National Posters
EWGLAM/SRNWP Meeting 2022

Development of Limited-Area NWP Systems at JMA

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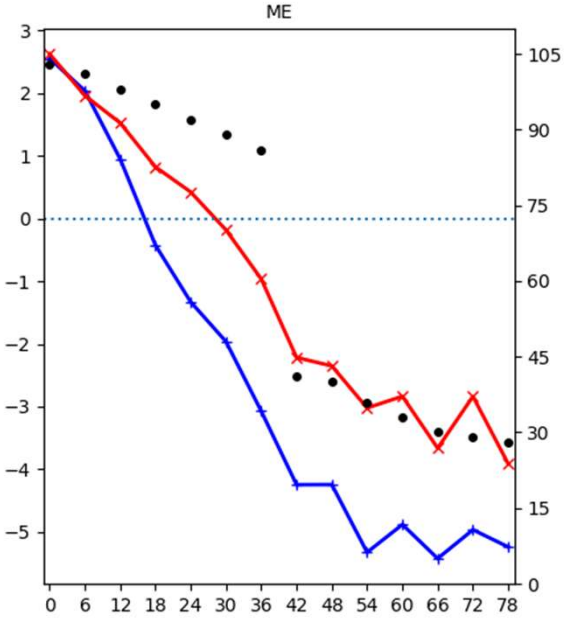
- Model updates on March 2022 at JMA.
  - Update of Meso-Scale Model (MSM2203)
    - Increasing vertical layers from 76 to 96 (the model top is enhanced from 21.8 to 37.5 km)
    - The forecast range is extended from 51 to 78 hours at 00 and 12 UTC
    - Introducing a one-dimensional ocean mixed layer model (OML)
      - Over-intensification bias in the central pressure of typhoon is alleviated.
  - Update of Local Analysis (LA2203)
    - Introducing hybrid 3D-Var using the ensemble perturbations of Meso-Scale Ensemble Prediction System (MEPS)
      - It enables to represent the flow-dependent background error covariance.

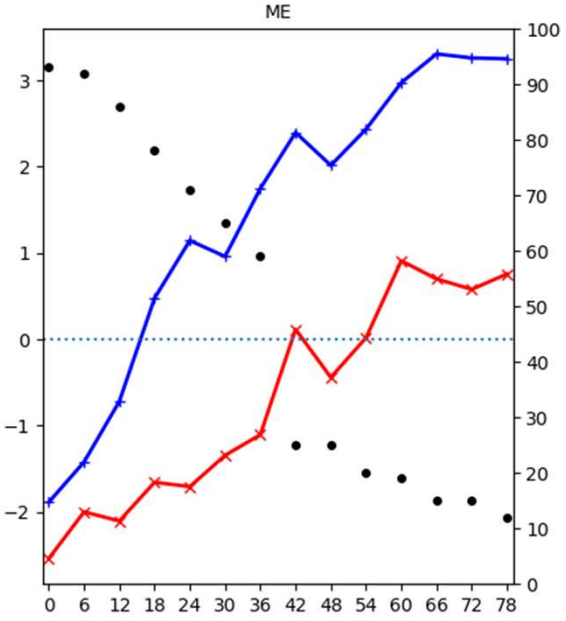
Statistical Verification for typhoons (MSM)

- Over-intensification bias in the central pressure is alleviated in MSM2203.
- Mean error of the central position is not improved.

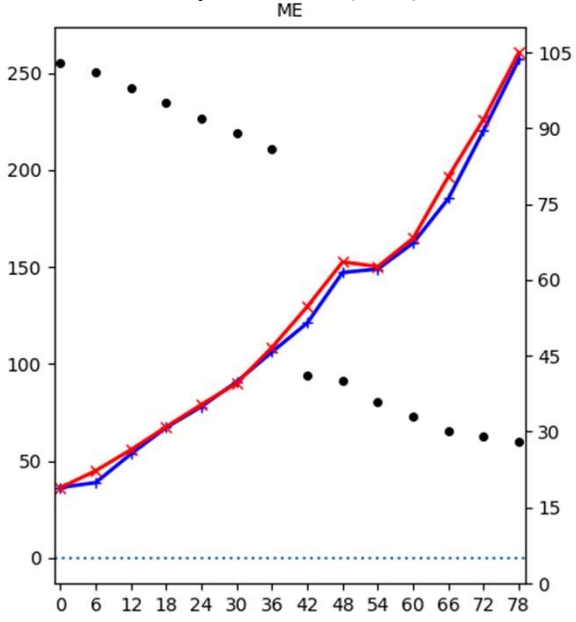
Central pressure (hPa)



Maximum wind velocity (m/s)



Central position (km)

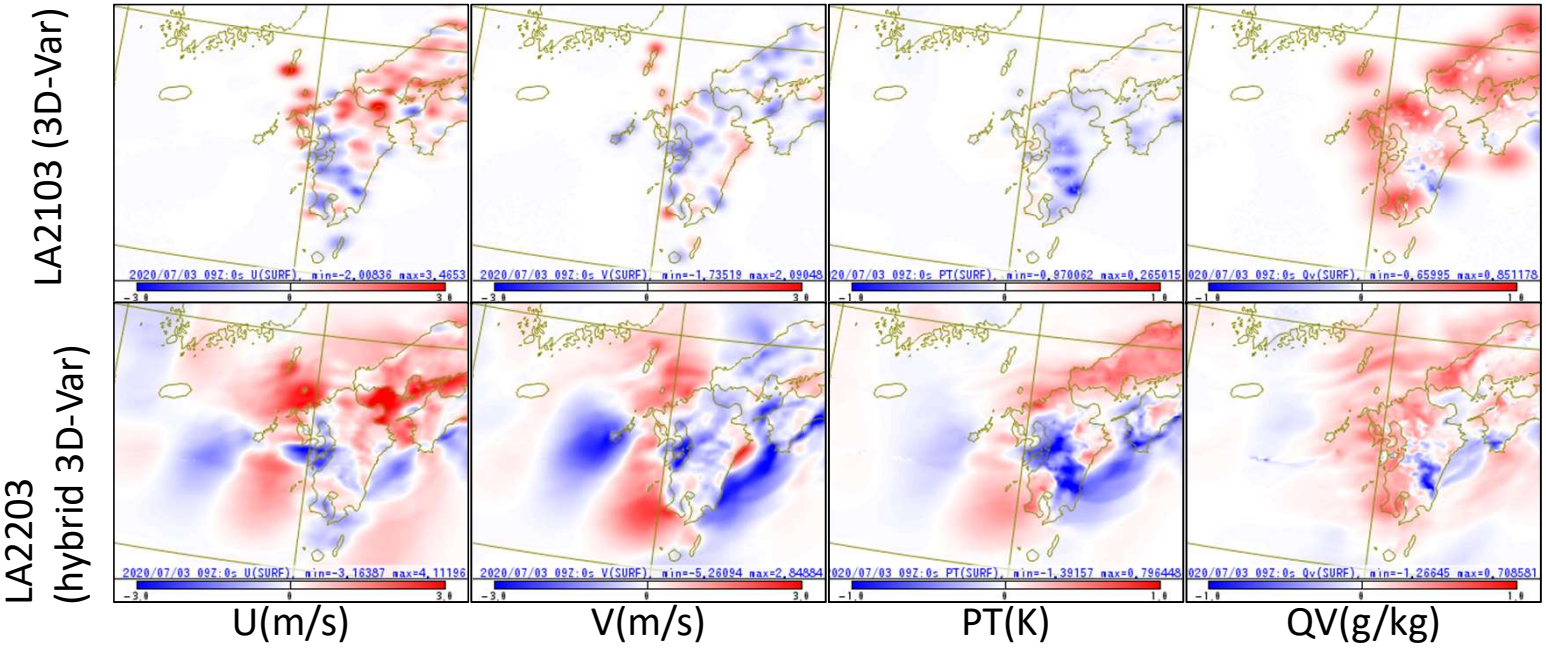


MSM2003 (previous)　MSM2203　● number of samples（right axis）

Analysis increment in the hybrid 3D-Var

- The background error covariance B is calculated as the (same weight) average of the climatological Bc and the ensemble based Be.
- The analysis increment in the hybrid 3D-Var reflects the ensemble spread predicted by MEPS.

Analysis increment at the surface



NWP Activities at ONM-Algeria

1. New HPC system

- Updated the NWP operational suite from Cy43t2.bf.10 to cy46t1.bf.07 with positive impact.
- Improvement of the horizontal and vertical resolution of AROME.

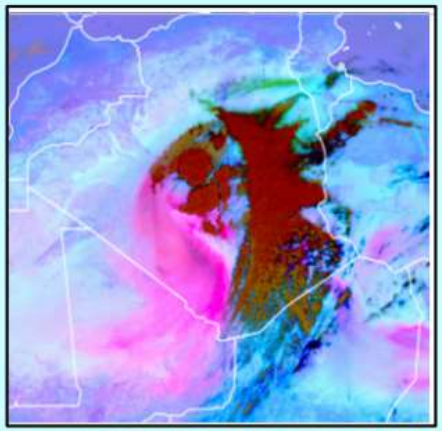
Models	AROME	ALADIN	ALADIN-DUST
Cycle	Cy46t1.bf.07	Cy46t1.bf.07	Cy46t1.bf.07
H. Resolution	2.5km	6km	14km
V. Resolution	90 Lev	70 Lev	70 Lev
Grid	600 x 600	600 x 600	250 x 250
Initial conditions	ALADIN	ARPEGE	ARPEGE

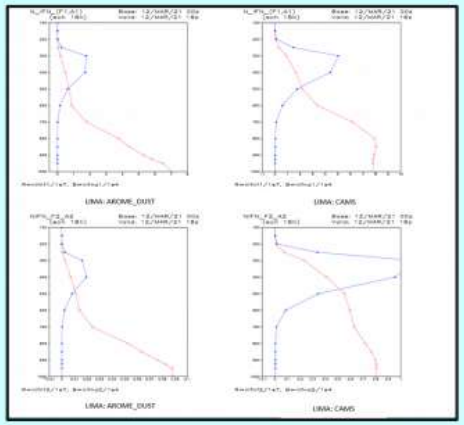
2. Scientific Activities

2.1 Testing visibility diagnostics in AROME at high resolution : W. CHIKHI et al.

	AROME 0.5	AROME 1.3
	All period	
PC	77,29	79,02
POD	0,53	0,47
FAR	0,55	0,54
	December	
PC	79,55	81,19
POD	0,38	0,29
FAR	0,64	0,65
	May	
PC	72,43	74,35
POD	0,71	0,69
FAR	0,46	0,44

2.2. Coupling LIMA-Aerosol-CAMS: M. MOKHTARI et al.





Vertical profile of IFN_A and IFN_F

Mohamed MOKHTARI

ACCORD
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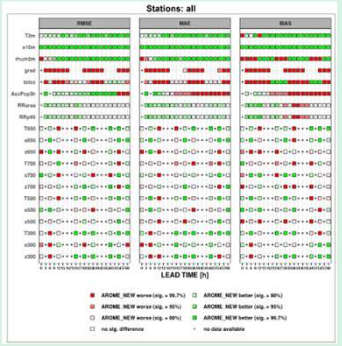
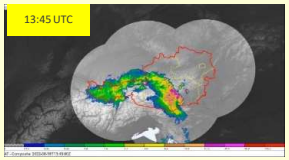
National Poster: NWP related activities in AUSTRIA

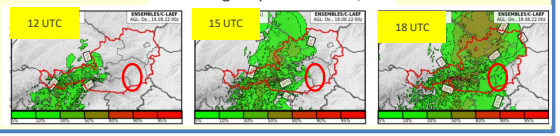
- **Major upgrade of 3 NWP systems in Dec 2021 (cy43t2bf11)**:
  - **AROME-Aut** (2.5km/L90, 8x per day), new orog, Bmatrix, adapted screening level diagnostics
  - **C-LAEF** (2.5km/L90, 8x per day), surface perturbation scheme
  - **AROME-RUC** (1.2km/L90, 24x per day), extended wind farm param, additional Mode-S data, E-GVAP ZTD



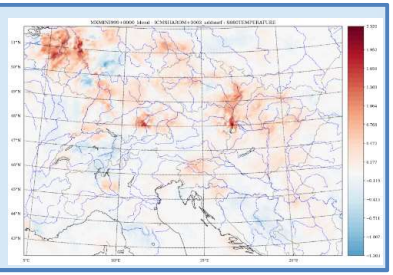
- **Evaluation of extrem wind event (‚Derecho'-case study):**
  - Extreme wind gust > 140km/h observed on 18.8.2022
  - Unusual fast/strong system from the south
  - Models predicted day with strong convection on wrong location
  - Latest AROME-RUC runs with good performance, but too late -> subhourly Nowcasting might help in such events



C-LAEF gust prob > 60 km/h



- **3D-EnVar:**
  - First tests with AROME 3D-EnVar implemented
  - Case studies comparing 16 Member C-LAEF vs. 32+2 member C-LAEF ensemble increments



NWP at Croatian Meteorological and Hydrological Service, 2022

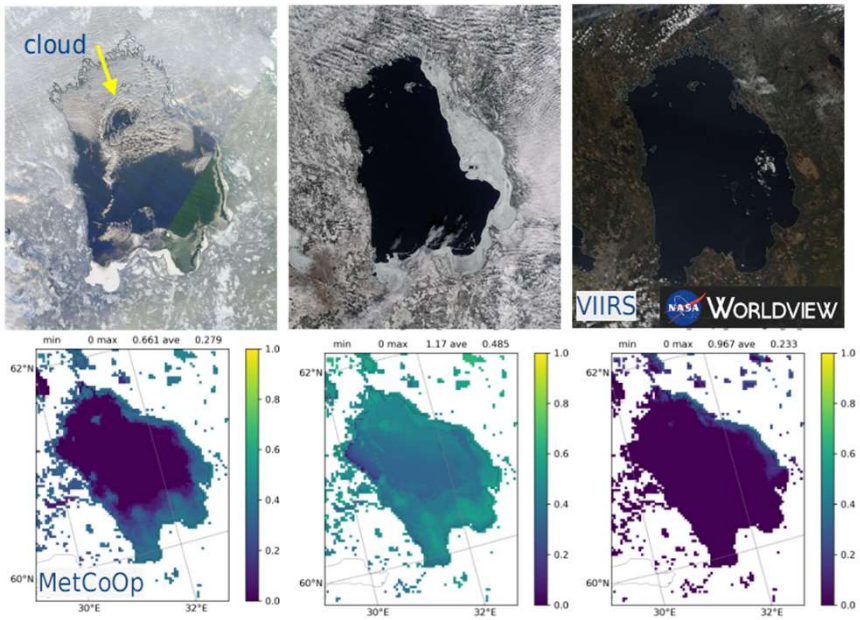
- Operational suite:
  - 2 current configurations (ALADIN-HR4, ALADIN-HRDA),
  - 2 future configurations (ALADIN-HR4, ALADIN-HR2).
- Tuning of CY43T2-based e-suite:
  - improved standard deviation of screen-level temperature and cloudiness in winter and summer,
  - decreased negative bias of temperature and its diurnal variation in winter,
  - decreased negative bias of cloudiness in winter and summer,
  - case study for heat wave forecast - improved prediction of the heat wave peak at multiple locations.
- Tuning of CY43-based HR20 configuration (especially wind forecast): improved wind and wind gusts forecast compared to dynamical adaptation configuration.
- Post-processing:
  - Operational forecasts improvement:
    - Better analog-based forecasts of the temperature, wind speed, and wind gusts by applying:
      - weighting procedure for determining the importance of each predictor variable,
      - statistical correction for the high (or low)-percentile events.
  - The Kalman Filter research:
    - The optimization of the variance ratio r in the Kalman Filter algorithm was performed to determine the optimal value for different post-processing methods for the wind speed and wind gust variables.
- Universal Thermal Climate Index (UTCI) forecast:
  - The meteorological data used for the calculation of UTCI are hourly model values of air temperature, relative humidity, wind speed and mean radiant temperature from NWP model ALADIN-HR cy43
  - 72-hour forecast of UTCI over local domain and for point data → still in the test phase

SRNWP activities at FMI in 2022

- **Operational MetCoOp nowcasting (MNWC)**
  - MNWC becoming operational in October 2022
  - Cloud ingest, pySURFEX surface analysis, hourly forecasts out to +12 hours lead time with 15 min output frequency

- **High-resolution heat wave simulations**
  - HARMONIE-AROME experiments at high resolution have been conducted to evaluate the performance of the model during heat waves

- **Freshwater lake model Flake in MEPS**
  - a prognostic lake scheme, FLake is included MetCoOp HARMONIE-AROME NWP system (MEPS)
  - the model has been used to study the behaviour of lake surface temperature, ice and snow



Lake Ladoga ice cover : comparison of satellite images with MEPS

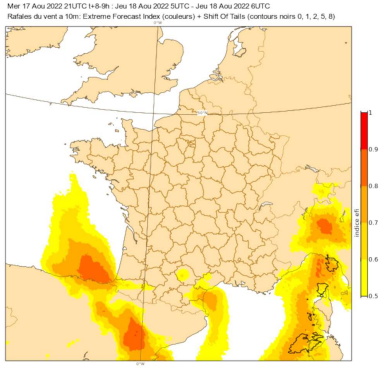
NWP suites @MF: a few higlights

Operationnal suite : CY46T1_op1 (June 2022)

- Arpege EPS and Arome EPS have the same resolution than their deterministic counterpart :
- TI1798 c2.2 L105 and 1.3 km L90
- New Arpege physics : Tiedtke deep convection scheme, 1D sea-ice scheme, etc.
- And much more: assimilation of MW rainy cloudy observations, linear interpolators for hydrometeors and no diffusion, new version of the Ecume oceanic surface fluxes scheme, etc.

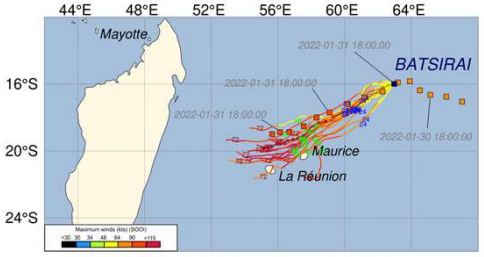
Next e-suite: CY48T1_op1, to start by 2023 Q1

- OOPS in 3DVar and 4DVar analyses
- Assimilation : 3DEnVAR Arome, hybrid B matrix in Arpege 4Dvar
- Arome EDA : 50 members (instead of 25 currently)
- Physics : EcRad (Arome), use of SST from Mercator-Océan global model and enhancement of Tiedtke deep convection scheme (both for Arpege), change of aerosol and ozone climatologies (from CAMS, Arome)

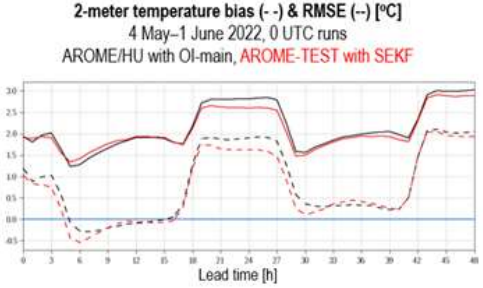


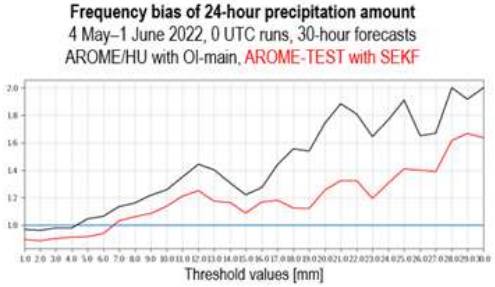
In between :

- Transfer to operations of EFI and SOT diagnostics on Arpege EPS and Arome EPS
- Preparation of Arome overseas EPS

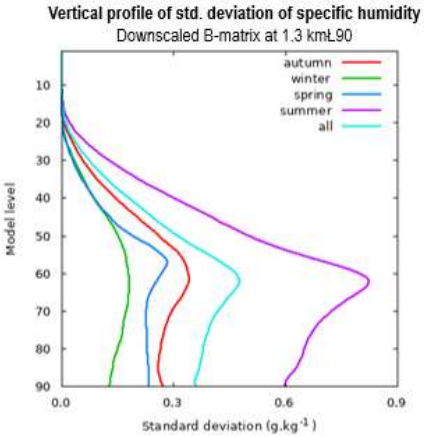


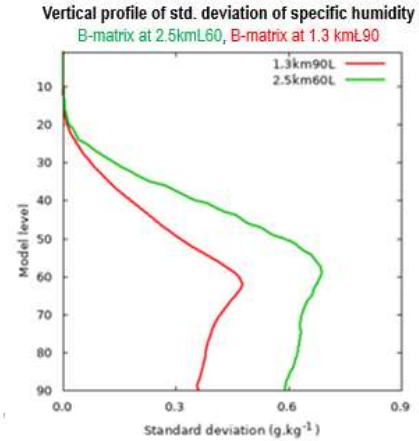
NWP activities at the Hungarian Meteorological Service





Operational implementation of SEKF in AROME/HU



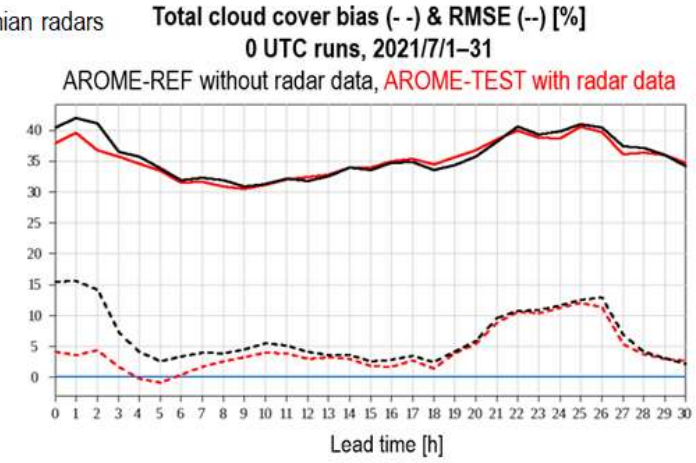


Computation of B-matrix at 1.3kmL90 resolution with AROME

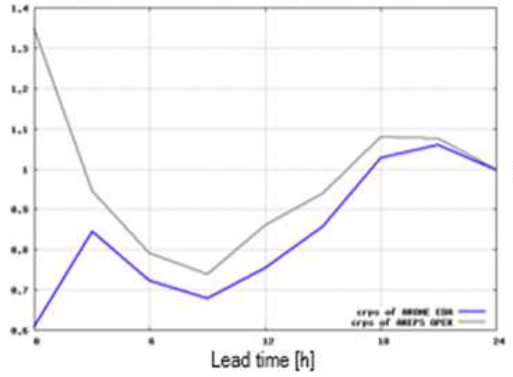
Some positive impact from OPERA radars in AROME assimilation

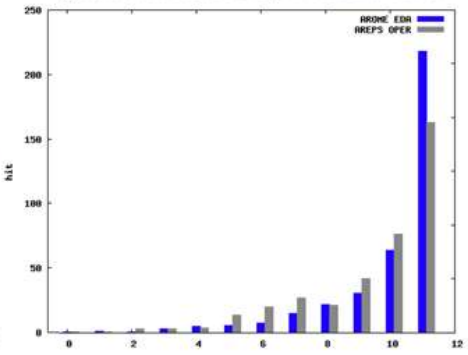
Experimental settings:

- 4 Hungarian & 2 Slovenian radars
- HOOF2.0

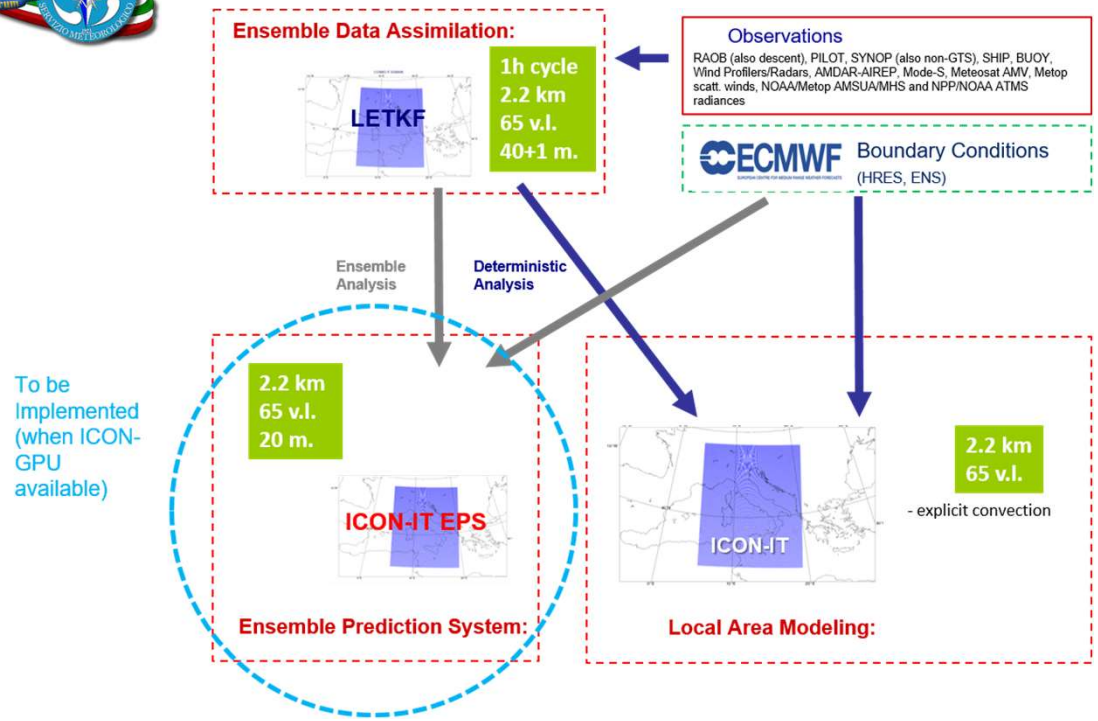


Mostly positive impact of EDA in AROME-EPS in summer





Italian Air Force Met. Service: migration to ICON model



- The ICON model (1h DA cycle + 00/12 UTC model runs) is fully operational at the Italian Met Service since jul 2020, together with COSMO-IT, and available to forecasters for daily use
- The full switch to ICON is conditioned to the availability of the GPU version (ICON-IT EPS implementation). ICON will hopefully become the "reference" model by Q4 2023
- The use of the ICON model will also be advantageous from a computational point of view: on the basis of daily resource consumption (SBU) on the ECMWF cray-hpc, it can be estimated that the use of ICON model saves around 40% of computational resources

*Results are encouraging as generally ICON-IT outperforms COSMO-IT for surface parameters and temperature profiles (**verification scores in the poster**)*

1. Operational status of ICON PL and COSMO PL models.

ICON PL became fully operational in September 2022. There are no plans to stop running COSMO models operationally and COSMO-CE-PL (COSMO-EULAG) will continue to be supported and developed (according to the available resources).

2. The results of numerical reconstruction of a Fast-Developing Convective Bow Echo System.

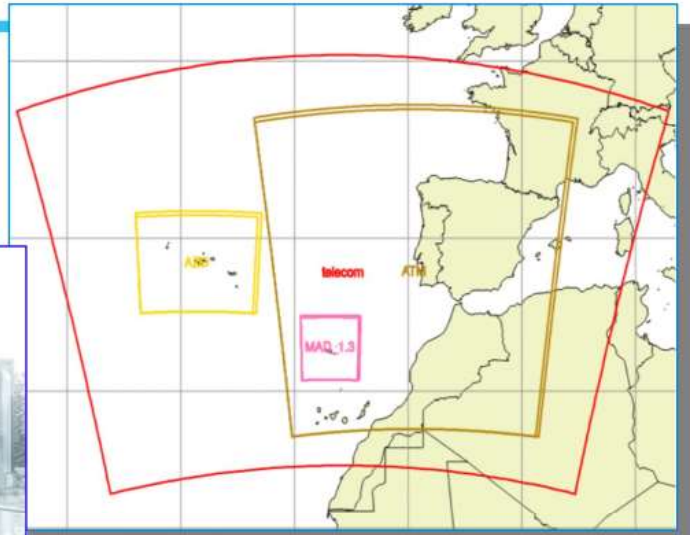
A fast-developing bow echo system passed over north-eastern Poland in August 2007, producing wind gusts up to 35 m/s and causing 12 fatalities. The reconstruction was performed with a convection-permitting 2.2km grid length COSMO model with Initial and Boundary Conditions being taken from ERA-5. The reconstruction was successful after correcting the model representation of atmospheric environmental conditions and introducing additional stochastic mechanism for convection initiation.

3. A study of the impact of initial conditions perturbations on the quality of the COSMO PL ensemble.

The perturbation was applied to the temperature in the first few soil layers, in order to have a long-lasting effect in the forecast. The results of the perturbations down to about 2.5 metres compared with ERA-5 data are presented.

Portuguese activities on SRNWP: 2021-2022

- **Re-design of the Portuguese NWP system**



- **Looking for synergies**

Instituto Português do Mar e da Atmosfera
Rua C - Aeroporto de Lisboa | 1749 - 077 Lisboa, Portugal | www.ipma.pt

NWP related activities @ SHMU

- ALADIN systems
  - operational **ALARO/SHMU** 4.5 km/L63
  - experimental ALARO 2 km/L87 in two different modes (ARPEGE vs ECMWF coupling)
  - experimental ALARO 1 km/L63 RUC hourly suite
  - *operational A-LAEF (ALARO-1vB) 4.8 km/L60 - CY40T1bf07, ECMWF HPCS*

ALARO-1vB
CY43T2bf11
new HPC NEC LX
(mid March 2022)

- Interesting R&D work
  - tuning of BLENDVAR @ 4.5 km/L63 and the e-suite scores
  - BLENDVAR vs. VARBLEND comparison
  - setup of RUC nowcasting suite at 1 km - a case study
  - successful installation of harpSpatial and the first spatial scores
  - new A-LAEF epsgrams

ARSO METEO Slovenia

SLOVENIA

LACE nwp central europe

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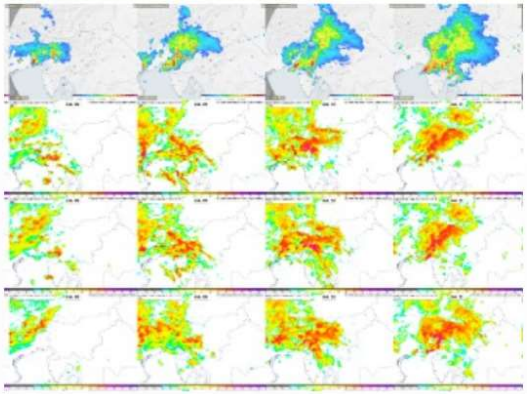
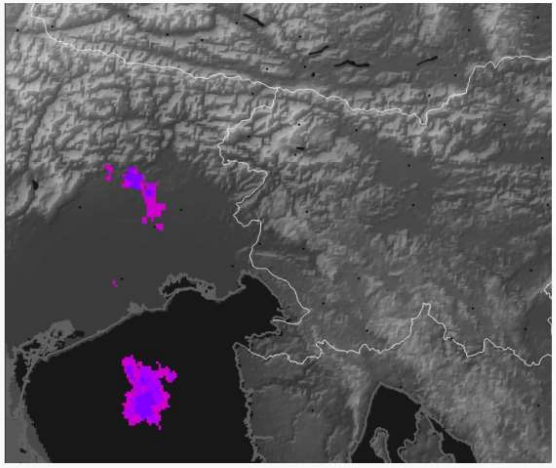
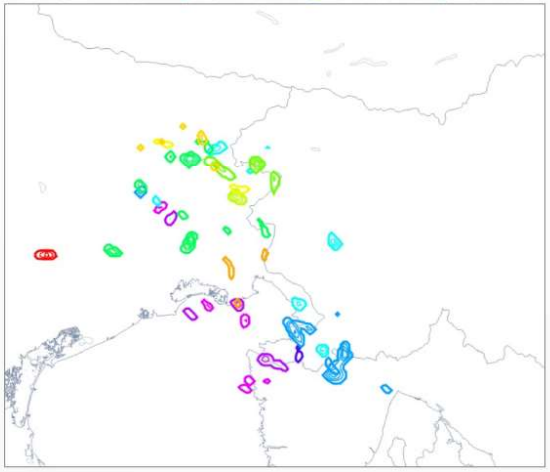
NWCRUC:
non-hydrostatic
ALARO@1.3km with
1 hour DA 3DVar+OI
24 x +36h





Radar measurement



Time lagged ensemble
(45dBz reflectivity threshold)

Radar DA activities:
impact of reflectivity,
HOOF tool:
preprocessing of
OPERA data,
wind data dealiasing,
superobing.

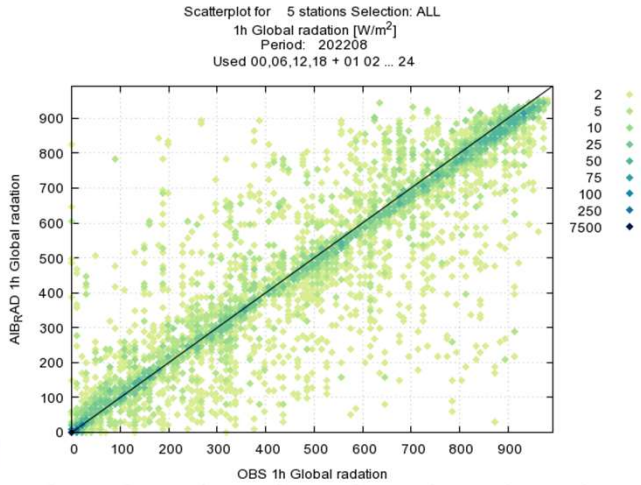
Research:
rain rates from microlinks -
new preprocessing method

AEMET (Spain) Highlights

- HARMONIE-AROME operational suite based on cy43h2.1 in the new ATOS-Bull system
  - New data: SEVIRI WV6.2 and WV7.3
  - Refined scales in CANARI sfc analysis

- Comparison of different radar pre-processing: ODE(BALTRAD) or OIFS(OPERA)
  - Similar results

- Objective verification of radiation
  - Routine verification of Global and Direct SW and LW is performed



Very High Resolution modelling

Including Data Assimilation

- Possible Canary Islands operational suite at 1.25 km: Clear added value

Dynamic adaptation versions at 1 km and 500m

- Stable versions with clear improvement on t2m and V10m
- But so far the added value of 500m is not clear compared with 1km