

High resolution model intercomparison for Convective Events during CHUVA-Santa María

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Motivation

To analyze the ability of high resolution models to represent organized convection over SESA

Objective

To perform an assessment based on a model intercomparison focused on the precipitation forecast quality during 3 particular events where organized convection has been observed

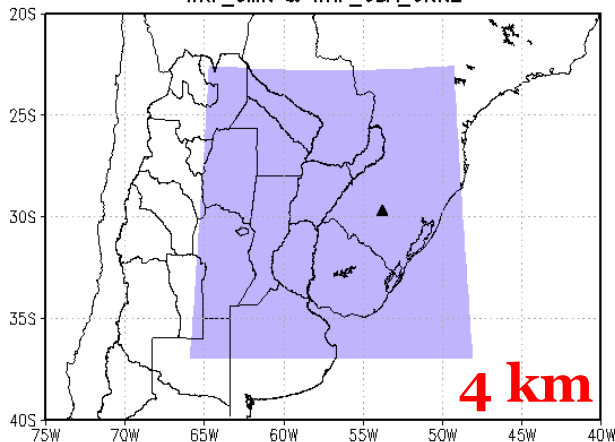
Name	WRF-SMN	WRF-UBA-UNNE	WRF-CPTEC		WRF_GruMA-UFSM	BRAMS-IAG-USP	BRAMS-CPTEC		MESO_NH
Model	WRF ARW 3.4.1	WRF ARW 3.4.1	WRF ARW 3.4		WRF ARW 3.3	BRAMS -4.3	BRAMS 5.0		Meso-NH 4.9
Initial and boundary conditions	GFS 0.5°, 26 levs, BC 3hs	GFS 0.5°, 26 levs, BC 3hs	3 RUNS	CPTEC best member	GFS 1°, 21 levs, BC 6hs	GFS 0.5°, 26 levs, BC 6hs	2 RUNS	CPTEC T299 6h	ECMWF_16 km, 91 levs, BC 6hs
				NCEP best member				GFS 0.5°, 26 levs, BC 6hs	
				GFS 0.5°, 26 levs, BC 3h					
Horizontal resolution	4km	4 km	2km		12km	16 km	2 km		2 km
Nesting	NO	NO	feedback 12km/2km		feedback 48km/12km	NO	NO		2-way 10 Km / 2 km
Data assimilation	NO	NO	NO		NO	Surface data	NO		NO
Convection Param	No	NO	KF in 12km/No in 2km		KF/KF	Grell-ensam closure	NO		Bechtold / NO
PBL Param	YSU	MYJ	MYJ		YSU	Mellor Yamada	MY 2.5		Cuxart et al.
Microphysics	WSM6	WSM6	WSM3		LIN	2 momts all species	Walko et al		Pinty and Jabouille

Total = 10 different model runs

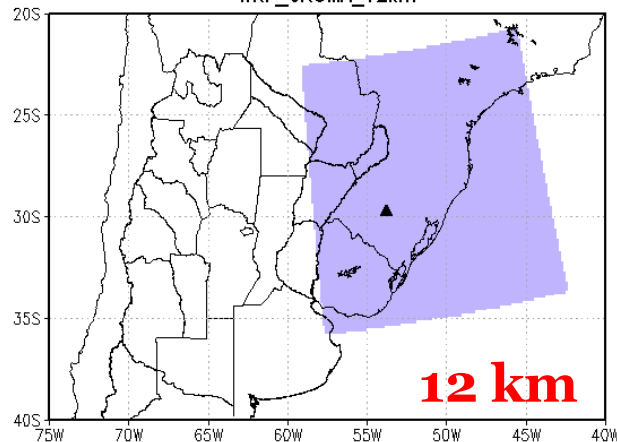
▲ Santa María

model domains

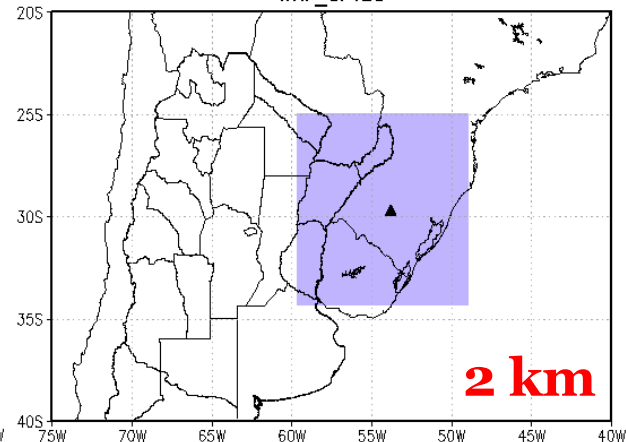
WRF_SMN & WRF_UBA_UNNE



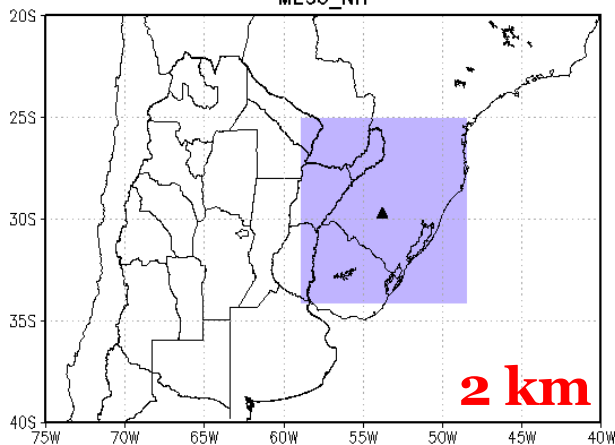
WRF_GRUMA_12km



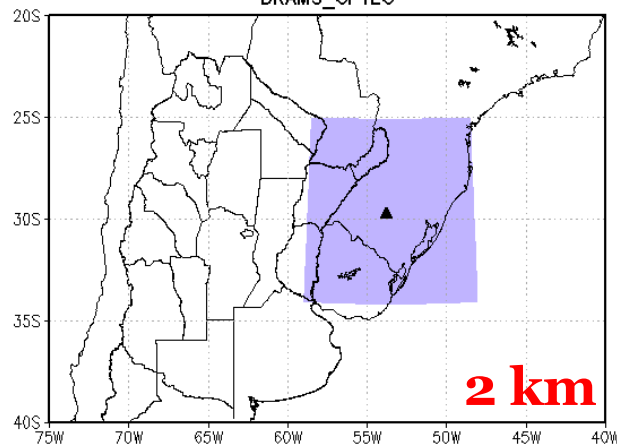
WRF_CPTEC



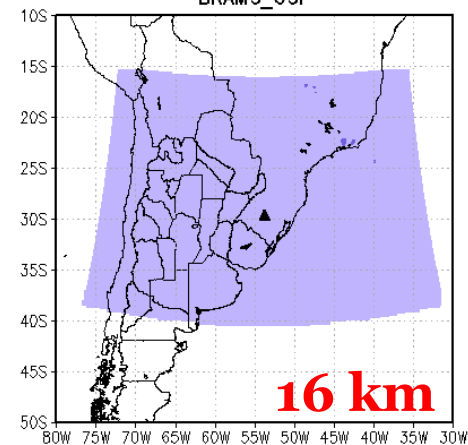
MESO_NH



BRAMS_CPTEC



BRAMS_USP



- Output temporal resolution was 1 hr except for WRF_GRUMA (6hs)
- Most of the models had initializations at 12UTC, some also had at 00UTC
- Forecast ranges varied from 36 to 72 hs.

CHUVA Santa Maria: 6th November to 22nd December 2012

In order to compare
model performances



A **visual inspection** has been done
for 3 different convective events:

- 22 November 2012
- 05 December 2012
- 10 December 2012

Based on model output availability, we focused on the following fields:

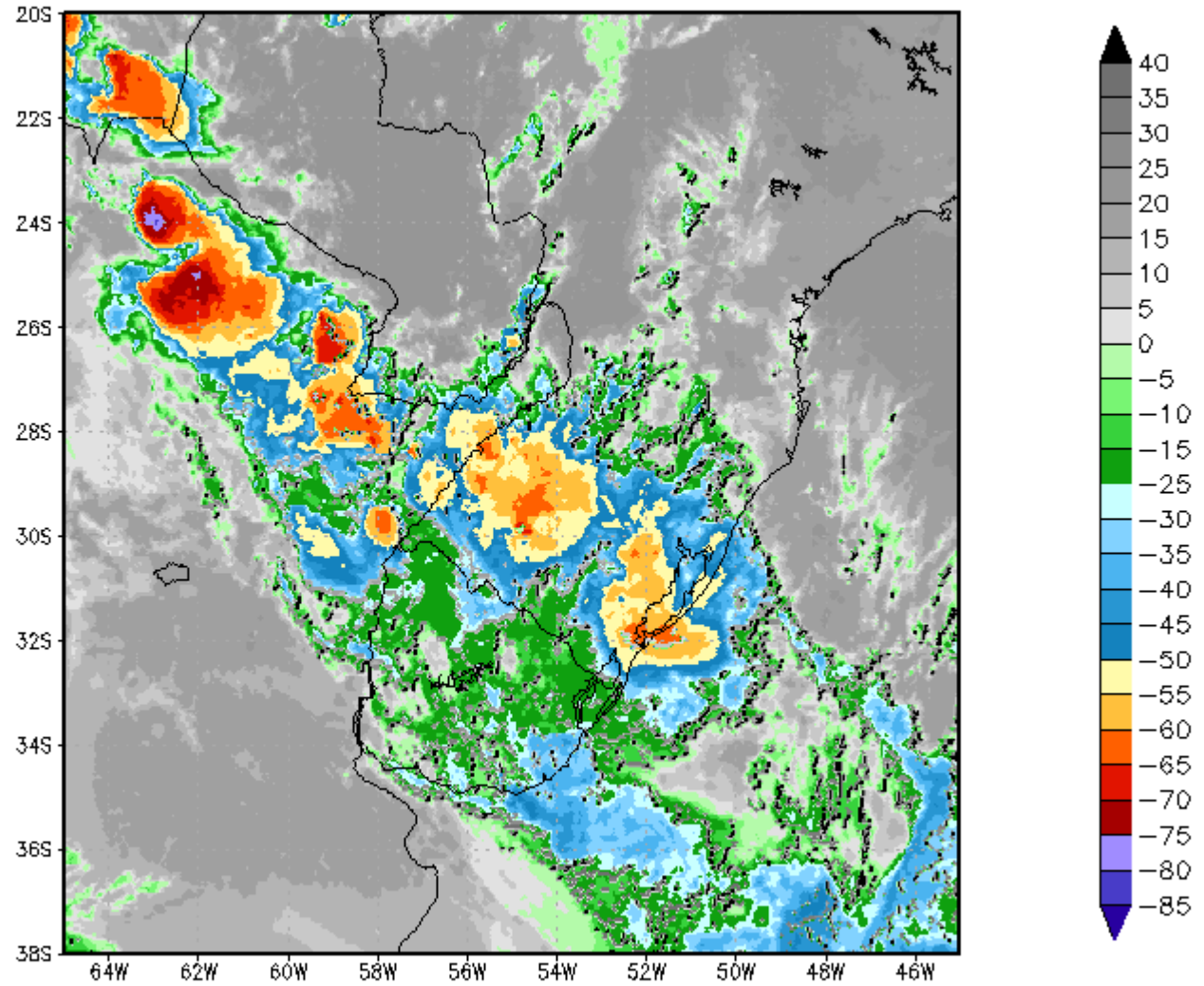
- 3hr and 6hr accumulated rainfall
- up to 36hr-forecast range, initialized at 12 UTC

We included 2 satellite precipitation estimates:

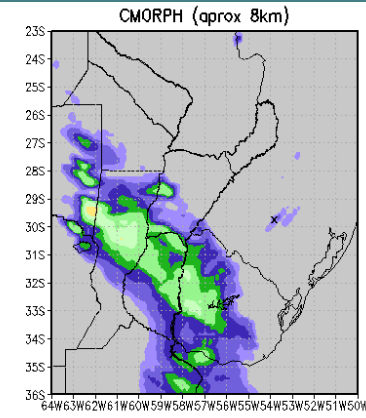
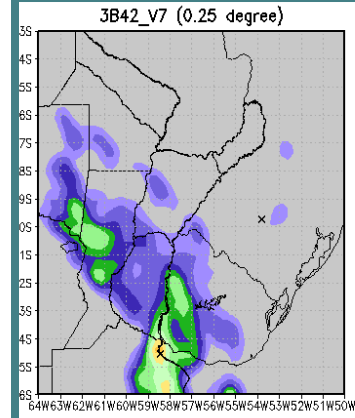
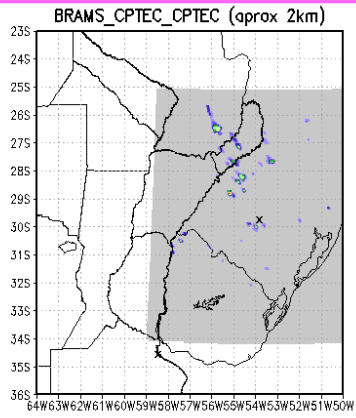
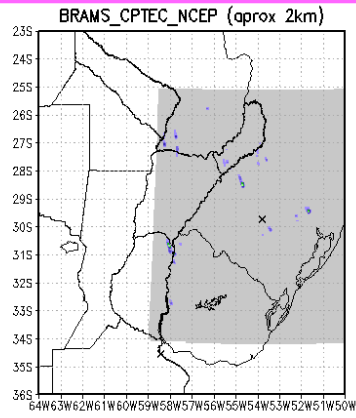
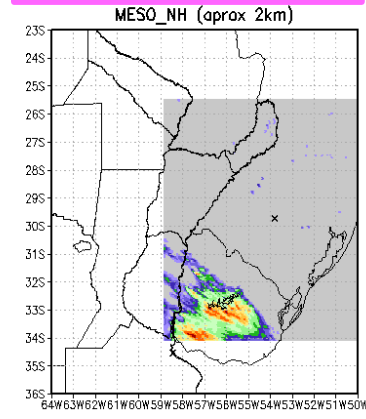
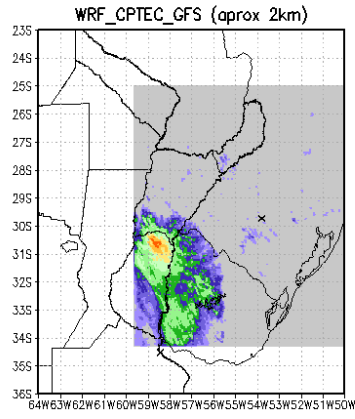
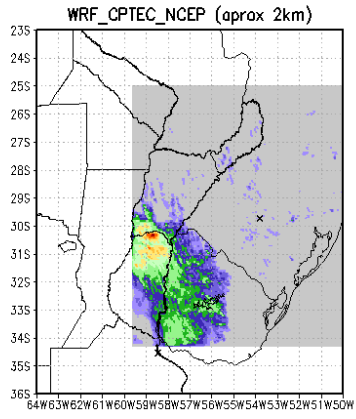
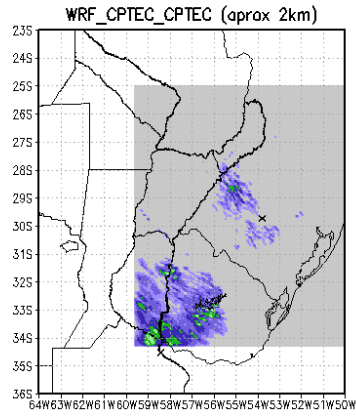
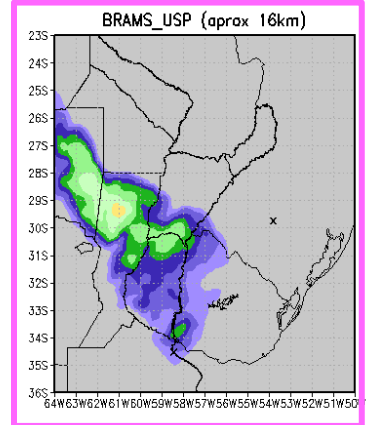
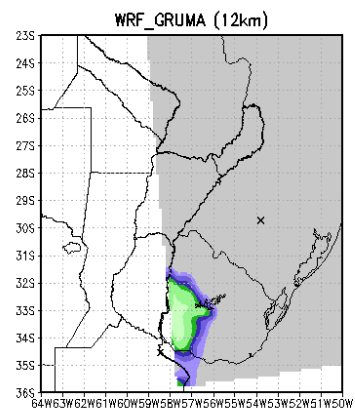
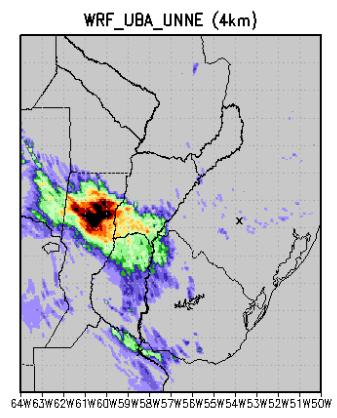
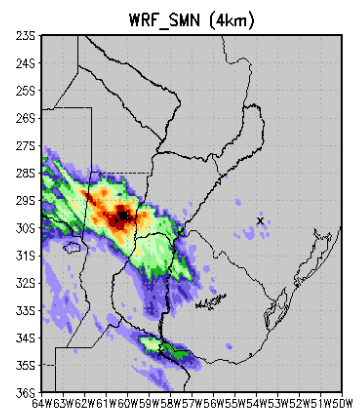
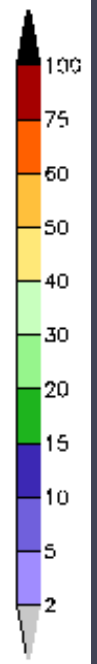
TRMM 3B42_V7
CMORPH _ 8km (Joyce, R. J., et al, 2004)

Known
limitations!

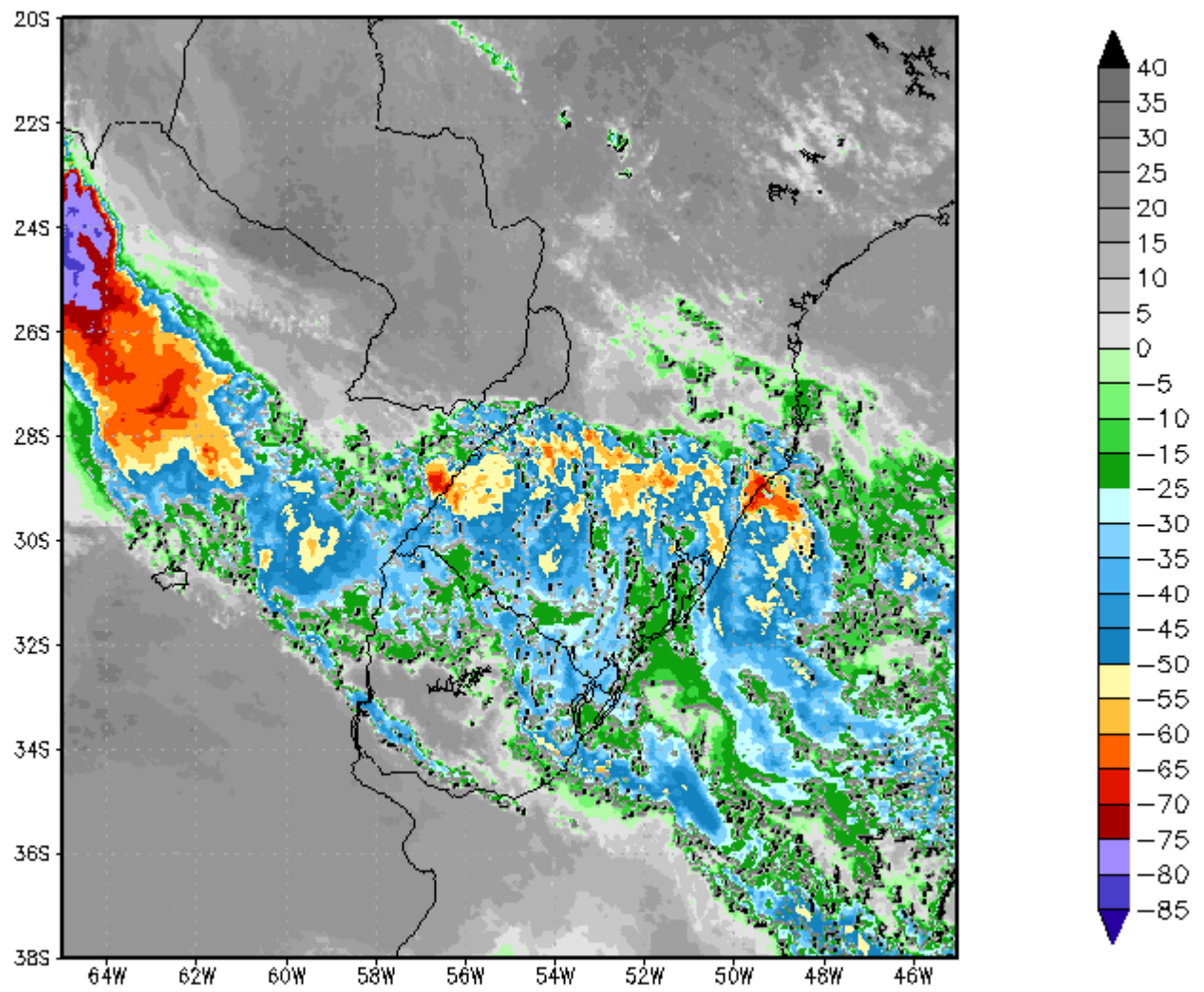
2012 11 22 23:00Z



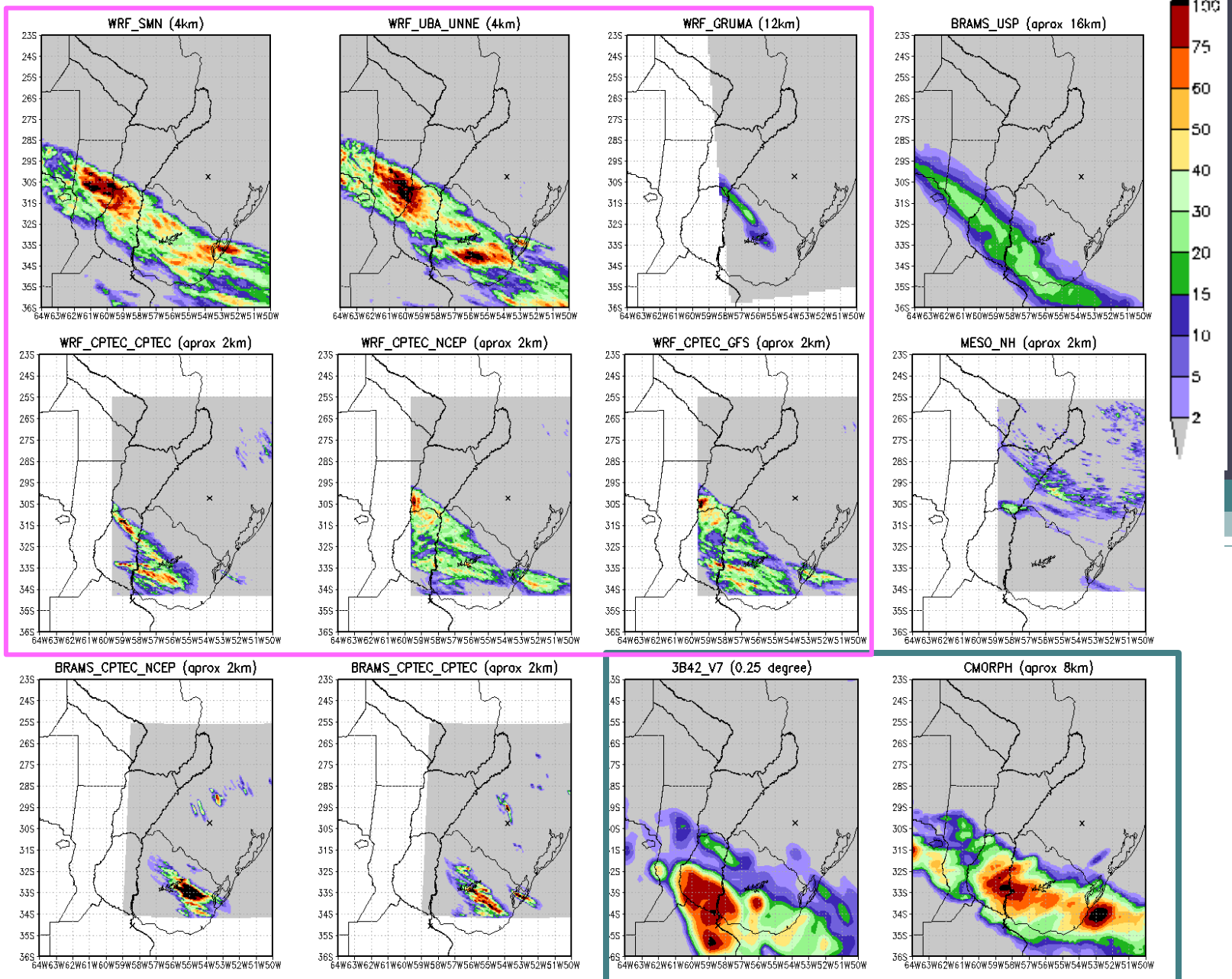
6hr_precipitation (mm) forecast valid for 18Z22NOV2012 initialized on 12Z21NOV2012



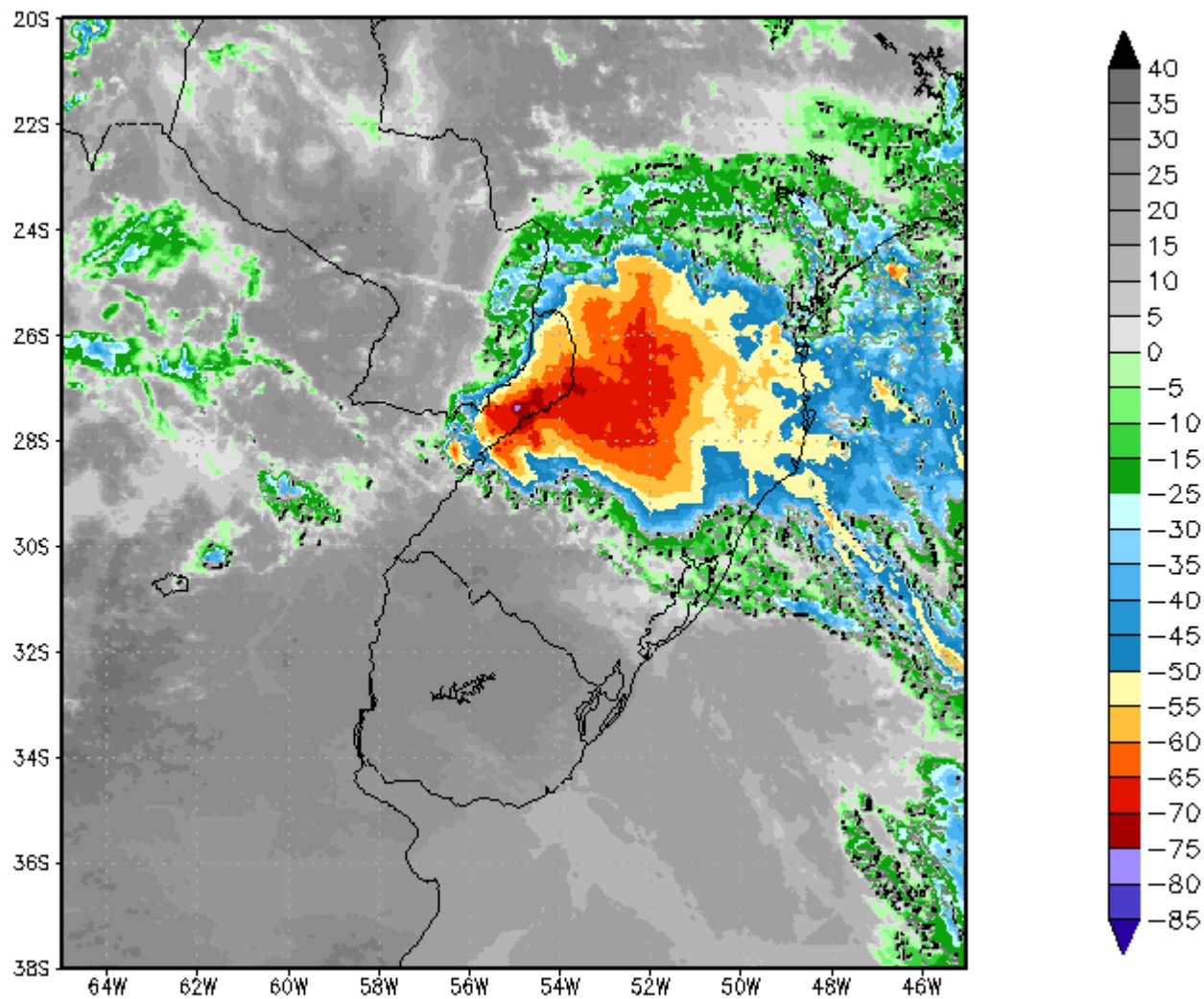
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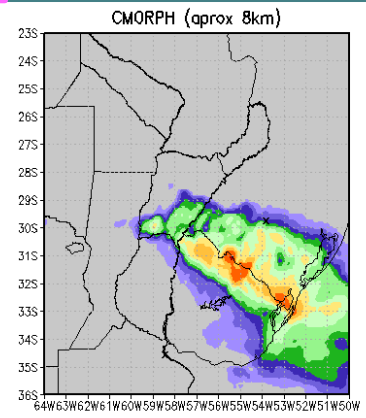
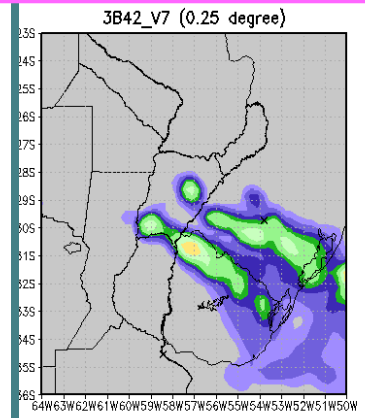
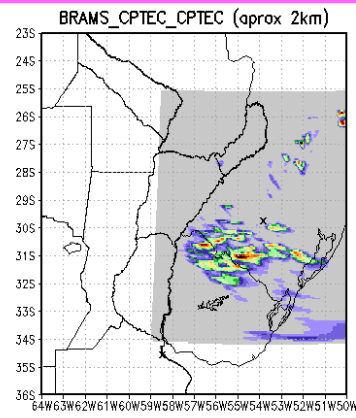
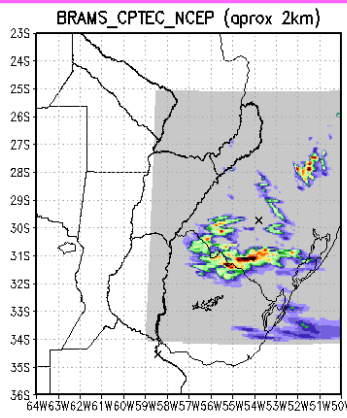
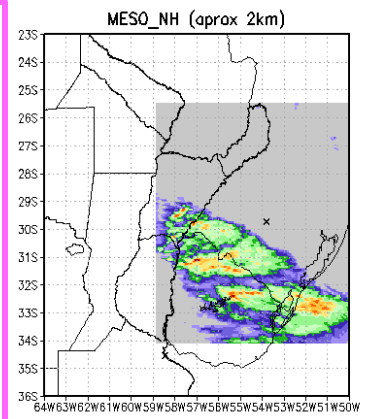
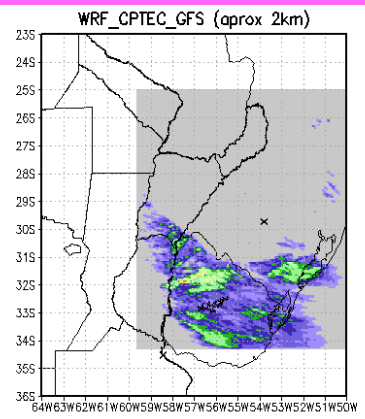
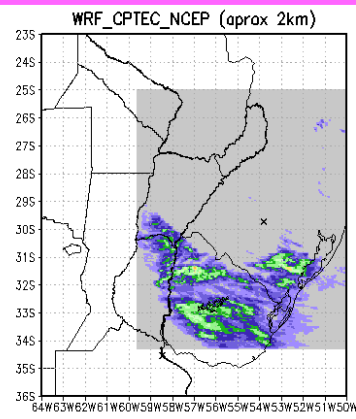
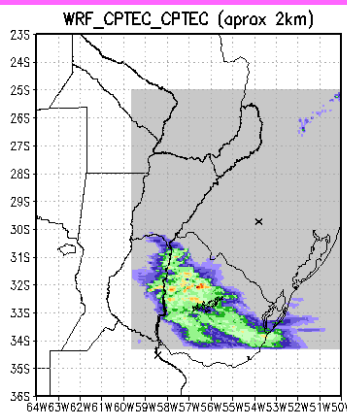
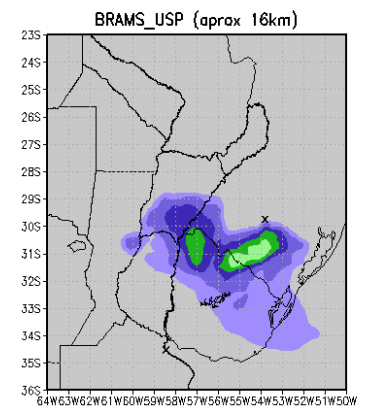
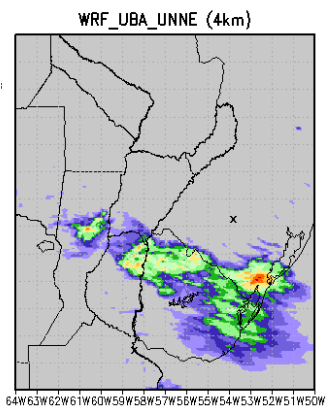
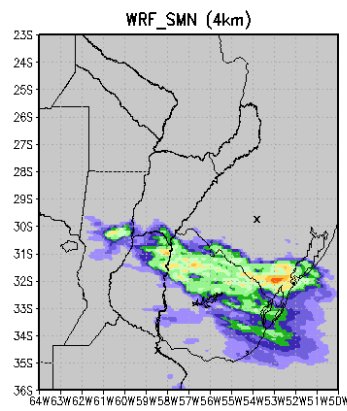
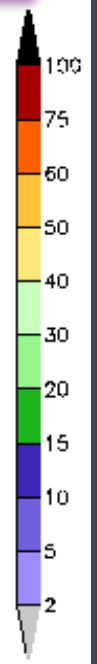
6hr_precipitation (mm) forecast valid for 06Z07DEC2012
initialized on 12Z06DEC2012



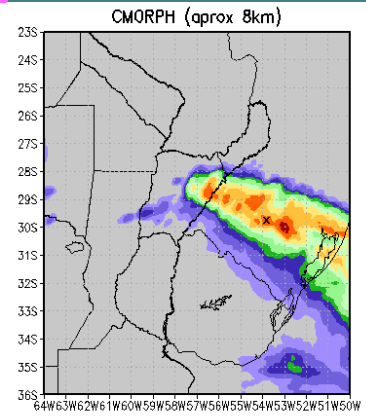
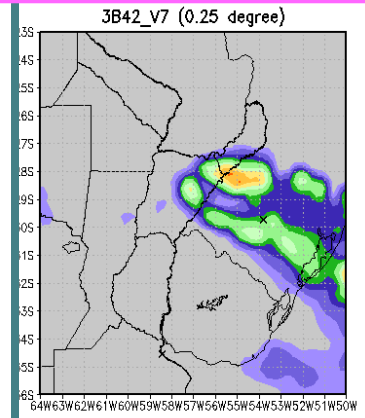
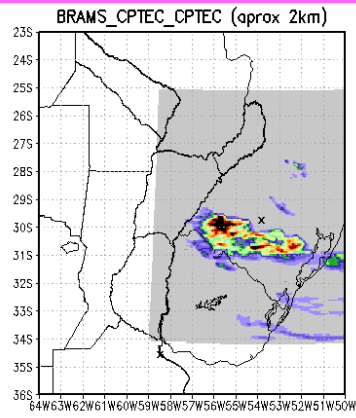
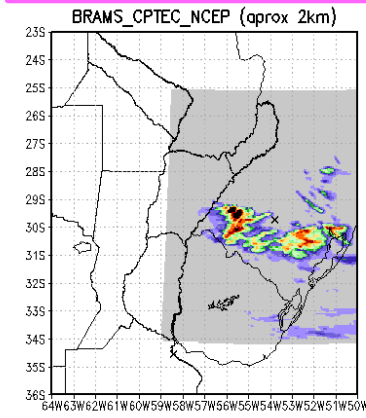
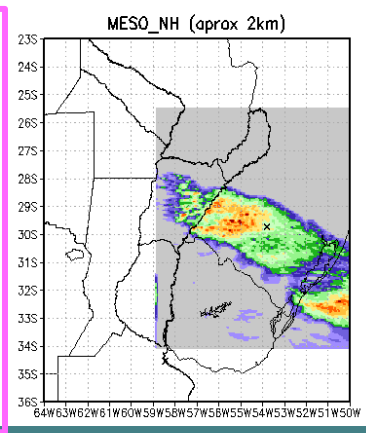
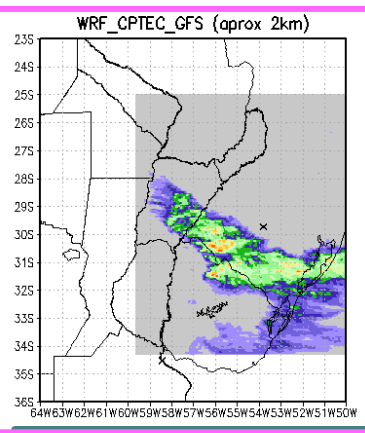
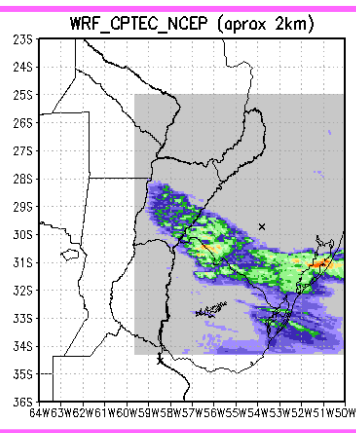
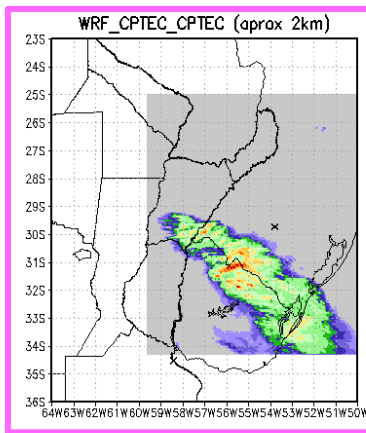
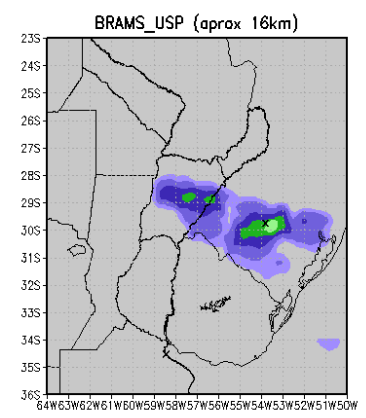
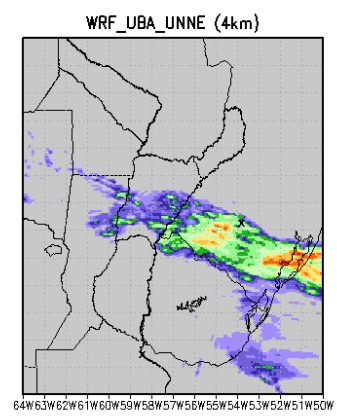
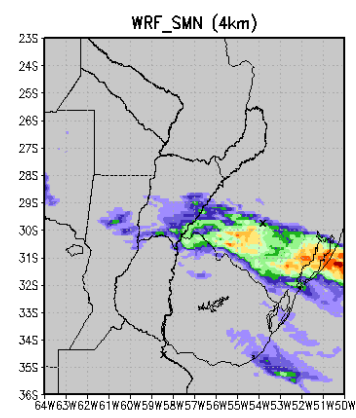
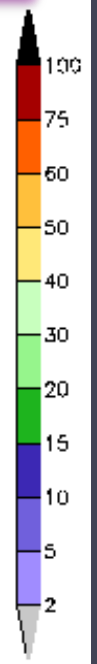
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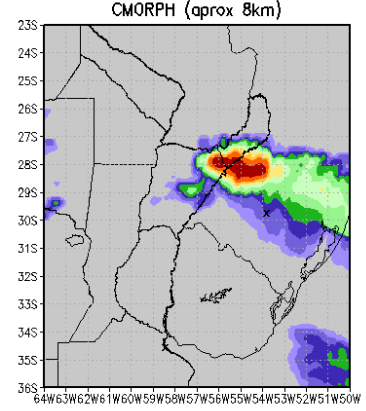
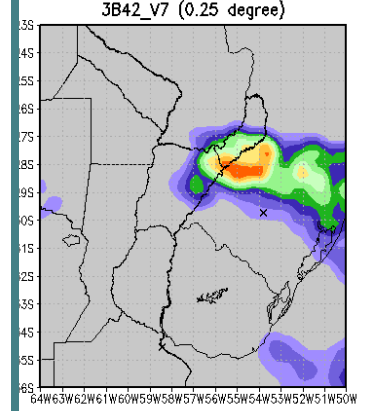
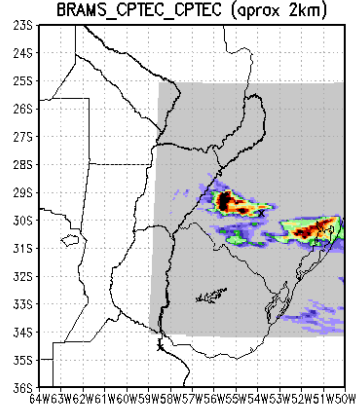
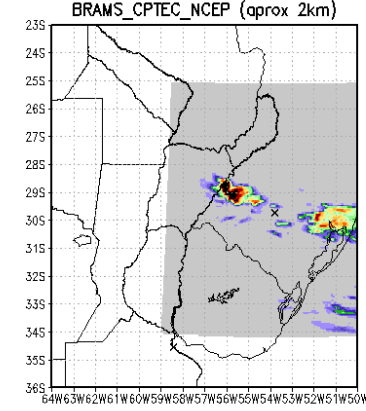
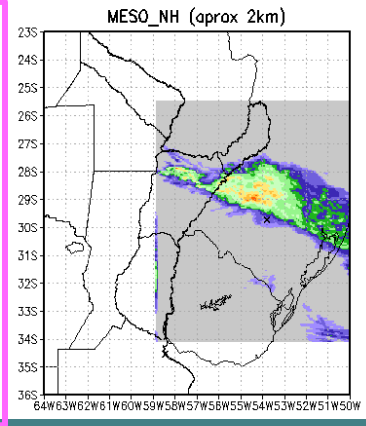
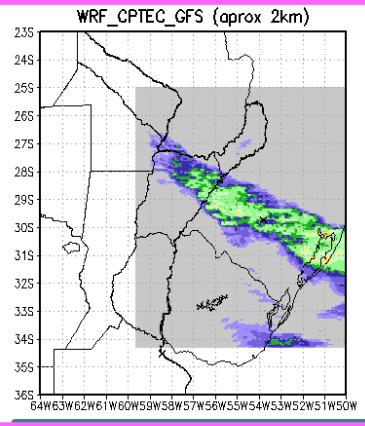
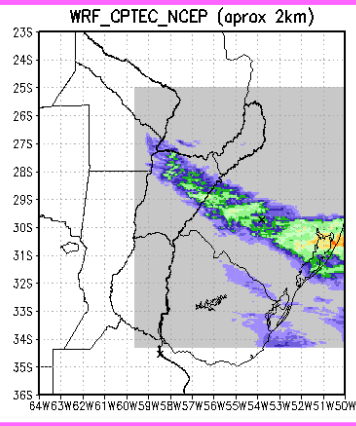
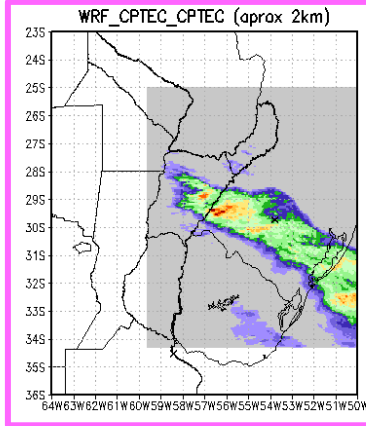
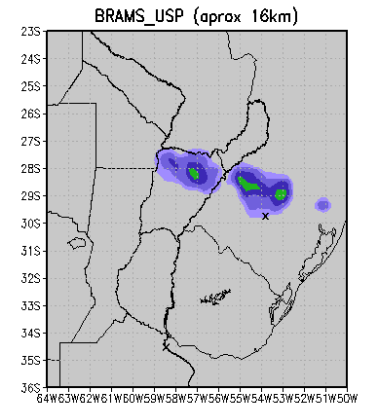
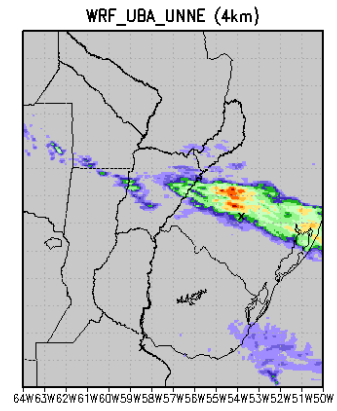
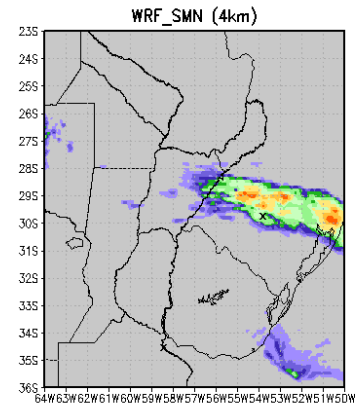
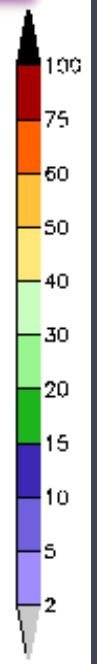
3hr_precipitation (mm) forecast valid for 03Z11DEC2012
initialized on 12Z10DEC2012



3hr_precipitation (mm) forecast valid for 06Z11DEC2012
initialized on 12Z10DEC2012



3hr_precipitation (mm) forecast valid for 09Z11DEC2012
initialized on 12Z10DEC2012



Disdrometer locations



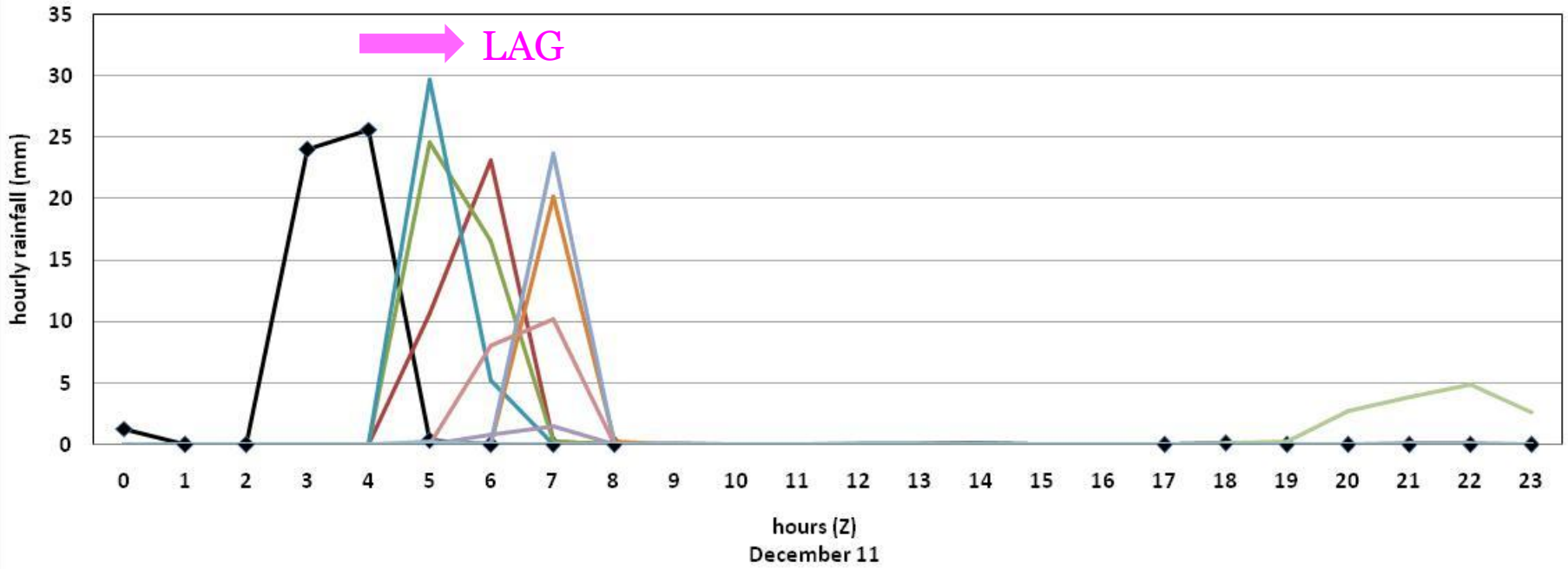
Parsivel Santa María

Comparison between disdrometer's hourly rainfall and the nearest grid point of the models



For a particular day ...

Comparison between SM disdrometer and forecasts initialized on December 10 at 12 Z



LAG

- ◆ parsivel SM
- WRF_SMN
- WRF_UBA_UNNE
- MESO_NH
- WRF_CPTEC_CPTEC
- WRF_CPTEC_NCEP
- WRF_CPTEC_GFS
- BRAMS_USP
- BRAMS_CPTEC_CPTEC
- BRAMS-CPTEC_NCEP

Preliminary results:

Visual comparison has shown:

- Sensitivity to domain size, resolution and initial conditions (e.g. GFS vs CPTEC)
- Sensitivity to model characteristics (BRAMS-WRF-MESO NH).

According to this evaluation it seems that finding an optimal balance between resolution and domain size (that must include the area of convective initiation) is critical

Future work:

- Include other measures of performance to facilitate the synthesis of results and their representativeness.
- Refine the intercomparison (selecting “similar “ runs) to drive more robust conclusions and recommendations for operational settings
- Analyze the quality of the ensemble mean

Thank you! Obrigado!