



# **CNRM strategy for the cooperation on atmospheric models for NWP, research and climate**

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# Main objectives and cooperation for global NWP

- A state-of-the-art global model ARPEGE:
  - Flexibility for Meteo-France operations (fcst delivery at appropriate times, TSR, LBC for ALADIN-France and then AROME, plumes fcst, ...)
  - Global forecast and LBC for oversea territories
  - Suitable for a short-range ensemble prediction system
  - A research model (i.e. cyclogenesis and predictability)
  
- Main cooperation:
  - ECMWF : dynamics, data assimilation, radiation, software
  - GMGEC (climate res. group) : towards a common physics package, sea-air fluxes
  - to be mentioned :IPSL → assimilation methods, ensemble prediction

## Main objectives and cooperation for LAM NWP (1/2)

- A state-of-the-art model AROME:
  - Improving the fcst of convective systems and thunderstorms, fog, cloudiness, local winds, temperature in the cities, ...
  - Assimilation of high-resolution pertinent data (radars, lidars, GPS, ...) for the nowcasting of convective systems, fog, ...
  - A progressive increase in the vertical and horizontal resolution (from 2,5 km to 1km over France)
  - Explore its potential for hectometric resolution modelling (500 m over smaller important areas),
  - Capability for on-line fcst of weather-dependant phenomena (vegetation, road temperature, chemistry, hydrology, snow, energy consumption, ...)
  - A research model (i.e. campaigns reanalysis, case studies, assimilation of new data, predictability of convective events ...)
  - Very high resolution downscaling with AROME in climate mode (town climates, ...)

## Main objectives and cooperation for LAM NWP (2/2)

- An operational capability at intermediate resolution (from 10 km to +/- 5 km):
  - Higher resolution than ARPEGE over large areas (Overseas, Defense, Africa, ....)
  - Possible need for an ensemble fcst at higher resolution (France/Europe, overseas, ...)
  
- Main cooperation for LAMs (AROME and ALADIN/ALARO):
  - Consortia ALADIN/HIRLAM: dynamics, physics, lateral coupling, data assimilation, predictability, software and system (maintenance of the code), surface, ...
  - GMME : Meso-NH physics (inc. L.A), SURFEX, radar / GPS assimilation
  - GMGEC : ALADIN-Climate, sea-air fluxes, 1-D ocean model

# Main objectives and cooperation for climate

- A state-of-the art Earth climate model
  - IPCC scenarios, seasonal forecast
  - Climate studies
  - High resolution climate projections (stretched ARPEGE, ALADIN-Climate, ....)
  
- Main cooperation
  - French scientific community : IPSL, CERFACS, LGGE, ...
  - European scientific community : ENSEMBLES, PRUDENCE, COMBINE, ....
  - GMAP: physics, IFS/ARPEGE software
  - GMME : physics, SURFEX, CO2, sea-air fluxes
  - Some ALADIN SMNs : ALADIN-Climate

# Main objectives and cooperation for research on meso-scale atmospheric processes

- A strong capability with Méso-NH
  - From CRM to LES
  - In particular, possibility to model atmospheric flows at the resolution of a few tens/hundreds of meters
  - Versatility for very diverse studies: convection, turbulence, wakes, atmospheric electricity, noise propagation, on-line chemistry (inc. CO<sub>2</sub>), aerosols, contrails, ...
  - A support team for diverse users
  - Maintaining a strong expertise in grid-point dynamics
  - Diagnostics
  - Grid-nesting facility
  
- Main cooperation
  - Laboratoire d'Aérodynamique
  - A very large Scientific Community
  - GMAP: AROME and now ARPEGE physics
  - GMGEC : physics, sea/air fluxes, SURFEX
  - GMEI : cloud physics, radiation, aerosols

# CNRM strategy regarding cooperation

- Taking advantage of every cooperation for improving NWP climate and research models
  - Coordination group GMAP/GMME/GMGEC/ GMEI on physics
  - Each member defends the interests of the partners of his group
  - Proposals for the short-term and long-term evolution of NWP and research models
  
- A strong synergy inside CNRM
  - Rationalisation of human resources through common developments
  - A faster transition from research to operations, thanks to the common physics Meso-NH/AROME and the convergence between ARPEGE NWP and Climate (KFB-CBR, radiation, Lopez, EDKF, sea-air fluxes, SURFEX, on-line chemistry, ...)
  - Cross-fertilizing : common case studies of bad forecast, validation of NWP models on climate mode and vice-versa, questions to research, ...
  
- ➔ The cooperation inside ALADIN/HIRLAM consortia and with ALARO team (convergence actions) is a key issue for some of our strategic objectives