Summary report of the
2021 Joint DAWD and DAsKIT working days,
Online meeting/Ljubljana 22-24 September

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In 2021, the Joint DAWD and DAsKIT Working Days were planned similarly as last year: due to the ongoing pandemic situation the event was held as a video meeting which was organized by ARSO, using the Zoom videoconferencing facility. The meeting was opened by a welcome message from Mojca Dolinar, the Director of meteorology and hydrology at ARSO. The general organization of the ACCORD DA area was presented next by the AL Roger Randriamampianina. The first day was devoted to national status reports, followed by a summary of upper-air and surface DA of the HIRLAM consortium. On second day, particular aspects of the current development and research activities were discussed; this year, the focus was on the B-matrix role, design, computation and evaluation. Other sessions included assimilation of humidity related observations, surface data assimilation and system aspects. There was a maximum of 59 different online participants (a few possibly duplicated due to multiple logins) registered during the meeting.
National presentations (Day 1), summary presentation from HIRLAM consortium and thematic talks are available at the LACE webpage under the DA area http://www.rclace.eu/?page=216#workshops.

Summary of thematic talks (Day 2)

Session on the B-matrix

In his presentation, Pierre Brousseau described the role of the B-matrix for data assimilation and introduced the current way of its modelling in the regional model. Different sampling strategies were described (NMC, DSC, EDA) and the benefits of LAM EDA to analyse smaller scales were presented. In the discussion it was concluded that when choosing the global ensemble as IC/LBC for regional simulation, the EDA are preferred (the operational global long-range ensemble runs demonstrate too much spread at initial forecast ranges). It was shown that the daily re-computation of B in a 3D-Var framework results in little sensitivity in the forecast scores. The dependence on the forecast range used for the B-matrix sampling was demonstrated and it was shown that it is usually possible to apply such a matrix in the DA cycles with larger frequency (with appropriate rescaling). At the end of the talk, some principles of 3D-EnVar scheme were presented. It allows for a fully flow dependent analysis increments which as such agree much better with local orography, a shown on an example from the French Alps. In the following discussion it was mentioned that the tools/procedures should be better documented, especially for the need of DAsKIT which begins with the B computation. Several other issues were also discussed such as the order of members when creating sampling differences. The second talk by Antonin Bučánek focused on practical steps in the computation - preparation of dataset of differences between forecasts used to sample errors, setup of EDA with observation perturbations and optionally additional perturbations of SST and first guess, B-computation with the Festat program and a-posteriori diagnostics methods and tools. A link to examples available on Belenos HPC at MF was also provided. The last talk by Yelis Cengiz was a description of B computation for a Turkish domain at ECMWF (DSC method). In the discussion it was stressed that the choice of EDA stream of global ensemble would be preferable. Several concerns about the initialization of soil fields (different soil scheme in AROME and IFS) were raised with no definite solution proposal. This section was also attended by members of ST8 ACCORD support team and discussions are expected to continue during further meetings of this support team.

Radar and GNSS assimilation

The first talk of the session was a report on the outcome of a recent LACE stay on radar reflectivity DA by Suzana Panežić in Prague. Several setups were evaluated in order to study the sensitivity to screening selections and in particular to drying effect observed in the lower troposphere. The impact of the box size used to search for similar reflectivity profiles was shown to be small. Secondly, using smaller observation error shows a better fit of simulated and observed reflectivity but higher bias in the resulting relative humidity columns. If dry observations are denied from the simulation, the drying effect diminishes (but such a solution would not benefit from using the dry information at all). The work shall continue during another stay in 2022.

In the next presentation, Peter Smerkol described the recent advances in implementation of torus mapping method to correct the aliased radar winds from the reflectivity-optimized scans. It has progressed a lot (for example the dealiasing by height sectors is now available), but still needs additional QC to filter the unsuccessful cases. A possibility to create super observations of both reflectivity and radial winds will be available soon. This approach is already used operationally in Austria (using the prepopera tool).

Finally, Idir Dehmous presented his recent work on ZTD assimilation (3 processing centres around Belgium). The use of ZTD had a positive impact on the light precipitation forecast skill. Overall, an increase of humidity bias due to ZTD was demonstrated. In this study, a static bias correction was applied and it is to be compared with the variational approach.

Surface data assimilation

In the first talk of the session, Helga Toth described her recent experiments with the simplified extended Kalman filter (SEKF) for surface assimilation based on conventional observations. Several tunings of observations, background error and perturbation magnitude were tested in order to experimentally determine stable settings. It was discussed that a neutral impact is currently observed at larger costs. However, additional value could be provided on cases (as shown for strong precipitation) and potential is seen for including new observations.

In the second talk, Yelis Cengiz presented a validation of surface DA using the OI_MAIN. In comparison to a downscaled reference in the discussion it was mentioned that the use of MESCAN seems to correct summer scores; usefulness depends on the geographical domain; one should pay attention to the change on "horizontal correlation distances" when moving from classical CANARI to CANARI-MESCAN. There are also open questions regarding proper update/cycling of surface temperature field for all tiles in SURFEX.

Code and system session

An introduction to execution of 3D-Var analysis (minimization) in the OOPS version of the AROME/ALARO system was provided by Benedikt Strajnar. Changes in namelist organization were described and methods on how to intercompare the OOPS/OOVAR runs with MASTERODB ones in terms of minimization cost function diagnostics. Recent experience with running OOVAR at Belenos (MF) and local HPC was described. The OOPS-based results are identical to the MASTERODB runs except for 2m observations as verified for the case of ALARO model configuration (T2m, RH2m).

In the final talk, Alex Deckmyn provided the status and expected evolution of the NodeRunner, an ecFlow based flexible and lightweight assimilation scripting system developed and used at RMI and to be used by some DAsKIT members. The system is now also available for initial testing as a git repository located at the ecgate server (ECMWF). Instructions for installation and setup of a first run were provided. Implementation at TEMS (Bologna) is also planned.

Summary of final discussion (Day 3)

General discussion

The LACE DA AL first briefly presented an overview of discussed topics, which was followed by a short topical discussion. In the remaining time, a feedback on the new research and support teams of ACCORD was requested by the ACCORD AL. Some members expressed opinion that the communication hugely intensified since we are a common consortium. Then, the reporting practice was touched and there is a wish not to duplicate work on the LACE and ACCORD levels. As an example, the latest report from HIRLAM (an online shareable document) was mentioned. The participants also expressed their opinion that a yearly face-to-face meeting is preferred in the future. Following the general discussion session which ended the "2021 Joint LACE Data Assimilation Working days & ACCORD Data Assimilation basic kit Working Days", two parallel sessions have taken place on both the LACE and DAsKIT sides, to discuss and plan specific topics.

RC LACE internal discussion and planning

The organization of ACCORD DA and its impact on LACE DA area and the working practice was further internally discussed. A Slack communication channel for LACE was considered but the group did not see a particular need to have one in the near future. On the other hand, a wish for bi-monthly internal informal LACE meetings was identified and these are to be organized by the LACE AL. The idea is to have a fixed day of the month (ideally 2nd week in month) and the agenda is up to individual participants' needs. A time discrepancy for manpower planning for LACE and ACCORD RWP was identified and discussed but the group accepts this and sees no issue with provision of estimated numbers for LSC meetings in advance. Regarding the reporting, the LACE members agree to try to make it through a common ACCORD web document for the next LSC with deadlines/periods as usual. The members of RC LACE teams identified a need for yearly physical meeting (DAWD) also in the future. Stefan Schneider proposed that the topical meetings should be held mostly at the ACCORD level (to have enough expertise) and technical issues might be resolved internally within LACE. LACE members also highlighted that the organization of DAWD in parallel with the autumn LSC is a good way to save excessive travel costs for the LACE participants.

The RC LACE plan for 2022 is available at the RC LACE website and was quickly discussed point-by-point. In particular, the group identified a need to validate new satellite products in combination of GNSS-RO data (currently no manpower in the plan). Furthermore, a detailed plan of stays was composed:

1) S. Panezić (Further sensitivity studies with radar reflectivity DA) – CHMI Prague (3-5w)

2) P. Scheffknecht (assimilation of microwave links) – ARSO Ljubljana (3-4 w, postponed from 2021)

3) A. Dumitru (Computation of background-error covariances) - CHMI Prague

4) K. Szanyi (Reflectivity data assimilation incl. test of superobservations)

5) M. Ličar (Remote-sensed observations in SEKF) – ZAMG Austria or OMZS Hungary

At the end, the feedback on several data-related questions, triggered by the DM, was collected (feedback to OPERA users group, provision of EMADDC data by region, precipitation data on the OPLACE). A common conclusion is that the group sees no immediate need for splitting the Mode-S data by the provider and that the AWS precipitation data can be provided by most members.

DAsKIT internal discussion and planning

The DAsKIT session was opened by Roger Randriamampianina, ACCORD DA Area leader (AL) after the following list of topics was proposed by Maria Monteiro (MM) to initiate the discussion among the DAsKIT group:

Meetings format: DA working days & dedicated actions

1. DAsKIT article for the newsletter
2. DAsKIT wiki
3. Further actions: B-matrix vs. NodeRunner
4. Further meetings:
5. ACCORD DA code training (3 candidates from DAsKIT), maybe in November.
6. ACCORD surface working weeks (October 18-22); is Roger planning the DAsKIT surface action included there ?
7. SURFEX NWP training week (early 2022).

The main conclusions could be registered as follows:

1) On the format of the DA meetings (working days, dedicated actions, etc), it was said that practical sessions are useful and, if on-line, they should be recorded. Moreover, ideally (for the participants) it would help if they could be hybrid (physical and remote) but, in this case, drawbacks were pointed out like the stress increase on the learning process. However, the AL mentioned that any further ideas the ST2 participants may have are welcome and should be pointed out to speed up the access to communication.
2) A strong point of discussion was the need to provide the countries - which do not have it yet – with a way to compute a local B-matrix. One should note here that, up to the recent successful Turkish effort, to migrate LACE scripts to ECMWF, DAsKIT countries were relying on stays in Météo-France to compute their B-matrices and this effort was usually done by use of the OLIVE/Vortex platform which could not be run remotely. Several information and ideas came up from the discussion on the possibility to create and maintain dedicated tools by DAsKIT for this purpose, to know: Alex Deckmyn has just delivered a first NodeRunner version to be tried locally in order to cycle DA algorithms, but it is only available from ECMWF computing platforms (tested on TEMS, to be migrated to the new "Bologna platforms"); Idir Dehmous has some idea on how to extend NodeRunner modularity concepts to B-matrix computation; Yelis Cengiz just successfully applied ZAMG scripts with support of SHMU to compute a first B-matrix; two stays to adapt and migrate to "belenos" a plug-in of NodeRunner, to compute B-matrix, have been approved by ACCORD up to the end of the year that may need to be adapted to dedicated remote sessions (at this moment, it is the wish of Turkey already; the other stay concerns Algeria and its format is under discussion; the constraints on both stays are related to the actual pandemic travel limitations). At the same time, a few countries are computing, or willing to compute, a new B-matrix, some of them do not have access to extra computing power like ECMWF. As a consequence, a meeting with the involved people should take place in the very short-term, in order to optimise the available efforts and better prepare a two-fold plan: i) to track a road-map for the development of the tool; and ii) to organise an eventual practical action

(remote or hybrid) to guide the countries on a first experience on how to compute a B-matrix (by downscaling), where countries could fulfill recommended steps during a time period and share issues by video-conf on a weekly basis. This possibility will be mentioned on ST8.

3) On the possibility to take decisions in this moment on to the computation of a second B-matrix by an ensemble method, it was said that this should happen later. In particular; mentioned concerns pointed to: the order of the perturbation format, of the observations, of SST, etc.; and SPPT should be avoided for the time being. In particular Wafa Kahlaoui explained her steps to CANARI perturbation, a job which was done during a stay in Prague. On the topic it was said that, ideally, B-matrix should be computed whenever new observation types are assimilated and that a few observation types on the assimilation scheme may not justify a B-matrix computation by the ensemble method.

4) Another topic of much interest was the possibility to include a presentation (the one presented by Yelis Cengiz) on the actual issues with the local implementation of the surface DA schemes on the short-coming ACCORD surface working days. Patrick Samuelsson should be contacted by MM to understand if it is possible.

5) The draft of the DAsKIT article to the newsletter was mentioned and an extension of the deadline to deliver feedback on it was postponed to 27 September 2021.

6) Finally, the last words came from the AL which highlighted the need to continue to enhance communication internally and among the actual DA research an support teams inside ACCORD: as much as possible, the participants should rely on Slack (besides the DAsKIT wiki page), on a daily basis and to request for support at any moment.

TODOs

A short to-do list can be created out of discussions during the whole working days:

- Check the webpage for old presentations (AL)
- Document the Jk procedure on the LACE forum (Croatian team)
- LACE AL organizes bi-monthly internal DA meetings
- LACE AL provides recordings of the thematic talks, in particular the B-matrix session (also for ST8 support team)
- DAsKIT colleagues will take surface DA issues (related to CANARI-OI-MAIN) to the ACCORD surface WDs

Some of these items were completed during and immediately after the workshop.