheric analysis that measures more or less the same signals in the atmosphere, but often complements each other, provide additional data coverage and increase resilience. We do not think of this as a competition between, say, AMSU-A, IASI, AIRS and CrIS. Similarly, for the soil moisture analysis, SMOS and ASCAT are complementary from each other. ASCAT relies on 20 years of operational scatterometer data (and still there is a full team working and improving soil moisture in Vienna), so it is fair that it will be ready for operational implementation slightly before SMOS which is less than 5 years old only. SMOS is still very young. Our objective is to use SMOS/SMOS Follow-on for our operational soil moisture analysis.

Patricia, Joaquin and Lars