Overview of Météo-France NWP systems

2 HPC, 2 implementations

In operations since February 2021
No upgrade during the 4 year contract

Each HPC: ATOS BULL Sequana XH2000
2292 computing nodes

10.39 PFlops peak performance

2 AMD Epyc Rome processors with 64 cores at 2.25 Ghz

=> Five fold increase in performance than the previous HPC

Regional operational NWP systems based on AROME

operational suite: cy46t1_op1

3DVar
- 3DVar with 1h cycle
- 8 forecasts per day

EPS (PE-Arome)
- 16 perturbed members + control
- 4 forecasts per day (+ 51h)
- Initial perturbations from Arome-EDA
- SPPT
- LBCs from Arpege-EPS
- random surface perturbations

EDA (AE-Arome)
- 3.25 km, 100 s timestep
- 3DVar with 3h cycle
- 25 members

Nowcasting (Arome-PI)
- 3DVar, guess from 3dvarfr, 10' cut-off
- 24 forecasts per day up to 6h

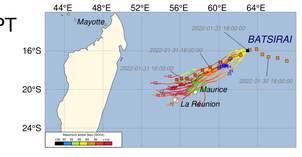
Arome-IFS
- downscaling of IFS
- Arome surface
- 4 forecasts per day

Common features
(except otherwise noted)
- 1.3 km, 50 s timestep
- 90 levels (5m to 10 hPa)
- 51 h forecast lead time

Arome-Overseas (Arome-OM)
- 5 domains, use of mixed precision
- 4 forecasts per day (+78h on demand)
- Downscaling of IFS with prior "warmup"
- Use of Arpege surface (continent)
- 1D ocean model

EPS Arome-Overseas (PE-Arome-OM)
- 15+1 members at 2.5 km, mixed precision, hydrostatic, SPPT
- 5 domains, 2 runs per day (+78h on demand)
- Use of IFS as unperturbed initial conditions
- Boundary conditions + initial perturbations : Arpege EPS
- Perturbation of surface + ocean layers

NEW!



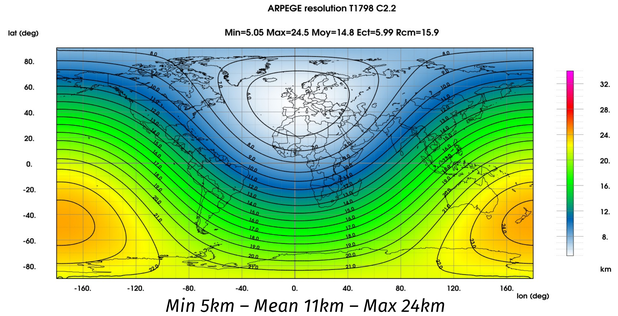
References
- Brousseau et al 2016, Improvement of the forecast of convective activity from the AROME-France system. Q.J.R. Meteorol. Soc., 142: 2231-2243
- L. Raynaud et F. Bouttier, 2016: Comparison of initial perturbation methods for ensemble prediction at convective scale, Q. J. R. Meteorol. Soc.
- Bouttier et al. 2016 Sensitivity of the AROME ensemble to initial and surface perturbations during HyMeX. Q. J. R. Meteorol. Soc.
- Merlet et al, 2017: Arome for nowcasting, Aladin-Hirlam Newsletter n°9
- Faure et al, 2020: Operational Implementation of the AROME Model in the Tropics, Weather and Forecasting, 35(2), 691-710

Global operational NWP systems based on ARPEGE

operational suite: cy46t1_op1

4DVar
- 4DVar with 6h cycle : Tl224 c1 & Tl499 c1
- Use of EDA background covariances (12h average)
- 4 forecasts per day
- New: Tiedtke deep convection scheme, 1d sea-ice model, SRTM, All-sky assimilation of microwave data from MHS and ATMS

Common features
(except otherwise noted)
- Tl1798 c2.2 (5 to 24 km)
- 240 s timestep
- 105 levels (10 m to 0.1 hPa)
- 102 h forecast lead time

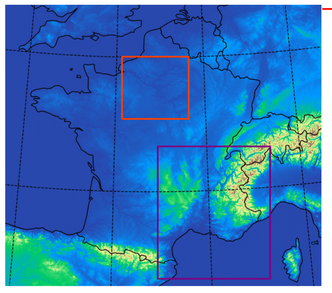


Min 5km – Mean 11km – Max 24km

EPS (PEARP)
- 34 perturbed members + control
- 4 forecasts per day
- Initial perturbations from Arpege-EDA + SV
- random pertubed parameters + 2 deep convection schemes

EDA (AEARP)
- Tl499 c1
- 4DVar with 6h cycle (Tl224 c1)
- 50 members

References
- Descamps et al 2015, PEARP, the Météo-France short-range ensemble prediction system. Q.J.R. Meteorol. Soc, 141: 1671-1685
- Bouyssel et al, 2022, The 2020 Global Operational NWP Data Assimilation System at Météo-France, Data Assimilation for Atmospheric, Oceanic and Hydrologic Applications (Vol. IV)



Further perspectives (2024)

- 2 domains for Arome applications @500 m in near real time (2023) then in operations (2024)

Next e-suite: cy48t1_op1:
- OOPS in 3DVar and 4DVar analyses
- Assimilation: 3DEnVAR Arome, hybrid B matrix in Arpege 4Dvar
- Arome EDA: 50 members *(instead of 25 currently)*
- Physics: EcRad (Arome), use of SST from Mercator-Océan global model and enhancement of Tiedtke deep convection scheme (both for Arpege), change of aerosol and ozone climatologies (from CAMS, Arome)
- Dynamics : use of WENO interpolations for T and Q in stratosphere (Arpege)
- Observations: *"all sky" assimilation of microwave obs, Arpege: GOES-17, CrIS mode «FSR», GNSS-RO (GRACE-C, Sentinel-6, Spire), scatterometers HY-2B & HY-2C(Arome), AMV HIMAWARI/AHI, Mode-S from EMADDC (Arome), WIGOS adaptations*
- PEARP: revision of singular vectors and of the range of perturbed parameters
- Arome forecasts will be run using single precision

Calendar: switch to operations by S1 2024

EWGLAM 2023
September 2023, Reykjavík

ACCORD
A Consortium for COnvection-scale modelling Research and Development

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