THE ALADIN COLLABORATION

WWW.CNRM.METEO.FR/ALADIN

ALADIN is a successful collaboration on numerical weather prediction involving 16 National Meteorological Services in Europe and Northern Africa. It started after an initiative taken by Météo France in 1990 and has been growing to a large-size international collaboration of about 90 full time equivalents. Since its start, the program has brought its members to the forefront of the developments in high-resolution short-range Numerical Weather Prediction.

ALGERIA | AUSTRIA | BELGIUM | BULGARIA | CROATIA | CZECH REPUBLIC | FRANCE | HUNGARY

MOROCCO | POLAND | PORTUGAL | ROMANIA | SLOVAKIA | SLOVENIA | TUNISIA | TURKEY

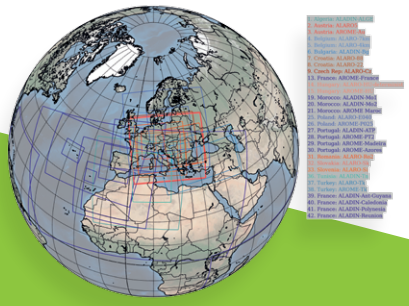
OBJECTIVES

→ Code development

The main activity is the conceptualization, definition, development, operation, and the maintenance of a shared, state-of-the-art, high-resolution Numerical Weather Prediction system called ***the ALADIN System***[1]. This system is used to configure the Numerical Weather Prediction applications in the participating member states. The code is shared with the global ARPEGE model of Météo France and the Integrated Forecast System (IFS) of the European Centre for Medium Range Weather Forecasts (ECMWF). The applications of the ALADIN System can run on limited geographical areas at about ten times higher resolutions than the ones of the global applications, allowing to compute weather forecast maps in high detail.

→ From science to operations

Significant scientific achievements are published in leading international journals. The ALADIN program coordinates scientific research and implements the scientific results into the new versions of the ALADIN System. These versions are regularly exported and installed on the High-Performance Computers in the Institutes of the ALADIN members. They are implemented in the operational applications. The members then run the numerical weather prediction model on limited areas covering their national territories Feedback from the weather forecasters of the Institutes is used to steer future Research and Development (R&d).



OPERATIONAL CONFIGURATIONS IN ALADIN CONSORTIUM

→ Expertise building

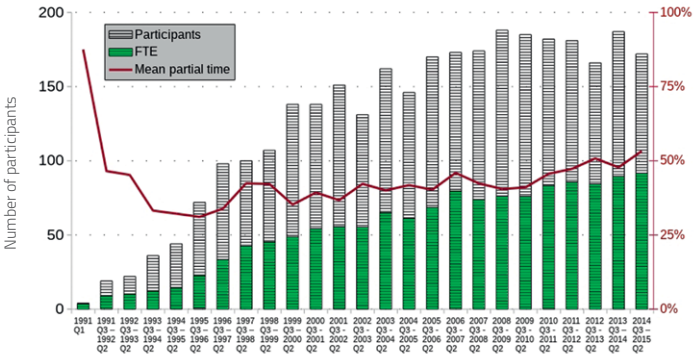
ALADIN provides a specialized background for training and recruitment of experts. This background is tightly linked to the national applications and is, as such, unique compared to purely academic research. This allows the members to create small to medium size teams to carry out R&D at a state-of-the-art international level.

→ Pooling of Resources

The activities of the consortium are supported by collective commitments of human resources to the operational and maintenance efforts, and to the management activities. The program has been used as a background to draw extra resources from external funding, both at national and international levels.

TOTAL PARTICIPATION IN THE ALADIN PROJECT

Evolution in the yearly Full Time Equivalent (green)



1. The acronym is derived from the French expression Aire Limitée Adaptation dynamique Développement InterNational.

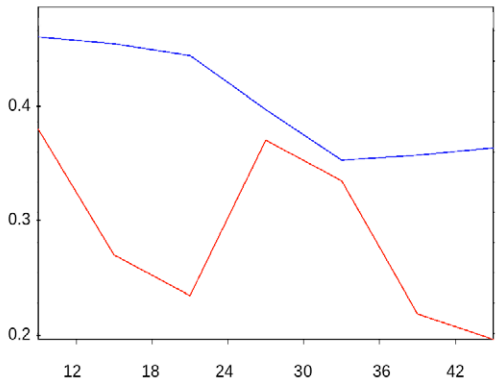
APPLICATIONS

The ALADIN consortium provides a platform for the ALADIN members for organizing optional activities related to numerical weather prediction. This can be done by individual members or in more intense optional multilateral collaborations. The applications range from nowcasting tools, specific academic case studies, to past and future climate simulations. Long model runs are used for creating atlases of wind climates. Climate-change simulations are carried out in the context of international regional climate modeling programs such as, for instance, the CORDEX project.

The most notable organization that takes part in the ALADIN consortium is the LACE consortium with 7 members in Central Europe. This consortium provides extra resources to exchange and to process meteorological data used in the model. It develops and maintains a pan-European probabilistic forecast system called LAEF. The ALADIN consortium shares its code with the HIRLAM consortium in a close scientific and technical collaboration.

ILLUSTRATION

Brier Skill Score, added value of PEARO (blue line) versus PEARP (global system, red line)



Threshold event is RR > 1mm/6h, computed over 302 days (Dec. 2015 - Oct. 2016). The horizontal axis is forecast time range in hours. The higher the Brier Skill Score is, the better the probabilistic system performed for that event.

Probabilistic prediction systems are expected to provide valuable information for decision-making processes of high impact weather forecasting. They can help users both to improve the evaluation of the risk of a hazardous event and for guidance on cost-to-benefit weighted decision processes. Several probabilistic prediction systems have been developed within the ALADIN collaboration, with specific targets in terms of geographical coverage, time ranges and operational mode: GLAMEPS (developed together with the HIRLAM consortium), LAEF (developed by the LACE group), PEARO (developed at Météo-France).

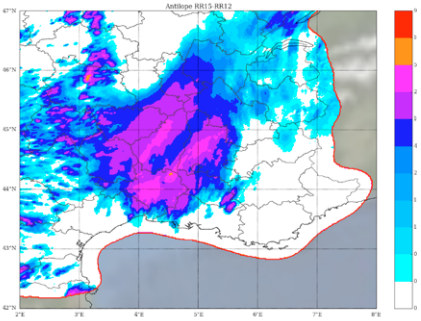
The PEARO system benefits from the advances of the AROME model configuration such as the increased capability to forecast more accurately high impact convective weather (storms, heavy precipitation etc.). Objective verification, performed over nearly one year of evaluation, indicates a significant improvement over an existing global probabilistic prediction system based on ARPEGE, especially regarding precipitation (see figure) and 10-meter wind speed. PEARO should enter in full operational mode at Météo-France by the end of 2016.

Extreme precipitation event in France on 20 July 2014

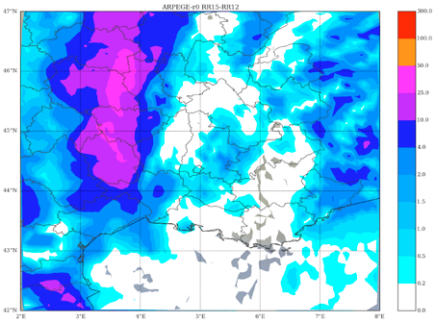
During the afternoon of 20th of July 2014, a stormy front moved over Southern France. Cumulated rain rates of about 60 to 90 mm/24h were observed over the Cévennes mountains with a maximum value of about 120 mm/24h, shown on the radar images on the left. In addition, locally very strong wind gusts were reported under thunderstorms.

Global models like ARPEGE and ECMWF/IFS suggested that the front would tend to remain just West of the Rhone Valley, West of 5°E (map in the middle). The output on the right is from the AROME Limited-Area Model (LAM) configuration of the ALADIN System. The high-resolution output was significantly more realistic in terms of intensity and location of the most active part of the frontal system.

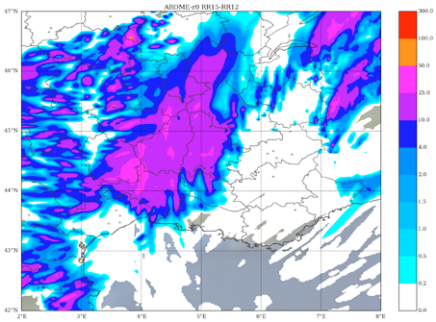
Radar image



ARPEGE forecast, 0h run



AROME forecast, 0h run



The possibility to evaluate this more detailed solution allowed forecasters to issue early warnings for large areas to the very South-East of Massif-Central and East of the Rhone River in the afternoon of 20th July, and thus to match the expectations of local Security authorities and stakeholders.