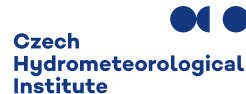


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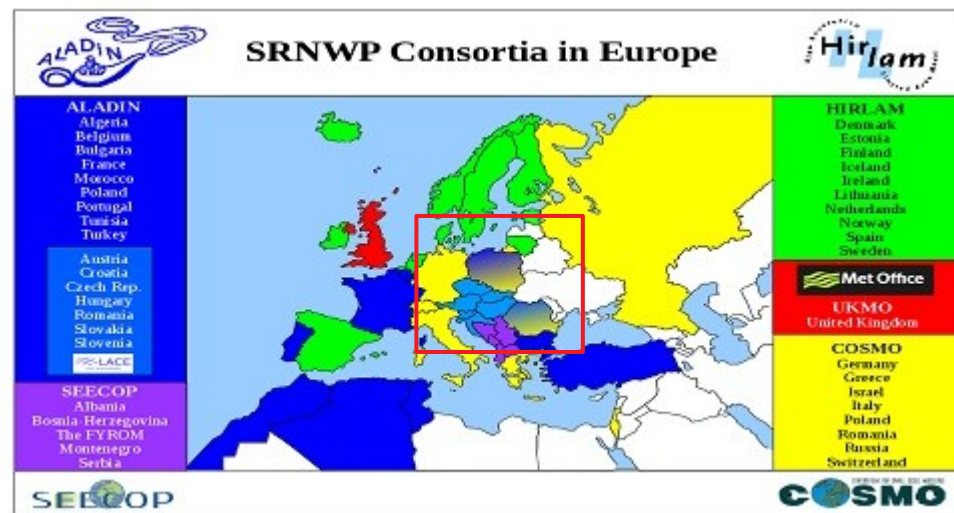
RC LACE 2021 overview

Martina Tudor on behalf of RC LACE MG and many researchers



ARSO METEO
Slovenia

- ▶ NMSs of Austria, Croatia, Czech Republic, Hungary, **Poland**, Romania, Slovakia and Slovenia








- ▶ **Common operational applications**

- ▶ A-LAEF – Limited Area Ensemble Forecasting system
- ▶ OPLACE – observation pre-processing for LACE (oper DA)
- ▶ Common research activities

- ▶ <http://www.rclace.eu/>

Organisational changes in 2021

- ▶ Project Manager: Martina Tudor
- ▶ Area Leaders:
 - ▶ Data assimilation (upper air and surface): Benedikt Strajnar
 - ▶ Dynamics and coupling: Petra Smolíková 
 - ▶ Physics (and surface parametrizations): Bogdan Bochenek 
 - ▶ Predictability: **Clemens Wastl** 
 - ▶ **Applications and Verification Simona Tasku** 
Operational
- ▶ Data Manager: Alena Trojáková
- ▶ System and Code Coordinator (SCC): Oldřich Španiel 
Forum

SCC main technical activities 2021 – CY48t1

Action/Subject: Phasing of common ALADIN cy48t1 cycle

Description and objectives: The main objective was to create/validate new cycle of ALADIN code cy48t1 based on ALADIN/HIRLAM contributions in spring 2021 in remote mode. There has been executed remote phasing in total period 6 weeks.

Documentation: <https://www.rclace.eu/forum/viewtopic.php?f=112&t=710>

Status: The cycle CY48t1 has been released in July 2021 and it is available in MF GIT repository (see RC LACE Forum).

Action/Subject/Deliverable: Technical preparation and validation of the export version cycle cy46t1, support during implementation on others platforms/compilers.

Description and objectives: The main objective was preparation and validation bugfixes for model part of the code for new cy46t1_bf07 export version. The bugfix cy46t1_bf07 has been prepared and validated.

Status: The cy46t1_bf07 has been merged and tested and it is prepared to be released for the latest export version. Documentation: RC LACE Forum

- ▶ Action/Subject/Deliverable: Single precision code in cy46t1
 - ▶ implementation of the single precision to ALARO physics
 - ▶ cy46t1 - issue with reproducibility of the ALARO 1 code with local gcc
- ▶ compiler (delay of delivering new SHMI HPC)
 - ▶ beaufix/belenos/lxgmap12
- ▶ Adiabatic mode - phasing of development with F. Vana to cy46t1
 - ▶ arpifs/interpol/lascaw_cla_ad.F90
 - ▶ arpifs/interpol/lascaw_cla.F90
 - ▶ arpifs/interpol/lascaw_cla_tl.F90
 - ▶ arpifs/interpol/lascaw_vintw_ad.F90
 - ▶ arpifs/interpol/lascaw_vintw.F90
 - ▶ arpifs/interpol/lascaw_vintw_tl.F90
 - ▶ arpifs/interpol/suhsImr.F90
 - ▶ arpifs/interpol/suvsleta.F90

OPLACE maintenance and development

- ▶ **GNSS Radio Occultation (GNSS-RO)** added in Jan 2021
 - ▶ data considered as essential (available on default-ftp account)
 - ▶ BUFR format & file names: bufr_10_ro_*network* where *network*=cosmic2, metopb, metopc, paz, tandemX, terraX
 - ▶ bias free data & to be used as anchor within VarBC scheme
- ▶ **new microwave sensors (MWHS-2/MWTS-2)** added in Feb
 - ▶ Microwave Atmospheric Humidity/Temperature Sounder 2 (MWHS-2/MWTS-2) from Chinese polar satellites (FY3-D)
 - ▶ BUFR format & file names: bufr_7_mwhs2_fy3d, bufr_7_mwts2_fy3d

OPLACE maintenance and development

- ▶ Ocean winds from ScatSat-1 discontinued
 - ▶ irrecoverable instrument failure occurred on 28th February
- ▶ new BUFR encoding for EUMETSAT's wind products
 - ▶ implemented on 3rd March 2021 (postponed from 2020)
 - ▶ data sample tested & only param.cfg requires update for cy43t2
- ▶ GNSS ZTD test network SGO1 corrected in August
 - ▶ corrected use of backup file
 - ▶ updated metadata file used in QC during the conversion to BUFR to get the same number of data as in OBSOUL processing
 - ▶ thanks to V. Homonnai

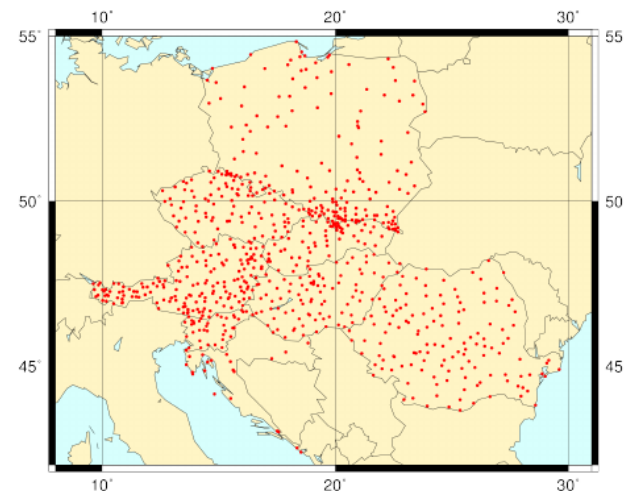
OPLACE maintenance and development

► OPLACE backup

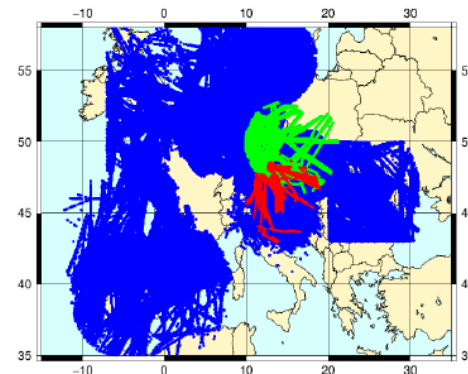
- OPLACE data outage in April 20th & May 13th 2021 due to major issues of IT infrastructure at HMS
- M. Bellus prepared a backup of SYNOP data
 - OBSOUL format & file names: obsoul_1_gtsbck_sk
 - OPLACE users are encouraged to adapt their DA applications to download and merge both obsoul_1_xxxxxx_hu & obsoul_1_gtsbck_sk to mitigate possible OPLACE issues
- alternative backup for more obs types (SYNOP, TEMP, AMDAR) using ECMWF MS/CS backup observations has been prepared but is still under evaluation

- ▶ LACE exchange of high resolution surface synoptic data
 - ▶ stable and reliable for operational use
 - ▶ minor changes except more stations in HU (+12) and CR (+5)
 - ▶ technical issue with data from SK (-24) should be fixed soon

| Number of national stations | | Update WRT 2020 |
|-----------------------------|-----|-----------------|
| Austria | 169 | -2/+0 |
| Croatia | 27 | -1/+5 |
| Czech Republic | 89 | -0/+0 |
| Hungary | 104 | -1/+12 |
| Romania | 134 | -0/+0 |
| Slovakia | 25 | -24/+0 |
| Slovenia | 12 | -2/+0 |
| Poland | 178 | -2/+0 |
| Total: | 738 | |



- ▶ exchange of high resolution aircraft Mode-S data
- ▶ stable and reliable data provision
 - ▶ Mode-S **MRAR** from ARSO/Slovenia
 - ▶ Mode-S **MRAR** from CHMI/CZ
 - ▶ Mode-S **EHS** from EMADDC (KNMI)/EU
- ▶ EMADDC plans an upgrade in 2021
 - ▶ improved new heading correction method based on the entire area & new $T, V_{trueAir}$ correction method (De Haan et al 2021)
 - ▶ more information for each obs added (roll angle, source, receiver or radar id, WL, QC flag)
 - ▶ a new distribution using specific accounts and SFTP protocol
 - ▶ **OPLACE adaptations under preparation**



- ▶ Operational upgrades (new cycles, hourly systems)
- ▶ New data impact on operational data assimilation
- ▶ Background error statistics
- ▶ Extended Kalman filter in surface assimilation
- ▶ New data for surface DA
- ▶ Sensitivity of surface OI to structure functions
- ▶ Implementation of RADAR reflectivity and radial wind
 - ▶ Check the dedicated presentation by Benedikt Strajnar (9:15 Wed)

Data Assimilation - operational

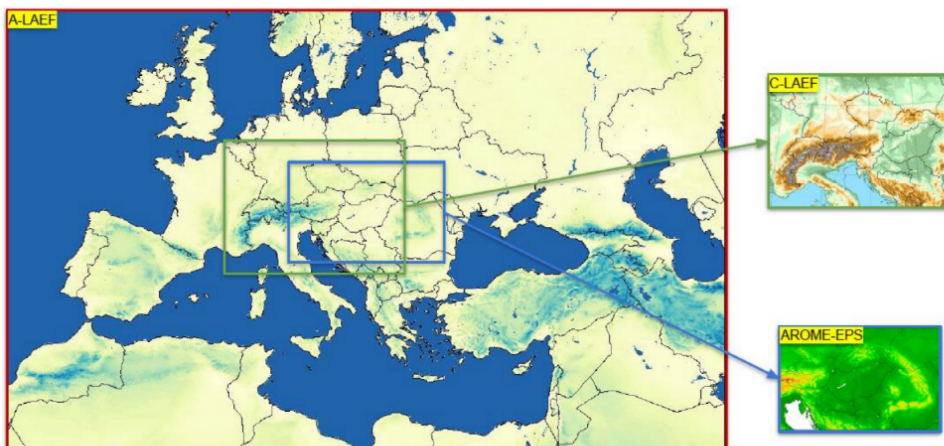
| DA | AUSTRIA AROME | AUSTRIA C-LAEF | CROATIA ALARO | CZECH REP. ALARO | HUNGARY ALARO | HUNGARY AROME | SLOVAKIA ALARO | SLOVENIA ALARO |
|----------------|--|---|-------------------------------------|---|---|--|---|---|
| Resol | 2.5L90, 600 x 432 | 2.5L90, 600 x 432 | 4.0L73 480 x 432 | 2.3L87-NH 1069 x 853 | 8L49 | 2.5L60 | 4.5L63 | 4.4L87 432 x 432 |
| Cycle | 40t1 | 40t1 | 38t1_bf8 | 43t2pt_op1 | 40t1 | 40t1 | cy43t2bf11 | 43t2_bf10 |
| LBC | IFS 1h (lagged) | IFS-EPS | IFS 3h (lagged) | ARP 3h | IFS 3h (lagged) | IFS 1h (lagged) | ARP 3h | IFS 1h/3h (lagged) |
| Method | OI_main MES-CAN + 3d-Var | OI_main MES-CAN + 3d-Var, pert. obs. + Jk | OI + 3D-Var | OI + BlendVar | OI + 3D-Var | OI_main + 3D-Var | OI + DF Blending | OI + 3D-Var |
| Cycling | 3h | 6h | 3h | 6h | 6h | 3h | 6h | 3h |
| B matrix | Downscaled LAEF 11 km | static C-LAEF EDA | NMC method | EDA | EDA | EDA | - | Downscaled ECMWF ENS |
| Initialization | No (SCC) | No (SCC) | No (SCC) | IDFI in production, SCC | DFI | No | No | No (SCC) |
| Obs. | Synop + AS Amdar Geowind Temp ASCAT, Snow-grid/MODIS snow-mask., Mode-S EHS EMADDC | Synop + AS Amdar Geowind Temp, ASCAT, Snow-grid/MODIS | Synop Amdar/MRAR Geowind Temp Sevir | Synop + AS (soil) Amdar/MRAR /EHS Geowind/HRWI ND, Profiler, ASCAT, Temp Sevir, | Synop + AS Amdar Geowind Temp Sevir AMSUA/MHS ASCAT | Synop + AS GNSS ZTD Amdar/MRAR Temp, Mode-S MRAR (SI, CZ), | Synop + AS Amdar/MRAR /EHS Geowind Temp Sevir AMSUA/MHS /IASI ASCAT | Synop + AS Amdar/MRAR / EHS Geowind Temp Sevir AMSUA/MHS /IASI ASCAT/OSCAT E-GVAP ZTD (passive) |

Hungary
Moved to
Cy43t1
In March

| DA | AUSTRIA AROME-RUC | CZECH REP. VarCanPack |
|----------------|---|--|
| Resol | 1.2 L90 900 x 576 | 2.3L87-NH 1069 x 853 |
| Cycle | 40t1 | 43t2pt_op1 |
| LBC | AROME 1h | - |
| Method | OI_main MESCAN + 3d-Var + LHN + FDDA | 3DVAR + OI |
| Cycling | 1h | - |
| B matrix | Static EDA + differences of the day | EDA |
| Initialization | IAU | - |
| Obs. | Synop + AS, Amdar/MRAR/EHS national, EHS EMADDC, Geowind, Temp, Seviri, AMSUA/MHS/HIRS/ATMS/IASI (+ Metop-C), ASCAT, GNSS ZTD (Austria), GPSRO (OPLACE), Radar RH/Dow, INCA + AS at hig.freq., MODIS snowmask | Synop + AS, Amdar/MRAR/EHS, Geowind/HRWIND, Pro-filer, ASCAT, Seviri |

Ensemble prediction

| System | Description | HPC |
|-----------|--|-------|
| A-LAEF | Common RC-LACE EPS with 4.8 km horizontal resolution based on ALARO-1 physics. | cca |
| C-LAEF | Convection-permitting EPS of Austria with 2.5 km horizontal resolution based on AROME physics. | cca |
| AROME-EPS | Convection-permitting EPS of Hungary with 2.5 km horizontal resolution based on AROME physics. | local |



| | A-LAEF | C-LAEF | AROME-EPS |
|-----------------------|---|---|---|
| CMC | ALARO | AROME | AROME |
| Code version | cy40 | cy40 | cy40 |
| Horizontal resolution | 4.8 km | 2.5 km | 2.5 km |
| Vertical levels | 60 | 90 | 60 |
| Runs per day | 2 | 4 | 1 |
| Forecast length | +72h (00/12 UTC) | +60h (00 UTC), +48h (12 UTC), +6h (06/18 UTC) | +48h (00 UTC) |
| Members | 16+1 | 16+1 | 10+1 |
| Assimilation cycle | yes (12h) | yes (6h) | - |
| IC perturbation | ESDA [surface], spectral blending by DFI [upper-air] | ESDA [surface], EDA, Ensemble-JK [upper-air] | downscaling (AROME-EDA is being tested) |
| Model perturbation | ALARO-1 multi-physics + surface stochastic physics (SPPT) | hybrid stochastic scheme with a combination of parameter and tendency perturbations | - |
| LBC perturbation | ECMWF ENS (c903@cy46) | ECMWF ENS (c901+e927) | ECMWF ENS (c901+e927) |

* AROME-EPS moved to CY43t1 in March

Check dedicated presentation by Clemens Wastl, 9:00 Tue

- ▶ Developments in TOUCANS mixing length formulation
- ▶ Prognostic graupel validation
- ▶ Very high resolution tests
- ▶ ALARO1 with SURFEX
- ▶ New topography parameters
- ▶ Snow simulations with Crocus
- ▶ Check the dedicated presentation by Bogdan Bochenec
 - ▶ On 11:20 Thu

- ▶ Design of VFE for NH model
- ▶ Dynamic definition of the iterative time schemes
- ▶ Terms redistribution through new vertical motion variables
- ▶ Experiments in very high resolution
- ▶ Reformulation of the NH system as departure from HPE
- ▶ The reports are available on the RC LACE web page
- ▶ Check the dedicated presentation by Petra Smolikova
 - ▶ On 11:40 Wed

- ▶ New area!
- ▶ Joint operational verification
- ▶ LAEF verification package and HARP
 - ▶ HARP adapted to use OP LACE data
- ▶ Review of existing applications and verification issues
 - ▶ questionnaire
- ▶ Check the dedicated presentation by Simona Tascu
 - ▶ On 9:15 Thu

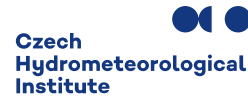
Thank you

- ▶ Petra Smolíková, Neva Pristov, Martin Belluš, Antonín Bučánek, Alena Trojáková, Oldřich Španiel, Radmila Brožková, Jure Cedilnik, Jozef Vivoda, Christoph Wittmann, Jan Mašek, Mario Hrastinski, Bogdan Bochanek, Simona Tasku, Benedikt Štrajnar, Patrik Benaček, Viktoria Hommonai, Florian Meier, Mirela Pietrasi, Maria Derkova, Antonio Stanešić, Stefan Schneider, J. Vural, Helga Toth, Viktor Tarjani, Peter Smerkol, Michal Nestiak, Martin Imrišek, Katarina Catlosova, P. Scheffknecht, Martin Dian, Balasz Szintai, J. Kemetmuller, Piotr Sekula, Matjaž Ličar, Iris Odak Plenković, Florian Weidle, Clemens Wastl, Endi Keresturi, Stjepan Ivatek-Šahdan, Mathieu Dutour Sikirić, Kristof Szanyi, Gabriella Toth, Katalin J. Radnoczi and Yong Wang.

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Thank you for your attention.



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