LACE Working Group for Data Assimilation: Plans for 2005

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Contents

1 Introduction

This paper discuss the research and development plan for 2005 of the LACE working group for data assimilation. The development work is still grouped the same way as in earlier plans. Beside the data assimilation work plan the ALADIN EPS plans of the LACE countries are listed below as well.

2 Detailed research plan for the year 2005

2.1 Data Assimilation

2.1.1 Methods: algorithmic aspects

- **Tuning of the multivariate humidity formulation of the B matrix**
  Description: In some cases the multivariate humidity formulation can have a negative impact on the humidity analysis itself, in spite of the fact that it improves the mass analysis. Last year a proposal was worked out for the tuning of the humidity observation and background error variances in order to correct this fact.
  Objectives: The impact of the tuning will be verified via single observation experiments at first attempt. The final goal is to evaluate the tuning's impact by running assimilation cycles and computing general scores.
  Priority: medium
  Realization: 1.5 month stay in Bp (not paid by LACE)
  Risk evaluation: 3
  Estimated efforts: 3 person x month
  Proposed contributors: Kristian Horvath (CRO), Gergely Bölöni (HU), Loik Berre (FR)
  Schedule: April, May

- **Computation of an ensemble B matrix for the ALADIN/HU domain**
  Description: The computation of a B matrix based on ensemble differences is planned.
  Objectives: Perturbed (observation perturbation) ARPEGE forecasts will be downloaded from Toulouse and used as coupling files for 6h ALADIN forecasts. The ALADIN 6h forecast differences will be used as input for the

"festat" pack. The statistical features of the computed B matrix will be diagnosed and its impact on the analysis and short range forecast will be studied.
Priority: high
Realization: 2 month stay in Bp
Risk evaluation: 2
Estimated efforts: 3 person x month
Proposed contributors: Kristian Horvath (CRO), Gergely Bölöni (HU)
Schedule: September, October

- **Validation of 3D-FGAT**
  Description: 3D-FGAT has been validated on cy28. Its beneficial features compared to 3D-VAR could be validated with high frequency data.
  Objectives: Assimilation experiments should be done both with 3D-VAR and FGAT using the same database including high frequency data (e.g. AMDAR). *(It is still uncertain whether the Hungarian team will have enough manpower even to supervise Steluta, so this topic is listed here provisionally at this stage.)*
  Priority: high
  Realization: 2 month stay in Bp
  Risk evaluation: 3
  Estimated efforts: 3 person x month
  Proposed contributors: Steluta Alexandru (RO), Gergely Bölöni (HU)
  Schedule: September, October

2.1.2 Observations

- **Assimilation of MSG/AMV data**
  Description: The AMV (Atmospheric Motion Velocity) information will be assimilated from MSG. The technical work of feeding of ODB is ready.
  Objectives: Impact of the AMV data will be evaluated on the analysis and forecasts. The plan is to use these data both over the sea (as it is done in ARPEGE) and over land.
  Priority: high
  Realization: local work
  Risk evaluation: 2

Estimated efforts: 3 person x month
Proposed contributors: Roger Randriamampianina (HU)
Schedule: March to May

- **Assimilation of radar data**
  Description: The long term plan to work out a system that assimilates derived profiles from radar reflectivity is continuing.
  Objectives: The LACE contribution to the work in 2005 will consist of development of the data screening.
  Priority: high
  Realization: 2 months stay in Toulouse + coordination
  Risk evaluation: 2
  Estimated efforts: 3 person x month
  Proposed contributors: Marian Jurasek (SK)
  Schedule: September, October

- **Assimilation of AMDAR data**
  Description: A filter procedure (based on the lamflag program) was developed in 2004 in order to get rid of redundant aircraft data measured in very different times inside the cut-off window but close to each other in space. Its impact on the analysis and forecast will be evaluated.
  Objectives: The impact of the filter procedure will be verified by parallel assimilation tests.
  Priority: high
  Realization: local work
  Risk evaluation: 3
  Estimated efforts: 2 person x month
  Proposed contributors: Roger Randriamampianina (HU)
  Schedule: March, April

- **Assimilation of wind profiler data**
  Description: However we do not expect much impact of wind profilers, we will need the technical background to be able to test these data in the assimilation in the frame of the EUCOS project (see more explanations later).
  Objectives: The data will be put into ODB and the quality will be surveyed

through the observation monitoring system. Later on the impact of the wind profilers will be studied using the ARPEGE blacklist.
Priority: high
Realization: local work
Risk evaluation: 3
Estimated efforts: 3 person x month
Proposed contributors: Roger Randriamampianina (HU), Gergely Bölöni (HU)
Schedule: February to May

- **General observation impact studies (EUCOS project)**
  Description: HMS joined the EUCOS (EUMETNET Composite Observing System) project, which aims to explore the importance of the different elements of the European (ground based and space) observing system. The goal of the project is to get feedbacks and proposals for the future developments of the observing system.
  Objectives: A work plan has been distributed which consists of impact studies of the different observations (SYNOP, TEMP, aircraft, satellites, wind profilers).
  Priority: high
  Realization: local work
  Risk evaluation: 2
  Estimated efforts: 4 person x month
  Proposed contributors: Roger Randriamampianina (HU), Gergely Bölöni
  Schedule: February to April

2.2 LAMEPS

The EPS activities inside LACE are still coordinated under the working group for data assimilation. The planned efforts for working on EPS in 2005 are comparable with those planned for DA. The following topics cover the ALADIN/LACE EPS plans for 2005.

- **Downscaling of the PEACE system**
  Description: The PEACE system (the operative ensemble forecast system of ARPEGE) has been recently reconfigured (new resolution for the singular vector computations and for the forecasts, new optimization domain for the singular vector computations).
  Objectives: The 10 +1 PEACE members will be downscaled for a 1 month period, then the results will be evaluated whether the downscaling brings or not extra information comparing to the ARPEGE EPS forecasts.
  Priority: high
  Realization: local work
  Risk evaluation: 3
  Estimated efforts: 4 person x month
  Proposed contributors: Edit Hágel (HU)
  Schedule: continuous work

- **Downscaling of optimized ARPEGE perturbations for Central Europe**
  Description: An optimal target domain of the ARPEGE singular vector computations for Central Europe (CE) was proposed last year.
  Objectives: The goal now is to run and downscale an ARPEGE EPS optimized for CE on the same resolution as the present PEACE system. The downscaling will be done on the formal LACE domain.
  Priority: high
  Realization: local work
  Risk evaluation: 3
  Estimated efforts: 5 p x m
  Proposed contributors: Edit Hágel (HU)
  Schedule: continuous work

- **Generation of perturbations with the Breeding method**
  Description: The idea is to try to generate LAM initial perturbations with the breeding method.
  Objectives: At HMS first of all, the literature about the method will be studied and later on the technical background needed will be worked out. About the ZAMG plans more precision will be given later on.
  Priority: high
  Realization: local work

Risk evaluation: 3
Estimated efforts: 6 p x m (both 3 in AU and HU)
Proposed contributors: Edit Hágel (HU), Yong Wang (AU), other Austrian colleague
Schedule: continuous work

- **Downscaling of the ECMWF EPS system**
  Description: Here the aim is to downscale the ECMWF EPS system with the ALADIN model. The work will be done both in Zagreb and Budapest independently.
  Objectives: The representative members of the ECMWF EPS system will be chosen by clustering, then they will be used as initial and boundary conditions for the ALADIN forecasts to be run for interesting cases.
  Priority: high
  Realization: local work (CRO & HU)
  Risk evaluation: 2
  Estimated efforts: 5 person x month (2 in CRO, 3 in HU)
  Proposed contributors: Balázs Szintai (HU), István Ihász (HU), Stjepan Ivatek-Sahdan (CRO), Cedo Brankovic (CRO)
  Schedule: not precized

- **Downscaling of ARPEGE and ECMWF MAP reanalyses**
  Description: The ALADIN downscaling of MAP reanalyses of the 2 different global models can be interesting in order to study the possibility of coupling ALADIN with ECMWF compared to the usual coupling with ARPEGE.
  Objectives: Two MAP cases (IOP5 and IOP15) will be studied via downscaling of the ARPEGE and ECMWF MAP reanalyses and of their mixture (ARPEGE surface + ECMWF upper air).
  Priority: medium
  Realization: local work
  Risk evaluation: 3
  Estimated efforts: 2 person x month
  Proposed contributors: Stjepan Ivatek-Sahdan (CRO), Branka Ivancan-Picek (CRO)
  Schedule: not precized

- **EPS post processing**
  Description: The precise plans will be included later on.
  Realization: local work
  Estimated efforts: 3 person x month
  Proposed contributors: Alexander Kann, (AU)
  Schedule: not precized

- **Ensemble Transformed Kalman Filter (ETKF) and definition of the observation error covariance matrix**
  Description: The precise plans will be included later on.
  Realization: local work
  Estimated efforts: 6 person x month
  Proposed contributors: Yong Wang (AU), Student (AU)
  Schedule: not precized

- **Breeding + ETKF coupled by the ECMWF EPS system**
  Description: The precise plans will be included later on.
  Realization: 2 months stay in Vienna + 1 month local work
  Estimated efforts: 3 person x month
  Proposed contributors: Yong Wang (AU), Richard Mladek (CZ) (?)
  Schedule: not precized

3 Summary of means

The following table is a short abstract of report above concentrating on the needed manpower for each research topic. The desired LACE support is indicated together with each item as well. Also there is a proposal for the means to be used to finance participations on the foreseen workshops.

Topic	Estimated efforts	LACE support
DA		
Tuning of the multivariate humidity formulation	3 p x m	none
Ensemble B matrix computation	3 p x m	2 p x m
Validation of 3D-FGAT *(uncertain)*	3 p x m	2 p x m
Assimilation of: MSG/AMV data AMDAR data Wind Profiler data Radar data	 3 p x m 2 p x m 3 p x m 3 p x m	 none none none none
General observation impact studies (EUCOS)	4 p x m	none
EPS		
Downscaling of the PEACE system	4 p x m	none
Downscaling of optimized perturbations for CE	5 p x m	none
Breeding ▪ AU ▪ HU	 3 p x m 3 p x m	 none none
Downscaling of the ECMWF EPS system ▪ CRO ▪ HU	 2 p x m 3 p x m	 none none
Downscaling of ARPEGE and ECMWF MAP reanalyses	2 p x m	none
EPS post processing	3 p x m	none
ETKF + obs error cov matrix	6 p x m	none
Breeding + ETKF coupled by ECMWF EPS system	3 p x m	2 p x m
Total	**58 p x m**	**6 p x m**

Workshops	
DA Symposium	2 p x w
HIRLAM/ALADIN DA training	1 p x w
LAMEPS (Bologna) workshop	1 p x w
Dyn/Stat adaptation (Vienna) workshop	1 p x w
Total	**5 p x w**

Table 1: Estimated means in 2005