# 4.2 common activities

*http://www.umr-cnrm.fr/aladin/*

# Period 2010-2015

| Issue | Coodrination during 2015-2020 |
|---|---|
| *Code engineering:*<br>Management of the cycles | ACNA |
| *Schools of thought on physics:*<br>to parameterize or not to parameterize DC? | Code Architect |
| *Data assimilation:*<br>A solution for all? | DAsKIT |

# Physics (CA)

The Code Architect shall technically assist the ALADIN PM in supervising the definition of the ALADIN System, see, ARTICLE 5, Paragraph 43

This includes the following specific tasks; the Code Architect (CA)

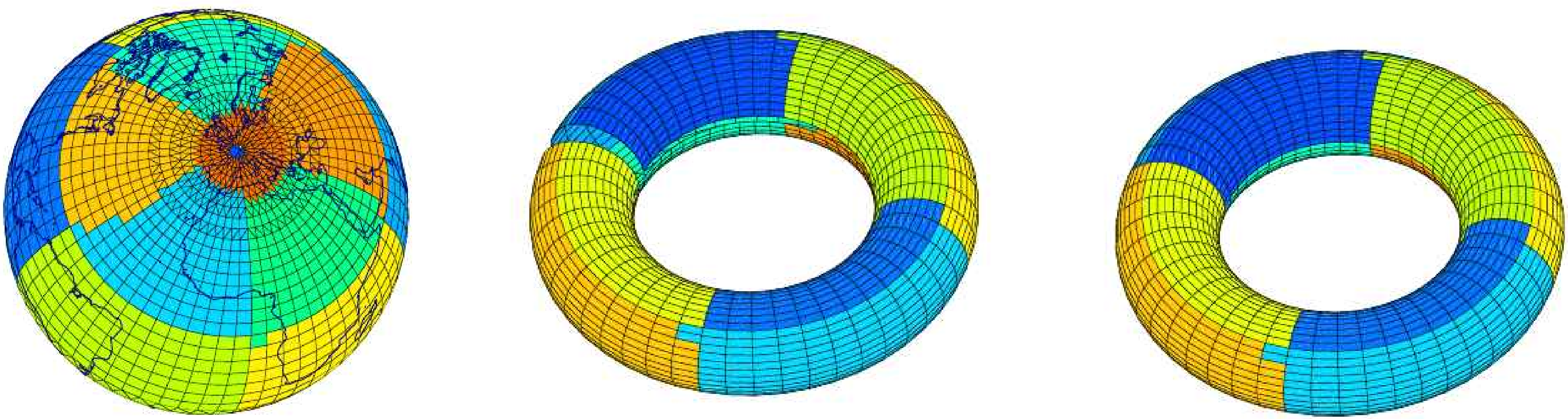
- will finalize the physics-dynamics action;
- will document the scientific consistency between different physics packages and the dynamics;
- propose technical solutions to implement new pieces of code in the model code, consistent with the common numerical framework (including the physics-dynamics interface and the constraints from the time step organization);
- will execute a 5-year engineering program with the aim to define the ALADIN System , according to a road map agreed with the ALADIN PM and PAC;
- will monitor the definition of the Canonical Model Configurations.

The CA will de facto be part of CSSI and will work in close collaboration with the ACNA and the chair of CSSI.

The ALADIN PM regularly reports about the activity of the CA to PAC.

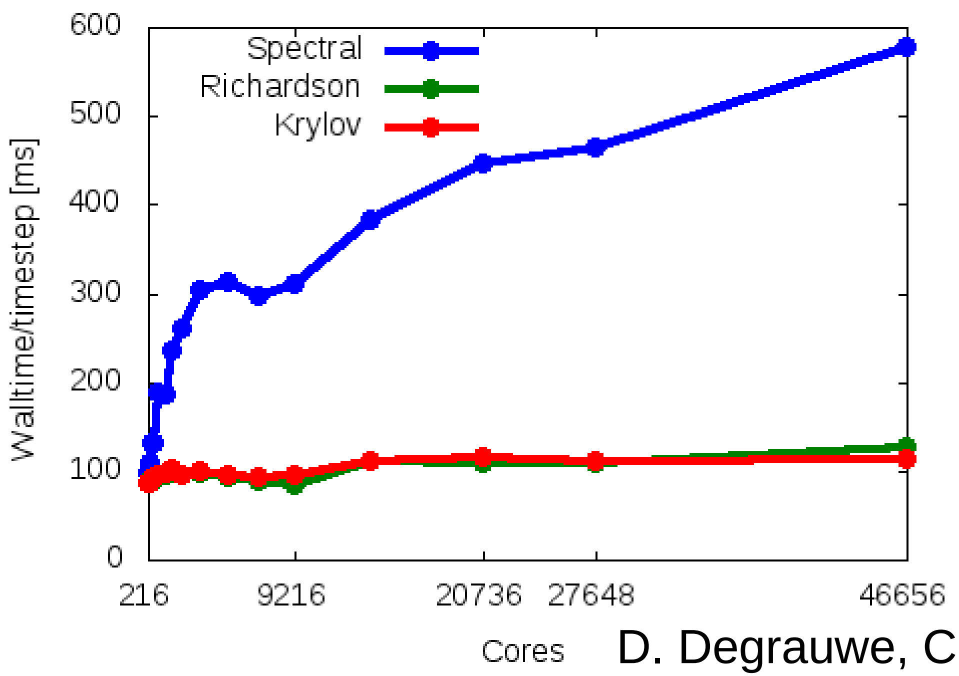
# Addressing future evolutions of software infrastructure

- Adopt the notion of “***separation of concerns***”: low level code to the local computing platform are not visible to the high-level scientific developer, thus separating the scientific concerns from the computing ones.
- Strengthen the collaboration with ECMWF (shared code)
- Work already started on Atlas to include LAM geometry
- Need to increase knowledge/efforts on DSL and Claw

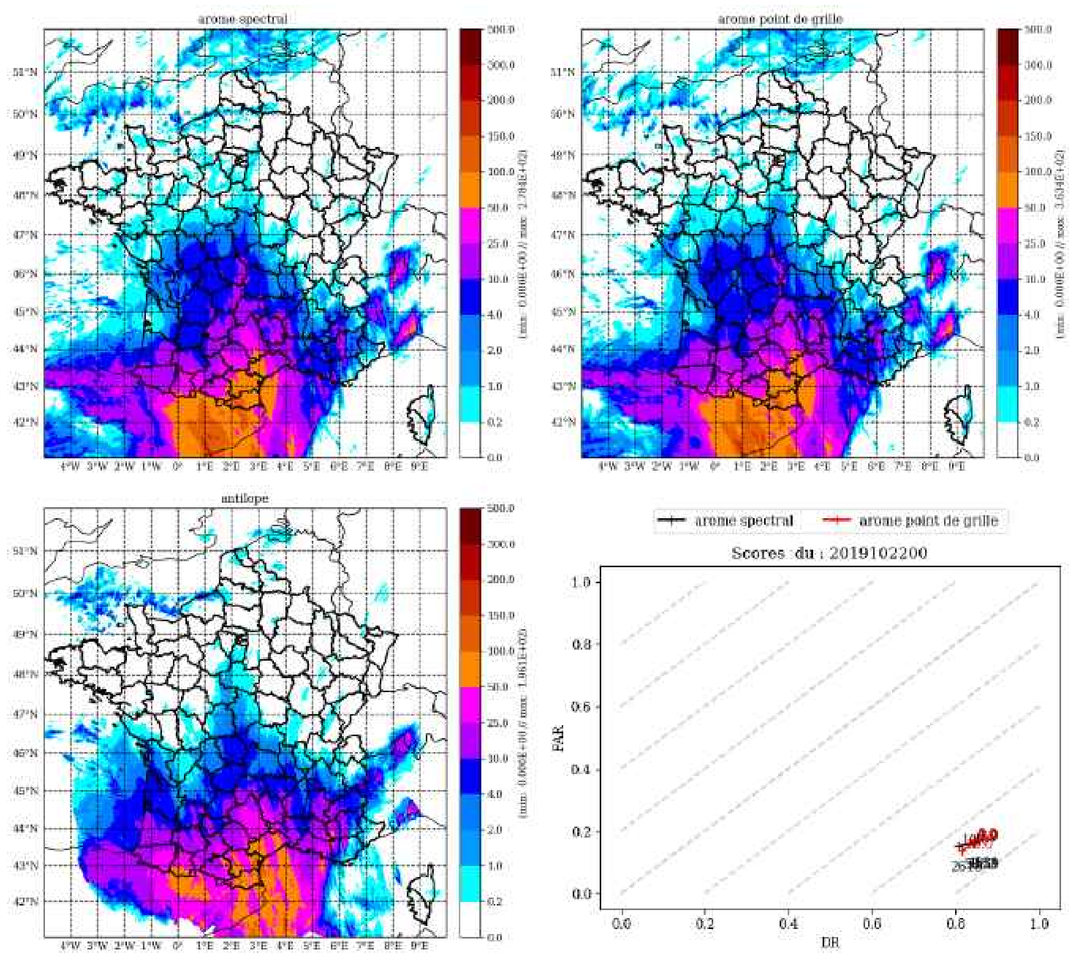


# Gridpoint solver

| | Step | Options (LAM vs. global) |
|---|---|---|
| 1. | Horizontal derivatives (vorticity, divergence and pressure–temperature gradients) | |
| 2. | Inverse spectral transform: spectral to grid point | bi-FFT$^{-1}$ / Legendre, FFT |
| 3. | Computation of the physics contributions | AROME physics / ALADIN/ALARO physics |
| 4. | Calculation of the tendencies of the prognostic variables of the model state | INTFLEX |
| 5. | Computation of the explicit grid-point dynamics and adding it to the total tendencies of the prognostic variables | IFS–ARPEGE–ALADIN hydrostatic / ALADIN-NH |
| 6. | Computation of the semi-Lagrangian departure points and Interpolation of the tendencies to these points | SLHD |
| 7. | Addition of the interpolated tendencies to the model state | |
| 8. | Lateral boundary coupling | bi-periodic LBC conditions |
| 9. | direct spectral transforms | bi-FFT / Legendre, FFT |
| 10. | solving the semiimplicit Helmholtz equation | IFS–ARPEGE–ALADIN hydrostatic / ALADIN NH |




D. Degrauwe, C. Clancy




T. Burgot, L. Auger

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RESEARCH ARTICLE

# A non-spectral Helmholtz solver for numerical weather prediction models with a mass-based vertical coordinate

Daan Degrauwe[1] | Fabrice Voitus[2] | Piet Termonia[1,3]

[1]Royal Meteorological Institute, Brussels, Belgium

[2]CNRM, Météo-France, Toulouse, France

[3]Ghent University, Ghent, Belgium

**Correspondence**

D. Degrauwe, Royal Meteorological Institute, Ringlaan 3, 1180 Brussels, Belgium.
Email: daan.degrauwe@meteo.be

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**Abstract**

Although semi-implicit semi-Lagrangian spectral atmospheric models have been very successful for decades, they are believed to face big challenges in the longer term. Foremost, the spectral method relies heavily on data-rich global communications, which may become problematic on future massively parallel machines. This paper investigates how the Helmholtz problem, as it arises in the dynamical core of a semi-implicit non-hydrostatic numerical weather prediction model with a mass-based vertical coordinate and a constant-coefficient reference state, can be solved efficiently without relying on spectral transforms, by using a multigrid-preconditioned iterative solver instead. In the particular case of a limited-area geometry, the convergence rate of this iterative solver can be determined *a priori*, which allows us to predict the required number of iterations. This knowledge is especially valuable for an atmospheric model that is used for operational weather forecasting, because it guarantees that the model runtime stays constant from one forecast to another. The *a priori* knowledge of the convergence rate also allows us to choose the parameters of the multigrid preconditioner optimally. Weak scalability experiments show the superior scalability of this solver with respect to a spectral solver.

KEYWORDS

Helmholtz problem, Krylov solver, scalability, semi-implicit timestepping, spectral methods

# Physics-dynamics interface

Geosci. Model Dev., 9, 2129–2142, 2016
www.geosci-model-dev.net/9/2129/2016/
doi:10.5194/gmd-9-2129-2016


Geoscientific Model Development
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## Generalization and application of the flux-conservative thermodynamic equations in the AROME model of the ALADIN system

**Daan Degrauwe[1], Yann Seity[2], François Bouyssel[2], and Piet Termonia[1,3]**

[1]RMI Belgium, Ringlaan 3, Ukkel, Belgium
[2]CNRM, Météo-France, Avenue Coriolis 42, Toulouse, France
[3]Department of Physics and Astronomy, Ghent University, Proeftuinstraat 86, Ghent, Belgium

*Correspondence to:* Daan Degrauwe (daan.degrauwe@meteo.be)

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Geosci. Model Dev., 11, 257–281, 2018
https://doi.org/10.5194/gmd-11-257-2018


Geoscientific Model Development
Open Access
EGU

# The ALADIN System and its canonical model configurations AROME CY41T1 and ALARO CY40T1

**Piet Termonia[1,2], Claude Fischer[3], Eric Bazile[3], François Bouyssel[3], Radmila Brožková[4], Pierre Bénard[3], Bogdan Bochenek[5], Daan Degrauwe[1,2], Mariá Derková[6], Ryad El Khatib[3], Rafiq Hamdi[1], Ján Mašek[4], Patricia Pottier[3], Neva Pristov[7], Yann Seity[3], Petra Smolíková[4], Oldřich Španiel[6], Martina Tudor[8], Yong Wang[9], Christoph Wittmann[9], and Alain Joly[3]**

[1]Royal Meteorological Institute, Brussels, Belgium
[2]Department of Physics and Astronomy, Ghent university, Ghent, Belgium
[3]CNRM/GMAP, Météo-France, Toulouse, France
[4]Czech Hydrometeorological Institute, Prague, Czech Republic
[5]Institute of Meteorology and Water Management – State Research Institute of Poland, Krakow, Poland
[6]Slovak Hydrometeorological Institute, Bratislava, Slovakia
[7]Slovenian Environment Agency, Ljubljana, Slovenia
[8]Meteorological and Hydrological Service, Zagreb, Croatia
[9]Zentralanstalt für Meteorologie und Geodynamik, Vienna, Austria

**Correspondence:** Piet Termonia (piet.termonia@meteo.be)

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Revised: 8 November 2017 – Accepted: 10 November 2017 – Published: 18 January 2018

# CA deliverables

| CA action (see ToR) | Deliverables | Link to future Strategy |
|---|---|---|
| *physics-dynamics action* | The flexible physics-dynamics interface (CPTEND_FLEX) was implemented in the code (Degrauwe et al. 2016) | **The physics Area**: the physics AL will deliver an analysis document on the convergence of the physics packages in 2023. |
| *document the scientific consistency between different physics packages and the dynamics* | An analysis of the APLPAR and APL_AROME routines has been carried out, with focus on TOUCANS | |
| *propose technical solutions to implement new pieces of code in the model code, consistent with the common numerical framework (including the physics-dynamics interface and the constraints from the time step organization)* | • ACRANEB2 in AROME (done before the appointment of the CA)<br>• SURFEX in ALARO<br>• a new gridpoint solver consistent with the time-step of the ALADIN System (Degrauwe et al. 2020)<br>• development of the Atlas library for LAM configurations (*Müller et al. 2019)* | **The Transversal area on future evolution of software infrastructure:** continue the work on Atlas, extend the effort to DSL and Claw.<br>**The physics Area**: the physics AL will deliver an analysis document on the convergence of the physics packages in 2023. |
| *will execute a 5-year engineering program with the aim to define the ALADIN System, according to a road map agreed with the ALADIN PM and PAC;* | The ALADIN System has been documented in the paper Termonia et al. (2018). | |
| *will monitor the definition of the Canonical Model Configurations.* | Development of mittrailette tests of the HARMONIE-AROME configuration | The objectives of the **System Area**: specifically, the goal to *Develop a more distributed, efficient and continuous process for the integration and validation of new* |

# DasKIT: see Newsletter 15

ALADIN-HIRLAM NL 15, June 2020 M. Monteiro et al.

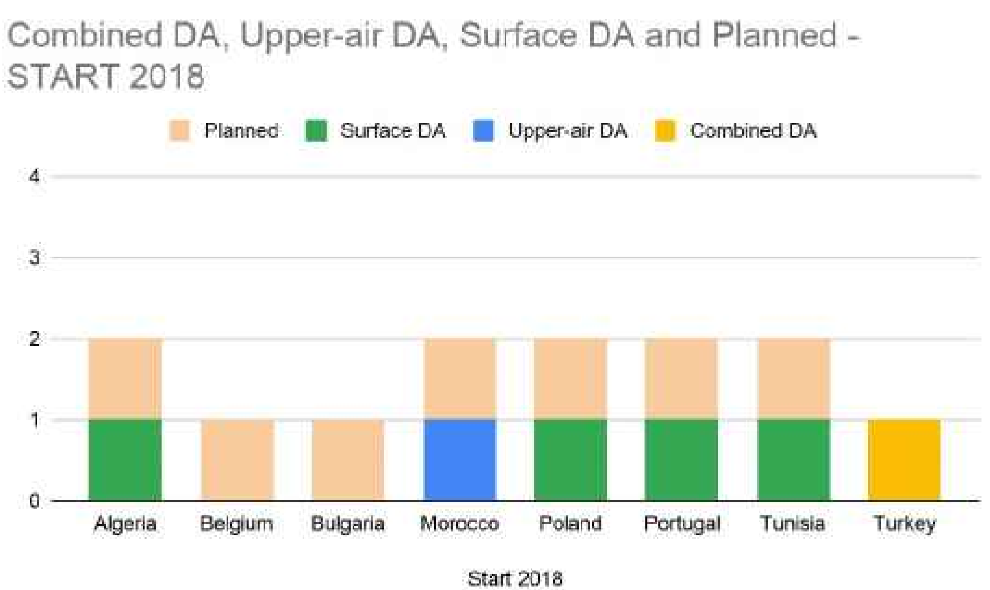
## The DAsKIT programme: status and plans

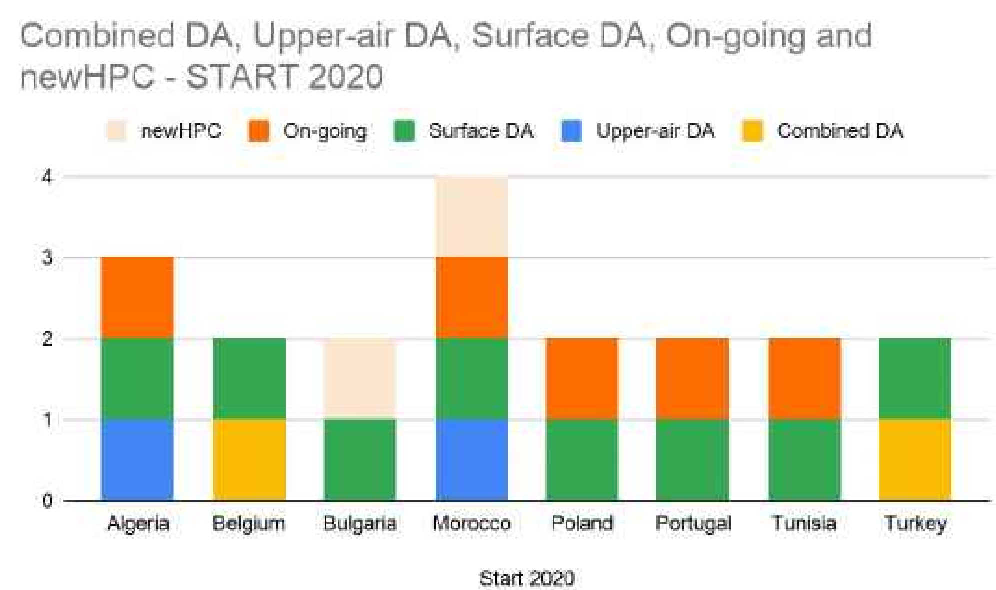
Maria Monteiro, Ouali Aitmeziane, Haythem Belghrissi, Andrey Bogatchev, Yelis Cengiz, Alex Deckmyn, Idir Dehmous, Fatima Hdidou, Wafa Khalfaoui, Marcin Kolonko, João Rio, Zahra Sahlaoui, Meral Sezer, Malgorzata Szczęch-Gajewska, Boryana Tsenova

# DAsKIT

| Operational configurations | | RUN OVER | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Algeria | Belgium | Bulgaria | Morocco | Poland | Portugal | Tunisia | Turkey | Austria | Croatia | Czech Rep | Hungary | Romania | Slovakia | Slovenia | France |
| RUN BY | Algeria | ALADIN 12 | | | | | ALADIN 12 | ALADIN 12 | | | ALADIN 12 | | | | | ALADIN 12 | |
| | Belgium | | ALARO 4 | | | | | | | | | | | | | | |
| | Bulgaria | | | ALADIN 7 | | | | | | | | | | | | | |
| | Morocco | ALADIN 18 | ALADIN 18 | ALADIN 18 | AROME 2.5 | | ALADIN 10 | ALADIN 18 | ALADIN 18 | ALADIN 18 | ALADIN 18 | ALADIN 18 | ALADIN 18 | ALADIN 18 | ALADIN 18 | ALADIN 18 | ALADIN 18 |
| | Poland | | ALARO 4 | ALARO 4 | | AROME 2.5 | | | | AROME 2.5 | ALARO 4 | AROME 2.5 | AROME 2.5 | ALARO 4 | AROME 2.5 | AROME 2.5 | |
| | Portugal | | | | | | AROME 2.5 | | | | | | | | | | |
| | Tunisia | | | | | | | ALADIN 12 | | | | | | | | | |
| | Turkey | | | AROME 2.5 | | | | | AROME 2.5 | | ALARO 4.5 | | | ALARO 4.5 | | ALARO 4.5 | |
| | Austria | | ALARO 5 | | | | | | | AROME 2.5 | AROME 2.5 | AROME 2.5 | AROME 2.5 | | AROME 2.5 | AROME 2.5 | |
| | Croatia | | | | | | | | | ALARO 8 | ALARO 2 | ALARO 8 | ALARO 8 | | ALARO 8 | ALARO 2 | |
| | Czech Rep | | ALARO 4.7 | ALARO 4.7 | | ALARO 4.7 | | | | ALARO 4.7 | ALARO 4.7 | ALARO 4.7 | ALARO 4.7 | ALARO 4.7 | ALARO 4.7 | ALARO 4.7 | |
| | Hungary | | ALARO 8 | ALARO 8 | | ALARO 8 | | | | ALARO 8 | ALARO 8 | ALARO 8 | AROME 2.5 | ALARO 8 | AROME 2.5 | AROME 2.5 | |
| | Romania | | | ALARO 6.5 | | | | | | | | | ALARO 6.5 | ALARO 6.5 | ALARO 6.5 | | |
| | Slovakia | | ALARO 9 | ALARO 9 | | ALARO 9 | | | | ALARO 9 | ALARO 9 | ALARO 9 | ALARO 9 | ALARO 9 | ALARO 9 | ALARO 9 | |
| | Slovenia | | ALARO 4.4 | | | | | | | ALARO 4.4 | ALARO 4.4 | ALARO 4.4 | ALARO 4.4 | | ALARO 4.4 | ALARO 4.4 | |
| | France | | AROME 1.3 | | | | | | | | | | | | | | AROME 1.3 |





Questions?