The NWP systems at Météo-France

**New HPC at Meteo-France in 2020**

*2 twin HPC, 2 implementations*

Centre National de Calcul
Météopôle, Toulouse

Espace Clément Ader
Montaudran

Computer Belenos
Belenos and Taranis HPC : ATOS BULL Sequana XH2000

10.39 PFlops peak performance
Node : 2 AMD Epyc Rome processors with 64 cores at 2.25 GHz
2292 computing nodes = 293376 computing cores
Dragonfly+ interconnection topology with HDR100 Infiniband technology
"hot" water cooling (40°C → 48°C)

Lustre file system : 11.6 Po, 408 Go/s (Belenos) & 8.2 Po, 288 Go/s (Taranis)
Disk storage 200 T

**Météo-France Numerical Weather Prediction Systems**

**ARPEGE Ensemble Data Assimilation (ARPEGE-EDA)**
operational since July 10th, 2018

**AROME-France Ensemble Data Assimilation (AROME-EDA)**

**MF global deterministic model : ARPEGE**

**MF global short-range E.P.S. : PEARP**
Ref: Descamps L. et al., 2016. PEARP the Météo-France short-range ensemble prediction system, QJRMS

**AROME Overseas (AROME-OM)**
in operation since Feb. 11, 2016, upgrade in Dec. 2017
ALADIN-HIRLAM Newsletter n°10 on 2018. Forecasting the tropical cyclones IRMA and Maria with AROME-Antilles, G. Faure & C. Fischer

**AROME-NWC: high resolution model for nowcasting**
operational since December 8, 2015
Ref: ALADIN-HIRLAM Newsletter n°9 Sep.2017, AROME for Nowcasting, N. Merlet et al

**AROME-France E.P.S. : PEARO**
operational production since October 2016
Ref: ALADIN-HIRLAM Newsletter n°8, Jan.2017, AROME-France EPS, F. Bouttier et al

**New version of the ARPEGE/IFS code : CY43T2, operational since 2 July 2019**

- Simultaneous switch of all systems to CY43T2
  - with technical changes (GRIB2, VORTEX)
  - use of version 8 of the external surface scheme SURFEX
  - new model output diagnostics : visibility, type of precipitations

**ARPEGE**
- increase of horizontal resolution (7.5→5.1 km over France), time step 360→240s,
- new tuning of the convection scheme
- changes in data assimilation : anti Grid Point Storm, tuning of sigma_b for humidity in ARPEGE-EDA, variational bias correction for GNSS observations, assimilation of more IASI channels over land, inter-channels observation error correlation for IASI and CRIS, new channels for geostationary clear sky radiances

**PEARP**
- increase of horizontal resolution (10→7.5 km over France), time step 514→360s,
- initialisation with 35 members from AEARP

**AROME**
- new version of ICE3 microphysics schema, MESCAN surface analysis, changes in radar assimilation

**PEARO**
- increase of horizontal resolution
- Coupling files for ALADIN Partners

**Impact (scores over 6 month e-suite period)**
- Significant improvement of ARPEGE synoptic forecasts for all parameters, all levels, all ranges and domains (improvement higher over Europe),
- Improvement of the distribution of the 10m wind, 6h precipitation and altitude parameters
- Neutral impact on AROME objective scores, with improvement of precipitation and surface humidity subjective scores

**Figure 1**: ARPEGE new resolution Tl1798c2.2 L105

**Figure 2**: ARPEGE and AROME Precipitation type diagnostic in a freezing rain event

**Figure 3**: An example of the ability of the global mesoscale hydrostatic ensemble system PEARP to capture an extreme storm event over France.

**Figure 4**: Impact (scores over 6 month e-suite period)

**Figure 5**: Significant improvement of the quality indicator of ARPEGE (PIMP) - comparison January-June 2019, 4th and 5th range, operational version (red) and e-suite CY42T2 (blue).