

Operational and pre-operational Portuguese (SR)NWP systems

The Portuguese SRNWP system relies on the **AROME forecasting model** (2.5km, L90) initialised by dynamical adaptation of the global ARPEGE model (10km). It is integrated over three domains:

- Mainland (PT2)
- Madeira (MAD)
- Azores (AZO)

The system is implemented on a **local ATOS machine** and is based on ecFlow scheduling system.

The model runs at **00, 06, 12, and 18 UTC**, providing hourly forecasts up to **72, 48, 72, and 48 hours**, respectively.

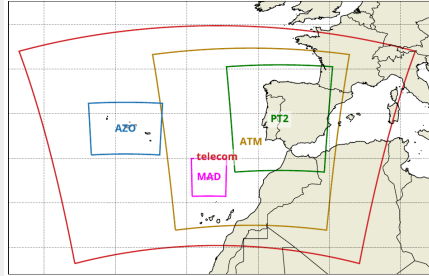
Last upgrade (Out 2024) included:

- **coupling frequency** - increased to **1 hour**
- **lead time** - extended up to **72 hours**
- **number of vertical levels** - increased from **60 to 90**.

The **upgrade of the local system** is ongoing:

- (1) **new geographical configuration (ATM) and model geometry** on the Atlantic/Iberian domain (2.5km, 90L) (top right panel);
- (2) **porting from CY43T2 to CY48T3**;
- (3) **data assimilation over the ATM domain**: pre-operational stage 3-hour cycling of the AROME combined (OI_MAIN + 3D-Var).

Besides, **HARP** is implemented and its validation is on-going.



Operational HPC System – ATOS HPC Bull Sequana X430 A5:

- **30 computing nodes**, each equipped with **2 AMD EPYC™ 7763** processors (64 cores @ 2.45 GHz) and **256 GB RAM**, totaling **3,840 cores**
- **2 login nodes**, each with **1 AMD EPYC™ Milan 7313** processor (16 cores @ 3.0 GHz) and **128 GB RAM**
- **2 management nodes**, each with **1 AMD EPYC™** processor (24 cores @ 2.8 GHz) and **128 GB RAM**
- **Lustre file system** with **160 TB** raw Lustre storage.

Timeline

Apr	2000	CY09 (ALADIN)
Jun	2000	CY11T2 (CYCORA included)
Jul	2001	CY12_b02 (CYCORA_bis included)
Apr	2002	Time step change (540s to 600s)
Jun	2006	CY28T3 (new geographical area and climatologies)
Jun	2007	Wind dynamical adaptation for 3 domains
Apr	2008	CANARI surface analysis fields (temp. & rel. humidity)
Dec	2008	CY32T3 (new domain and resolution)
Out	2009	CY35T1
Jan	2010	AROME-Mainland & AROME-Madeira in operations
Dec	2010	CY36T1 in ALADIN
Jun	2011	CY36T1 in AROME-Madeira
Out	2011	CY36T1 in AROME-Mainland
Dec	2011	AROME-Azores in operations (36T1)
Apr	2015	CY38T1: direct coupling of AROME with ARPEGE
Jun	2015	10km resolution in ARPEGE coupling
Jul	2017	Increase on the number of levels
Jul	2017	Increase on the run frequency for PT2 domain
Dec	2017	SURFEX in ARPEGE (CY42_op02) telecom files
Sep	2018	Hourly screen-level OI analysis from a surface DA for AROME-PT2
Nov	2019	New projection and geographical area of ARPEGE
Feb	2020	CY40T1_b07 in all domains
Jan	2024	CY43T2_bf11 ported to the new local ATOS machine
Out	2024	New telecom files: new coupling frequency, lead time, vertical levels

Local implementation of CY48T3

CY48T3 (gmkpack) has been installed and the AROME implementation is currently **under validation**.

To this end, **new climatologies** (CY48) have been computed as follows:

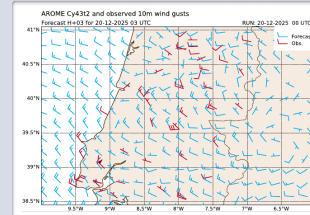
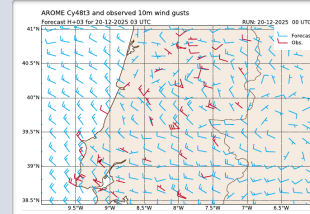
- Creation of the **ee923 files** from CY48T1, using the **CLIMAKE** software (*Belenos machine - Météo-France*)
- Creation of **decadal physiographic files** (PGD) compatible with CY48T3 (36 files), using new surface data (**ecoclimap SG**); the **orography field** has been replaced with the one from the CY48T1 ee923 files (*HPC machine - ECMWF*)

Preliminary results were analysed for a few **case-studies** and basic scores obtained for a **two week period**, covering a recent episode of intense precipitation in mainland Portugal (20 December 2025). Illustrations suggest the **workflow** has been properly **ported**.

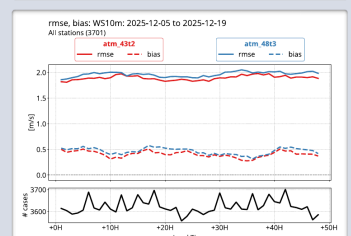
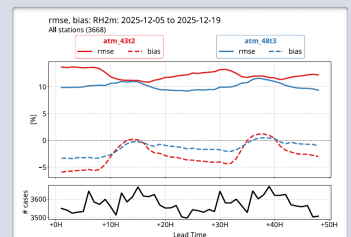
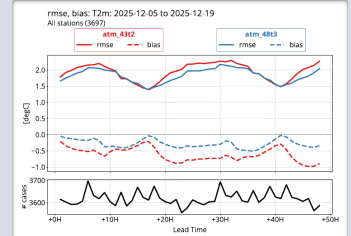
Local implementation of HARP

The latest version of HARP has been installed locally as follows:

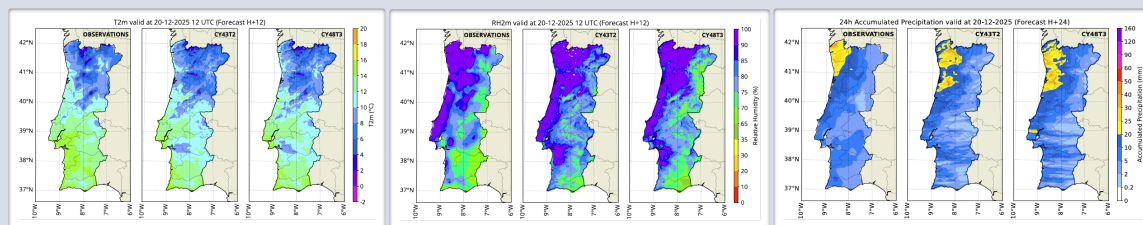
- **buf2vobs (gl)** converts locally preprocessed BUFR observations
- **OBSTABLEs** (SQLite) and **FCTABLEs** (SQLite) are generated using **vobs2sql.R** and **grib2sql.R**, respectively, adapted from the oper-harp-verif github repository,
- Scores are computed for the **set of surface and radiosonde stations** used in data assimilation
- Score **illustrations** are generated using Python scripts that read the .rds verification files produced by HARP



Wind Gust fields from a 3-hour forecast are shown for two AROME-ATM versions (CY43T2 and CY48T3), with observations for 20 December 2025. Wind barbs plotted every 10 grid points.



Comparison between CY43T2 and CY48T3 Verification scores obtained with HARP for this 2 week period in December.



T2m and RH2m from a 12-hour forecast are shown for two AROME-ATM versions (CY43T2 and CY48T3), with observed maps for 20 December 2025. The 24-hour accumulated precipitation from the same run is also included. Mapped observations were obtained via multivariate regressions; precipitation combines kriging and IDW using four distance ranges.

Contribution to other projects & developments

ACCORD

Participation and hosting of the **DAVAI** working week in November 2025 and on the **Tactus** baby steps developments with focus on the **scripting system development**, integration of **Data Assimilation** and contributions to **CY50T3**.

DE_330 (ECMWF)

The Portuguese contribution is twofold:

- development of DEODE system scripting (on ECMWF and EuroHPC platforms)
- integration of the Fire Index workflow into the pre-operational DEODE impact modelling workflow.

IBERA (AEMET)

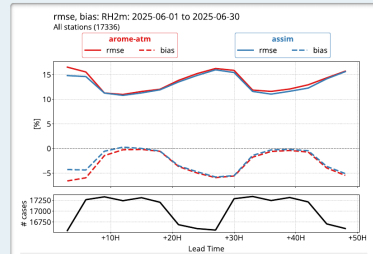
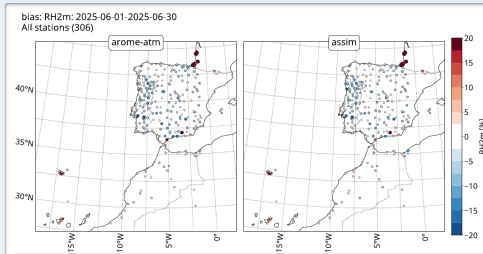
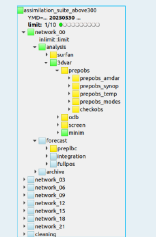
IPMA provides processed precipitation and Tmax/Tmin observations from the Portuguese surface network and is expected to contribute to the system validation.

Pre-operational DAsKIT

DAsKIT (OI+3D-var) is now running in a **pre-operational configuration (CY43T2)**, assimilating locally pre-processed **SYNOP, TEMP and AMDAR**, a B-matrix computed by downscaling of ARPEGE. It consists on a 3h analysis cycling with **+/- 30 time window** for AMDAR (and Mode-S) observations and **+1h time window** for **SYNOP and TEMP**.

For the time being, no data monitoring is done and the default thinning is applied.

The settings are being used at ECMWF to run denial experiments for **EUMETNET Study 24.1 - The impact of reducing E-ABO AMDAR data on global and regional NWP**, with the collaboration of Météo-France, where **Mode-S data** is also assimilated (see example ecflow suite in the panel on the right).



Comparison between AROME-ATM with dynamical adaptation (arome-atm) and with data assimilation (assim) of SYNOP, TEMP, AMDAR and MODE-S observations. Verification scores obtained with HARP for 1 month period in June 2025.