Agencia Estatal de Meteorología

GOBIERNO DE ESPAÑA

VICEPRESIDENCIA CUARTA DEL GOBIERNO

MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO

ESPAÑA PUEDE.

AEMET-γSREPS

Status of the Convection-permitting LAM-EPS at Spanish Met Agency

2021 1th ACCORD Workshop

AEMET γSREPS Predictability Group

Alfons Callado, Pau Escribà, David Quintero, David Gil, Maria Cortés and Joan Montolio

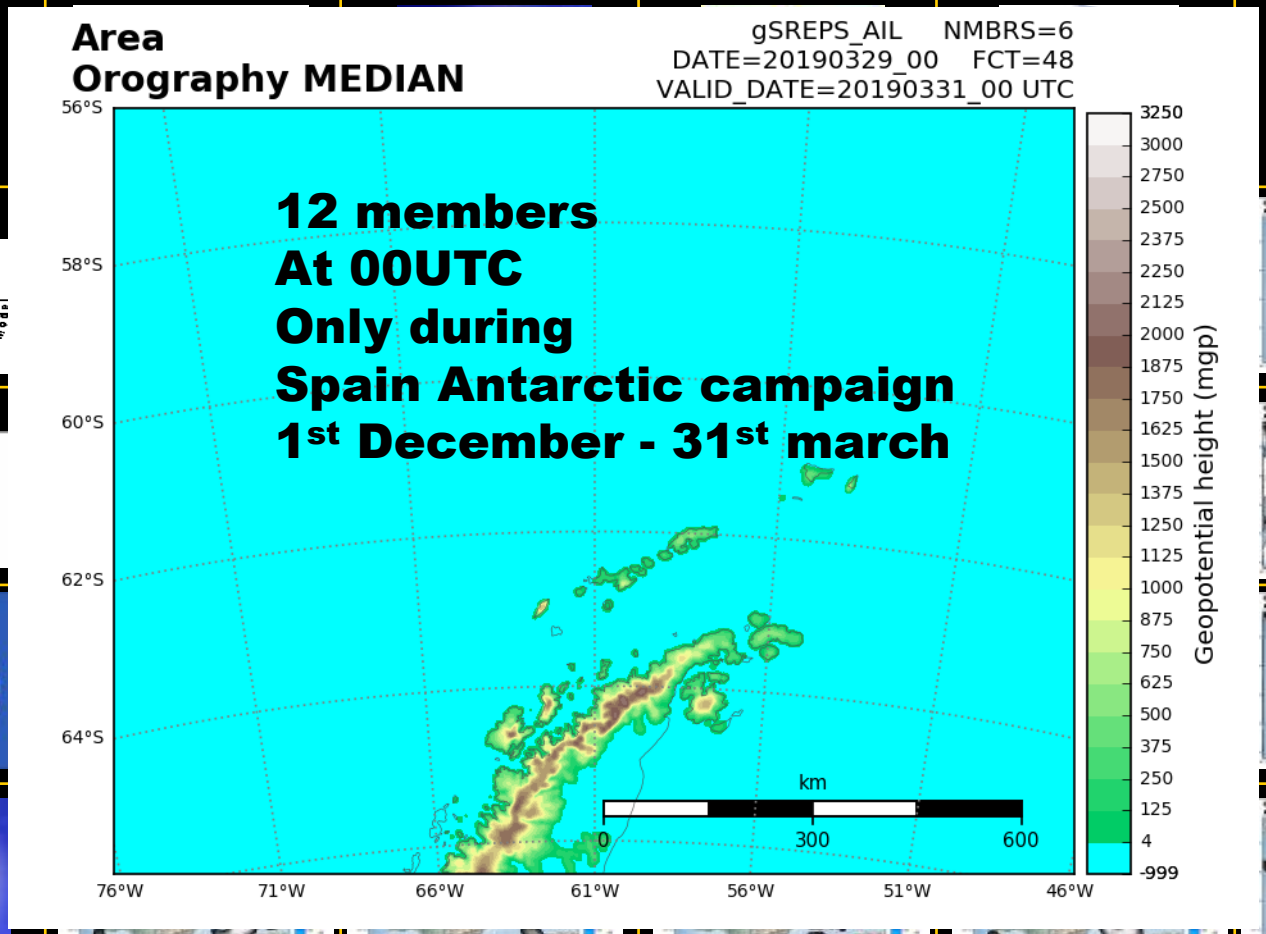
We keep your honesty, strength and sense of humor

γSREPS: What is?

AEMET-γSREPS system

- 20-members ***non-hydrostatic convection-permitting*** LAM-EPS
- Since April 2016 daily running at 00/12 UTC up to 60 hours (2020)
- 3 DOMAINS: *IBERIA_2.5*, ***CANARIAS_2.5*** and ***LIVINGSTON_2.5*** (Antarctica)

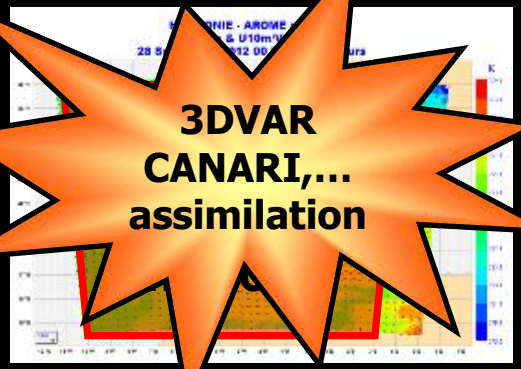
Multi-BCs	ECMWF / IFS	NCEP / GFS	MF / ARPÈGE	JMA / GSM	CMC / GEM
Multi-NWP					
HARMONIE-AROME					
HARMONIE-ALARO					
WRF ARW					
NMMB					



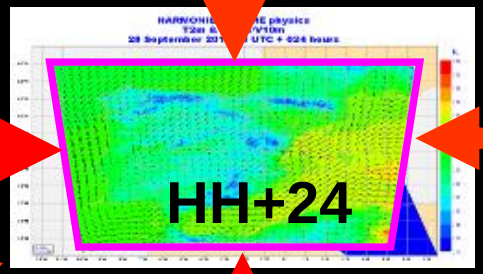
AEMET-γSREPS

- **Developing a *convection-permitting* LAM-EPS**
  - **3 sources of uncertainties**

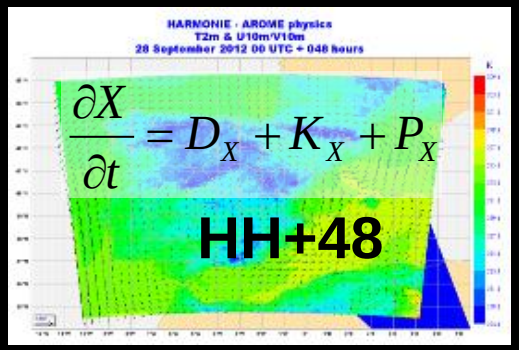
1
INITIAL CONDITIONS



2
BOUNDARY CONDITIONS



3
MODEL *ERROR*



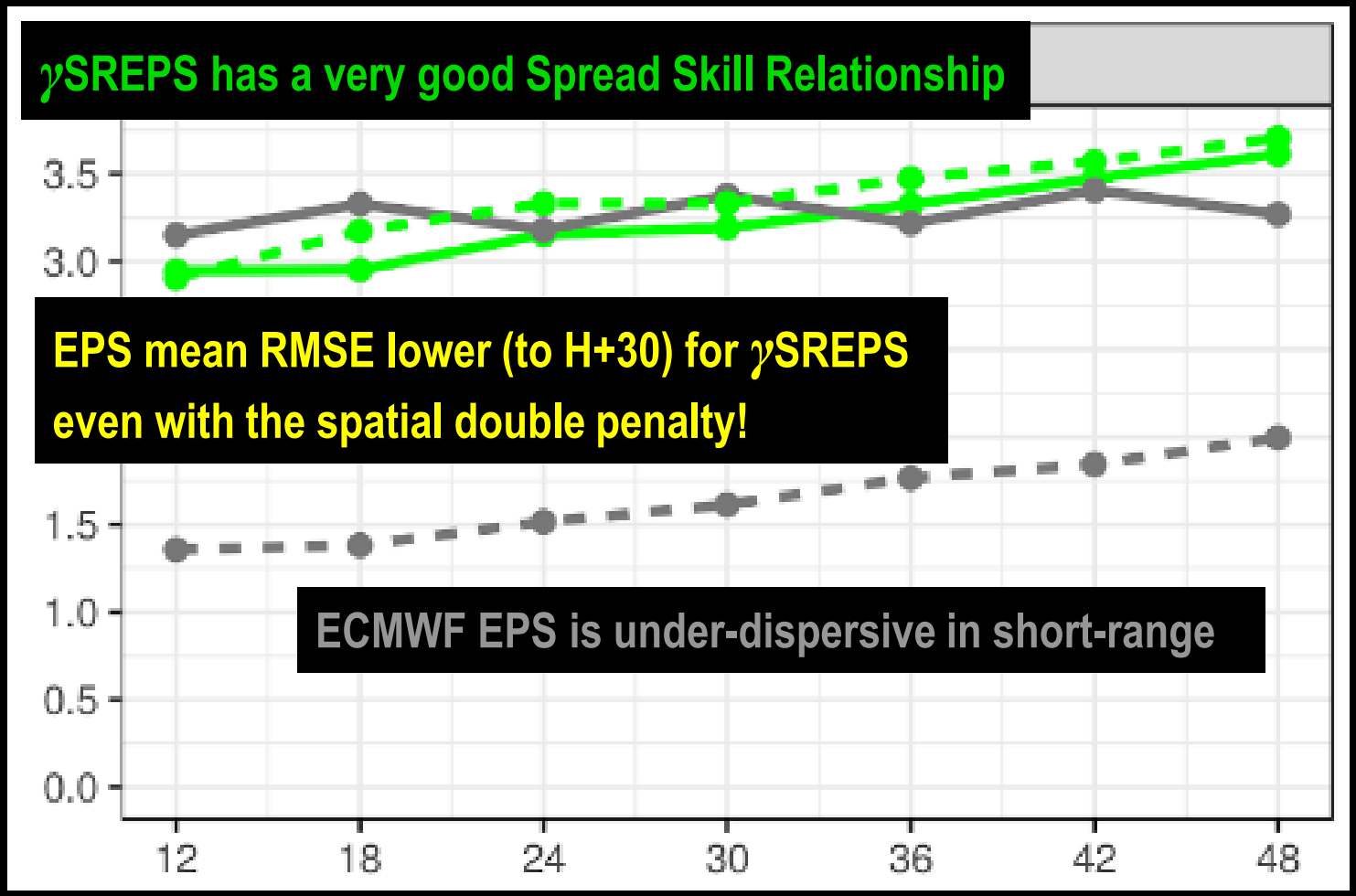
Complexity dealing with diferent DA algorithms and fields. Importance of separate tunning of AD algorithms for each EPS member

Initial conditions and Multi-BCs
- ECMWF – IFS
- NCEP – GFS
- MétéoFrance – ARPÈGE
- CMC – GEM (Canadian)
- JMA - GSM (Japanese)

Multi-model
- HARMONIE-AROME
- HARMONIE-ALARO
- WRF-ARW (NCAR)
- NMMB (NCEP)

γSREPS *versus* ECMWF EPS

- Recent result for a coming paper about HarmonEPS system: review of HIRLAM EPSs. Comparison of 12AccPcp for 00 and 12 cycles of November 2018



γSREPS

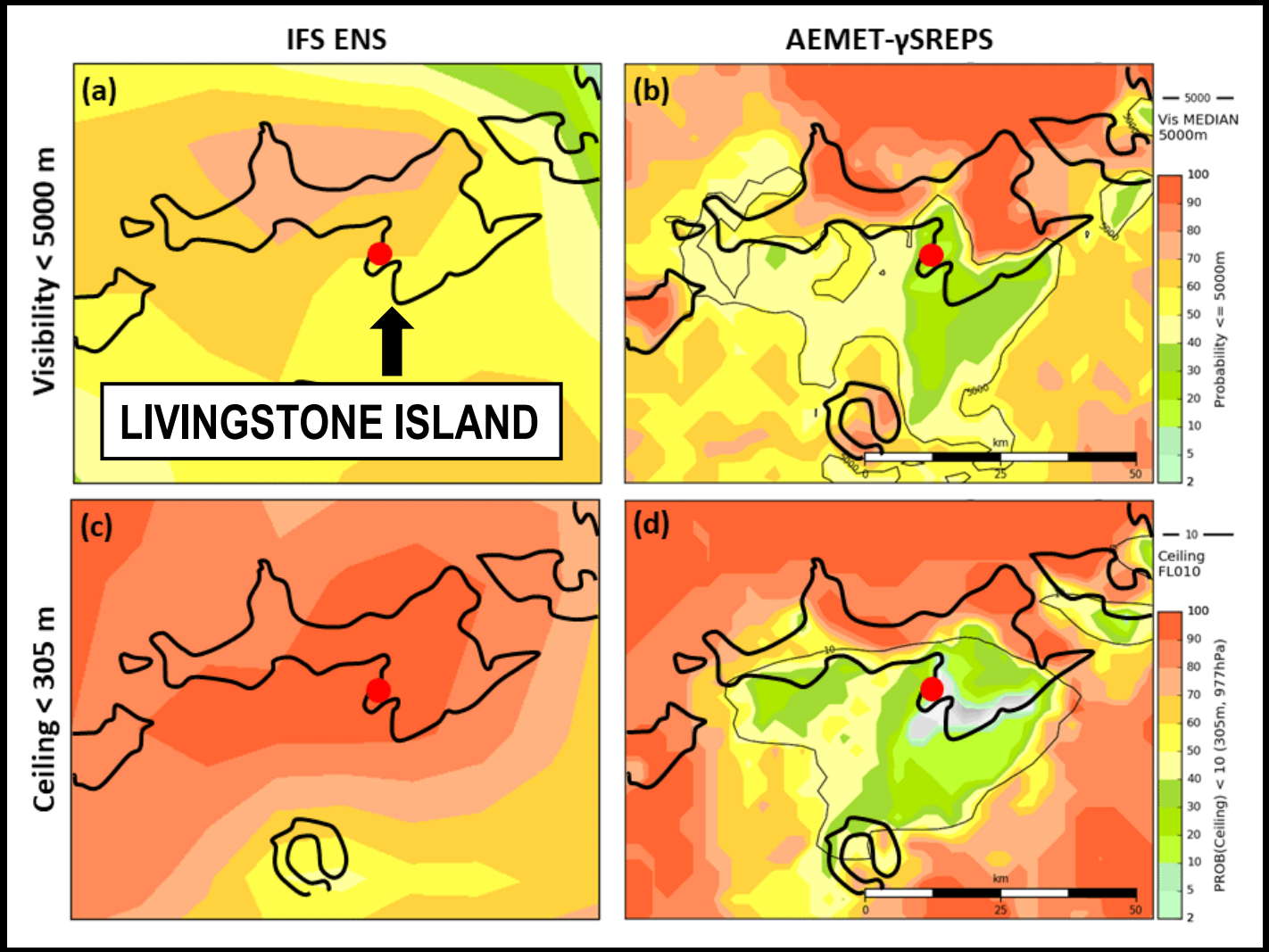
ECMWF EPS

Spread

em RMSE

γSREPS: Some subjective verification

γSREPS *in Antarctica*



PROB
Visibility
Below 5000m

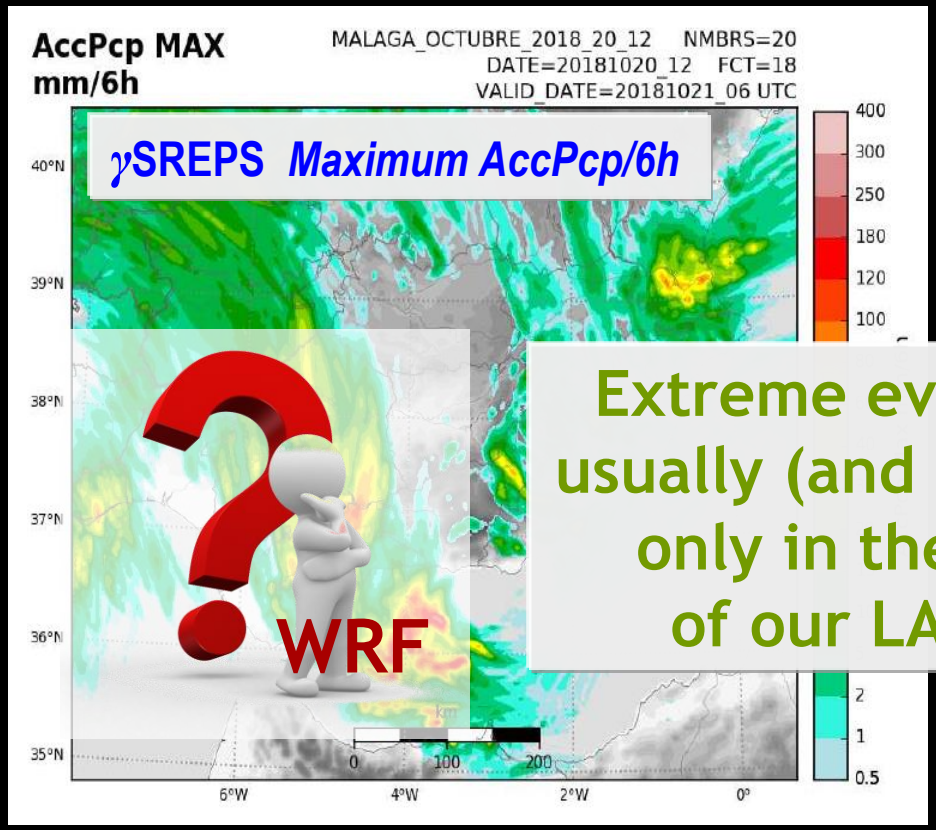
PROB
Ceiling
Below 305 m

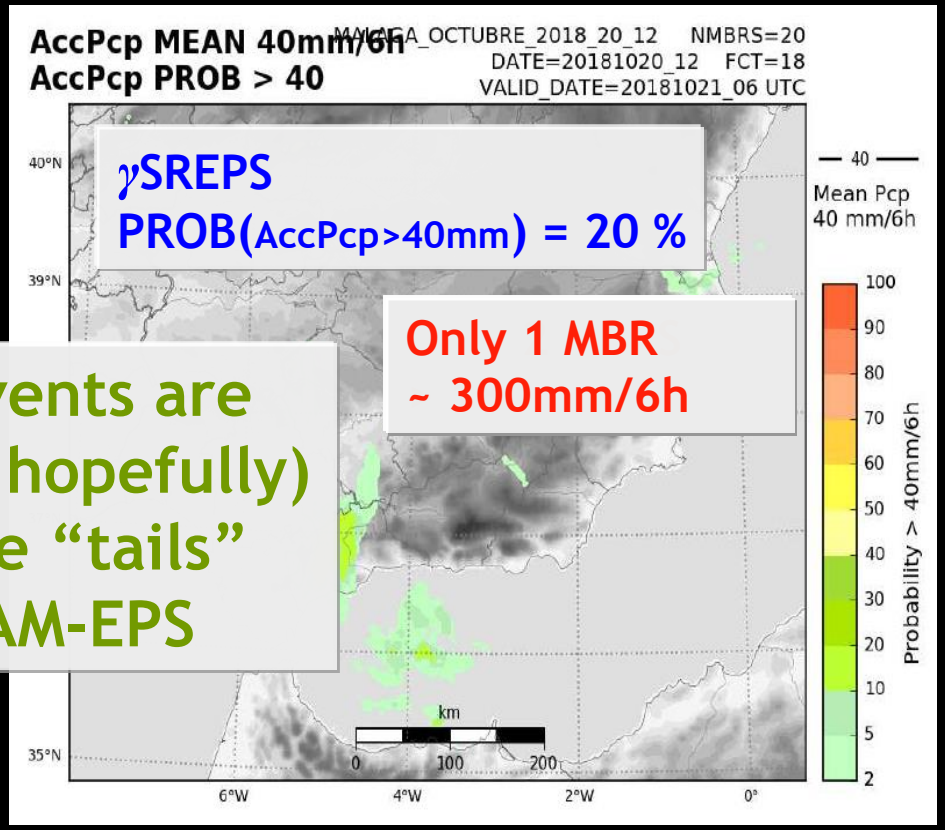
Gonzalez, S., Callado, A., Martínez, M., and Elvira, B., "The AEMET-γSREPS over the Antarctic Peninsula and the impact of kilometric-resolution EPS on logistic activities on the continent", Adv. Sci. Res., 17, 209–217, 2020, https://doi.org/10.5194/asr-17-209-2020

Case study: 21st October 2018 ALPANDAIRE-MÁLAGA AEMET maximum record of AccPcp in 6 hours: 289 mm

AUTHOR:
Carlos Manuel Jiménez Cavero
MALAGA forecasting office

- Convective Mesoscale System
  - Cut-off low, blocking ridge, low level wet jet
- Low predictability ⇔ High spatial/temporal uncertainty





Extreme events are usually (and hopefully) only in the "tails" of our LAM-EPS

Jiménez Cavero, C.M., June 2019, "*RÉCORD NACIONAL DE PRECIPITACIÓN EN 6 HORAS: 21 DE OCTUBRE DE 2018 - ALPANDEIRE – MÁLAGA: IMPORTANCIA DE La VIGILANCIA INTENSIVA*", internal AEMET publication

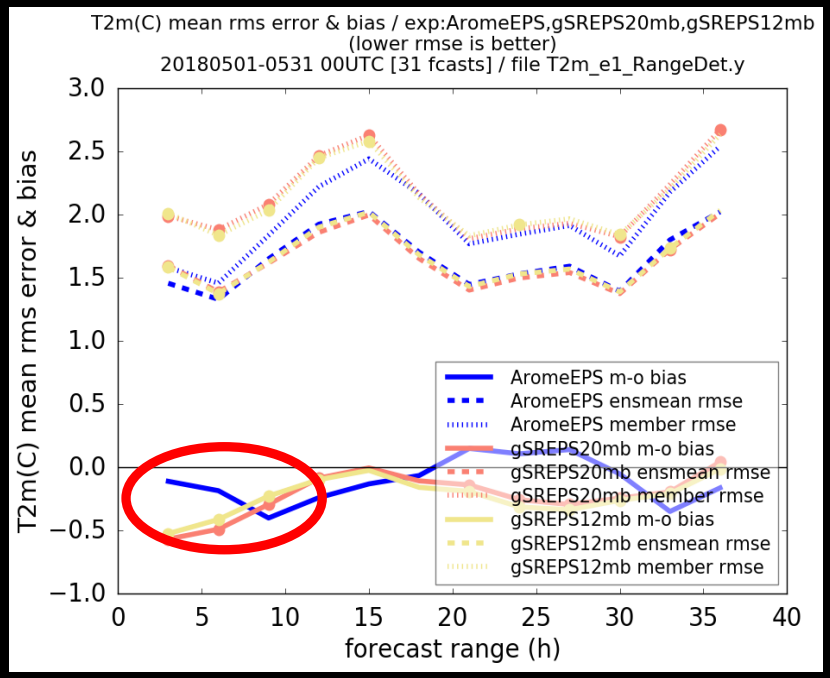
γSREPS: Surface Analysis

Surface Data Assimilaton in γSREPS

So far no data assimilation is done in γSREPS either in surface nor upper air

In the example below from a inter-comparison with AROME-EPS (MF) we see we have a clear degradation in the first 6 hours of T2m forecasts. The aim is to improve this to be used by the forecasters!

WE WILL START WITH SFC DA!!!

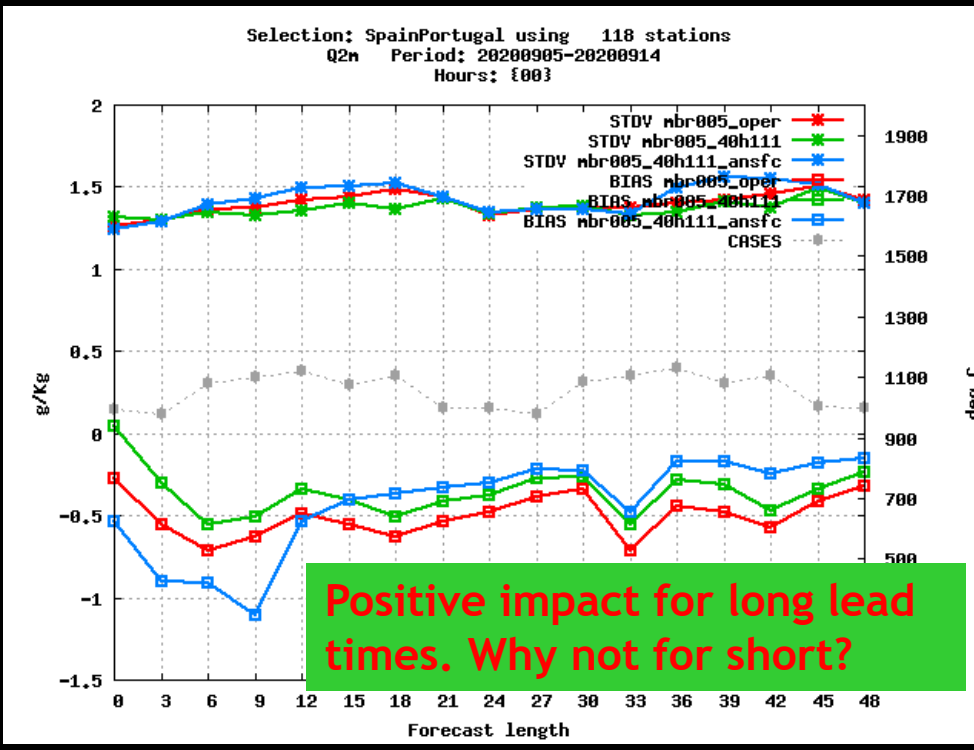


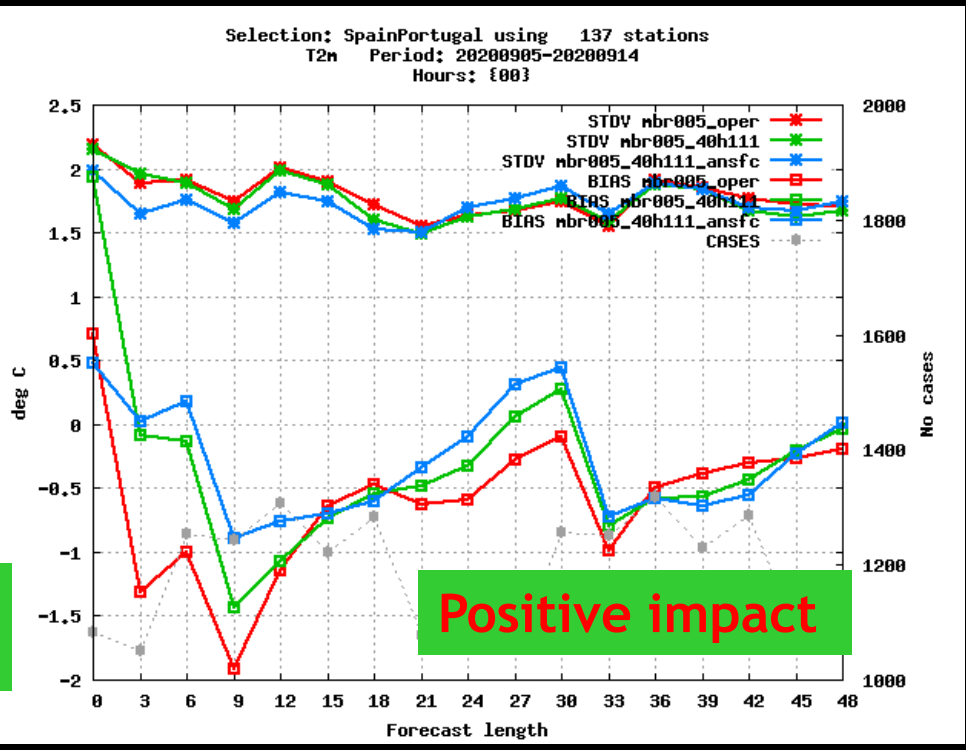
SFC DA in γSREPS (verif mbr 5: AROME+NCEP)

10 days September 2020 H+48 00 runs

Mbr005 oper Mbr005 40h111 Mbr005 AnSFC

Q2M T2m



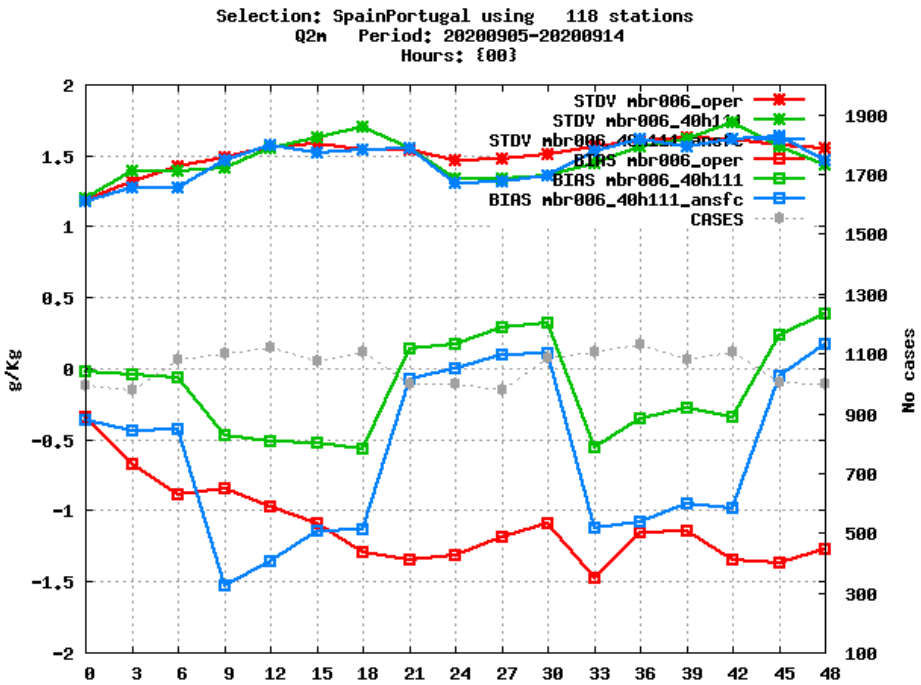


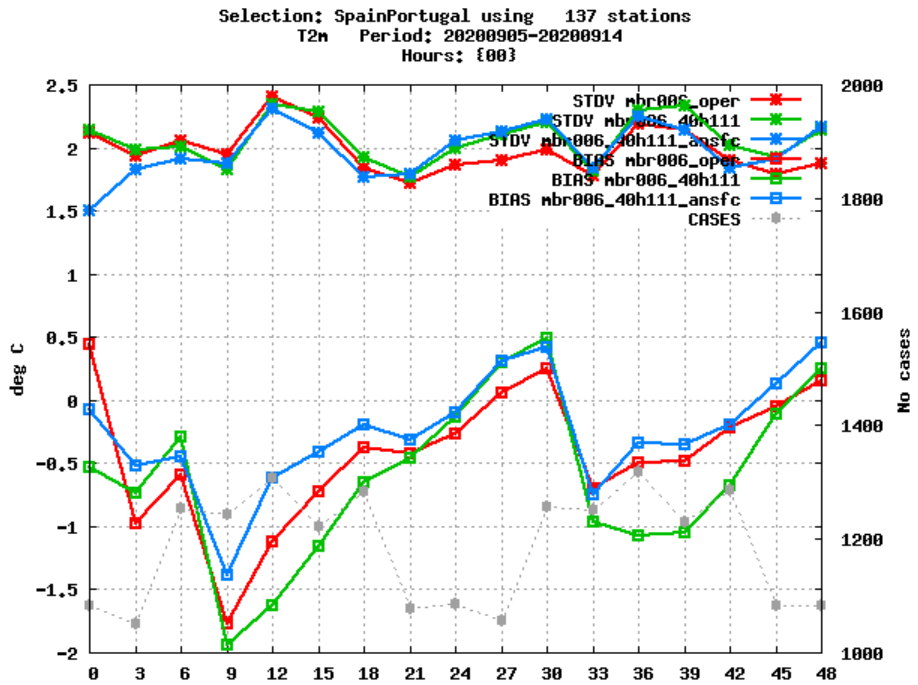
SFC DA in γSREPS (verif mbr 6: ALARO+NCEP)

10 days September 2020 H+48 00 runs

Mbr006 oper Mbr006 40h111 Mbr006 AnSFC

Q2M T2m





Different impact of ANSFC.
What happens with bias?

Clear positive impact of ANSFC

Surface Data Assimilaton in γSREPS

- ANSFC (CANARI) has an overall positive impact both in ALARO and AROME. For surface fields, impact is maintained over all forecast range (soil inertia). Some issues with Q2m biases must be checked

- ANSFC must be extended to WRF and NMMB with their own AD algorithm, GSI.

- Work in progress by tunning observation errors and first-guess errors with the Hollingsworth-Lonnberg tunning method (Candelas, Beatriz)

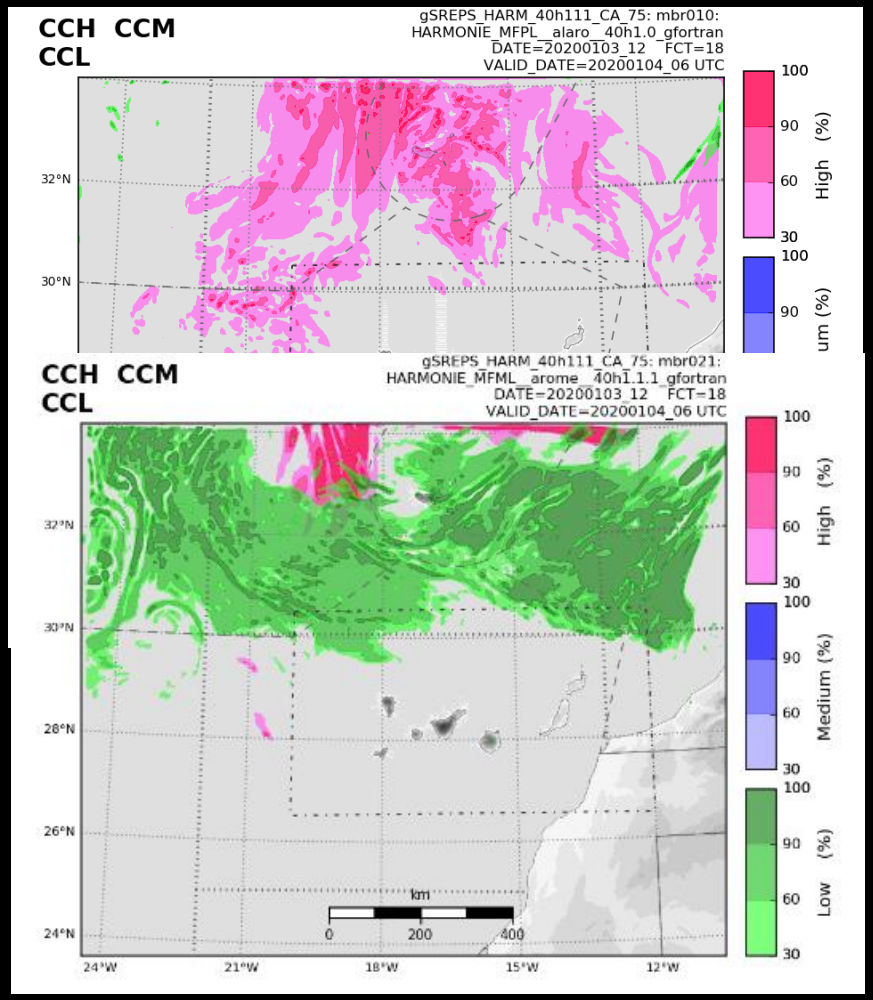
- Test LARGE SCALE mixing of upper-air in progress

γSREPS: ALARO Update

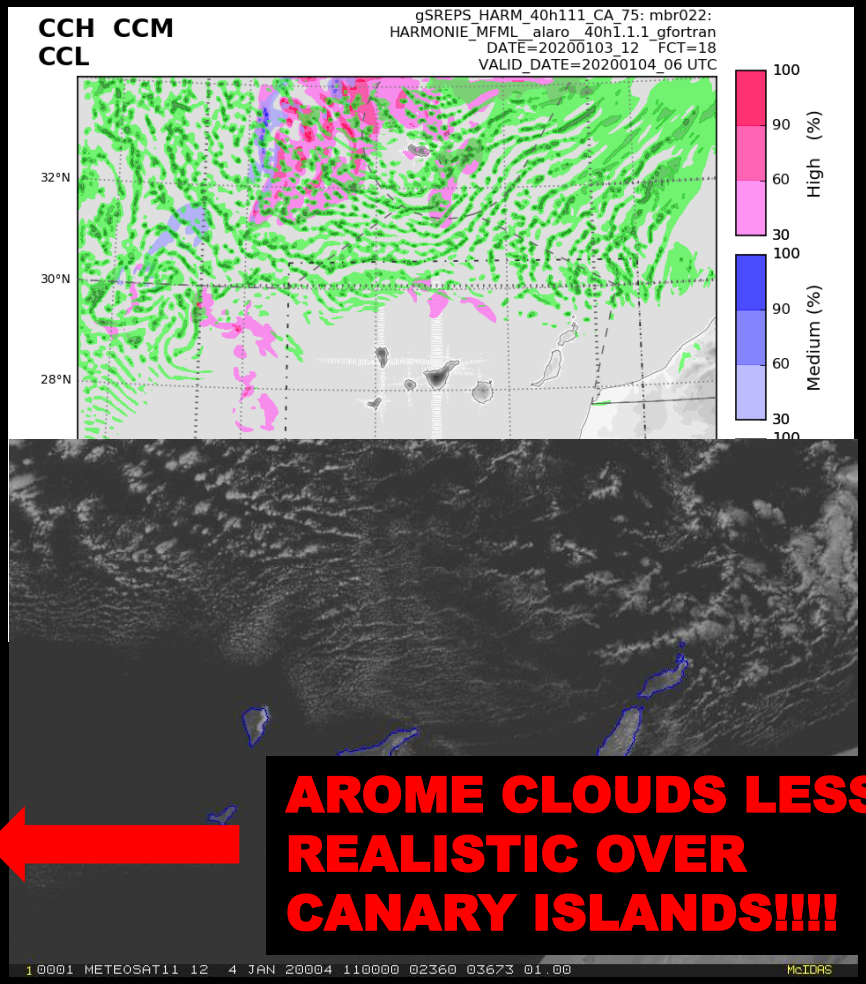
Update ALARO setup (thanks to Neva Pristov)

New ALARO setup is the same as the one in Slovenija, Ceská Republika, Slovensko… CY40

OLD ALARO



NEW ALARO

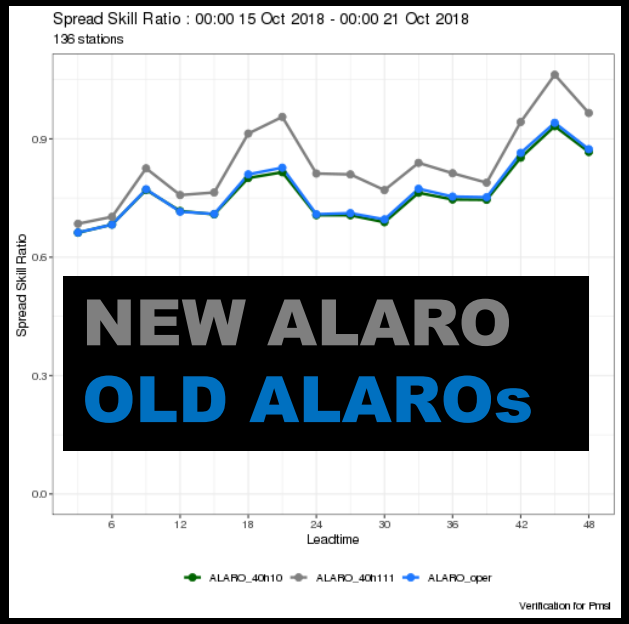


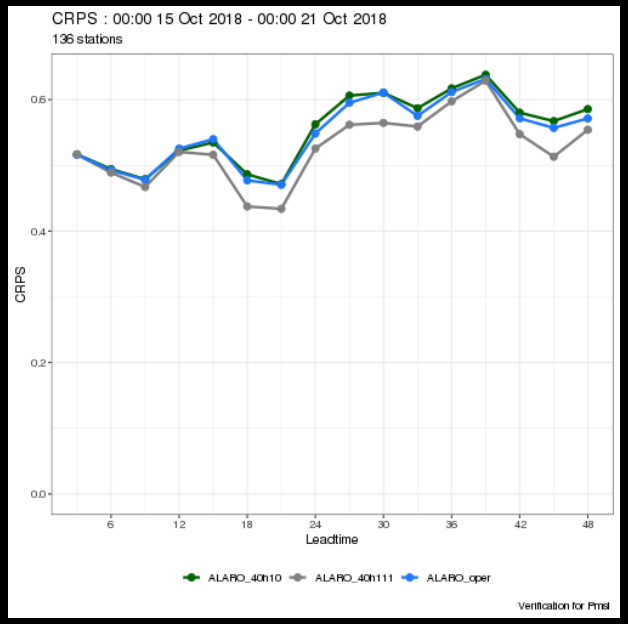
AROME CLOUDS LESS REALISTIC OVER CANARY ISLANDS!!!!

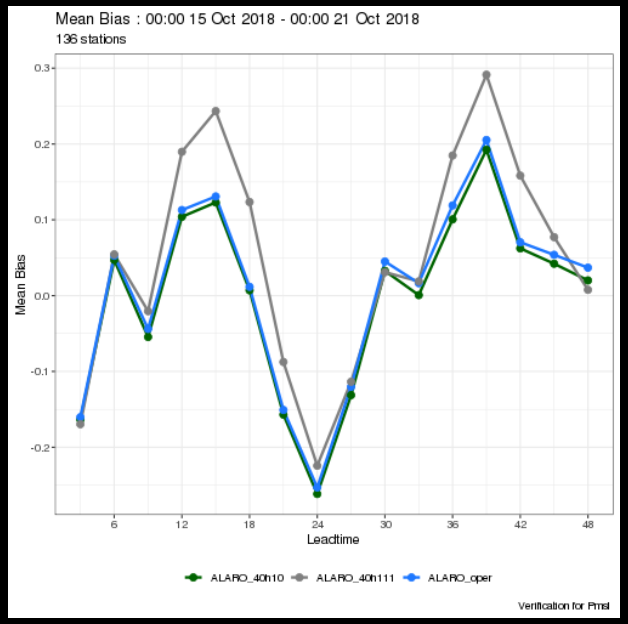
Update ALARO setup (MSLP verification)

MSLP 1 week October 2018 H+48 00 runs
5 member ALARO ensemble

SPREAD/SKILL RATIO **CRPS** **MEAN BIAS**







Update ALARO setup (verification summary)

New –vs- Old ALARO (both CY40)

N (neutral) + (New > Old) - (New < Old)

	Spread/Skill	CRPS	Mean Bias	Comments
AccPcp3h	N	N	N	More verif needed (AccPcp12)
CCtot	+	+	-	Cold bias (cloud shape?)
Pmsl	+	+	+	
Rh2m	+	+	++	
S10m	+	N	N	Different bias. Not using-SURFEX effect?
T2m	N	N	N	
VIS	+	+	-	

γSREPS: AIC12 on BULL and new HPCFs

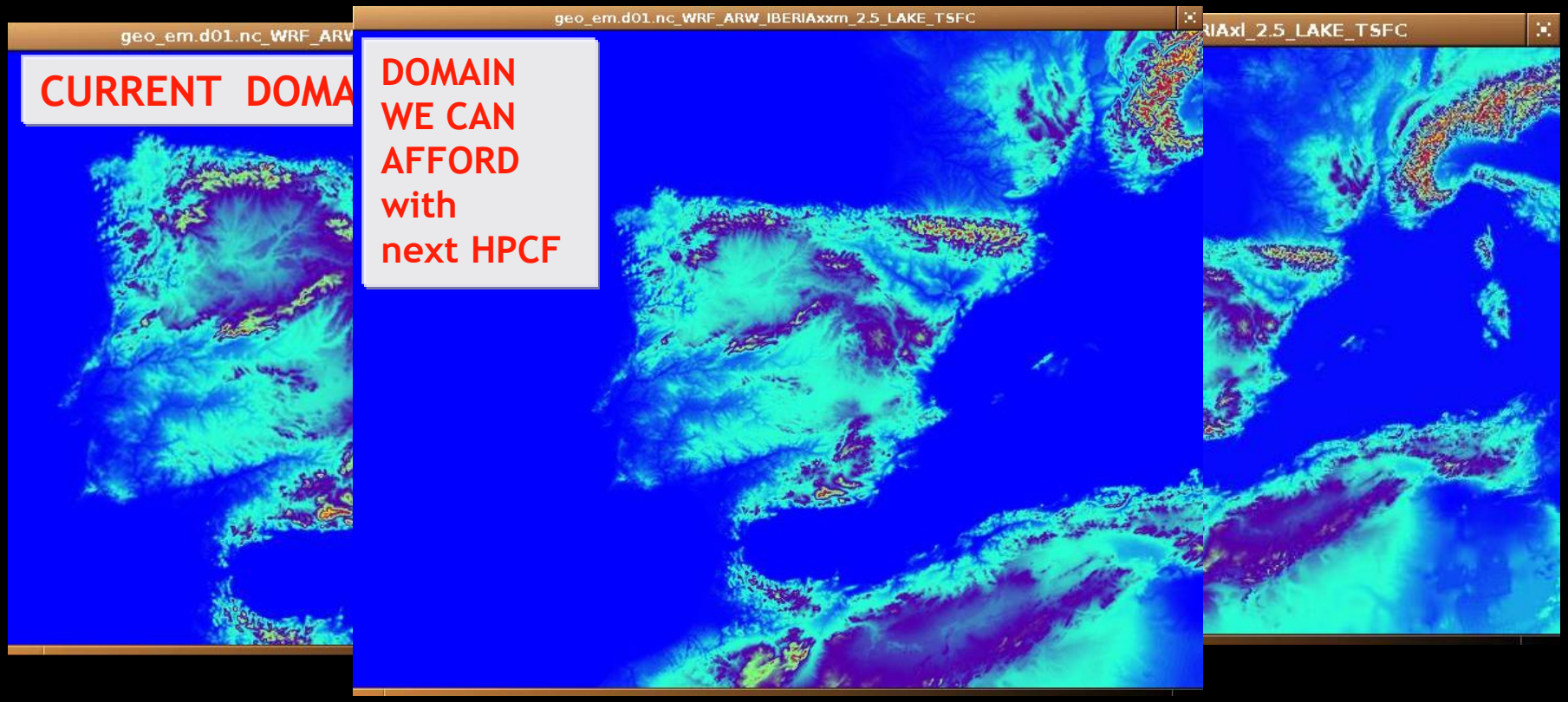
AEMET HPCF

- A reduced version (10 members) of the 12 UTC run for CANARY ISLANDS domain is running preoperationally on the current AEMET BULL HPCF

- The first cluster of the new BULL HPCF has been just installed last week and we have started the porting process. It is 10 times more powerful than the current one, with 50.000 cores. The first plan is to run there a complete 20 members run of the CANARY domain.

ECMWF HPCF

- **The new ECMWF HPCF in Bologna will allow to run a separate suite for DA and to increase the IBERIAN domain**



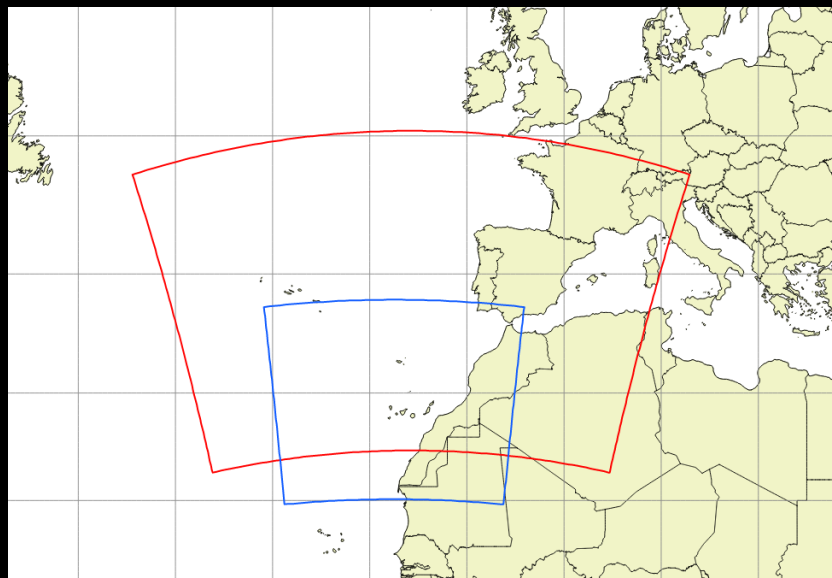
γSREPS: Updates in BCs

UPDATE of γSREPS BCs (2020-2021)

- Good work has been done to access to BDPE MF database (thanks to Eric Escaliere, Claude Fischer and Maria Monteiro), to get ARPEGE global model

- ARPEGE global model is downloaded for 2 domains covering a) ATLANTIC OCEAN/PORTUGAL/SPAIN (shared with IPMA) and b) CANARY ISLANDS

- Global GSM/JMA (Japanese Met Agency) has been increased from 100 to 128 so now we are receiving 111 instead of 86 levels



γSREPS: Opinion of Forecasters

Forecaster's opinions on γSREPS

"The main contribution of the system is to predict strong convective precipitation and its spatial variability. Besides it is useful to see the range of change of temperature from day to day or the localization of wind gusts in orographic areas and its associated spatial variability."

"The combination of HARMONIE-AROME with HRES-IFS and AEMET-γSREPS is the best tool we have for the short range forecast"

Thank you for your attention !!!

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Any question will be welcome

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