

The NWP systems at Météo-France

New HPC at Météo-France in 2020

2 twin HPC, 2 implementations

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Computer Belenos

Computer Taranis

Belenos and Taranis HPC : ATOS BULL Sequana XH2000

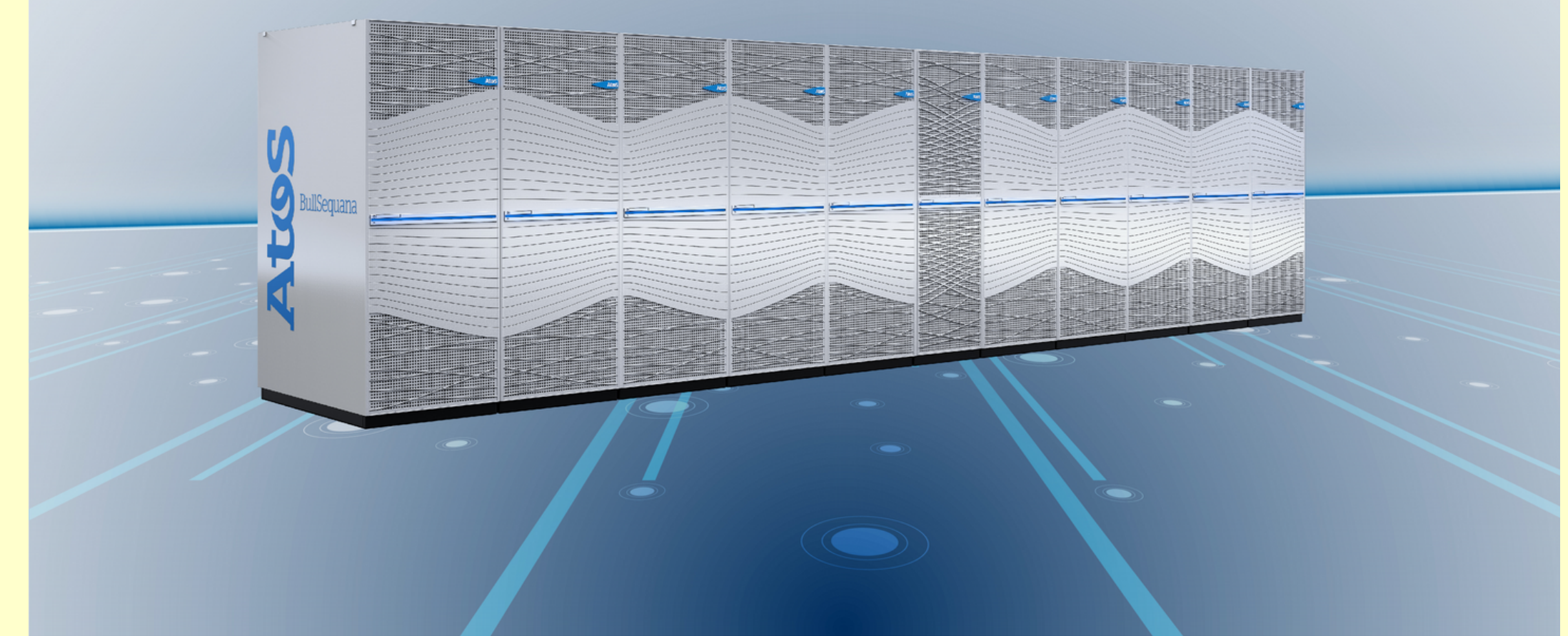
10.39 PFlops peak performance
Node : 2 AMD Epyc Rome processors with 64 cores at 2.25 Ghz
2292 computing nodes = 293376 computing cores
Dragonfly+ interconnection topology with HDR100 infiniband technology
"hot" water cooling (40°C → 48°C)
Lustre file system : 11.6 Po, 408 Go/s (Belenos) & 8,2 Po, 288 Go/s (Taranis)
Disk storage 200 To



from BULLX B710 DLC « Beaufix » and « Prolix »

Available : March 2020 (Belenos) Sept. 2020 (Taranis)

to ATOS BULL Sequana XH2000 « Belenos » and « Taranis »



=> Five fold increase in performance (ARPEGE and AROME-France benchmark runs)

Météo-France Numerical Weather Prediction Systems

ARPEGE Ensemble Data Assimilation (ARPEGE-EDA)

MF global deterministic model : ARPEGE

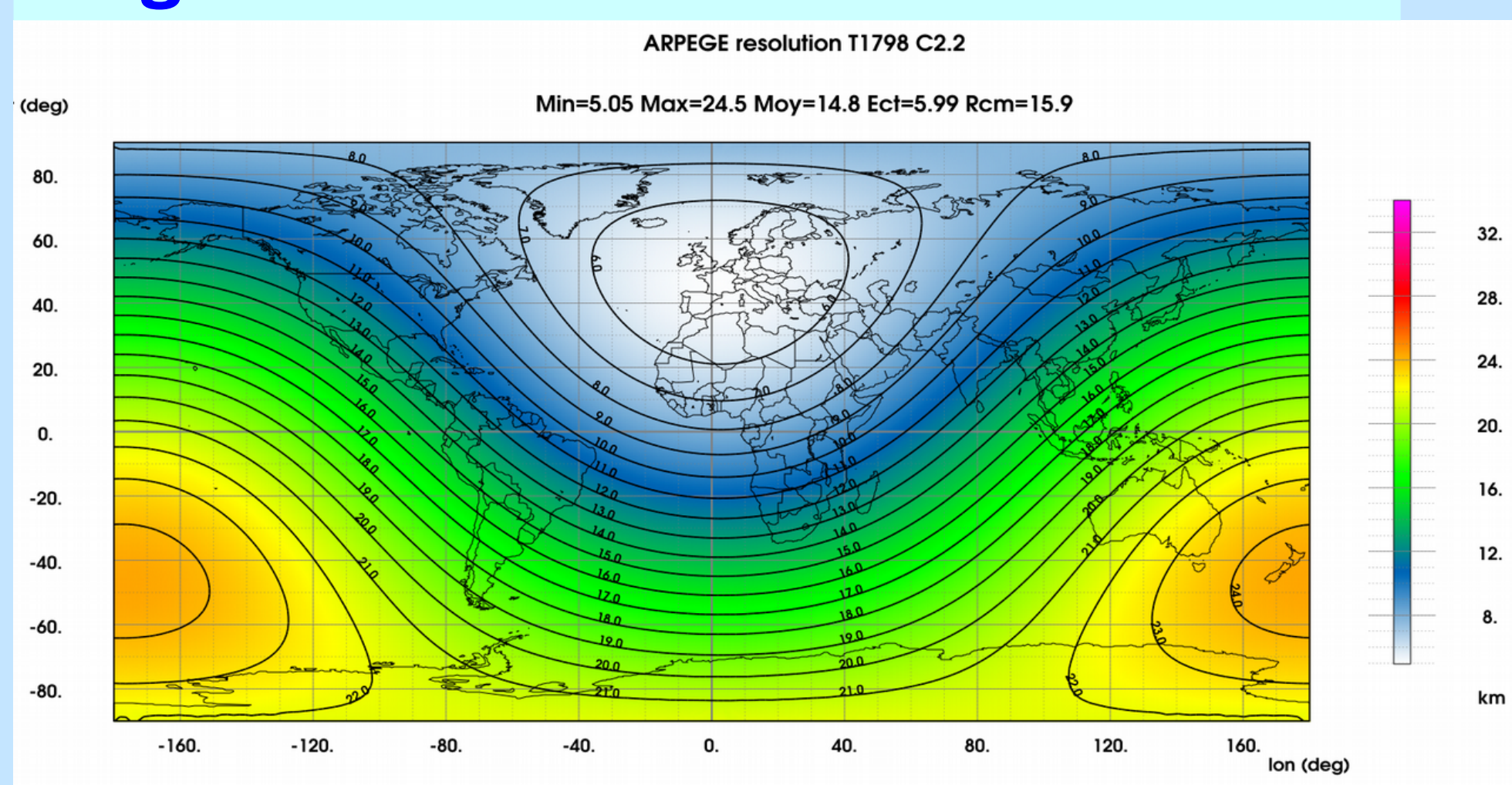


Figure 1: ARPEGE new resolution T11798c2.2 L105

MF global short-range E.P.S. : PEARP

Ref: Descamps L. et al., 2014. PEARP, the Météo-France short-range ensemble prediction system, QJRM

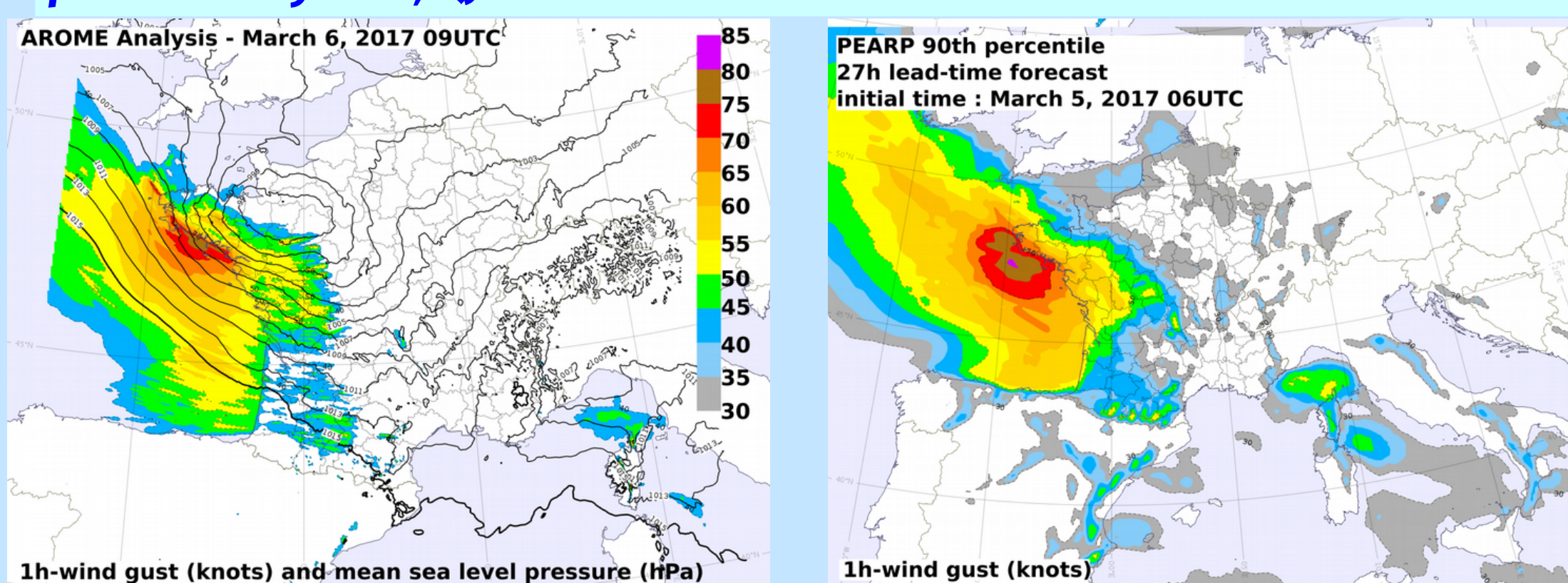


Figure 4 : An example of the ability of the global mesoscale hydrostatic ensemble system PEARP to capture an extreme storm event over France.

AROME-France Ensemble Data Assimilation (AROME-EDA) operational since July 10th, 2018

AROME-France deterministic model

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

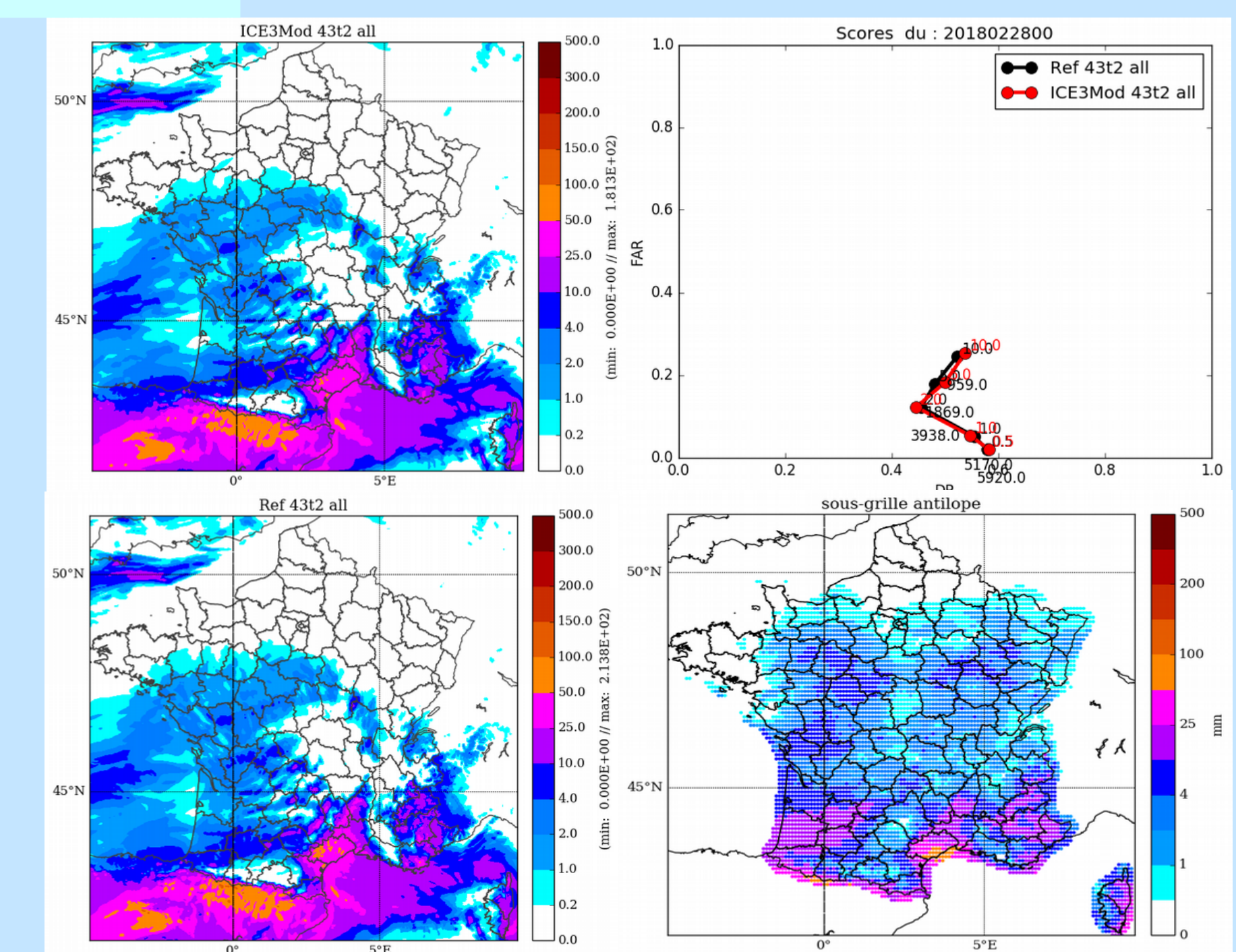
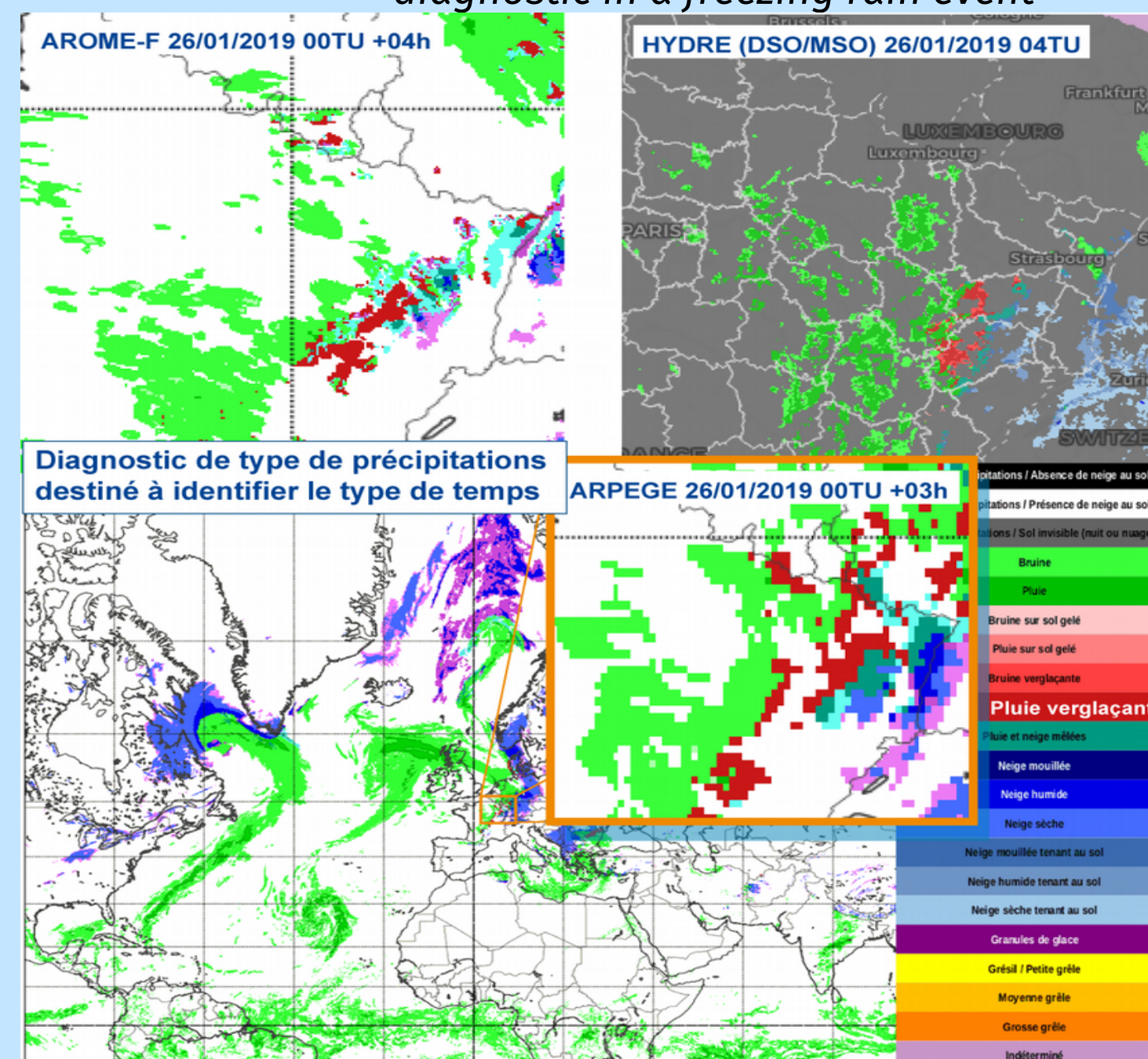


Figure 3: New version of ICE3 Microphysics (less time step sensitive, less graupels...)

AROME Overseas (AROME-OM)

in operation since Feb. 11, 2016, upgrade in Dec. 2017
ALADIN-HIRLAM Newsletter n°10 Jan.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
- AEARP : increase of horizontal resolution (42→40 km), 25 → 50 members, increased resolution also for the 4D-VAR analysis increments
- 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

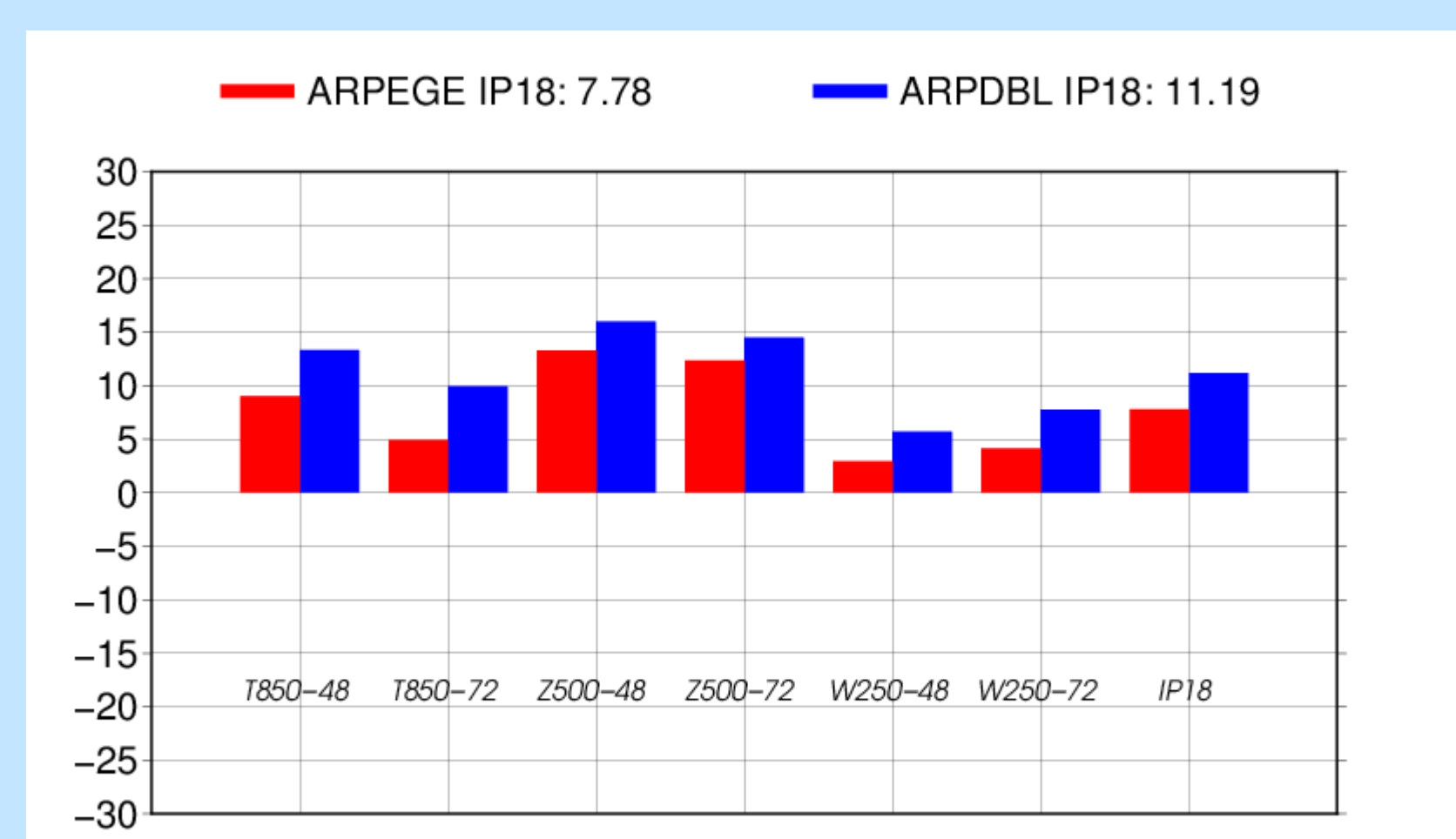


Figure 5 : Significant improvement of the quality indicator of ARPEGE (IP18) – comparison January-June 2019, 48h and 72h range, : operational version (red) and e-suite CY42T2 (blue).

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41st EWGLAM & 26th SRNWP meetings, Sofia, Bulgaria, 30 Sep.-3 Oct. 2019

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