

ALADIN systems run at or by SHMU				
label	ALADIN/SHMU		ALARO 2	A-LAEF
CSC	ALARO		ALARO	ALARO
status	operational		test mode	operational TC2
code version	CY43T2bf11		CY43T2bf11	CY40t1bf06
physics	ALARO-1vB		ALARO-1vB	ALARO-1 multi-physics + surface stochastic physics (SPPT)
horizontal resolution	4.5 km		2.0 km	4.8 km
points	625 x 576		512 x 384	1250 x 750
vertical levels	63		87	60
tstep	180 s		120 s	180 s
forecast ranges	78/72/72/60 (a' 1h)		78/72/72/60 (a' 1h)	81/-/81/- (a' 1h)
coupling model & frequency	ARPEGE, 3h		ARPEGE, 1h	ECMWF, 3h
assimilation	upper air spectral blending by DFI CANARI surface assimilation		CANARI	A-LAEF control member init downscaling
initialization	no initialization		DFI	no initialization
HPC	HPC3		HPC3	ECMWF HPCF

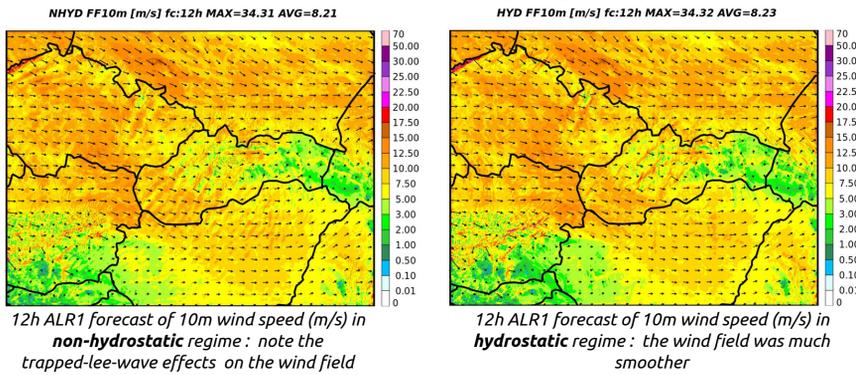
	HPC3 operational since 22 March 2022	HPC2 (till 22 March 2022)
HPC	NEC HPC1804Ri 2	IBM Flex System p460
HW	2x Intel Xeon SP 6230	4x Power7+ 8 core CPUs
nodes	240 (max. 40 tasks/node)	12
File system	LUSTRE (1.2 Pb)	GPFS, shared
queueing system	SLURM	loadleveler, shared
OS	CentOS linux	Red Hat Enterprise Linux
compiler	Intel FORTRAN Compiler	gfortran 4.9.3 (xlf 15.1.0)



Development of new forecasting systems

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A deterministic nowcasting and very short-range forecasting system (ALR1 suite) is planned to run at 1 km resolution with 1h update frequency. First tests were provided in dynamical adaptation regime on HPC3 and with CANARI surface assimilation, use of 3DVAR is planned. Hydrostatic as well as non-hydrostatic and hybrid (hydrostatic in first 3h) regimes were tested in order to mitigate effects of non-realistic convection on wind and temperature at the beginning of integration.

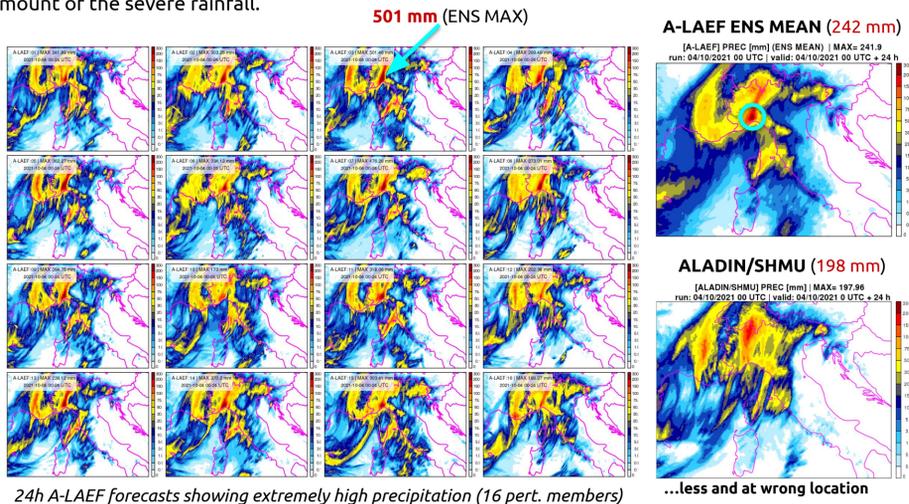


We also plan to introduce a new, short-range EPS forecasting system at 2 km horizontal resolution.

A-LAEF forecasts of record precipitation in Liguria region, Italy, 4/10/2021

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On 4 October 2021, 740 mm of precipitation within 12h was reported in Northern Italy (Rossiglione, Liguria region), which is an **European record**. Several members of the operational A-LAEF system (coupled to cy47r2 ECMWF runs) predicted extremely high precipitation in this region. Coupling with cy47r3 ECMWF inputs was also tested, showing slight improvements. The A-LAEF EPS mean significantly outperformed the deterministic ALADIN/SHMU forecast concerning both position and amount of the severe rainfall.



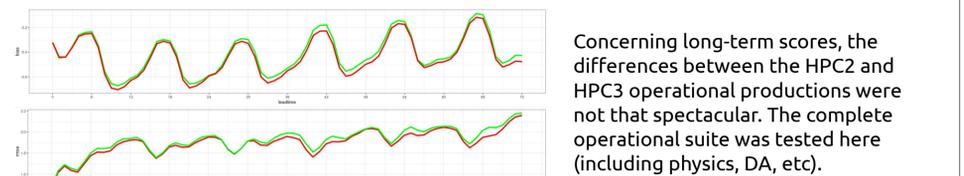
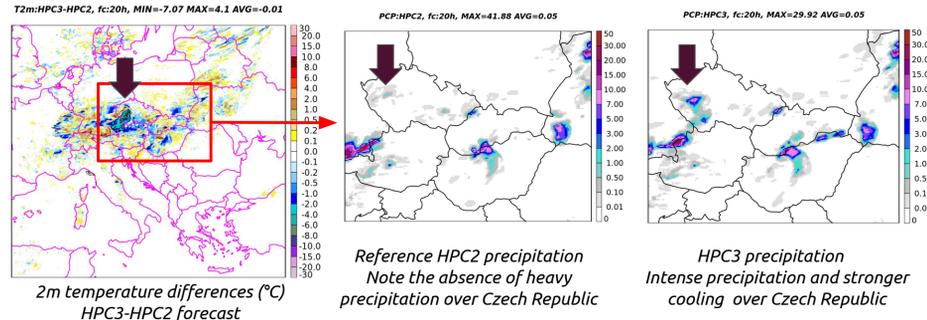
24h A-LAEF forecasts of probability of precipitation exceeding 150 and 200 mm, respectively

Further reading: Clemens Wastl, Martin Belluš, Gabriella Szépszó, 2022: EPS research and development in RC-LACE in 2021, 2nd Accord newsletter, 152-165.

Validation of HPC3 forecasts vs HPC2

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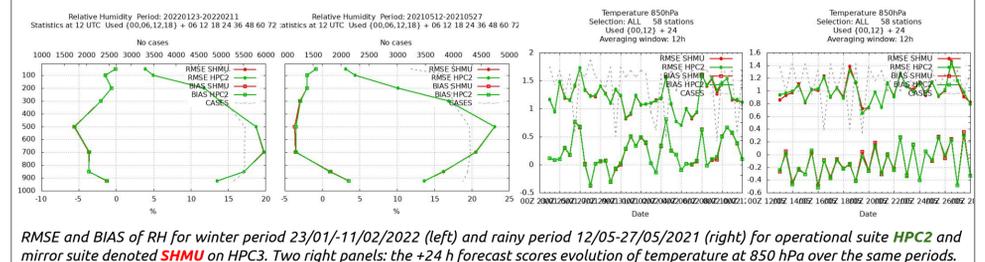
The ALADIN/SHMU model was tested on HPC3 on a deep convection case of 15 August 2021, with the same initial and boundary conditions as on HPC2. Significant (**exceeding 6°C**) differences in 2m temperature were found after 20 h of integration, which seems to be related with convective precipitation. Similar differences can be found when comparing forecasts between other HPCs as well and even on the same HPC machine when changing the mode of optimization (O2 vs O0).



Scores of 2m temperature, bias (top), rmse (bottom) for the period of 20 January 00 UTC till 21 February 12 UTC over 95 Slovak AWS. HPC2 result is in green, HPC3 in red colour. Computed using HARP.

HPC3 mirror suite vs. HPC2 scores

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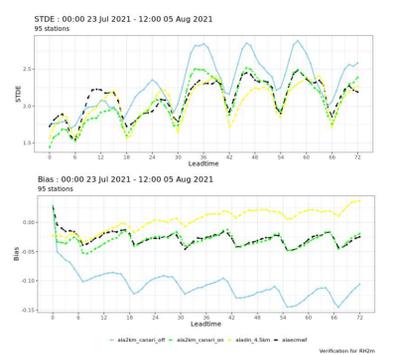


Alaro 2 km/L87 recent development.

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A deterioration of the 2m temperature and 2m relative humidity forecasts has been identified during summer 2021 in ALARO2 configuration with ISBA, coupled to ARPEGE in the dynamical downscaling mode (light blue line on Figures with scores on the right). Utilization of analysis of surface parameters based on CANARI optimal interpolation showed to be sufficient to alleviate the deficiencies (green line scores). Simple technical cycling approach was applied - the analyzed temperature and soil moisture fields are replaced in the initial conditions file that is an ARPEGE analysis so that the upper air fields of the driving model analysis are preserved.

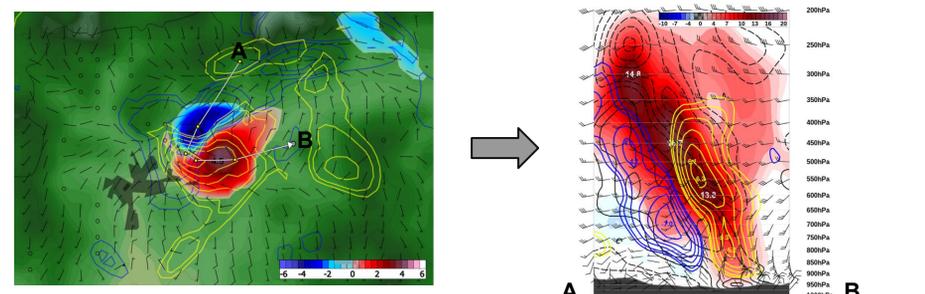
Further reading: Dian, M., Derková, M., Petraš, M., 2022: Algorithmic amelioration of the deficiencies in the screen level parameters forecast based on a dynamical downscaling approach, 2nd Accord newsletter, 91-95.



Numerical simulation of supercells in Slovakia

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Example of identification of supercell mesocyclone by an experimental ALARO model with horizontal resolution of 1 km over central Slovakia near Banská Bystrica city, run 27.6.2020, 12:00 UTC, forecast valid to 16:00 UTC.



Further reading: Šinger, M., 2021: Influence of orography on supercells in Slovakia, dissertation, Bratislava, Comenius University, 185 p.