Servei Meteorològic
de Catalunya

CURRENT DEVELOPMENTS OF LAPS INGEST PROCESSES AT METEOCAT

Area of Applied Research and Modelling – SMC

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Generalitat de Catalunya
Departament de Medi Ambient
i Habitatge

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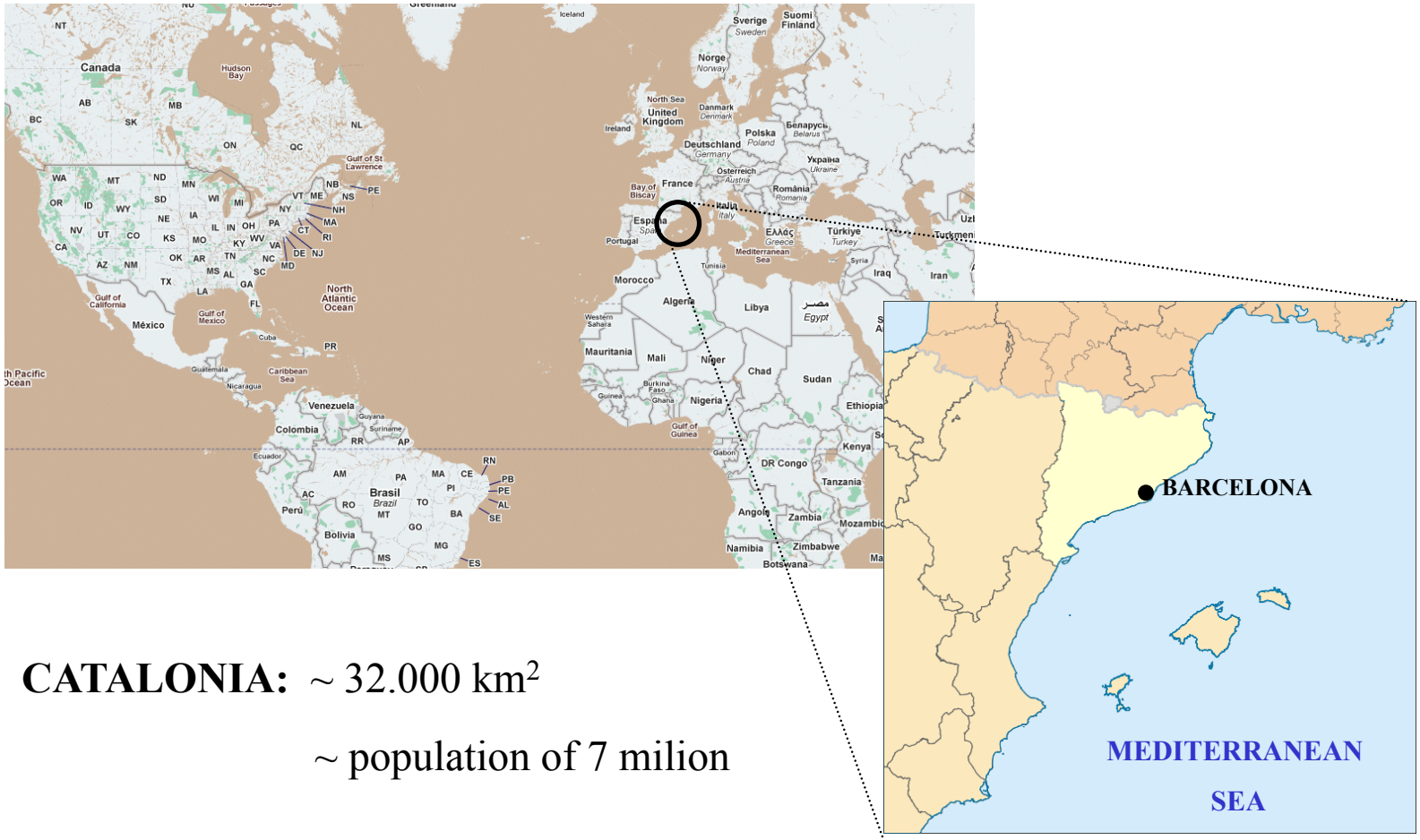
INTRODUCTION

METEOCAT: METEOROLOGICAL SERVICE OF CATALONIA



CATALONIA: ~ 32.000 km^2

~ population of 7 milion

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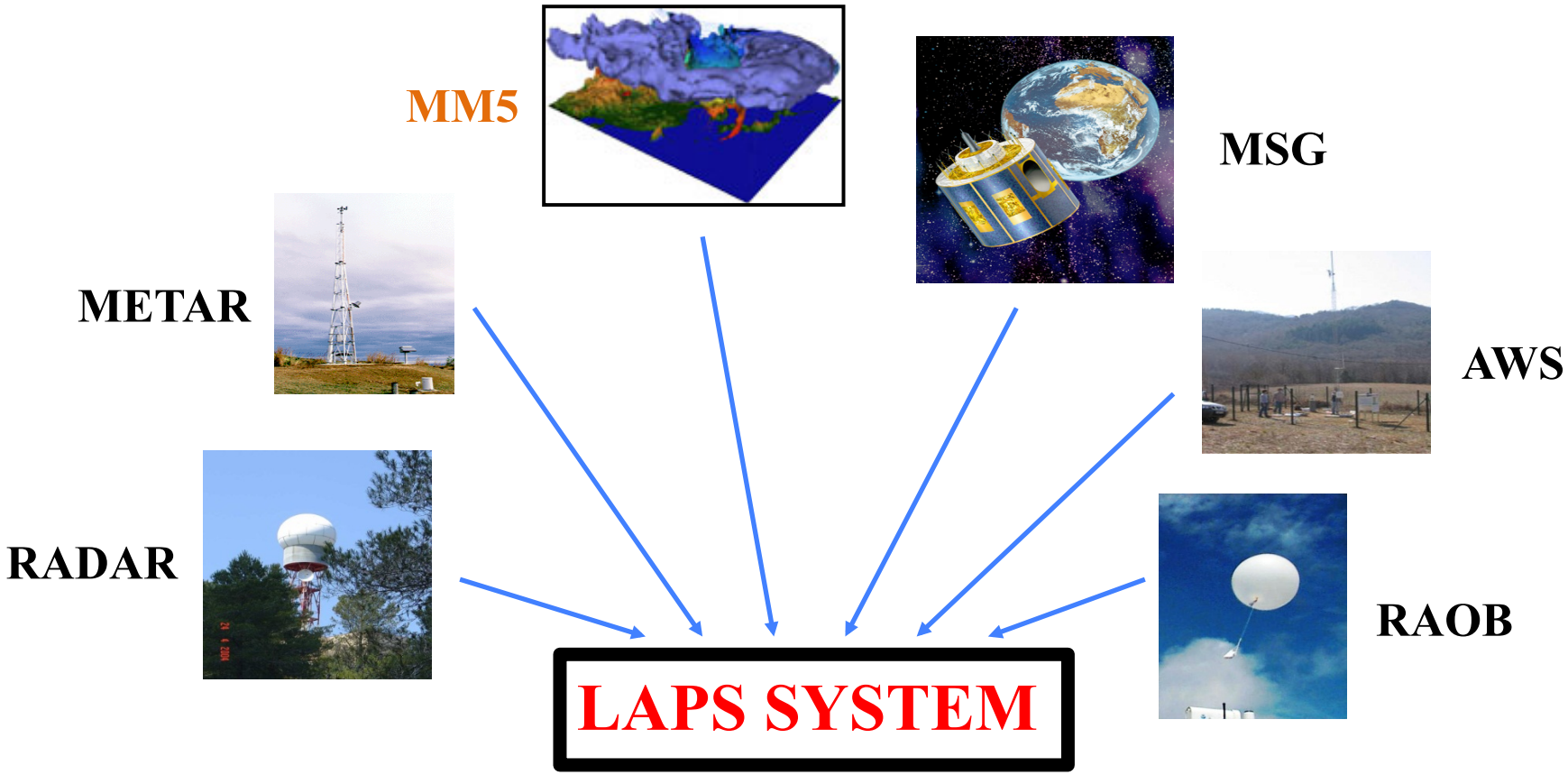
LAPS CONFIGURATION

Ingested data:



LAPS CONFIGURATION

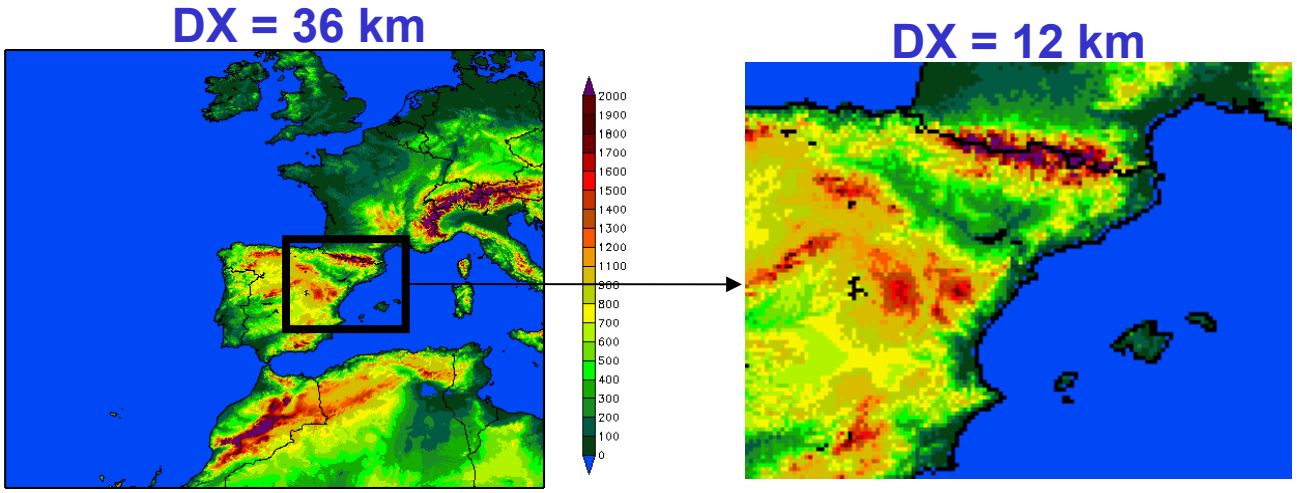
LAPS SYSTEM:

- *Version:* LAPS-0-39-4 (with some modifications)
- *Domains:* 36 km & 12 km (22 levels)

Platform: SGI Altix 350 with 24 processors, IFORT compiler

Background:

- MM5 coarse (36 km, 26 levels)
- MM5 nested (12 km, 30 levels)



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LAPS MODIFICATIONS: INGEST

Background model (LFMPOST.EXE):

Modified interface for MM5 assimilation. Changes in the MSLP calculation using routines of MM5 (not included in LAPS versions).

Surface (METARS, AWS) and Upper air data (RAOB):

New routines to process observational data and write ***LSO*** and ***SND*** files.

Radar data (IRIS FORMAT):

New interface for **IRIS** Doppler radar assimilation (**reflectivity** and **radial velocity**) using **RSL** (NASA TRMM).

Data from **4** Radar (*C band*) available:

Ubicacions dels radars meteorològics de la XRAD

LAPS MODIFICATIONS: INGEST

SATELITE DATA (MSG 9):

LAPS was conceived to use satellite data: GOES12

MSG (Meteosat Second Generation) requires major changes because:

- Different channels in both satellites.
- Different resolution at sub-satellite point and the zenith angle.

Satellite data obtained from MSG (five channels are obtained):

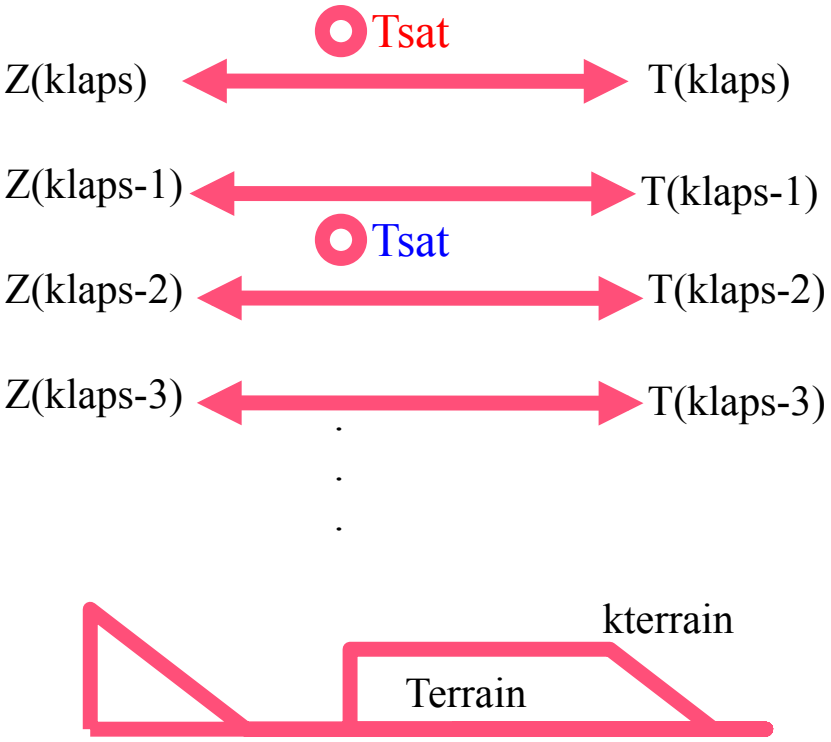
Visible, IR(12 micron), IR(3.9 micron), IR(10.8 micron) and Water Vapour(6.2 micron)

LAPS MODIFICATIONS: CLOUD

CLOUD ANALYSIS:

Modification routines to process satellite and radar: Cloud top

Original LAPS 0-36-7



Modified LAPS

What if Tsat < T(klaps)?

frac=T(klaps) – T(klaps-1)/ Tsat – T(klaps)

arg=H(klaps-1)+frac*(H(klaps)-H(klaps-1)

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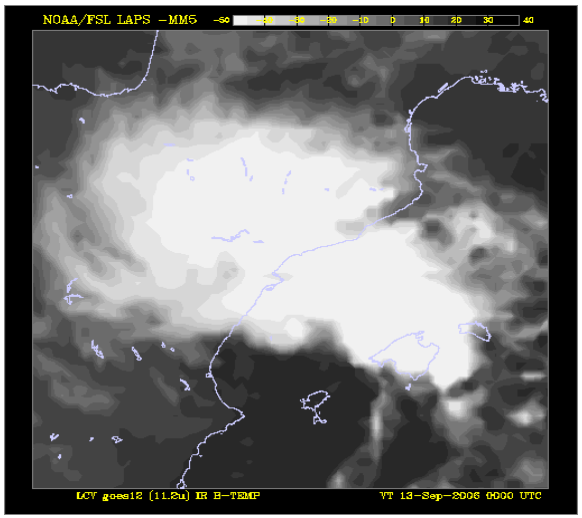
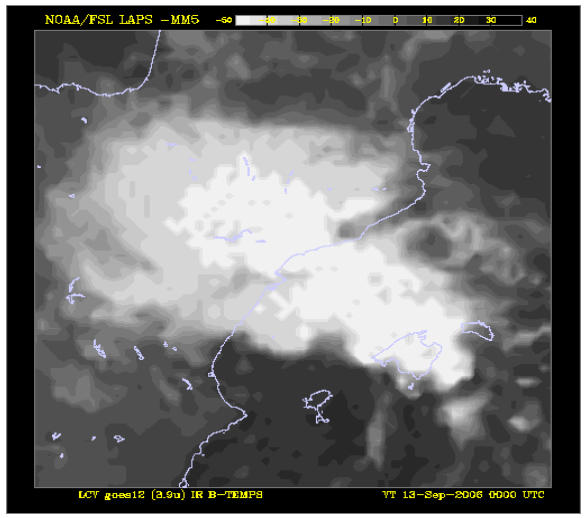
CLOUD ANALYSIS: 09/13/2006 (00UT)

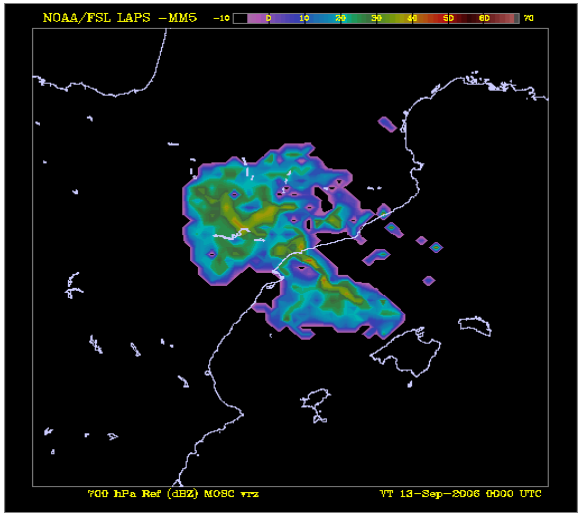
OBS.



Meteosat IR (10.8u)

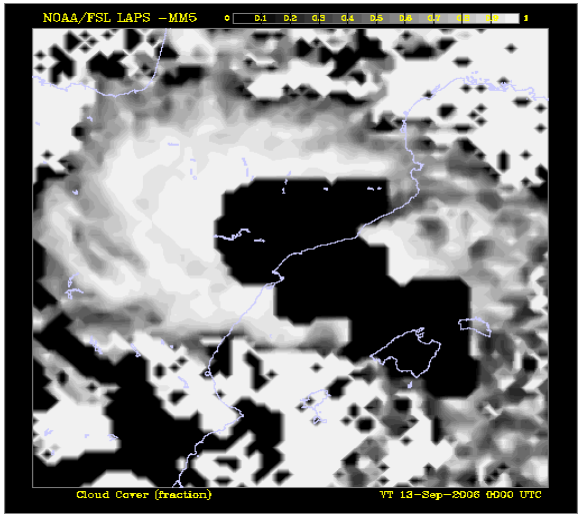


Meteosat IR (3.9u)

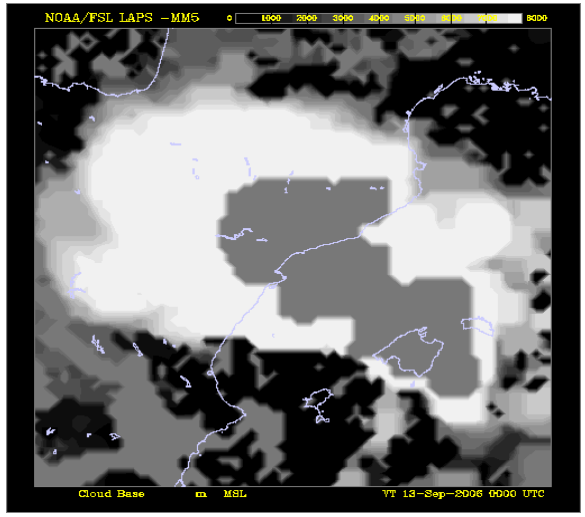


Radar Ref. (700 hPa)

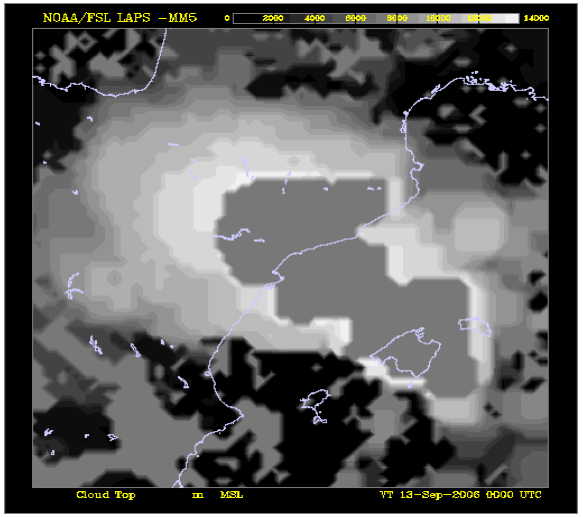
LAPS 0-36-7



CLOUD COVER



CLOUD BASE



CLOUD TOP

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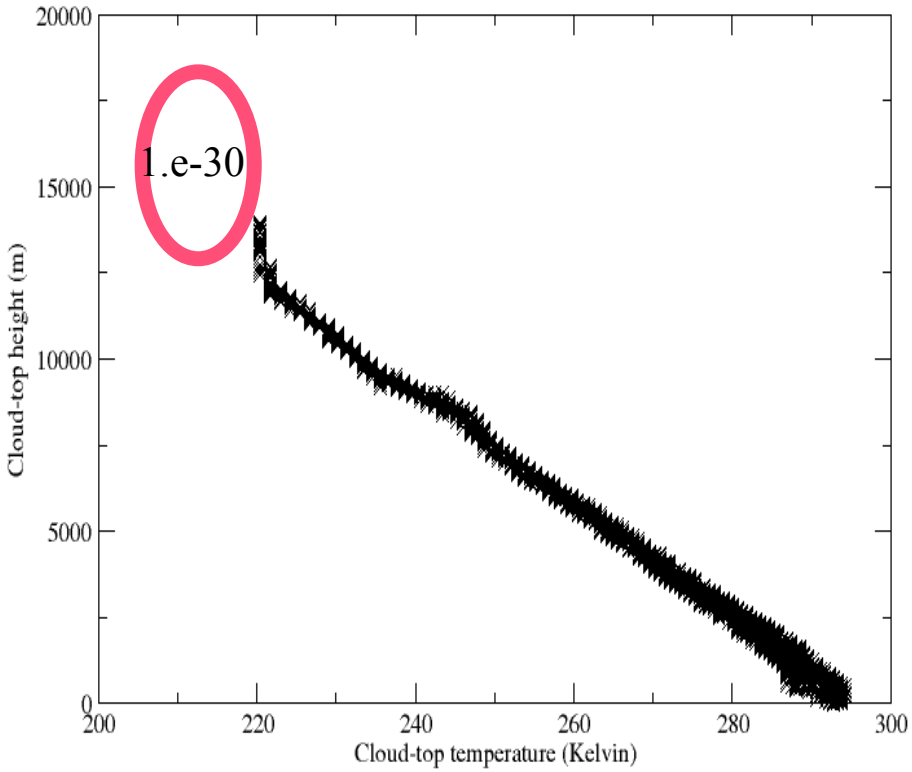
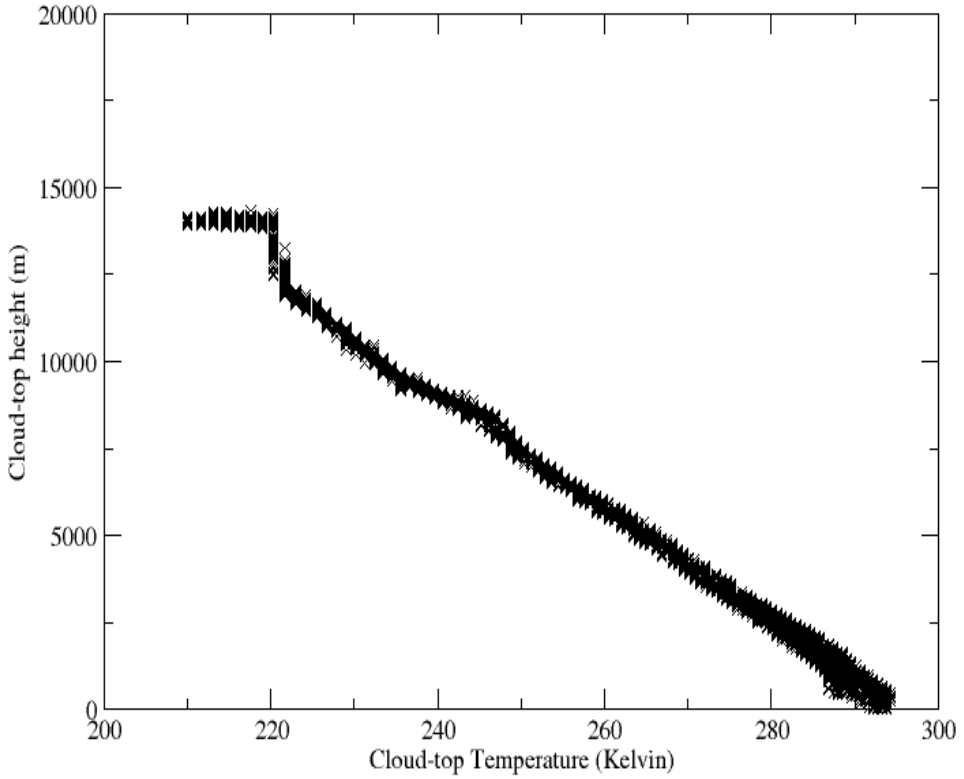
LAPS MODIFICATIONS: CLOUD

CLOUD ANALYSIS EXAMPLE: Cloud top

Original LAPS 0-36-7



Modified LAPS



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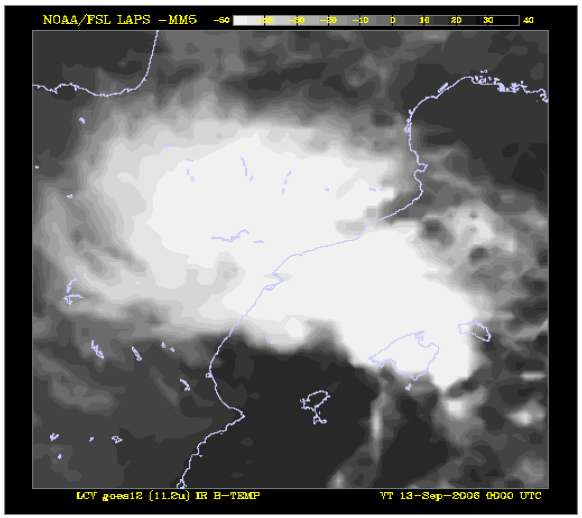
CLOUD ANALYSIS: 09/13/2006 (00UT)

OBS.



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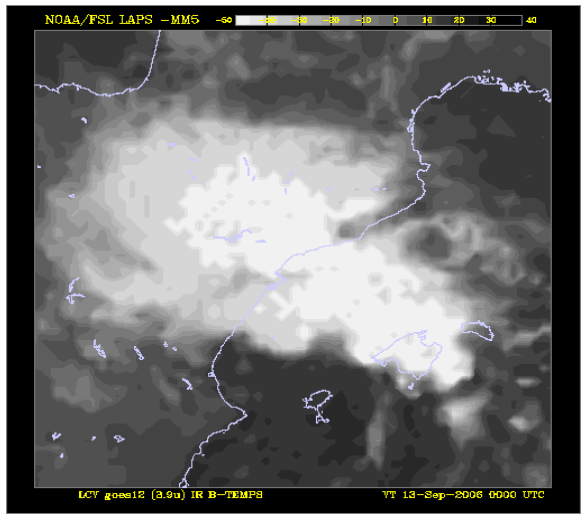

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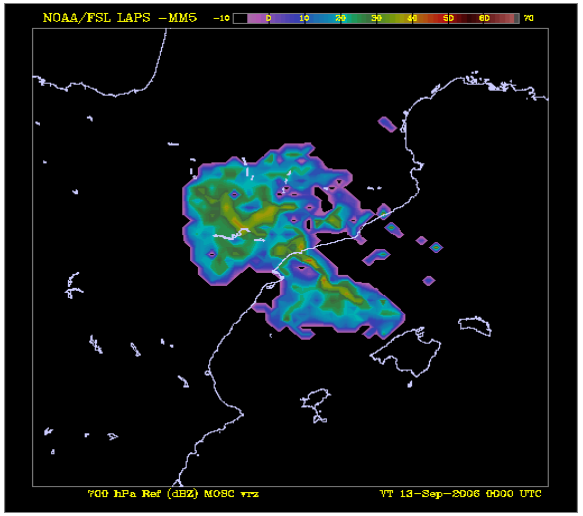
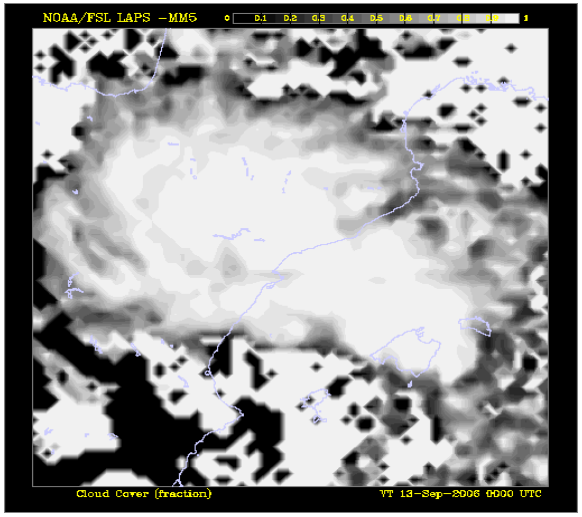
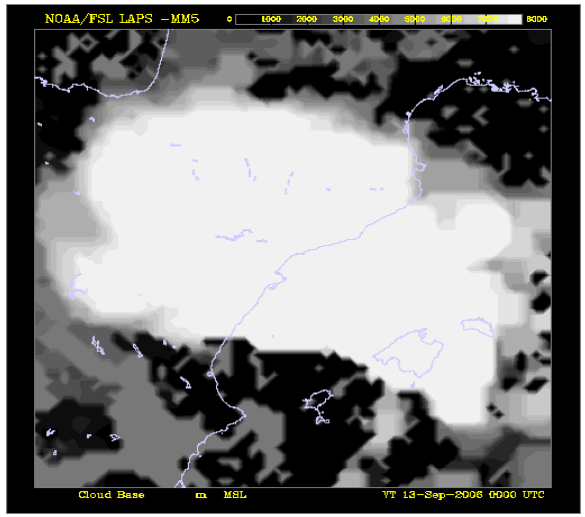


Radar Ref. (700 hPa)

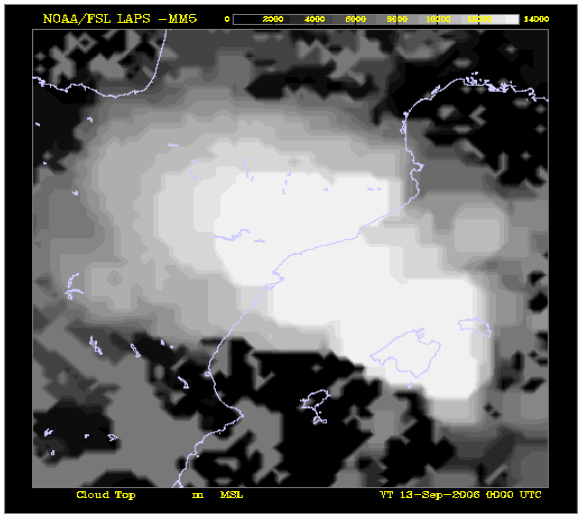
MOD. C.T.



CLOUD COVER



CLOUD BASE



CLOUD TOP

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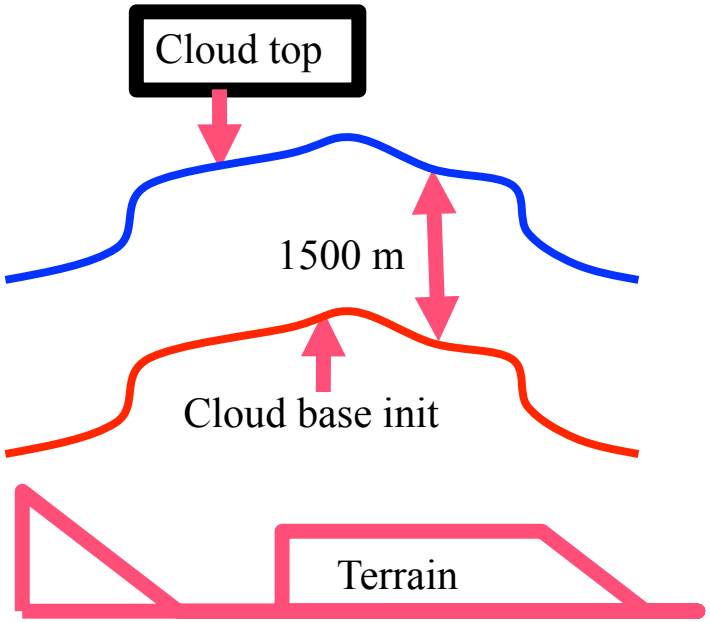
LAPS MODIFICATIONS: CLOUD

CLOUD ANALYSIS:

Modification routines to process satellite and radar: **Cloud base**

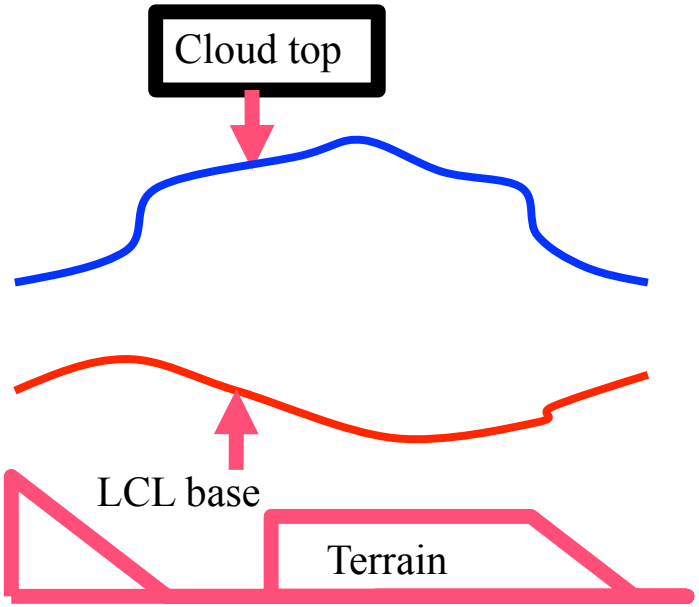
Original LAPS 0-36-7

Cloud base_init= cloud_top - 1500m



Modified LAPS

Cloud base_init = f(cloud top,LCL)



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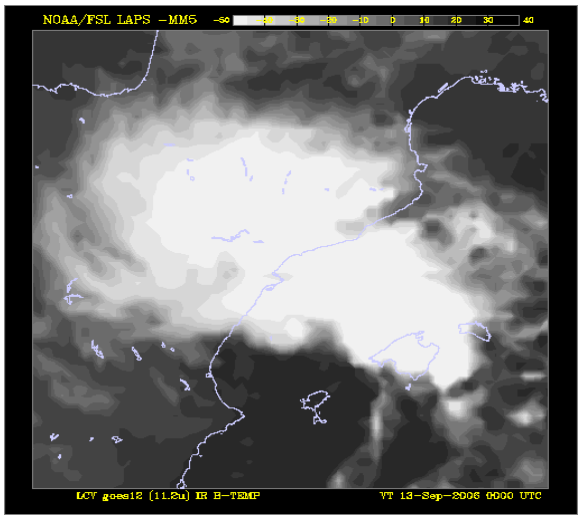
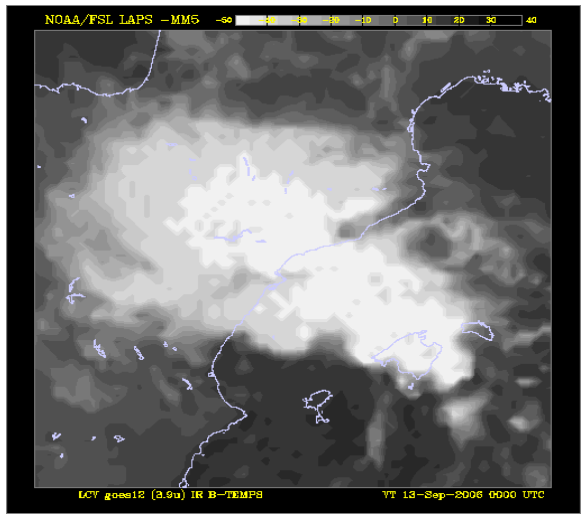
CLOUD ANALYSIS: 09/13/2006 (00UT)

OBS.



Meteosat IR (10.8u)



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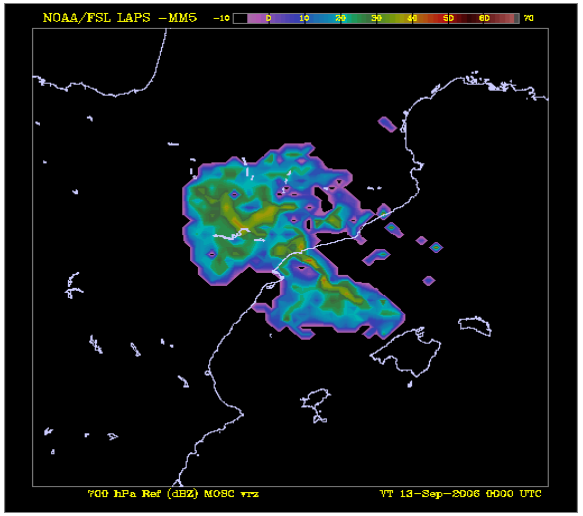
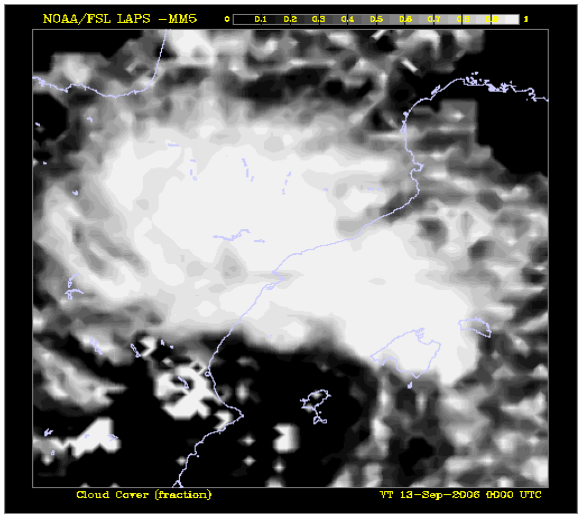
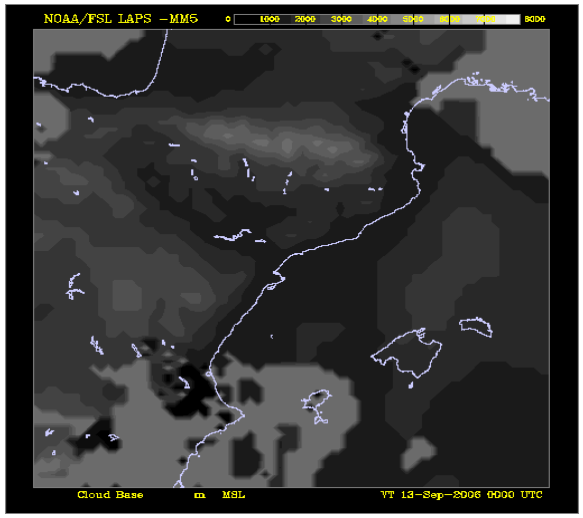


Radar Ref. (700 hPa)

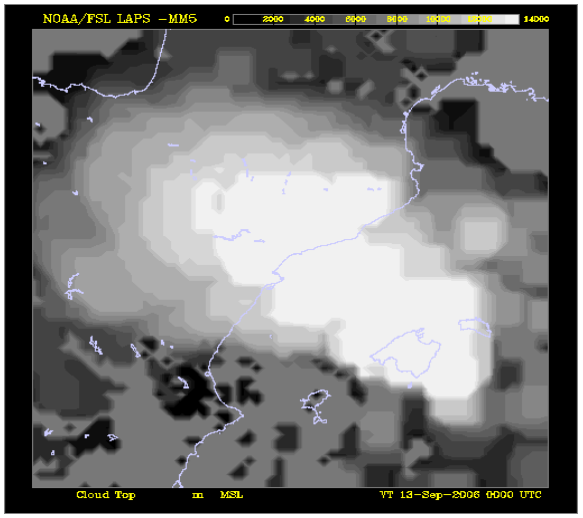
MOD. C.T. & C.B.



CLOUD COVER



CLOUD BASE



CLOUD TOP

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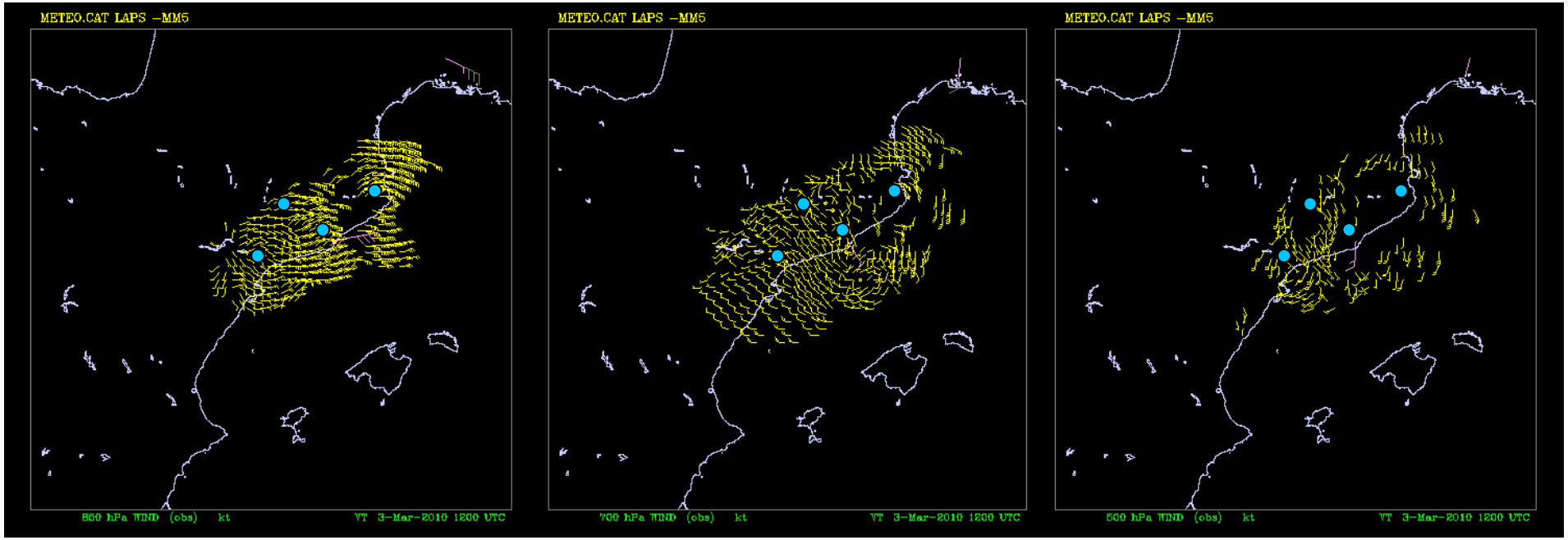
LAPS MODIFICATIONS: WIND

WIND ANALYSIS:

Minor modification in **multiwind_noZ.f** for radar wind computation (only when multi-radar n=4)

RADAR WIND OBSERVATIONS



850 hPa **700 hPa** **500 hPa**

- **RADAR POSITION**

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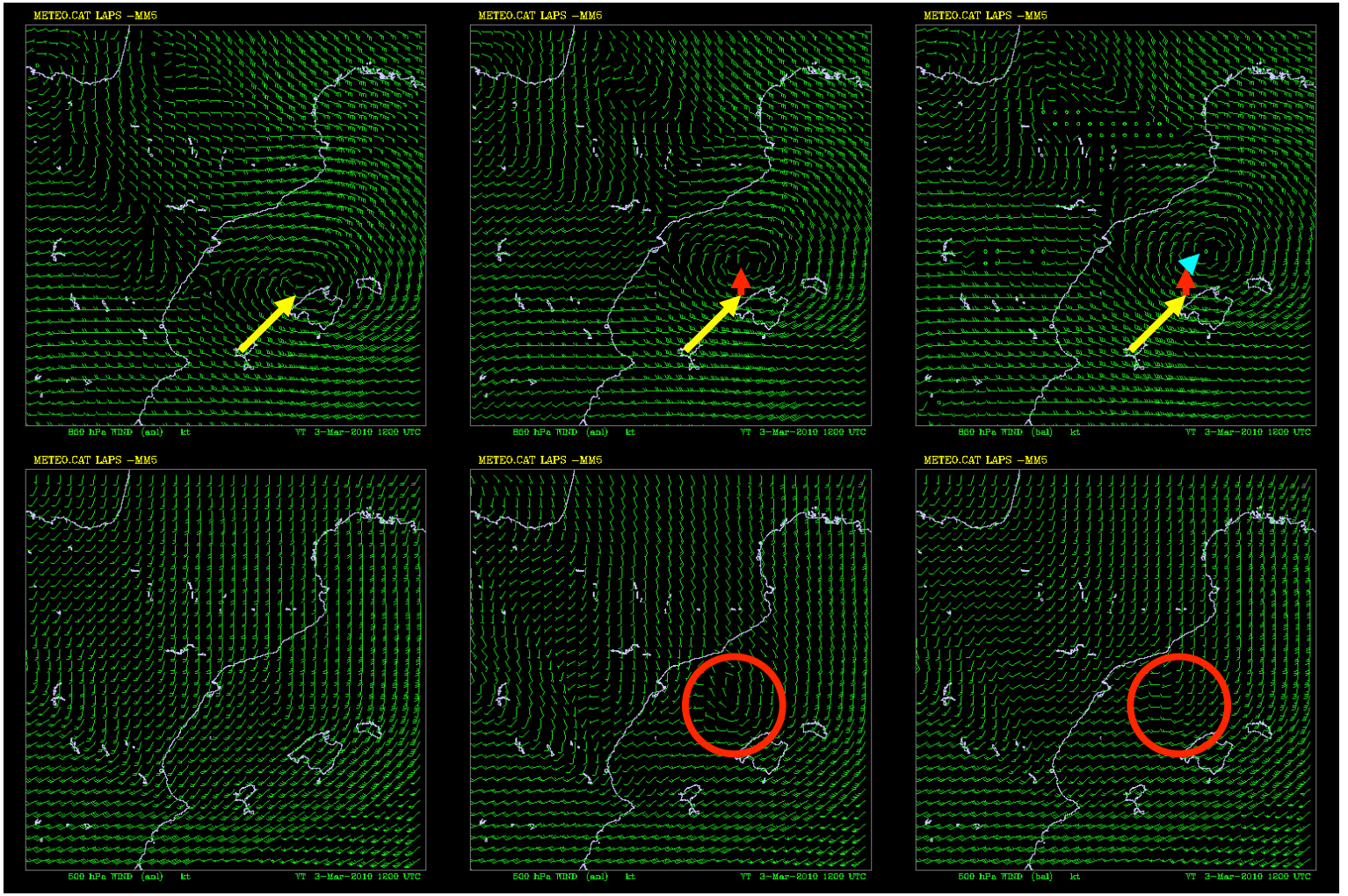
WIND ANALYSIS: 03/03/2010 (12UT)

CONV. OBS. + RAD. WIND + BALANCE

850 hPa

500 hPa



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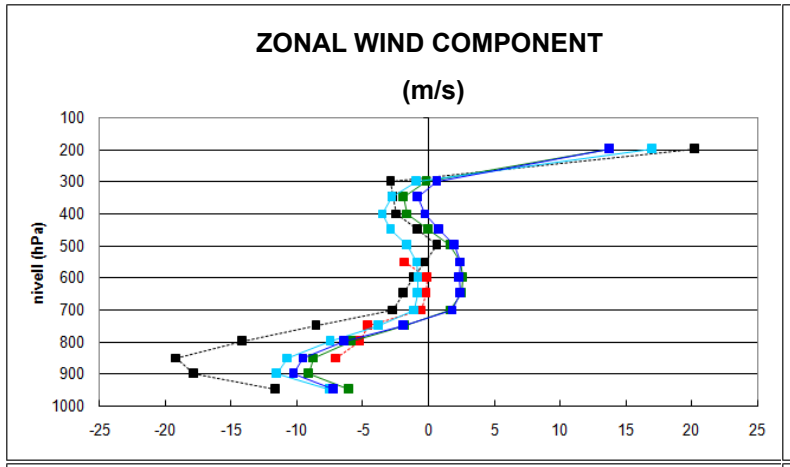
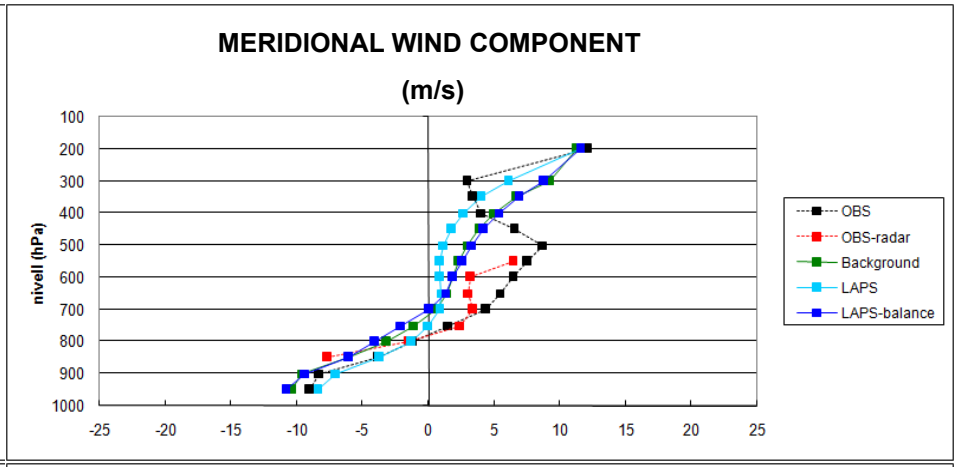
WIND ANALYSIS: 03/03/2010 (12UT)

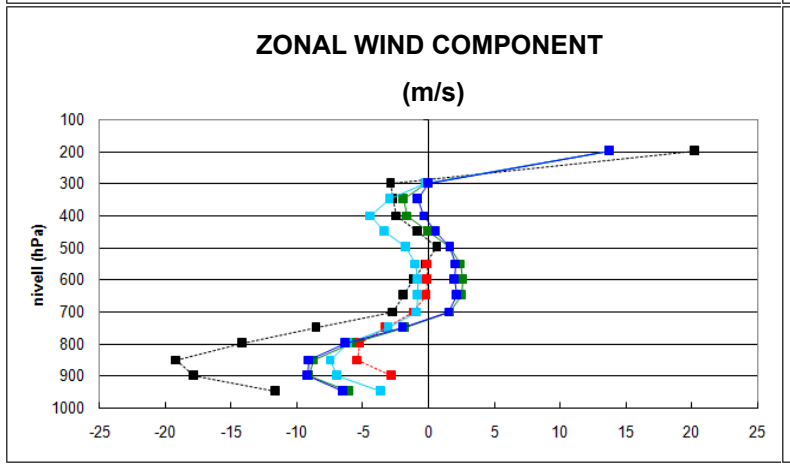
VERIFICATION: BCN SOUNDING

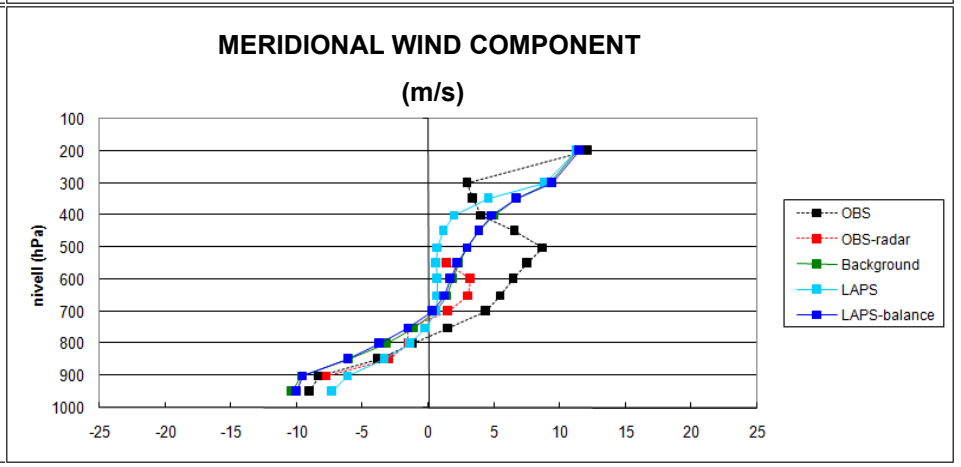
WITH BCN SOUND





WITHOUT





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OPERATIONAL LAPS

Observational data operationally assimilated:

	LAPS 12 km	LAPS 36 km	LAPS intermediate files
	# obs	*# obs*	
- MSG	(1)	(1)	lvd
- RADAR	(4)	(4)	vrz, v01, v02, v03, v04
- METAR	(~35)	(~400)	lso
- RAOB	(~5)	(~50)	snd
- AWS	(~200)		lso
- NWP	MM5-12km	MM5-36km	lga, lgb

Coupling LAPS with MM5 procedures:

- WARM: update every 3 hours (nudging)
- HOT: update every 1 hour

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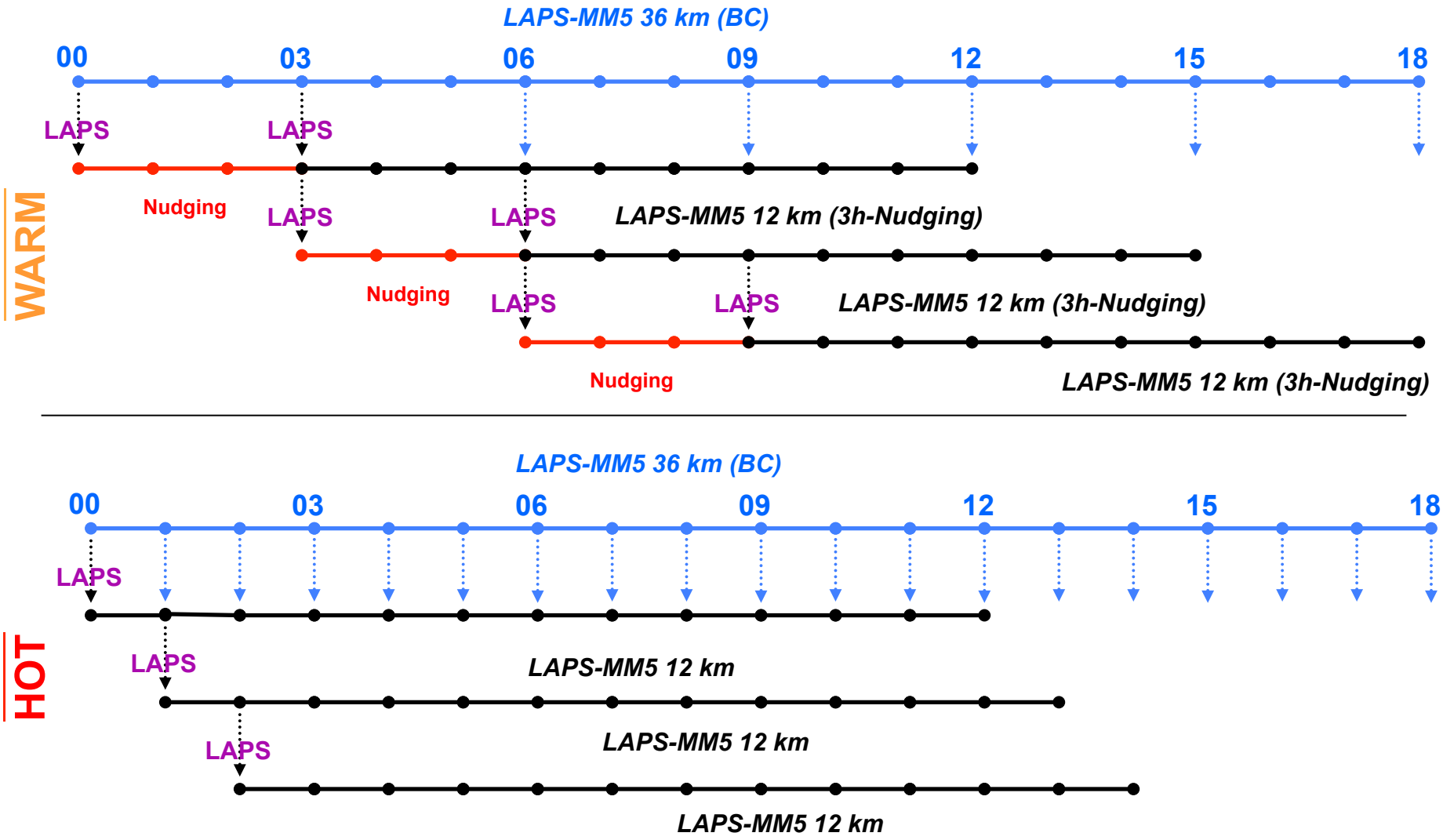
OPERATIONAL LAPS



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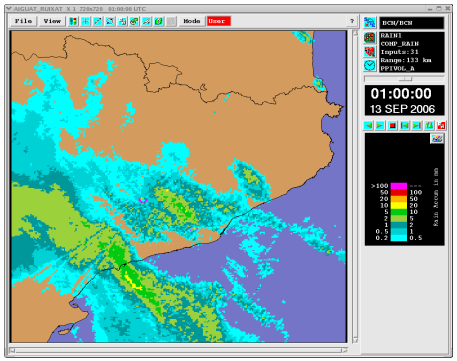
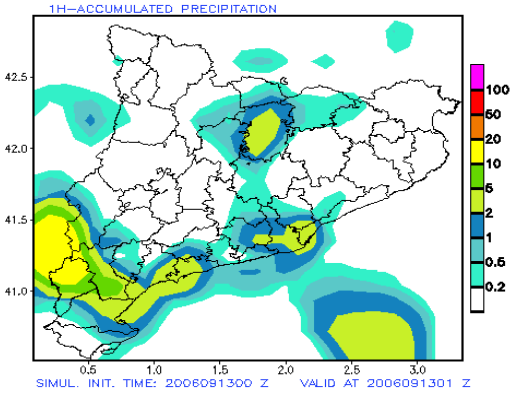
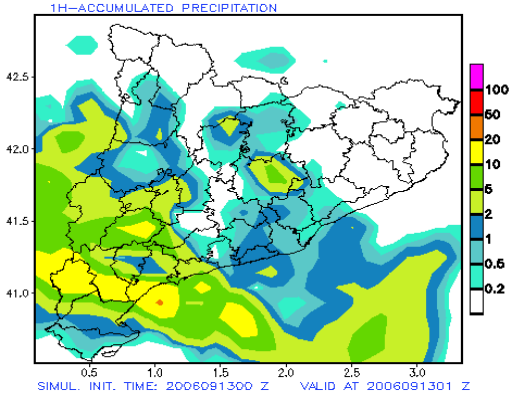
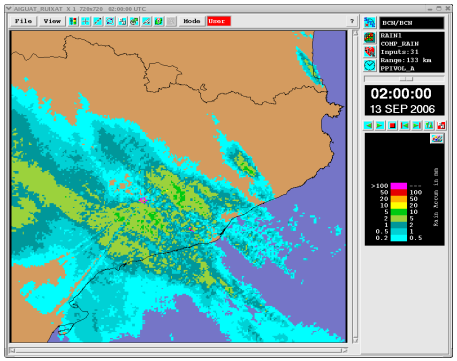
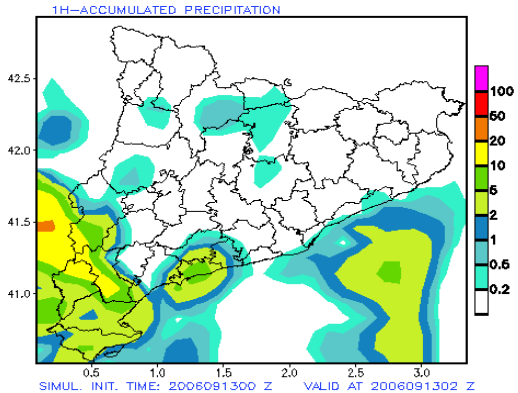
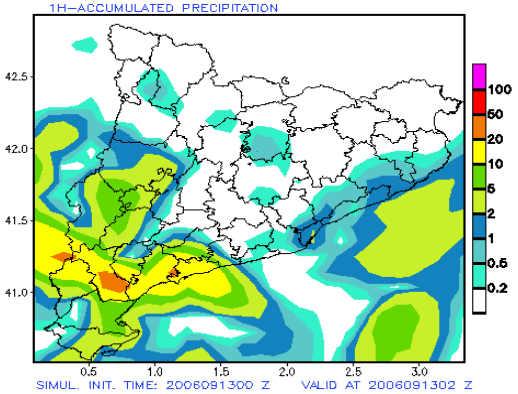
OPERATIONAL LAPS

Impact of LAPS to improve short-term QPF : Case study 13 September 2006

	OBS. RADAR	MM5 (control)	MM5-LAPS (3h-nudging)
00-01 Z			
01-02 Z			

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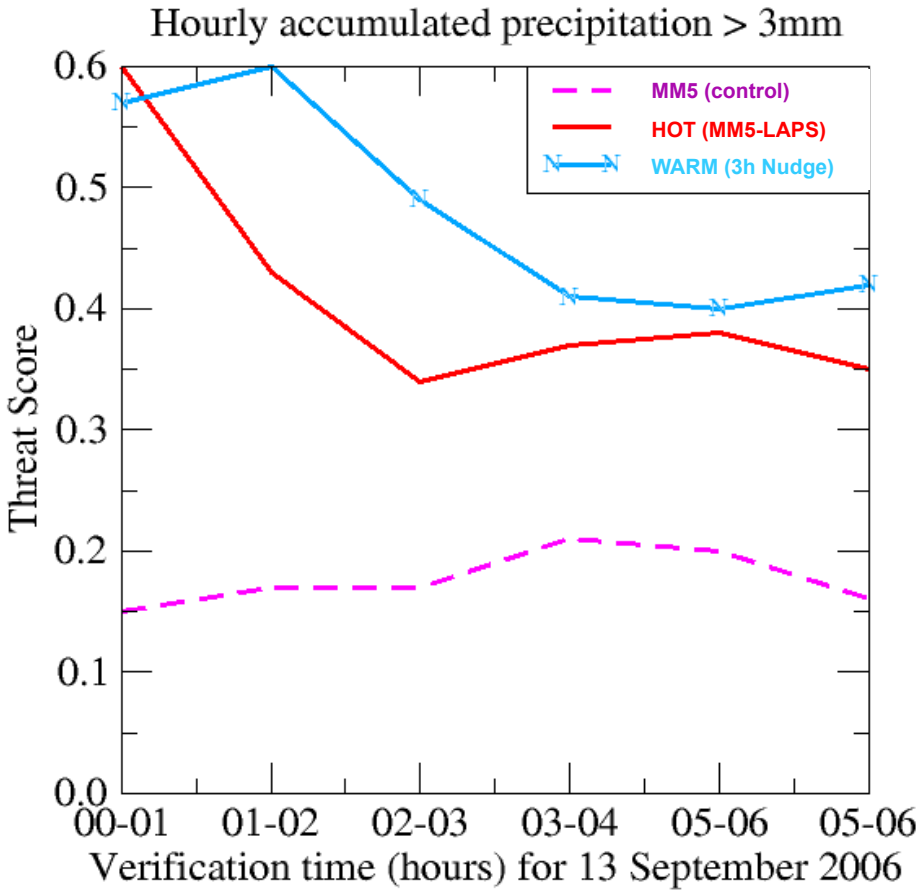

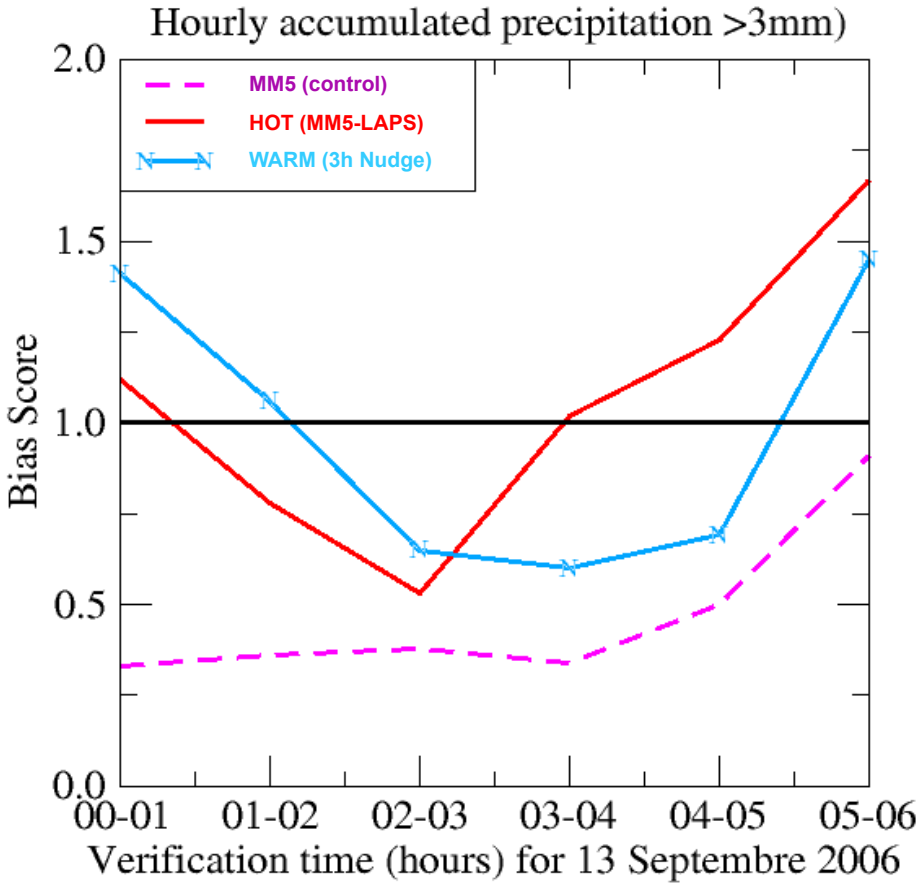

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CONCLUSIONS & FUTURE WORK

Summary & Future work:

• Modifications in **cloud top** and **cloud base** calculation improve the quality of **cloud cover** and **HUMIDITY** analysis.

• A necessary effort is needed to improve the **CLOUD** analysis (**cloud base**).

• **LAPS** system coupled with **MM5** produce better results in QPF during the first 6 hours.

• **Radial velocity wind** from radar data sometimes can deteriorate the **WIND** analysis. Some improvements are needed.

• **LAPS** upgrades are difficult due to the modifications required to ingest **MSG** satellite data.

CONCLUSIONS & FUTURE WORK

Simulations in testing phase:

- Increase resolution in **LAPS** domain (4 km).
- Coupling **LAPS** with **WRF.**
- Test **ECMWF** as a background in the **LAPS** system.
- Quality control in **radar wind:** long-term verification.
- Study **LAPS** surface analysis when using **AWS** local network .
- On-line verification of **QPF** using **LAPS-MM5** system (fuzzy verificaction).

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THE END

THANK YOU !

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