ALADIN data assimilation starters kit meeting

22-23 March 2017

Lisbon, Portugal

report

Subject:	Report of the ALADIN data assimilation starters kit meeting in Lisbon on 22-23 March 2017.
Summary:	The goal of this meeting was to gather representatives of all of the ALADIN countries that do not run an operational data assimilation (DA) and to • identify their needs and expectations for a future DA; • to start a feasible common action on the handling of observation data. This action will be followed up later.
Action(s) required:	• a concrete kick-off action is planned for the present countries on the handling of GTS data; • we will make a doodle for the first follow-up webex; • we need to discuss about the scope and design of the common ALADIN-HIRLAM data assimilation scripting system during the CSSI/HMG meeting.

Participants

BOGATCHEV, Andrey : NIMH/Bulgaria
COSTA, Vanda : IPMA/Portugal
DALKILIC, Tayfun : MGM/Turkey
DECKMYN, Alex : RMI/Belgium
DEHMOUS, Idir : ONM/Algeria
DERKOVA, Maria : SHMU/Slovakia
FISCHER, Claude : M-F/France
KOLONKO, Marcin : IMGW/Pologne
MILE, Máté : OMSZ/Hungary
MONTEIRO, Isabel : IPMA/Portugal
MONTEIRO, Maria : IPMA/Portugal
MOREIRA, Nuno : IPMA/Portugal
MUÑOZ, Daniel : AEMET/Spain
SATOURI, Anis : INM/Tunisia
TERMONIA, Piet : RMI/Belgium
TROJAKOVA, Alena : CHMI/Czech Republic
VITERBO, Pedro : IPMA/Portugal
ZAHRA, Sahlaoui : DMN/Marroco
WHELAN, Eoin : MET.IE/Irland

Summary of the meeting

According to a recent inquiry among the Members of the ALADIN consortium, there are still 9 ALADIN Members who do not run an operational data assimilation (DA): Al, Be, Bu, Mo, Po, Pt, Ro, Tu, Tk, for the sake of simplicity called the “DA starters” below. It turned out also that there is some spread in the status in the HIRLAM countries as well (e.g. not all HIRLAM countries have an operational 3Dvar). So it would be beneficial to plan this program together with HIRLAM.

We used 2017 ALADIN flat-rate money to invite at least one representative of each of these countries to accelerate the activities on data assimilation in their home Institutes. The meeting started with didactic introductions by a number of data assimilation experts in ALADIN and HIRLAM. The format of the meeting was kept loose in order to make room for discussions. The presentations are published on the ALADIN web site: http://www.umr-cnrm.fr/aladin/spip.php?article318.

Preceding to this meeting, a web meeting was organized together with the colleagues from HIRLAM to plan this action already in 1 December 2016. The notes from the hangout are available here:
https://docs.google.com/document/d/1q5m5jXo6WW9r5xxW9BE9taCypzXlj_VJGQpV3BYtaKs/edit
An inquiry was made amongst the ALADIN LTMs by ACNA, see on the web: https://docs.google.com/spreadsheets/d/1SrVYZzBJFYN53EHrkZKIa46To8Ewg_yDs61REUc5L80/edit#gid=287439123 or the appendix.

Below we briefly report on the conclusions and the planned action from the discussion session.

Conclusions

From the presentations of the participants it can be concluded that:

- Almost all attending countries have activities on data assimilation (Bulgaria plans to start soon, all the other acquired some expertise so far).
- All countries are now allocating at least 1 FTE to data assimilation, some countries even more (potentially up to 3-4). This could lead to a bit more than 10 FTE in total, adding to the manpower contributions in the DA activities in the ALADIN consortium.
- About half of these countries have tested OPLACE data so far.
- These countries are taking a stepwise approach, starting with a simple setup and then adding extra data types to it.
- Some countries have tested the HARMONIE scripting system, but now either some basic version of sms or some basic unix scripting is used.

LACE has been very successful in installing operational data assimilation in the services of its members. Part of the success is the use of OPLACE to commonly handled observation data. Another important aspect is a good coordination (by LACE Area Leader) to avoid unnecessary duplication of work and to provide help and/or contacts with relevant experts whenever needed. The LACE setup of 3Dvar and OI can be seen as a “canonical setup” in line with the ALADIN MoU5, although the possibilities for implementing different setups is far bigger than for the forecast model. M. Mile gave a detailed presentation on the specification of this system for the CMCs AROME and ALARO.

There may be restrictions due to data policy issues. For instance, some countries are not Members of EUMETSAT, ECMWF or EUMETNET, which may create restrictions in their access to certain types of data or databases.

General conclusions:

- Special attention is needed to the local handling of the observational data. A concrete action is planned to coordinate the activities in the 9 countries, see below.
- Close collaboration with the local OBS and IT departments is necessary, this has to be supported by the NMS directions
- Blending as part of BlendVar was seen by many of the participants as a useful zero-th order step in the implementation of a cycle. IUA (as presented by C. Fischer) is an interested alternative, but no country outside of Météo France has invested in it so far (?).
- A stepwise approach will be taken starting with a simple system (first focus on SYNOP, TEMP, AMDAR, GTS data, see below).
- LACE developed a tool for the monitoring of the use of observational data and this can be made available, see presentation of M. Mile.
- Our HIRLAM colleagues from Ireland are using a data handling system based on the SAPP software of ECMWF. ECMWF is open to provide the SAPP system “as is”, but without any support for its operational use. This may provide an interesting alternative for OPLACE.
- Exchange of experiences is needed; especially some help in providing expertise to learn from the LACE actions.

Planned action

Data handling

The DA starter countries are requested to carry out the following action/steps:

1. get data from GTS (in BUFR format) for SYNOP, TEMP and AMDAR data, as you can get it in your institute.
2. store these data in a local database (or in a directory structure on disk) and handle somehow GTS duplication and corrections messages.
3. Additionally a few reference BUFR files will be provided by Météo France (MF) and OBSOUL files from OPLACE.
4. Compile the code the have BATOR running.
5. Convert GTS data to ODB format (via BATOR). The converted reference data will serve as a verification whether you succeed.
6. Check the content of the resulting ODB (odbsql or mandalay softwares)
7. Document what you have done.
8. Organize a webex, tentatively in May as a follow up. Next steps will be planned later.

Everyone will use CY40T1, the Toulouse version. More details can be found in the appendix. The participating countries are invited to coordinate this action. The coordinator does not have to be particularly experienced in running an operational DA cycle, but should be a systematic person with good communication skills. Such coordination should be formalized later.

Note after the meeting from the WG on data assimilation in Helsinki: Eoin has the intention to organize a demonstration by webconf on SAPP. Interested countries can attend this, but this would be rather targeted to colleagues from the observation departments/IT department in their Institute.

Towards a common DA scripting system with HIRLAM

It was concluded that there is a need for an inquiry as to what the scripting system should provide as features and how it should be coded or recoded. The group of participants of this meeting was too small to arrive at any concrete conclusions. A more general enquiry might be needed. This will be put on the agenda of the CSSI/HMG meeting on 8 April 2017.

APPENDIX: outcomes of the LTM inquiries on data assimilation.

			Algeria	Austria	Belgium	Bulgaria	Croatia	Croatia	Czech R.	France	Hungary	Morocco	Poland	Portugal	Romania	Slovakia	Slovenia	Tunisia	Turkey
operational DA system?			no	yes	no	no	yes	yes	yes	yes	yes	no	no	no	no	yes	yes	no	no
manpower			DEHMOUS Idir, BAHLOULI Abdelhak, DJABBAR Arab	Meier Florian, Weidle Florian							Mate Mile, Helga Toth	Hdidou Fatima Zahra, Sahlaoui Zahra (*) [1]	Malgorzata Szczech, Marcin Kolonko	Maria Monteiro, Isabel Monteiro	Mirela Pietrisi, (Simona Briceag, Alexandra Craciun, Simona Tascu)				
oper	CMC [2]			AROME			ALARO	ALARO		AROME	AROME					ALARO	ALARO		
	dx			2.5km			8km	4km		1.3km	2.5 km					4.5km	4.4 km		
	levels			90			37	73		90	60					63	87		
	quality control	CYCLE		cy40t1/cy36t1			CY35T1	CY38T1 -bf03		CY41T1_op1	38T1					40t1	38t1		
		algo		CANARI QC, Screening			CANARI QC, Screening	CANARI QC, Screening		COMPAS tools	CANARI QC					canari QC	canari QC		
	SURFACE analysis	CYCLE		CY40T1bf05			CY35T1	CY38T1 -bf03		CY41T1_op1	38T1					40t1	38t1		
		algo		CANARI (MESCAN OIMAIN inline)			CANARI	CANARI (MESCAN correlaton funciton)		surface OI CANARI	OI_MAIN, CANARI					canari	canari		
		obs		SYNOP, OPLACE national			SYNOP, OPLACE national	SYNOP, OPLACE national		T2m, RH2m projected to Ws, Ts, Wp, Tp increments	SYNOP					SYNOP	SYNOP, OPLACE AMS		
	upper-air analysis	CYCLE		cy36t1			CY35T1	CY38T1 -bf03		CY41T1_op1	38T1					40t1	38t1		
		algo		3D-VAR			3D-VAR	3D-VAR		3D-VAR	3D-VAR					blending by DFI	3D-VAR		
		obs		SYNOP, TEMP, AMSUA, MHS, HIRS, SEVIRI, AMDAR, AMW, ASCAT, IASI			SYNOP, TEMP, AMSUA, MHS, SEVIRI, AMDAR, AMW, MODES	SYNOP, TEMP, SEVIRI, AMDAR, AMW, MODES		full available Arome-France list (Arpège+SEVIRI +radar)	SYNOP, TEMP, AMDAR, MODES					none	OPLACE (TEMP, AMDAR, MODES, AMV, SEVIRI, AMSUA, MHS)		
	initialisation	CYCLE		none			none	none		none	none					-	none		
		algo		for ALARO DFI						Note: for dynamical adaptation, we test IAU now						-			
test (e-suite)	CMC											ALADIN			ALARO	idem			ALARO
	dx											10 km			6.5 km				4.5 km
	levels											60			60				60
	QC	CYCLE										CY36T1			CY40T1				CY38T1BF3
		algo																	
	SURF	CYCLE										CY36T1			CY40T1				CY38T1BF3
		algo										CANARI			CANARI				Blending
		obs										SYNOP			SYNOP, OPLACE				
	upper-air	CYCLE										CY36T1			CY40T1				CY38T1BF3
		algo										3DVAR							3DVAR
		obs										SYNOP, TEMP, AMDAR, AMSUA, MHS							SYNOP, TEMP, AMDAR
	initialisation	CYCLE														40t1			none
		algo														IDFI			
plans	CMC		Arome	AROME-NWC	ALARO			ALARO		Arome	AROME	AROME	AROME	AROME	ALARO	idem	ALARO or AROME	ALADIN	
	dx		3 km	1.2km	1.3km			2km		kept rather the same ~1.3km	1.3 km	2.5 km	2 km	2.5 km	5 km		2 km	7.5	
	levels		60	90	87			73		perhaps a bit increased for PBL ?	90	90	60	60	60		87	70	
	what?		Surface DA CANARI	prep offline of AROME2.5 1h-3D-Var RADAR, LHN,cloudmask	Surface DA blending? 3DVar?	SURFACE OI CANARI		3DVAR		implement Ensemble DA and use EDA output for situation-dependent 3D-VAR	EDA	3DVAR	3DVAR	surface + 3DVAR (with local radar data)	surface + 3DVAR	3DVAR	3DVAR	3dvar	
	time scale		2017-2018	2017-2018	2017-2018	2018-2019		2018-2019		2018-2019 ?	2020	2017-2018	2017-2018	2017-2020	2017 - 2018	2017 (asap)	2017-2018	2017	
	foreseen problems?			computational costs		computational costs, no expereanced people in that area		computational costs		must compete with clim-based B in 3D-VAR	computational costs	computational costs, handling local data		computational costs to compute the first B-matrix in due time for 3DVAR	local computational platform			computational costs, handling local data	
	comment			still unclear if cycling IAU or open loop		use more obs in ALADIN5 and AROME 2.5		use more observations, GPS and Radar, test IAU		even later, not before 2020, move to Ensemble VAR (requires OOPS)	use more obs in AROME (RARAD, SAT, GPS)	use more obs in AROME (satellite, GPS and radar)		efforts are being put on the assimilation of local satellite data (ASCAT)		emphasis on RADAR data	emphasis on RADAR data, fesibility study on ensemble DA	AROME 2.5 3dvar	

APPENDIX II: Practical guidelines for the observation preprocessing action

Introduction: In order to get more familiar with observation preprocessing for data assimilation a coordinated action/exercise is proposed to test handling of surface synoptic (SYNOP) data by the ALADIN software (program called BATOR). The GTS SYNOP data which are available mostly in BUFR format are considered as the starting point, but the same processing can be used for local synoptic observation and/or other conventional data such as upper-air sounding, wind profiler and aircraft observations.

Task 1.1: Data acquisition
A local acquisition of GTS conventional data have to be set up. Eventually an overview of local non-GTS (high-resolution) observation availability should be prepared (including data format and possible means of the local data conversion to BUFR format).

Practical hints: It should be rather straitforward to get GTS SYNOP BUFR data from observation and/or IT department. Many ALADIN countries (except Bg and partially Tu) provide surface synoptic (SYNOP) observations in BUFR format to the GTS, see ECMWF monitoring overview. The list of meteorological bulletins for global, inter-regional and regional exchange on the GTS can be found in WMO Volume C. Address your questions/issues to http://www.rclace.eu/forum/viewtopic.php?f=21&t=537

Task 1.2: Data pre-processing
The GTS SYNOP data contains duplications, e.g. (GTS corrections/amedments) messages, furthermore given observation can be disseminated in several GTS messages. Data pre-processing should ensure that duplications are removed from the data sample. It can be achieved via a local database (or a directory structure on disk can be considered) from where the unique observations are selected. Data pre-processing may comprise a basic quality control (completness, …).

Practical hints: Data duplications should be removed and the most recent observations (latest corrections) should be selected. Software package for handling BUFR data should be installed to facilitate BUFR data inspection, e.g. ecCodes developed by ECMWF which provides an application programming interface and a set of tools for decoding and encoding messages in the following formats ecCODES or BUFRDC software. More details about GTS messages can be found in the WMO instructions. Address your questions/issues to http://www.rclace.eu/forum/viewtopic.php?f=37&t=538&p=1880#p1880

Task 1.3: Implementation and validation of BATOR
The ALADIN/ARPEGE/IFS software require observation in ODB format. A tool for data conversion is to be installed and validated (BATOR). The BATOR program is part of the ALADIN software and beside data conversion it can perform blacklisting, geographical selection, setting up of observation errors, etc.

Practical hints: A sample of data and script will be prepared on beaufix. Address your questions/issues to http://www.rclace.eu/forum/viewtopic.php?f=37&t=117&p=1881#p1881

How to check odb content? See http://www.rclace.eu/forum/viewtopic.php?f=50&t=126

Task 1.4: Observation monitoring
An observation monitoring system of any data assimilation systems is essential. The main objective

is to provide an informative selection of monitored parameters (statistics of availability and quality control (QC) status, time evolution of satellite biases, etc.). A local implementation of tools to inspect/extract ODB information (odbsql) is essential. Eventually a more advanced system/tool is desirable.

Practical hints: Address questions/issues regarding LACE observation monitoring to http://www.rclace.eu/forum/viewforum.php?f=40