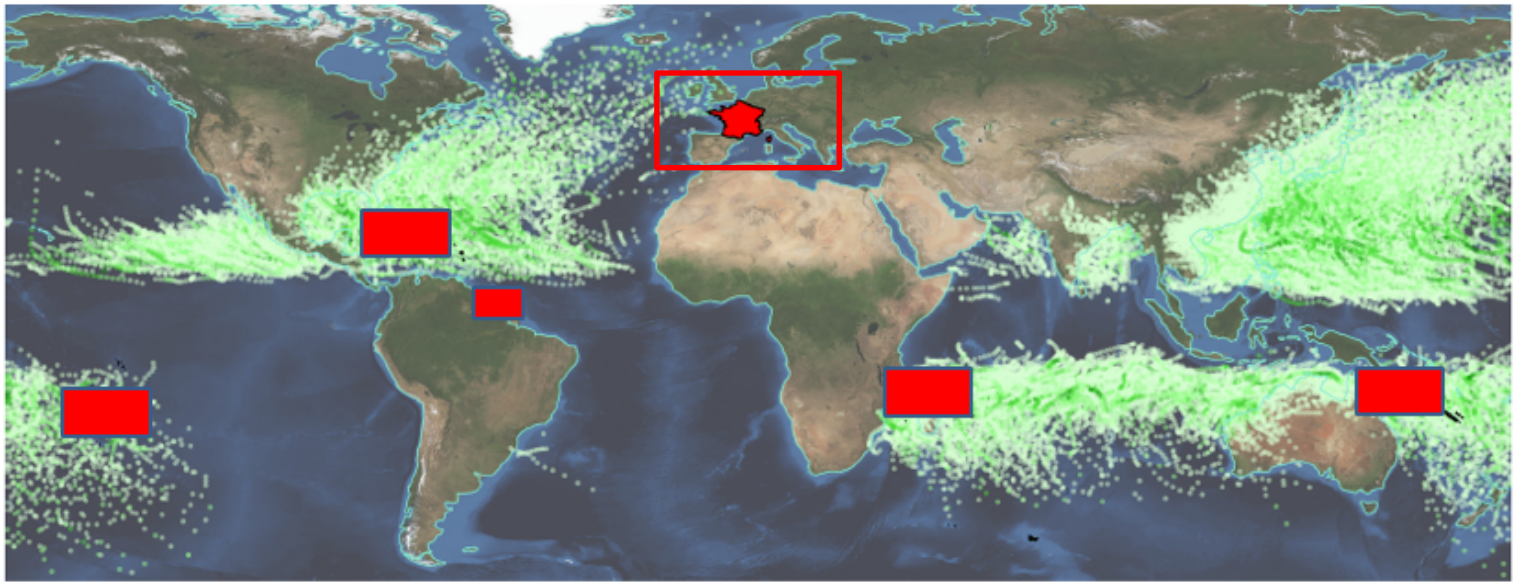
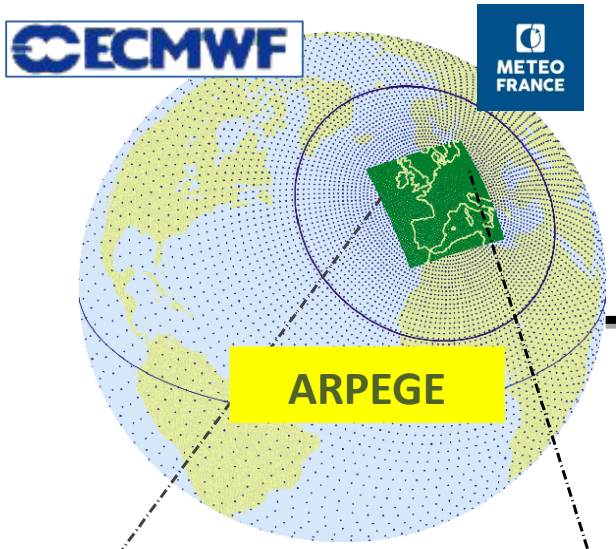
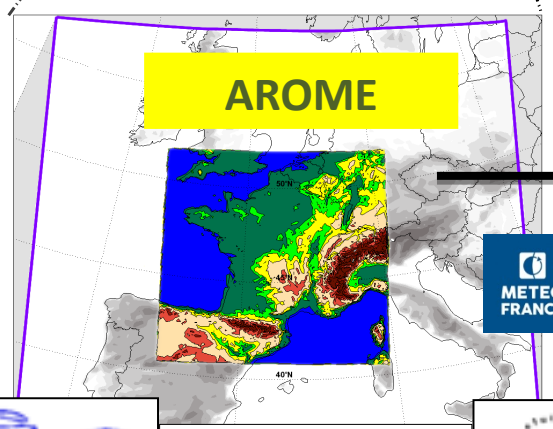
1st ACCORD Consortium Assembly
Progress and plans at Météo-France



Video-conference, 27 November 2020

A single coherent software from weather forecast to climate prediction and a mutualization of efforts at European level





ALADIN
LACE
Hirlam
ACCORD

ARPEGE-Climat
(50 km)

CNRM-ESM
marine-bio
carbon
CNRM-CM
NEMO

ARPEGE-Forecast
(5km – up to 5 days)

ALADIN-Climat
11 km

AROME (Western Europe)
1,3 km – up to 48 hours
+
5 oversea territories
2,5 km
+
up to 4 domains on demand
2,5 km

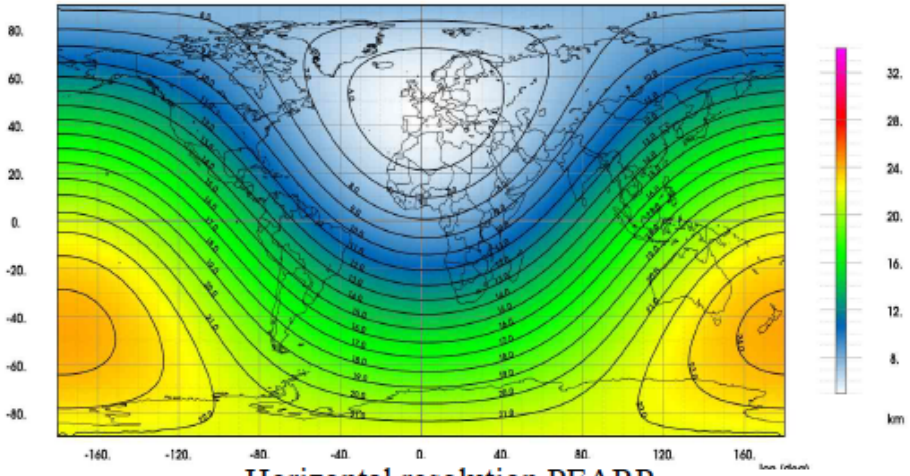
AROME-Climat
2,5 km

SURFEX
In all systems

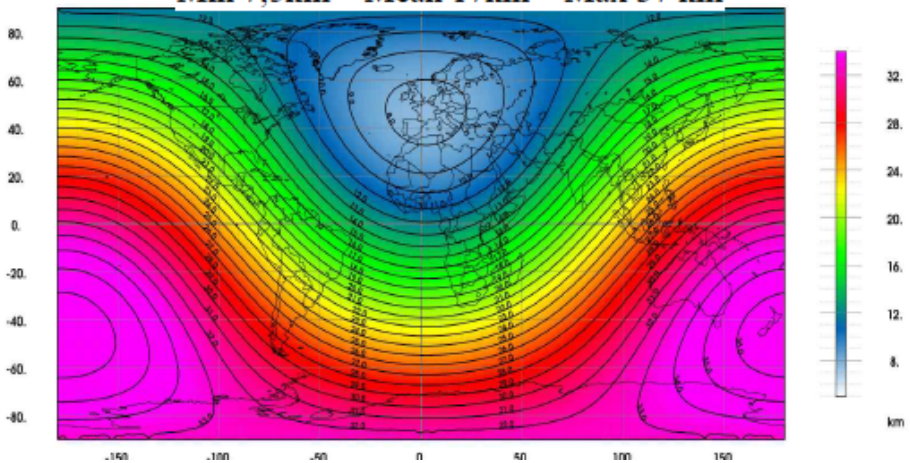
Global operational NWP systems based on ARPEGE

System	Characteristics
ARPEGE *Deterministic*	5km on W Europe 4DVar (6h cycle) 5 forecasts per day up to 114h
ARPEGE-EDA (AEARP)	50 members 4D-Var (6h cycle) Background covariances averaged on 12h and updated every 6h
ARPEGE-EPS (PEARP)	7.5km on W Europe 35 members four times per day up to 108h

Horizontal resolution ARPEGE
Min 5km – Mean 11km – Max 24 km

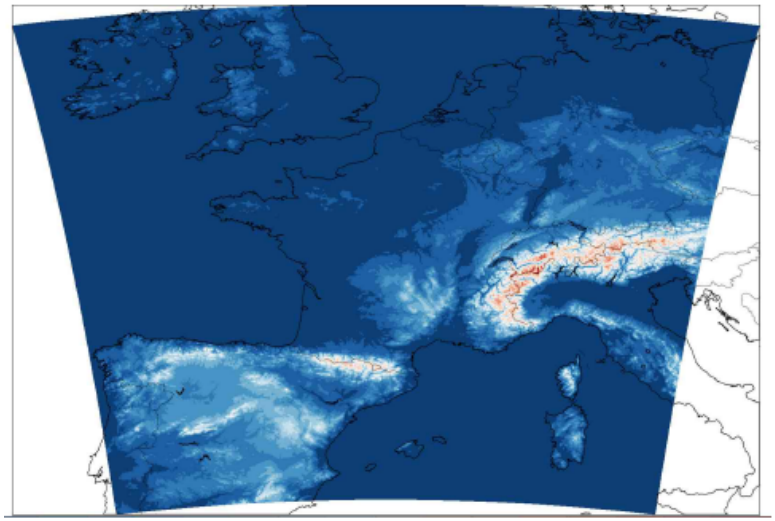


Horizontal resolution PEARP
Min 7,5km – Mean 17km – Max 37 km



Regional operational NWP systems based on AROME

System	Characteristics
AROME-France *Deterministic*	1.3km 3DVar (1h cycle) 5 forecasts per day up to 48h
AROME-France Nowcasting	1.3km 3DVar (no cycling – 10' cut-off) 24 forecasts per day up to 6h
AROME-IFS	2.5km Downscaling of IFS (altitude) and AROME-France (surface) 2 forecasts per day up to 48h
AROME-EPS (PEARO)	2.5km / 16 members Four times per day up to 51h Initial and boundary conditions from PEARP
AROME-EDA (AEARO)	3.25km 25 members 3DVar (3h cycle)
AROME Overseas (5 domains)	2.5km Downscaling of IFS (altitude) and ARPEGE (surface) 4 forecasts per day up to 48h



Recent evolutions of ARPEGE and AROME

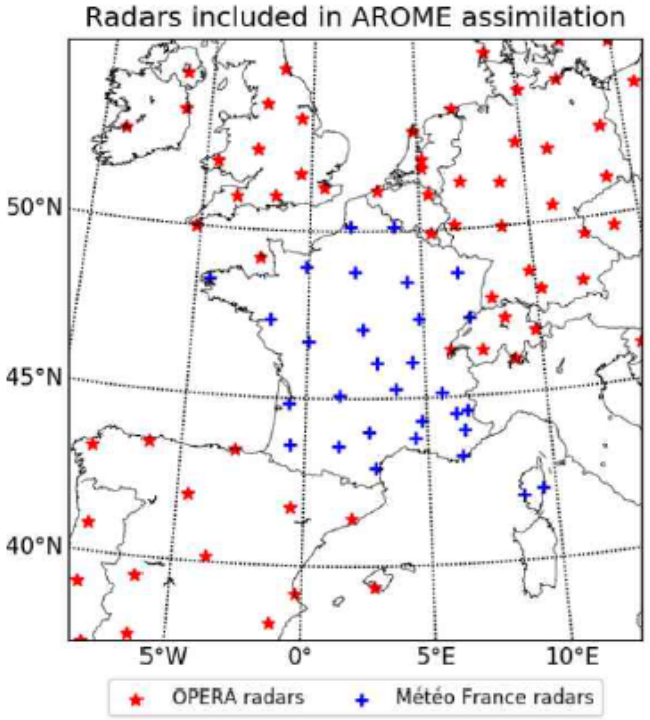
ARPEGE

- *Reminder July 2019 : increase resolution and assimilated observations*
  => significant improvements
- From January to June 2020
  - ✓ New diagnostics for aviation : clear air turbulence and icing
  - ✓ Assimilation : ASCAT/Metop-C, AMV/GOES17, …
  - ✓ Assimilation of new observations : ADM-Aeolus, new GNSS-RO, …
  - ⇒ with utmost dedication and care, during the lock-down
  - ⇒ Impact study ADM-Aeolus & new GNSS-RO: *information content of observations*

Obs type	Aeolus	GNSS-RO
% observation	0.42	2.90
% DFS	2.3	13.5

AROME

- January 2020
  - ✓ Implementation of snow analysis
  - ✓ Assimilation of OPERA radars



Short term implementations (2021)

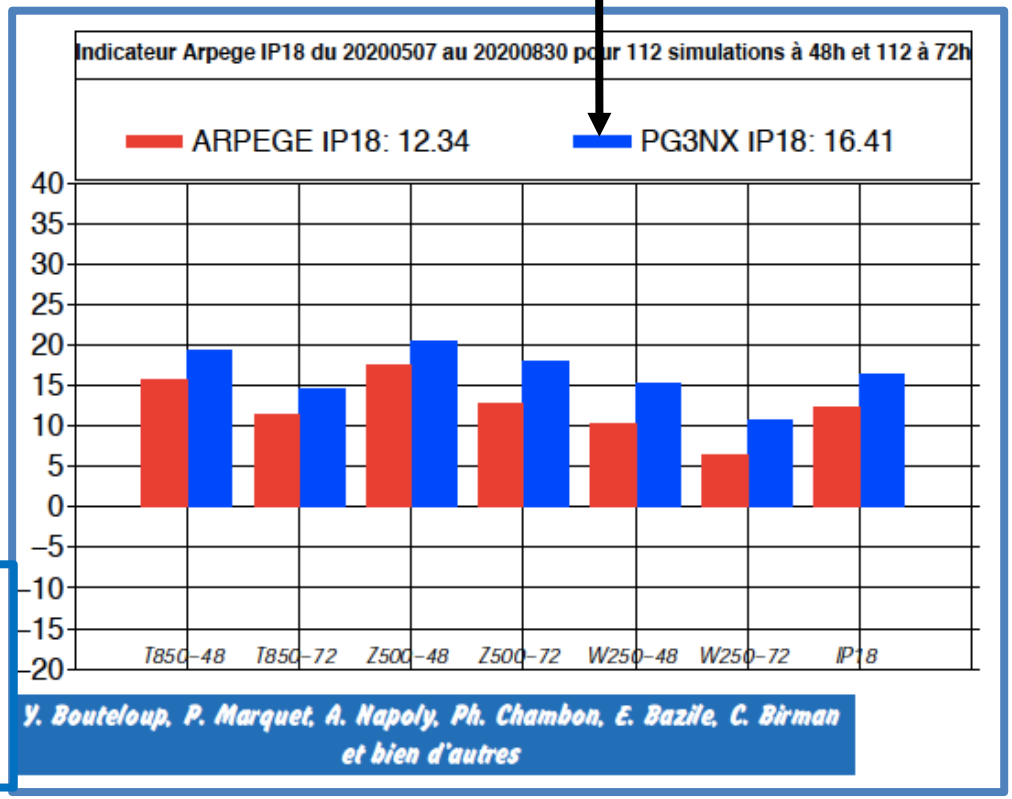
Operational switch of O-suite on new HPC:

- expected in January 2021

Start of next E-suite in spring 2021

- ARPEGE and AROME EPS at same resolutions as the "deterministic" ones

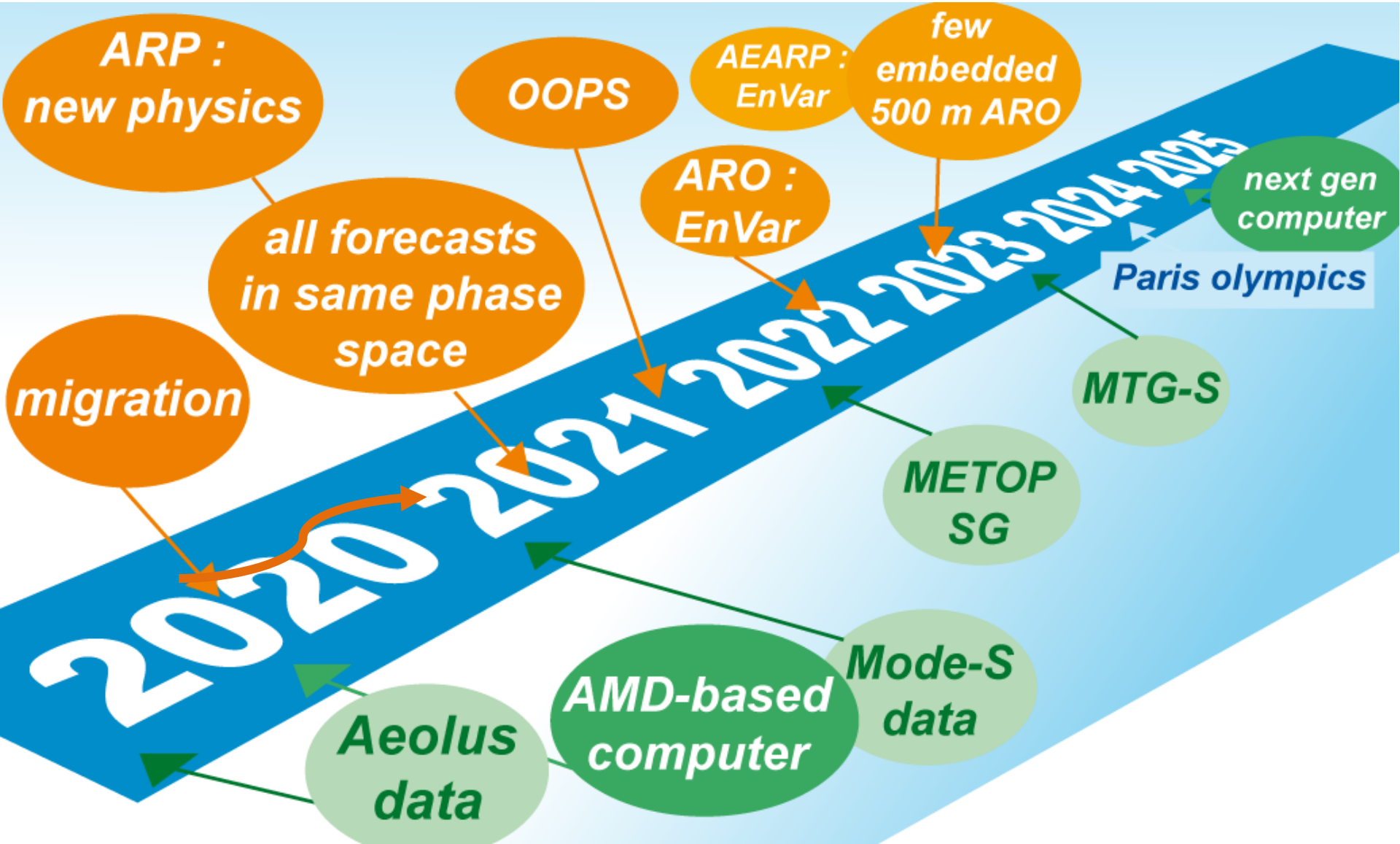
- Convergence IFS-ARPEGE: IFS convection scheme ; SRTM (solar)
- Sea-ice model GELATO-1D, snow analysis, ECUME sea flux, in ARPEGE and PEARP
- New advection scheme in AROME for hydrometor
- New diagnostics
- New assimilated observations
- …



Improvement of all components of the Arpege key performance indicator, temperature, wind, geopotential over Europe

Mid term perspectives (2021-2024)

Starting e-suite



Long term view : Scientific Strategy 2020-2030

Ensemble forecast and assimilation

- A fully consistent approach applied to both data assimilation (towards ensemble variational) and forecasts
- expected impact: earlier weather warnings and more user-oriented better decision support

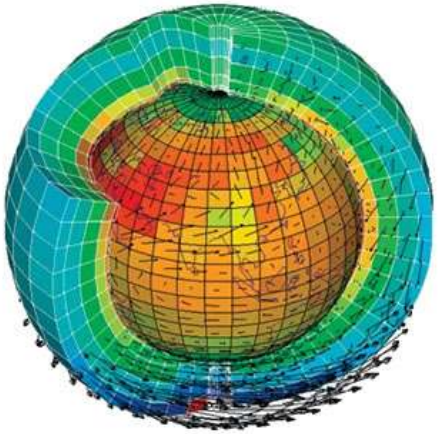
Kilometric Integrated « *regional Earth* » Système shared with climate

⇒ Allow different configurations and coupling levels according to the objectives of the forecast or application

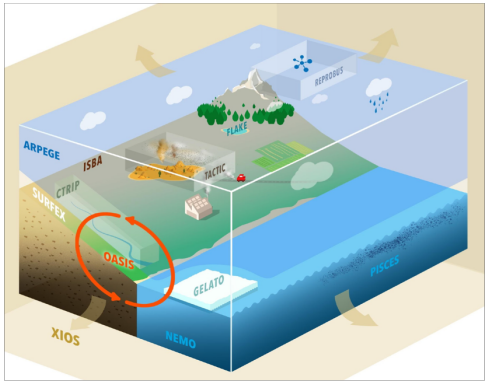
⇒ Forecasting mesoscale events with significant impacts

⇒ **Improve surface assimilation** and **re-organised SURFEX**

⇒ **Various chemistery schemes** with graduated complexities



Earth System 50 km

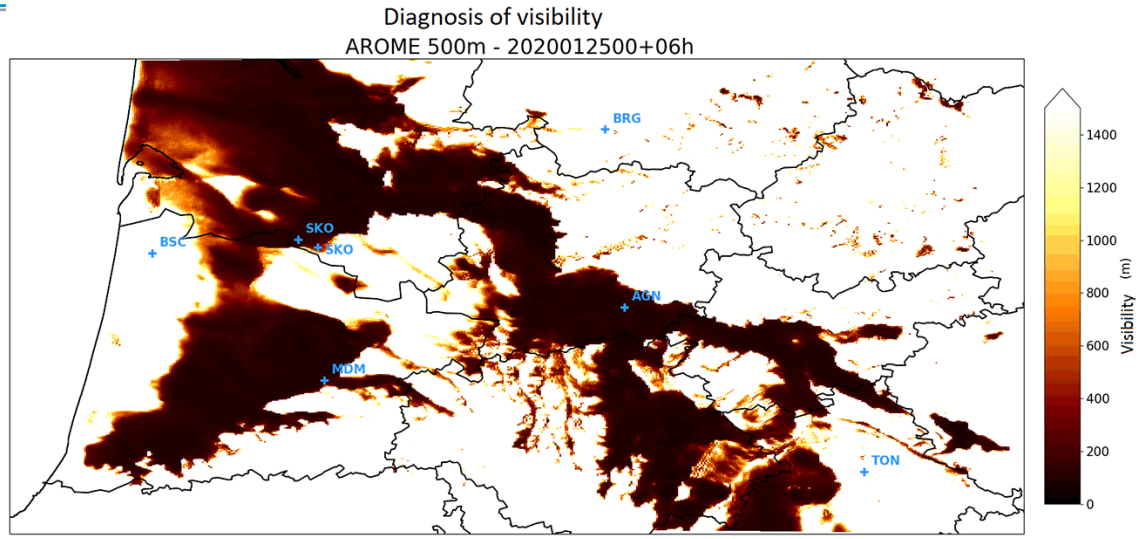


Intégrated System 1.3-2.5 km

Long term view : Scientific Strategy 2020-2020

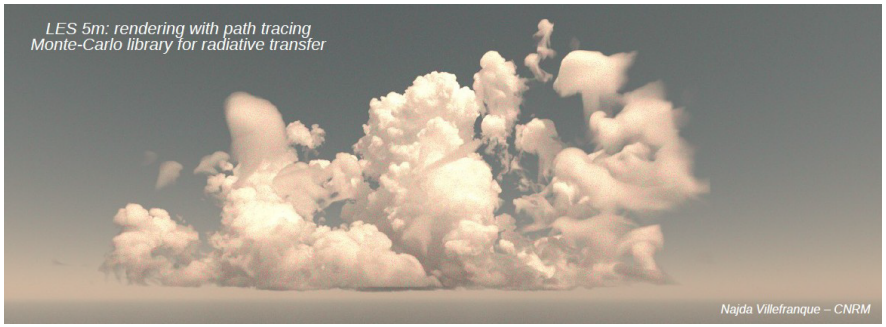
Hectometric scale

⇒ high stakes sites:
airports, cities, moutains, …



⇒ => Dédicated campaigns

⇒ Benefit metric numeric lab Meso-NH



METEO FRANCE

Long term view : Scientific Strategy 2020-2020

Oversea territories

- Résolution and ensemble
- coupled system : ocean and waves
- assimilation

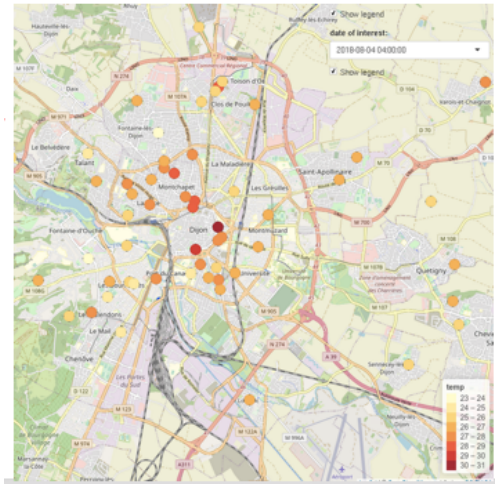
Urban areas

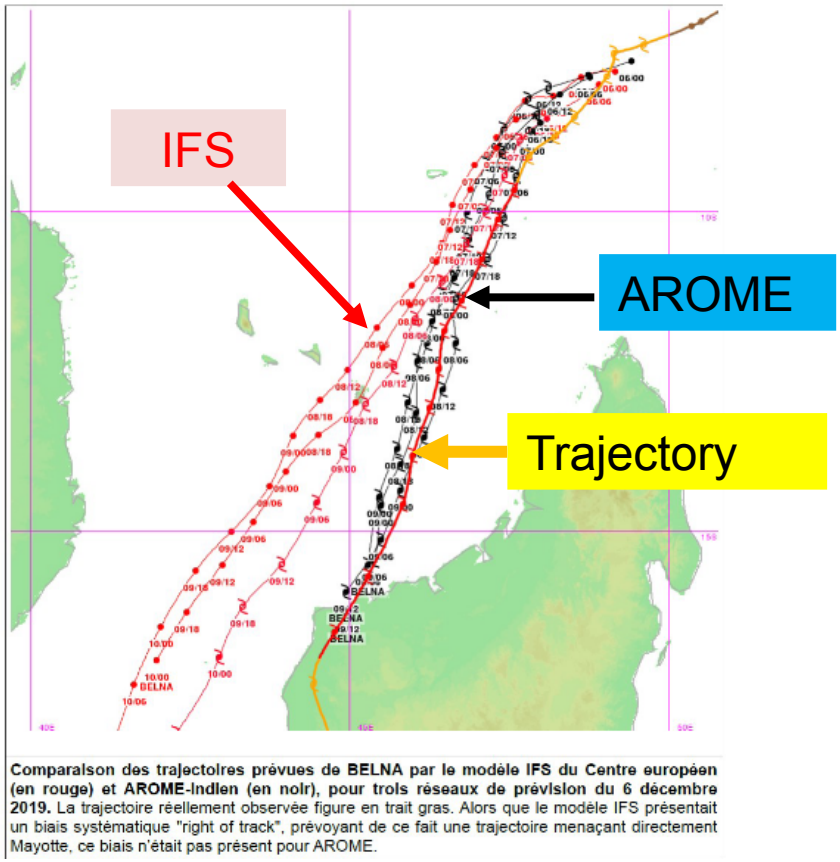
- Integrated city modelling

⇒ Urban heat island, air quality, hydrology

⇒ Forecasting, climate, adaptation

⇒ *Olympic Games Paris-2024 (WMO)*





Comparaison des trajectoires prévues de BELNA par le modèle IFS du Centre européen (en rouge) et AROME-Indien (en noir), pour trois réseaux de prévision du 6 décembre 2019. La trajectoire réellement observée figure en trait gras. Alors que le modèle IFS présentait un biais systématique "right of track", prévoyant de ce fait une trajectoire menaçant directement Mayotte, ce biais n'était pas présent pour AROME.

METEO FRANCE

Long term view : Scientific Strategy 2020-2020

Space observations

- Visibility of major programmes beyond 2030
- Increase of data (parameters, channels, spatial and temporal resolutions, ...)
- Low-cost spatial observation (new model: access-cost, duration, quality)

Climate

- Contribute to IPCC activities (CMIP experiments and drafting groups)
- Make progress on Seasonal Forecasting and its valorisation
- Determine climate change at the local level (metropolitan and overseas)

Moutains and avalanches

- Valorisation of regional climate projections in the mountains
- Profound change in "avalanche risk forecasting".

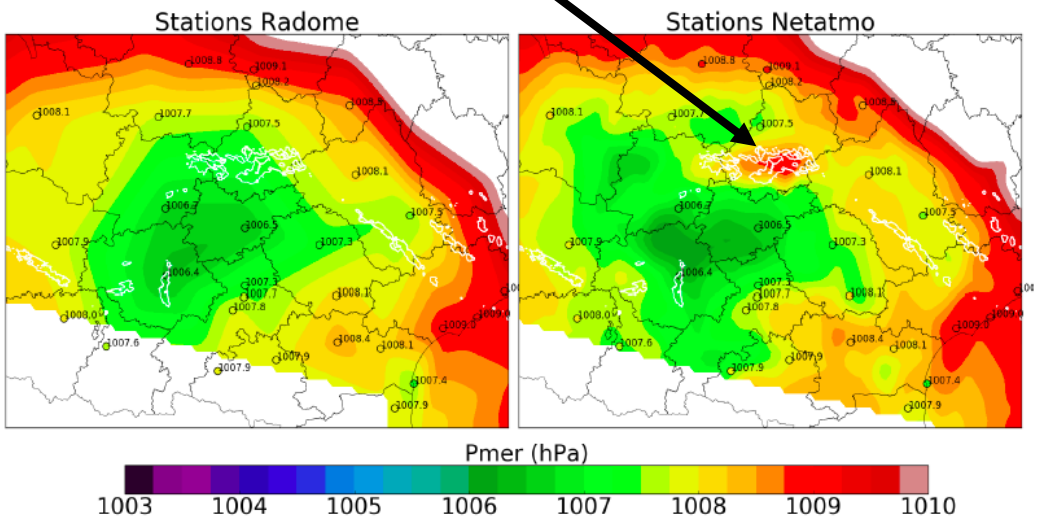
METEO FRANCE

Long term view : Scientific Strategy 2020-2020

Big Data

- Observation: monitoring and understanding of phenomena on a fine scale
- Ensemble Forecast and mass data: a trail for impacts

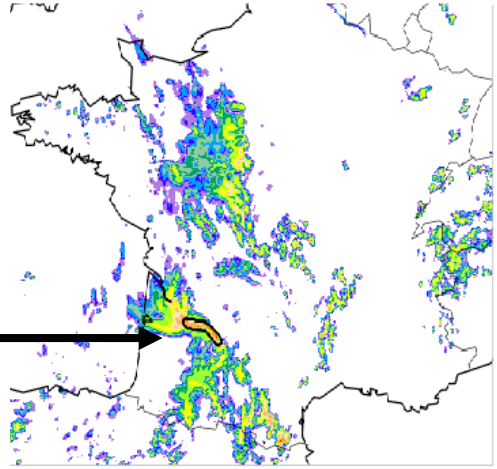
Detection of a small scale high pressure in a convective system under the precipitations



Artificial Intelligence

- A tool for mass data processing
- A tool for processing Ensemble Forecast
- A way for code acceleration (algorithm and physical parameterisations)

Bow echoes in AROME (16 members, 2.5 km)



Long term view : Scientific Strategy 2020-2020

European cooperations

- **ECMWF / Météo-France**: global model IFS-ARPEGE
- **ACCORD** : Limited Area Model
- **Green Deal / Destination Earth:** a European enterprise

⇒ **A challenge, together :**

redesigning dynamical core and structuring codes
to
face very high resolutions and run on any computer

METEO FRANCE

THANK YOU FOR YOR ATTENTION