Report from LACE DA Working Days 2014 in Zagreb
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Introduction:

In 2014 the LACE DA Working Days has been invited by Croatian Colleagues. The presentations are available online on LACE webpage, therefore in this report only the main issues will be summarized. The most relevant or recent activities which have been the frame of the Working Days are:

- Operational or quasi-operational systems i.e. status presentations
- Pre-processing and Quality Control of RADAR observations and preliminary studies
- Data Assimilation of GNSS ZTD observations
- Bias correction of polar-orbiting satellite observations and its channel selection in 3DVAR
- Data Assimilation of Mode-S MRAR data
- Discussion on climatological and flow-dependent structure functions
- The use of observations, the OPLACE system
- Discussion on OOPS project

Status Presentations:

Operational and pre-operational DA systems briefly summarized:

	Austria ALARO	Austria AROME	Croatia ALARO	Slovenia ALARO	Slovakia ALARO	Romania ALARO	Czech R. ALARO	Hungary ALARO	Hungary AROME
Resol.	4.8L60	2.5L90	8L37	4.4L87	9L36	6.5L49	4.7L87	8L49	2.5L60
Cycle	CY36exp	CY36exp	CY35t1	CY38bf3	CY36t1	CY36op2	CY38bf3	CY36op2	CY38bf3
Coupl.	IFS 3h	IFS 3h	IFS	IFS	ARP	ARP 3h	ARP 3h	IFS 3h	IFS 1h
Method	OI	3DVAR+ OI_main	3DVAR+ OI	3DVAR+ OI	OI	3DVAR+ OI	OI	3DVAR+ OI	3DVAR
Bmatrix	NMC	ENS-laef	ENS	ENS		ENS		ENS	ENS
Speciality	LCORRV	3h RUC	tunedBR	3h RUC	Blending		Blending		3h RUC

Austrian report (Florian Meier)

Beside the introduction of operational DA systems, Incremental DFI was further mentioned regarding its usage and random crashes (studied in the frame of 1 hourly updated analysis cycle). Also problems were reported about HIRS radiance assimilation and the proper satellite channel selection which would be important to share more effectively on LACE forum.

Croatian report (Antonio Stanesic)

It is important to note that during validation of CY38t1, Croatian colleagues are observed similar deviation of humidity forecasts from previous cycle than other LACE centers which corresponds to LACE forum topics inside “cy38t1_bf03 – export version”. More details can be seen in the status presentation.

Slovenian report (Benedikt Strajnar)

An interesting issue was shown about jumpiness of synoptic and sub-synopic runs of ALARO forecasts initialized from ALARO 3DVAR RUC analyses. Beside upper-air data assimilation, more efforts will be put on the snow analysis to improve winter time ALARO forecast in the future.

Slovakian report (Michal Nestiak)

On the top of the Slovakian DA activities (can be seen in the presentation), future plans about new parallel suite (based on CY38t1, with 4.5km horizontal resolution and 63 levels), local implementation of HARMONIE with “t” cycle has been also mentioned.

Romanian report (Mirela Pietrisi)

After the introduction of operational system configurations, a detailed study has been shown about so called MODE verification method which gives advanced estimate of the performance of ALARO forecast during different case studies.

Czech Rep. report (Antonin Bucanek)

The modified humidity treatments of CY38t1 has been described in details and the relevance of snow analysis has been highlighted. Also the upcoming parallel suite based on BlendVAR configuration will be soon implemented to operation by Czech colleagues.

Hungarian report (Mate Mile)

Beside showing current status of operational DA systems, developments of AROME 3DVAR RUC has been presented regarding RADAR data assimilation, calculation of new AROME EDA B matrix and surface data assimilation based on Extended Kalman-Filter.

HIRLAM's status about use of observations (Roger Randriamampianina)

Among many interesting researches, detailed description about data assimilation of ASCAT oceanwind observations has been discussed which observation provides beneficial element of the DA system. Also detailed introduction of KNMI activities has been shown with special emphasis on Mode-S EHS data and HARMONIE 4DVAR activities. At the second half of the presentation the data assimilation challenges about AROME-Arctic project brought interesting discussion about data coverage and the use of satellite observations.

HIRLAM's status about background error statistics (Magnus Lindskog)

First of all the parallel manner of new FESTAT has been introduced in HARMONIE system which provides faster calculation of background error statistics. Beside of many interesting topics, it was mentioned that the HARMONIE unified DA framework will cover many algorithmic development of

HIRLAM DA community which includes Jk method, Cloud mask initialization, Phase-error correction algorithms in the future version of HARMONIE. More details in the presentation uploaded to LACE webpage.

Pre-processing and Quality Control of RADAR observations:

Data Assimilation of Austrian RADAR observations (Florian Meier)

In Austria observations from 4 RADAR stations have been tested currently with limited RADAR Quality Control. It means only dealiasing was treated and "quality control" by Bator and Screening was used during data assimilation impact study. According to the verification results it was pointed out that the impact of RADAR on precipitation can be large however the use of more and better quality control is essential.

RADAR DA related activity 2014 (Michal Nestiak)

A summary about LACE RADAR data assimilation activity has been shown and a detailed overview about the tested RADAR data pre-processing with special emphasis on INCA2 QC and CONRAD conversion tool. A two months observation samples were collected from all LACE countries and difficulties have been found regarding conversion of Ouality Indexes generated by INCA2 QC into MF Ouality Indexes produced in BUFR format with CONRAD. Therefore more efforts are needed to make QC proper RADAR data in MF BUFR with correct QIs.

Discussion on the use of RADAR data

- Quality Control is the key issue of a successful RADAR data assimilation study
- INCA2 QC provides advanced tool to estimate the quality of RADAR reflectivity observations, however, it is hardly used for RADAR radial wind i.e. more work is needed to develop QC for radial wind
- Also dealiasing is not treated by INCA2 but this QC is available in BALTRAD and Prorad
- INCA2 uses NWCSAF QI (which has NWP background) but this QI can be easily switched off from QC procedure if needed.
- OPERA 3D RADAR data has to be quality controlled as well
- However assimilation of RADAR reflectivity and radial wind provides good impact in 3 hourly updated analysis cycle with 2.5km and 16km observation thinning (experience from AROME-France), move to higher resolution and more frequently updated RUC the quality of RADAR data become more crucial and has to be further studied.
- In conclusion a RADAR meeting was proposed to bring remote sensing people closer to NWP people and discuss relevant QC issues for future data assimilation.

Data Assimilation of GNSS ZTD observations:

GNSS ZTD assimilation in AROME-Hungary (Mate Mile)

A data assimilation study regarding GNSS ZTD has been introduced with AROME 3h RUC 3DVAR data assimilation system. The study was based on data from a recently E-GVAP implemented GNSS ZTD network so called SGOB network which provides dense and good quality of ZTD observation over AROME-Hungary domain. After pre-processing and with static bias correction the AROME with

ZTD assimilation gives slightly better forecasts during winter of 2014 (regarding surface scores) and in summer period improves short-ranges of AROME, but degradates long-ranges (regarding also surface scores).

Discussion on GNSS ZTD assimilation:

- E-GVAP membership is worth considering (so far Hungary and Croatia are members of E-GVAP from LACE countries)
- ZTD is able to provide useful humidity information to DA system (ZWD is a linear function of partial pressure of water vapour), however proper pre-processing and bias correction is needed.
- Variational bias correction is available in newer cycle CY38t1 which is under evaluation

Bias correction of polar-orbiting satellite observations and its channel selection in 3DVAR:

Satellite Data Assimilation in LAM (Patrik Benacek)

First of all, the length of the 3DVAR assimilation window (AW) has been discussed with respect to the stationary model field assumption applied to all observations in AW. In order to aviod time-delay bias in 3DVAR analysis shorter AW or more proper assimilation algorithm should be used like 3D-FGAT or 3h RUC. At the second half of the presentation variational bias correction has been studied with its different initialization methods. The coldstart, warmstart from LAM and Global coefficients were discussed regarding the evolution of bias parameters. Finally few slides have been shown about optimal channel selection of polar-orbiting satellites in a LAM 3DVAR system. Details and channel selection table can be seen in the presentation.

Discussion on Satellite DA:

- Sharing experiences about Satellite channel selection on LACE forum
- Thinning distances should be studied in LAM systems
- Option LAMSUB_FULL have to be revised (it has somehow effect on AMV as well)

Data Assimilation of Mode-S MRAR observations:

Data Assimilation of Mode-S MRAR over Slovenia (Benedikt Strajnar)

The Mode-S aircraft derived data provides good quality and dense observations. There are two types of Mode-S data namely Mode-S EHS and Mode-S MRAR (latter is routinely collected in Slovenia). After proper pre-processing and quality check Mode-S MRAR observations are considered as AMDAR data using OBSOUL format during DA. In Slovenian ALARO 3 hourly updated 3DVAR system the Mode-S MRAR data perform positive impact on analysis and forecast especially during winter cases. After the details of Slovenian impact study, a plan has been discussed about an EUMETNET proposal on Aircraft Derived Data (ADD).

Discussion on Mode-S:

- Mode-S MRAR (and EHS) data is also collected in Czech Republic
- It is worth considering to collect and test such observations in other LACE centers as well

- EUMETNET proposal will provide a future framework of these types of ADD observations for DA community (LACE (Beni) should stand for Mode-S MRAR activities)

Discussion on climatological and flow-dependent structure functions:

Studies with grid-point sigmaB maps and different assimilation setups (Antonin Bucanek)

A description and the application of grid-point sigmaB maps have been presented with respect to its usage in LAM. Several problems reported from last year have been corrected and sigmaB maps can be used properly in ALARO and AROME DA systems. On the other hand sigmaB maps generated from global AEARP provide little spatial variance over smaller domains, therefore it is an aim to produce such maps from LAM EDA or LAMEPS systems in the future. At the second half of the presentation additional corrections (SIGMAO_COEF) have been discussed regarding CY38t1.

Discussion:

- Corrections are shared on LACE forum, so everyone can apply at local systems
- To make LAM sigmaB maps more collaborations are needed with Meteo-France colleagues

The use of observation in LACE:

Report on DM Activity (Alena Trojakova)

The latest upgrades and maintenance issues have been summarized about OPLACE. Beside OPLACE acitivities a new COPE project has been introduced which will draw the future of observation handling in ARPEGE/IFS model cycle.

Discussion:

- To contribute in COPE project, LACE can work in filters, but the manpower is very limited.
- Recently Alena(LACE DM) will keep the contact and follow the work of COPE people
- OPLACE backup system is not needed because of the reliable operation of the current system

Status of OOPS for LACE discussion:

Status of OOPS project (Mate Mile), *Discussion:*

- LACE colleagues are agreed that we don't have recently DA algorithmic developments which should develop in OOPS compliant way, but we should join to the tests of first available OOPS LAM 3DVAR prototype
- The following LACE colleagues will dedicate time for the OOPS LAM 3DVAR testing:
  - Mate Mile from Hungary
  - Tomislav Kovacic from Croatia
  - A Slovenian newcomer who skilled in C++

General Discussion and Continuation of the Work:

During the discussion section the following topics were identified to futher work so called TODO-s:

- Satellite Channel Selection → post Patrik's table on LACE forum and LACE colleagues should do similar summary regarding their settings
- RADAR obsmonitor on LACE forum
- BUFR TEMP → test radiosonde with position in DA configurations
- RADAR QC → Detailed check of upgraded Austrian data
- DFS and MTEN related articles on LACE forum
- Update operational namelists on LACE webpage
- Check VERAL regarding Q (?)

AOB:

A general agreement was to organize DAWD during early autumn and at the same week as LSC to save time and travel expenses.