IPMA Instituto Português do Mar e da Atmosfera

Overview of IPMA´s NWP activities

2017

Isabel Monteiro, João Rio, João Ferreira, Maria José Monteiro, Manuel João Lopes,
Nuno Moreira, Pedro Silva, Vanda Costa, Ricardo Ramos, Rosário Ribeiro

Previsão Numérica do Tempo em Portugal - *Estado da Arte e Novos Desafios*

26-27 November 2018, IPMA, Lisbon

IPMA

Summary

- Infrastructure supporting development & operations
- NWP Models – characteristics / domains
- Applications, Users and Cooperation
- Developing and future activities

Summary

- **Infrastructure supporting development & operations**
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HPC Operational System

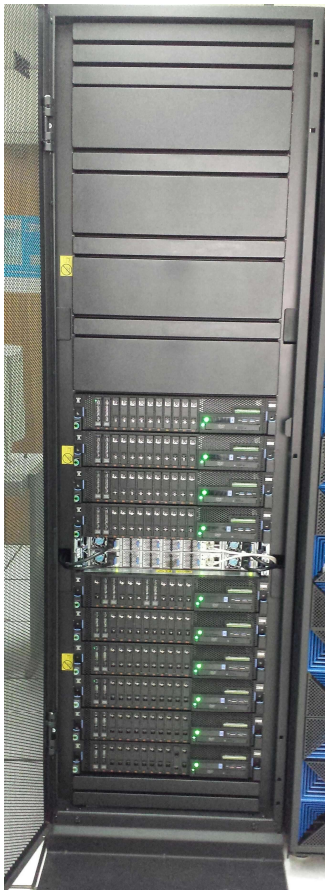
IBM P7

- 9 compute nodes
  - 24 cores POWER7+ @ 4.1 GHz
  - 128 GB RAM
  - **216 cores**
- 3 admin&management nodes
  - 2x 8 cores P7+ @ 4.1 GHz, 64 GB RAM
  - 8 cores P7+ @ 4.1 GHz, 32 GB RAM
- **6.9 teraflops**
- AIX version 7.1.3.7
- 5 TB

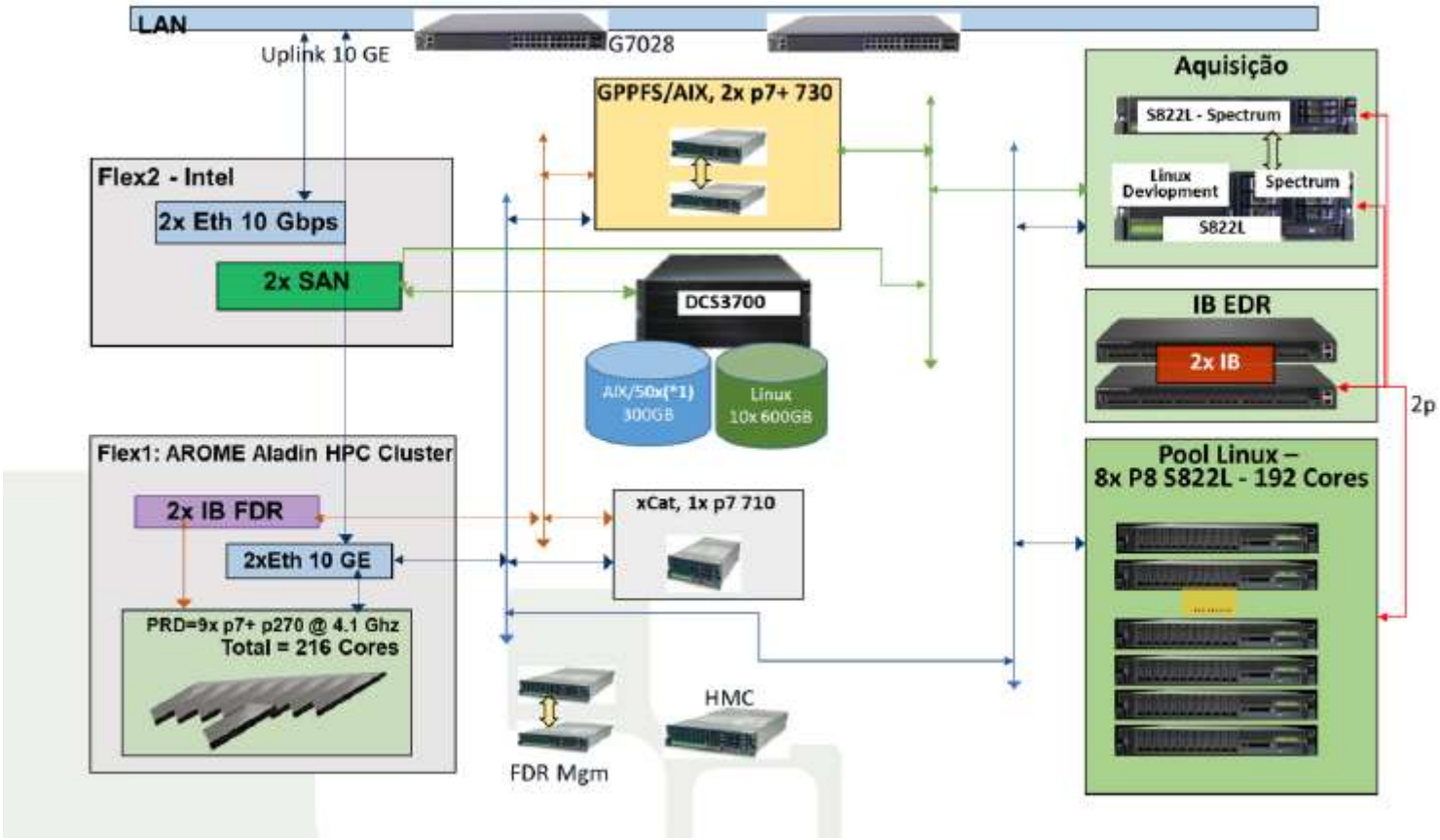
HPC Development System

IBM P8

- 8 compute nodes
  - 24 cores POWER8 @ 3.026 GHz
  - 128 GB RAM
  - **192 cores**
- 2 admin&management nodes
  - 24 cores P8 @ 3.027 GHz, 192 GB RAM
  - 8 cores P8 @ 4.1 GHz, 64 GB RAM
- **2.3 teraflops**
- Linux Red Hat
- 2 TB

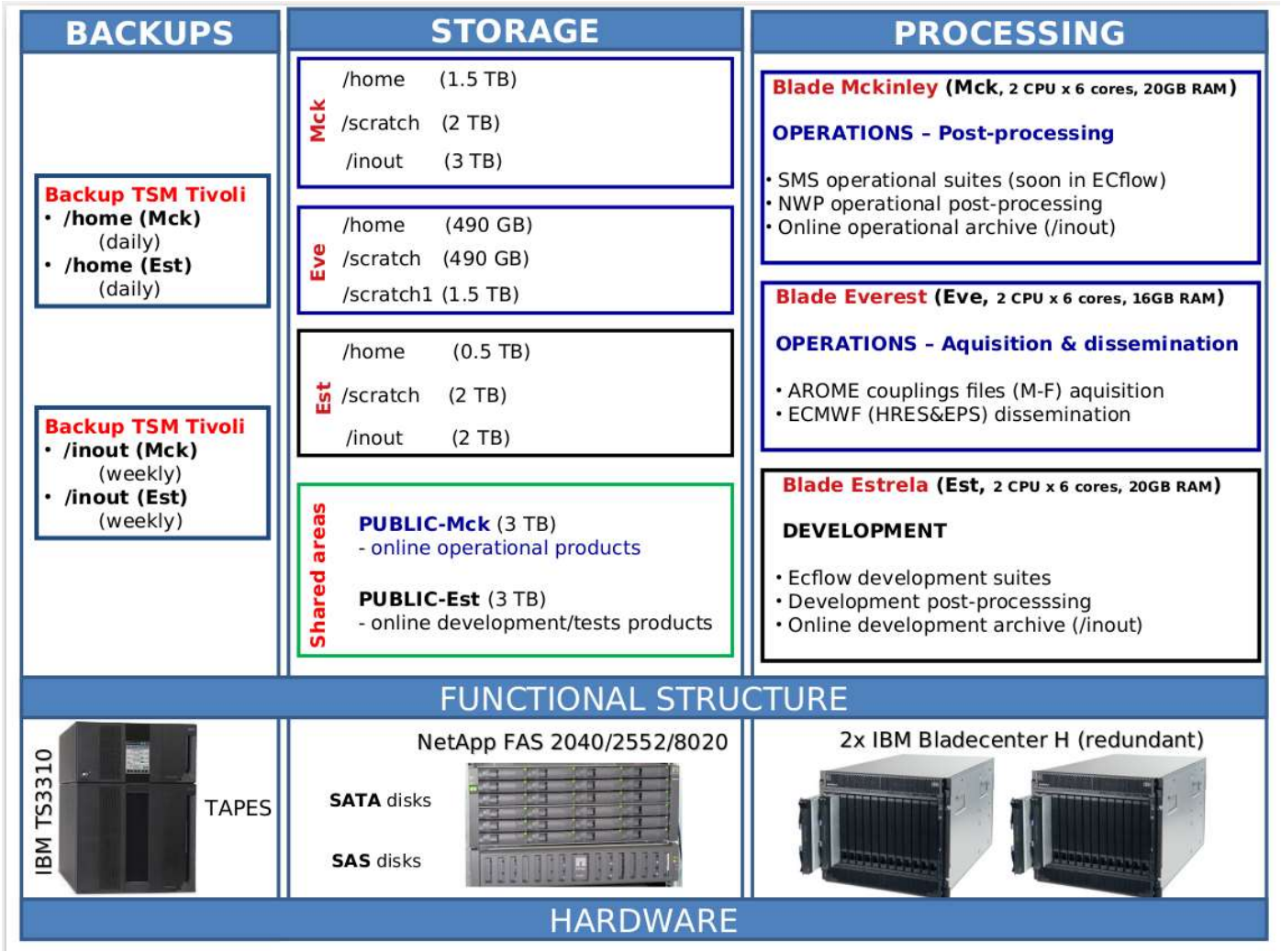


HPC O&D System

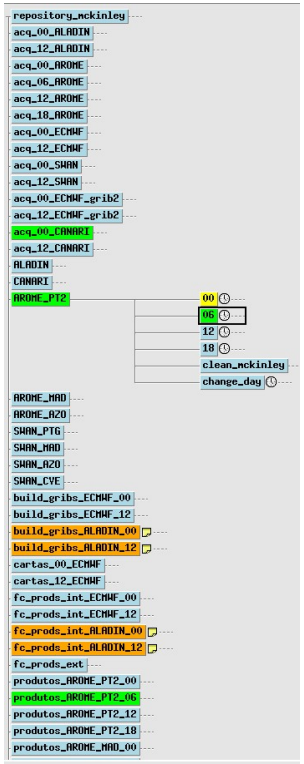


IBMp7 **IBMp8**

Post-Processing System



Ecflow Suites



Summary

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- **NWP Models – characteristics / domains**
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NWP Atmospheric Operational Models

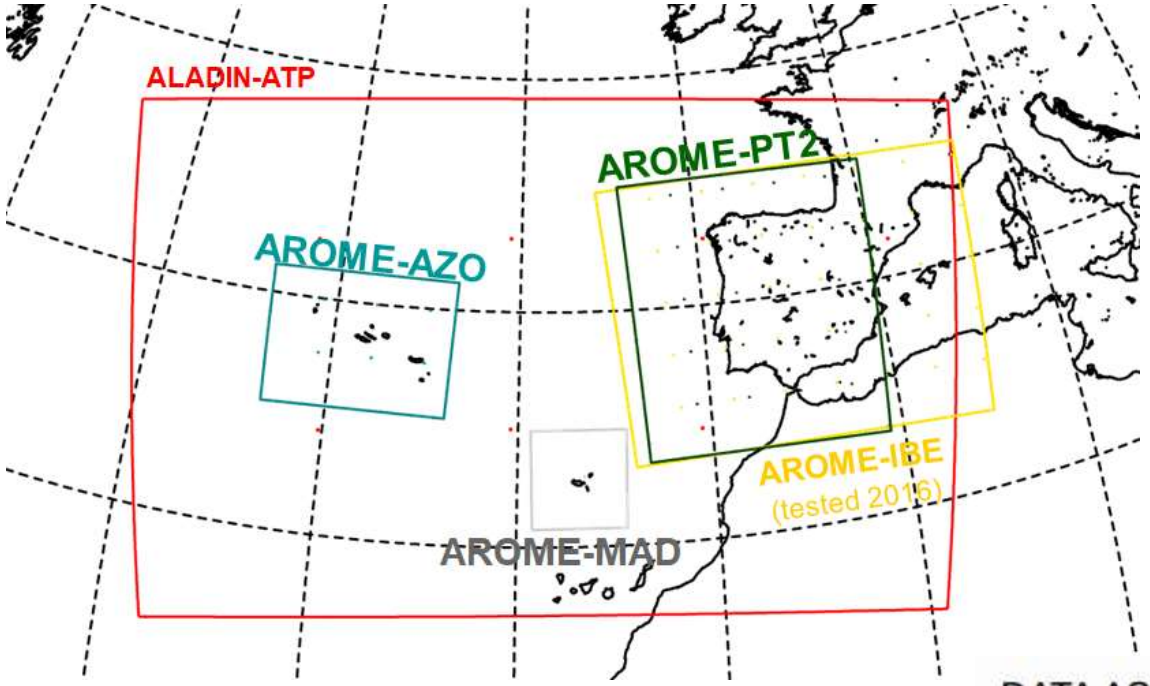
	Model	Mesh (km)	Gridpoints	Levels	Freq	Range	LBC
REMOTE	**ECMWF-HRES** (Global)	9	-	137	1h/3h	240h	-
REMOTE	**ECMWF-ENS** (Global)	18	-	91	3h	360h	-
LOCAL	**ALADIN** (LAM)	9	439 x 277	46	1h	72h	ARPEGE
LOCAL	**AROME-PT2** (High resolution LAM)	2.5	540 x 480	60	1h	48h	ARPEGE
LOCAL	**AROME-MAD** (High resolution LAM)	2.5	200 x 192	60	1h	48h	ARPEGE
LOCAL	**AROME-AZO** (High resolution LAM)	2.5	270 x 360	60	1h	48h	ARPEGE

AROME-PT2 **4 daily runs**

AROME-MAD/AZO **2 daily runs**

ECMWF	European Centre for Medium-range Weather Forecasts
ARPEGE	Action de Recherche Petite Echelle Grand Echelle
ALADIN	Aire Limitée Adaptation dynamique Développement InterNational
AROME	Applications of Research to Operations at MEsoscale

Domains & Assimilation



ALADIN & AROME

CANARI

DATA ASSIMILATIONS SYSTEMS

AROME-PT2, CY38T1, 46-levels (export)

. Hourly surface analysis OI based on Iberian SYNOP (T2m, RH2m, V10m), with background provided by a Surface DA cycling

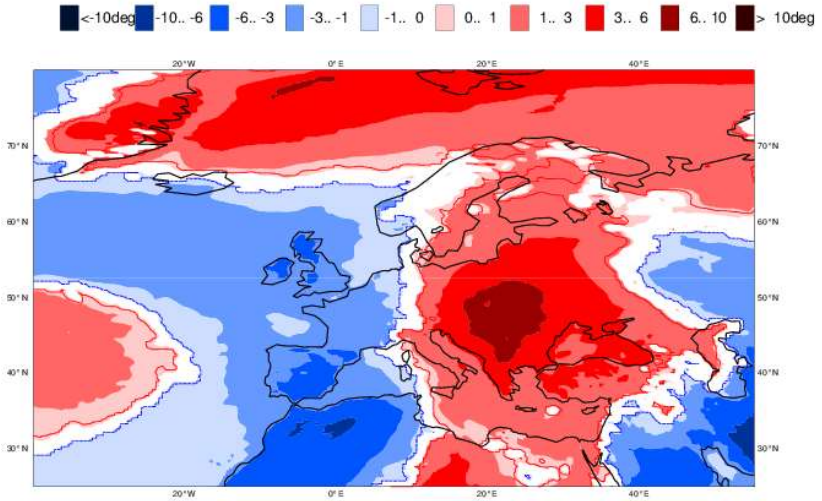
. 3-hour Surface DA cycling by OI_MAIN method

ALADIN-ATP, CY38T1 (export)

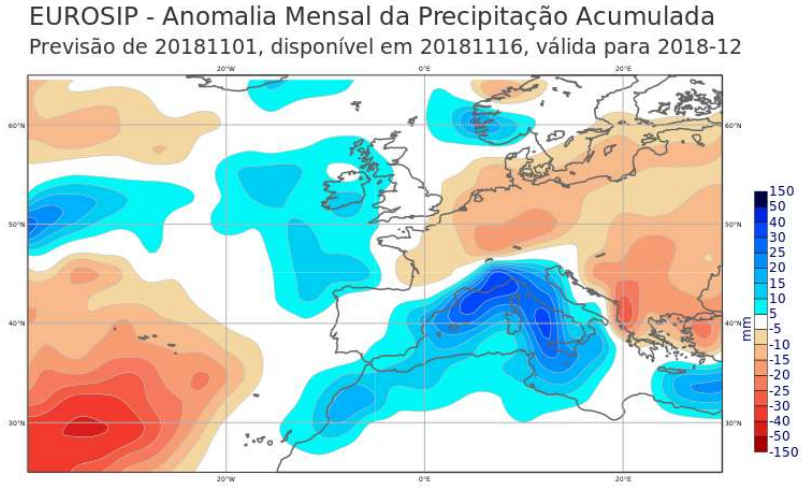
. Hourly (except 4 hours of the day) surface analysis OI based on Iberian SYNOP (T2m, RH2m)

Remote Long Range Atmospheric Forecasts

ECMWF Weekly Forecast:	ECMWF Monthly & Seasonal Forecast:	EUROSIP Seasonal Forecast:
51 members, 2 times a week, 36 km spatial resolution, 4 weeks forecast	51 members, 1 time a month, 80 km spatial resolution, 7 months forecast	5 models / 28 members (ECMWF/5, Météo-France/5, UKMO/14, NCEP/2, JMA/2) 1 time a month, 20 years hindcast



Temperature weekly anomaly



Precipitation monthly anomaly

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Also SST e MSLP anomalies for all

Wave / Current Models

operational

SWAN
(coupled ALADIN):

Ocean Waves
4 domains (mainland, Azores, Madeira and Cape Verde)
0.05º/0.01º spatial resolution,
3 days forecast

local

developing

SWAN
(coupled ECMWF):

Ocean Waves
4 domains (mainland, Azores, Madeira and Cape Verde)
0.05º/0.01º spatial resolution,
3 days forecast

ECMWF global wave model
("stand-alone" model):

Ocean Waves

2 times a day,
11 km spatial resolution,
10 days forecast

remote

NEMO

Ocean Currents
and
Sea Surface Height

4 days forecast

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SWAN = Simulating Waves Near Shore
NEMO = *Nucleus for European Modelling of the Ocean*

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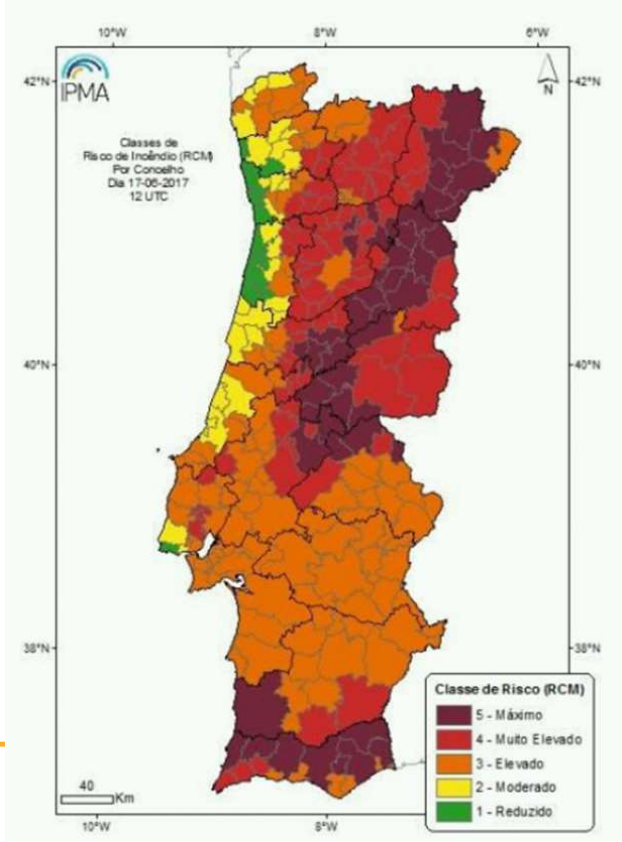
Internal Users

- 3 Operational Centres:
  - general forecast (Lisbon)
  - aviation forecast (Lisbon)
  - general forecast (Azores)

Previsão para 2ª feira, 26.novembro.2018

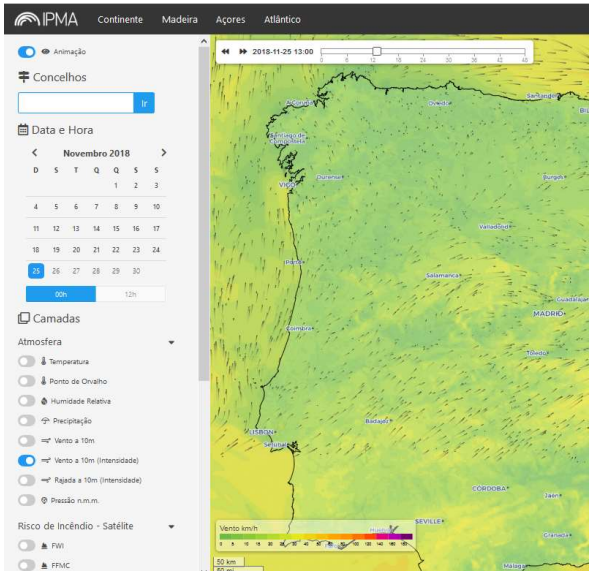
GRANDE LISBOA:
Céu pouco nublado, apresentando períodos de maior nebulosidade até final da manhã.
Vento moderado a forte (30 a 45 km/h) de noroeste, com rajadas até 65 km/h, tornando-se fraco a moderado (até 25 km/h) a partir do início da manhã.
Descida da temperatura mínima.

- Developments in other areas
  - Forest Fire Danger & Risk
  - Aviation
  - Agriculture

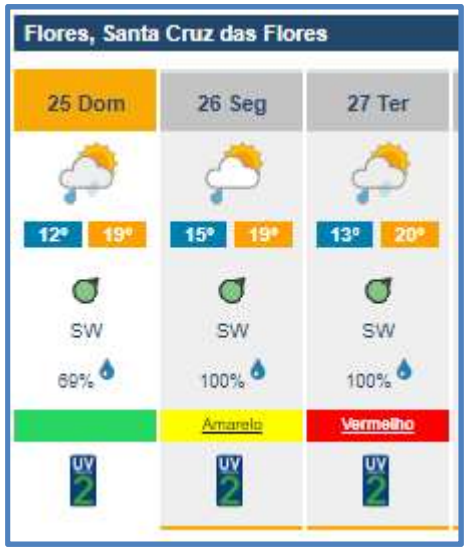


Outreach and External Users

- NWP Data
- Products
- Forecasts
- Warnings



- Web
- Dedicated Platforms



- General Public
- Media
- Public services and Authorities
- Private Companies

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Users and National Cooperation

Velejadores portugueses tiveram direito a previsões do vento exclusivas

Jogos Olímpicos
Teresa Firmino

Saber quando o vento ia mudar de direcção, numa área geográfica muito pequena, de outro país e de hora a hora, foi o desafio

Pela primeira vez, os velejadores portugueses que participaram numa prova – neste caso, nos Jogos Olímpicos de Londres – tiveram previsões meteorológicas privilegiadas, feitas de propósito pelo sucessor do Instituto de Meteorologia para a equipa

Gustavo Lima entre velejadores que receberam dados nos Jogos

Para fazer simulações do vento com malhas tão apertadas, o IPMA contactou cientistas de três instituições (Universidade de Aveiro, Instituto Superior Técnico e Instituto Geofísico do Infante D. Luiz), que utilizam modelos meteorológicos.

Aos três grupos, o IPMA disponibilizou o modelo meteorológico que usa: fornecido aos institutos de meteorologia nacionais pelo Centro Europeu de Previsão do Tempo a Médio Prazo, é para todo o planeta, tem um detalhe para 16 quilómetros e é sobre este modelo que o IPMA aplica simulações relativas aos três quilómetros das previsões em Portugal.

As previsões consideradas mais

Support to Sailing Portuguese Federation in Olympic Games London 2012

Participation of IPMA along with U.A., FCUL/IDL, IST

International Cooperation

- Portugal-IPMA member of **ECMWF** since **1976**
- Portugal-IPMA member of **EUMETSAT** since **1989**
- Portugal-IPMA member of **ALADIN** since **1997**
  [currently evolving to ALADIN-HIRLAM]
  [recent cooperation with HIRLAM]
- Portugal-IPMA member of **EUMETNET/EIG** since **2008**
- Cooperation with **KNMI** in Data Assimilation since **2016**
- Annual NWP meetings with **AEMET** since **2017**

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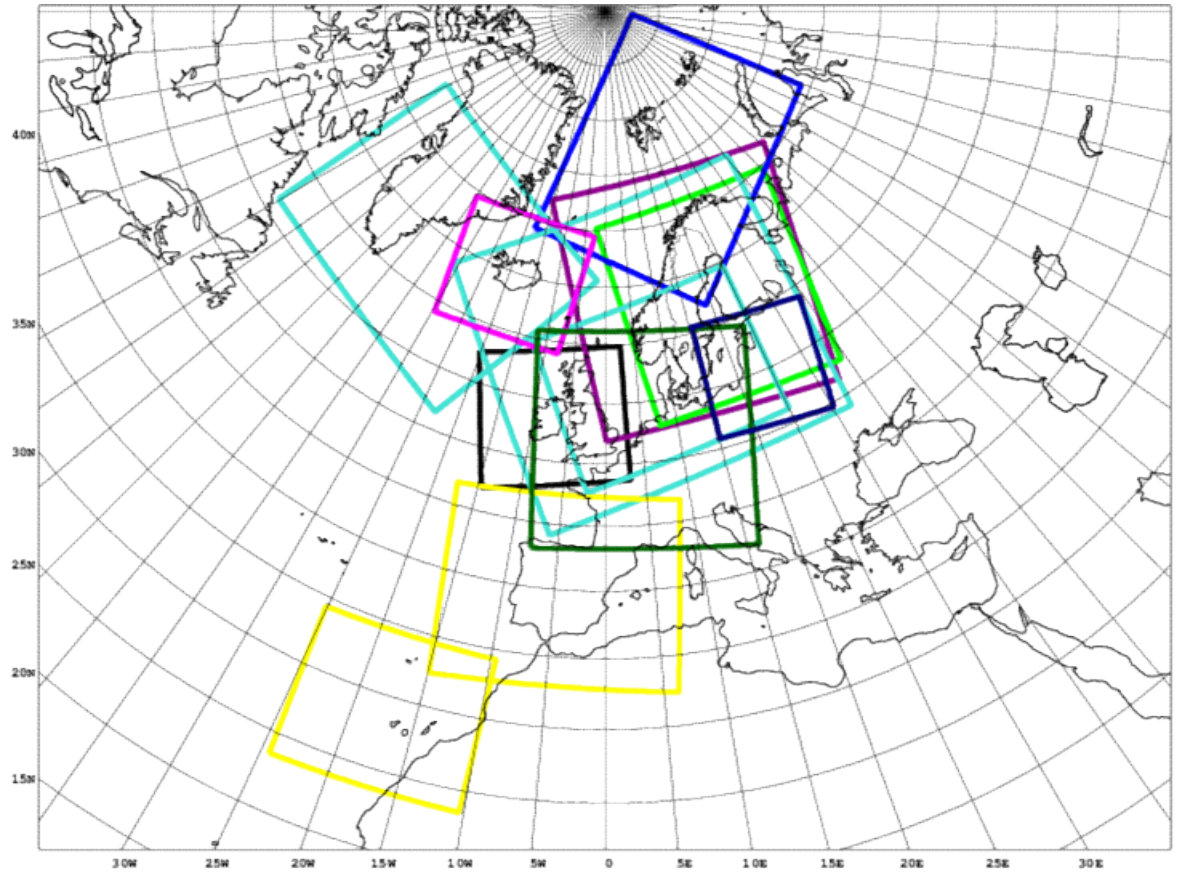
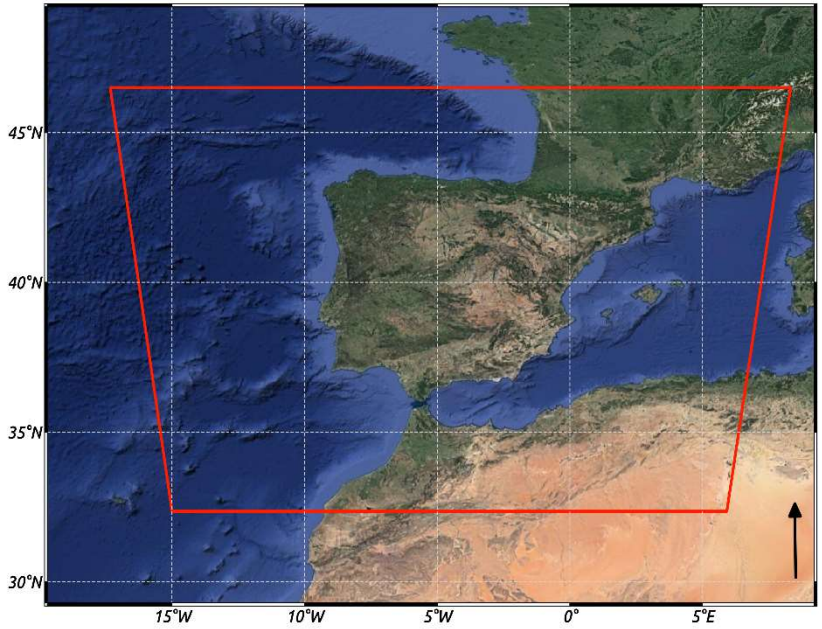
NWP future activities

HARMONIE-AROME domains in Europe



NWP future activities

HARMONIE-AROME domain IBERIAxxm_2.5



HARMONIE -AROME- Cy40h1.1

- Non-Hydrostatic
- 800 (lon) X 648 (lat) grid, 65 levels
- 2.5 km grid size
- 3D-Var, Assimilation 8 times/day
- 24-hour forecast
- ECMWF boundaries
- Time step 60s

NWP future activities (2019)

	Model	Mesh (km)	Grid Points	Lev.	Freq	Range	LBC	Assimilation +cycle
REMOTE	ECMWF/IFS	9	-	137	1h/3h	240h	-	4D-Var
	ECMWF-ENS	18	-	91	3 h	360h	-	4D-Var
	HARMONIE-AROME (prototype)	**2.5**	**TBC**	**65**	**1 h**	**24 h**	**ECMWF**	**3DVar+surf ana 8 times**
LOCAL	ALADIN	9	439 x 277	46	1h	72h	ARPEGE	
	AROME-PT2	2.5	540 x 480	60	1 h	48h	ARPEGE	
	AROME-MAD	2.5	200 x 192	60	1 h	48h	ARPEGE	
	AROME-AZO	2.5	270 x 360	60	1 h	48h	ARPEGE	
	HARMONIE-AROME IBERIAxxm_2.5	**2.5**	**800 X 648**	**65**	**1 h**	**24 h**	**ECMWF**	**3DVar+surf ana 8 times**

HARMONIE-AROME: (HirLAM Aladin Regional Mesoscale Operational NWP In Euromed- Applications of Research to Operations at Mesoscale)

IBERIAxxm_2.5 – configuration to operations IBM-P8

prototype – test configuration at ECMWF HPC

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THANK YOU!

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