

# QPF over Austria

Amadeus project 2005-2006

E. Bazile, F. Wimmer, Y. Seity and Y. Wang

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# Status of the TKE and the shallow convection in ARPEGE/ALADIN-MF

E. Bazile (GMAP), P. Marquet (GMGEC), S.  
Malardel (GMME)

GAME/CNRM (Météo-France/CNRS)

# QPF over Austria (Amadeus 2005-2006)



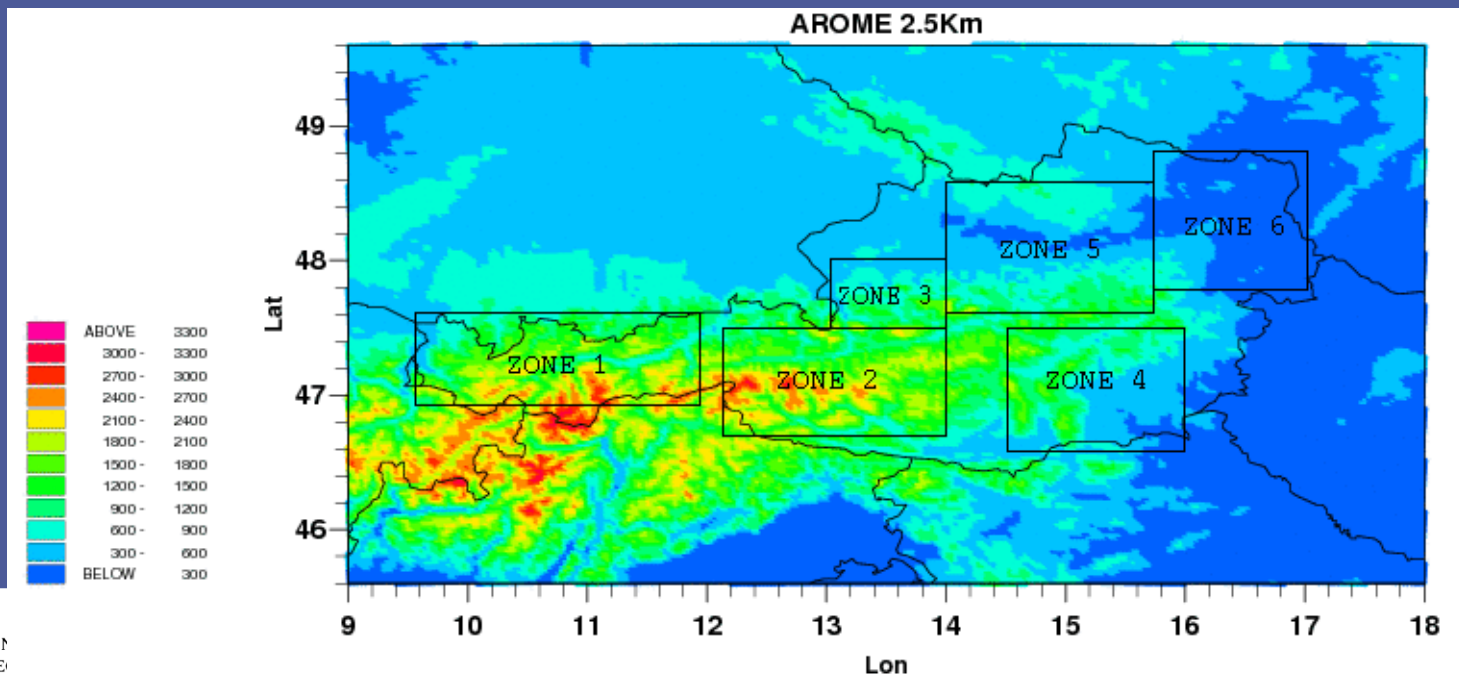
- August, October 2005 and April 2006 (in plan)
- HIRLAM will send the data ?
- and ALADIN-XX ?

# NWP models and experimental setup

- ARPEGE: Oper and PCS (oper since June 2006) 25km
- ALADIN-MF : OPER and PCS 9.5km
- ALADIN-ZAMG 9km
- ALADIN-CHMI (M. Janouzek) 9km
- ALADIN –SHMU (M. Derkova) 9Km
- HIRLAM-INM (J.A. Garcia-Moya) 13km
- HIRLAM-RCR (K. Eerola)
- HIRLAM-KNMI (S. Tijm)
- AROME-Prototype 2.5Km

# NWP models and experimental setup

- 3 periods: August, October 2005 and April 2006
- 24h forecasts starting at 00UTC
- Two comparisons:
  - 24h precipitation accumulation (20km grid)
  - 0-6h, 6h-12h, 12h-18h, 18h-24h (10km grid)



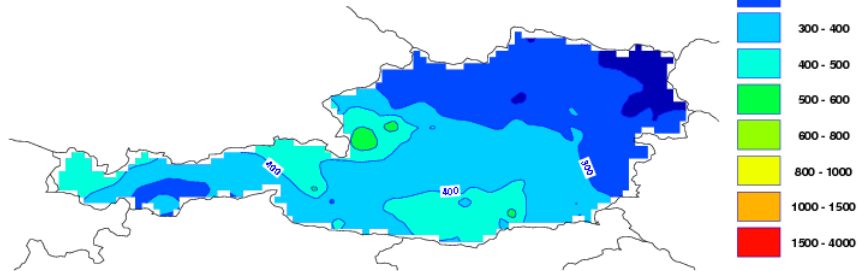
# POD, FAR, ETS, HSS

	Obs. Yes	Obs. No
Forecast Yes	Hit (a)	False Alarm (b)
Forecast No	Miss (c)	Correct rejection(d)

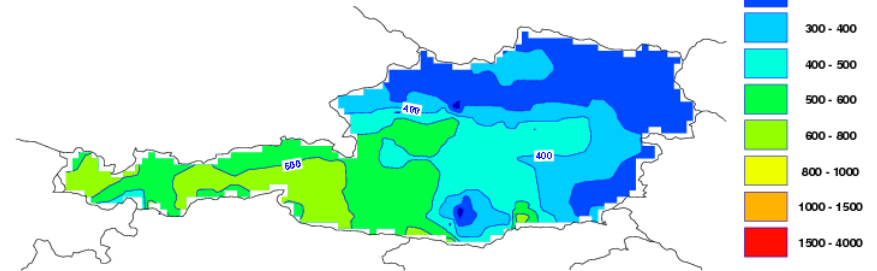
- POD Probability of Detection =  $a/(a+c)$
- FAR False Alarm Rate =  $b/(a+b)$
- ETS Equitable Threat Score = sensitive to the number of hits compared to the number of false alarm and misses:  
$$(a - R) / (a+b+c-R)$$
with R represents the number hits for random chance  
$$(a+b)(a+c)/n$$
- HSS=Heidke Skill Score =  $(a+d-Ref)/(T-Ref)$  with  
 $T=a+b+c+d$  and  $Ref=((a+b)*(a+c)+(b+d)*(c+d))/T$

# Cumulated rain for August, October 2005 and April 2006

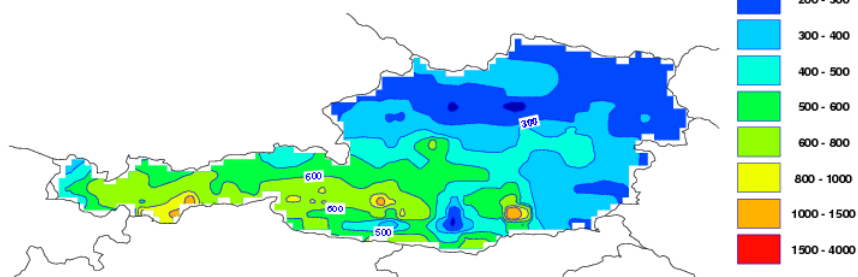
## INCA analysis



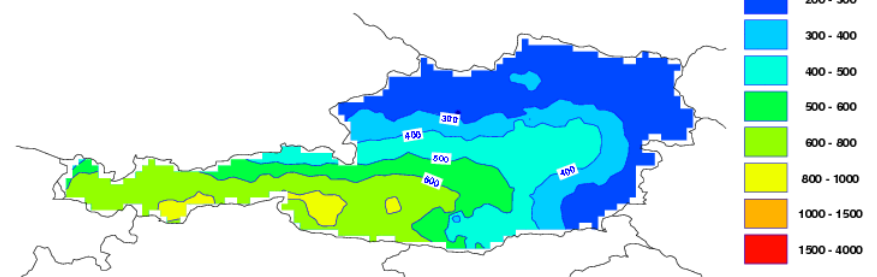
## ARPEGE OPER



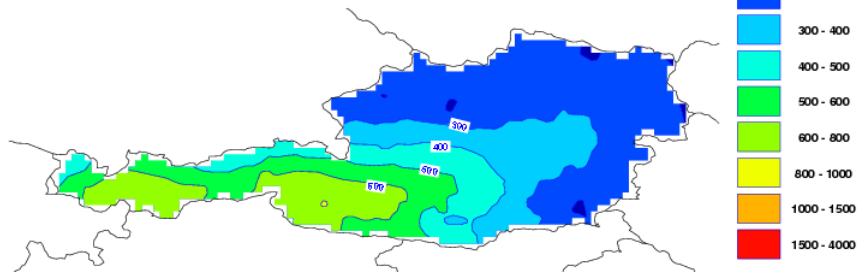
## HIRLAM/INM



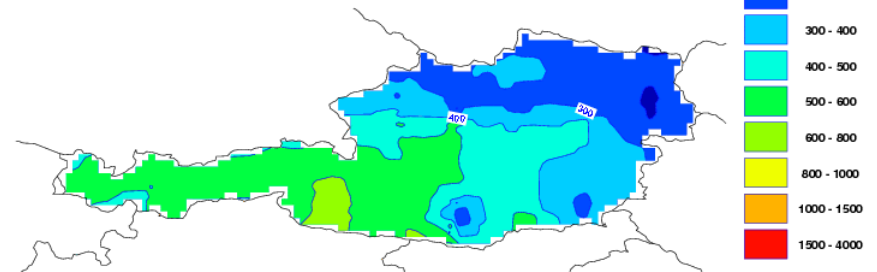
## HIRLAM KNMI



## HIRLAM FMI/RCR

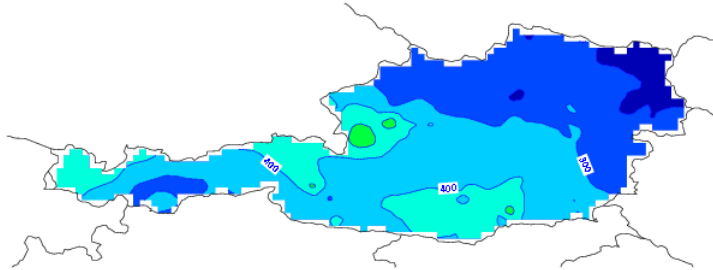


## ARPEGE PCS

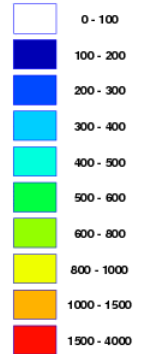
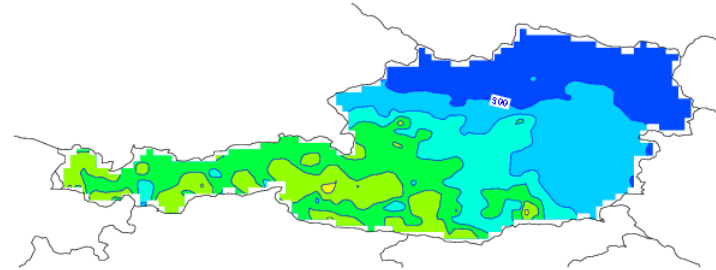


# Cumulated rain for August, October 2005 and April 2006

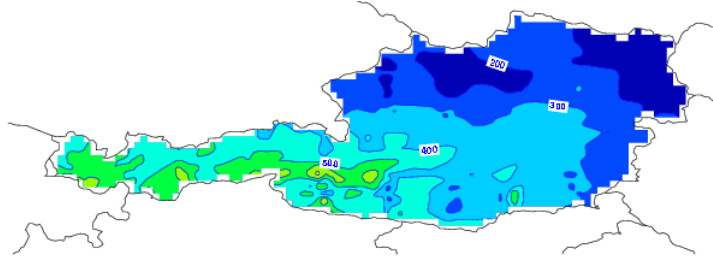
## INCA analysis



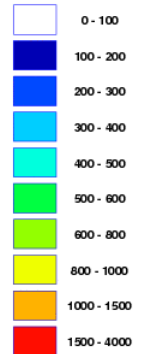
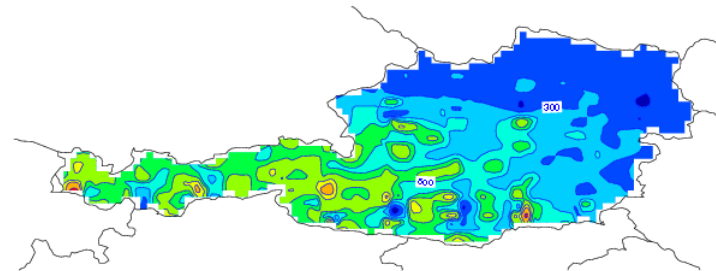
## ALADIN-CHMI



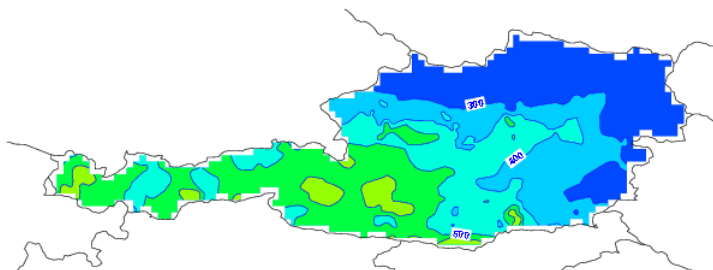
## AROME-Proto



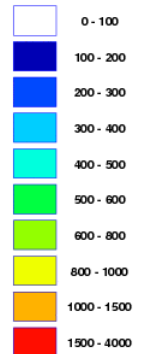
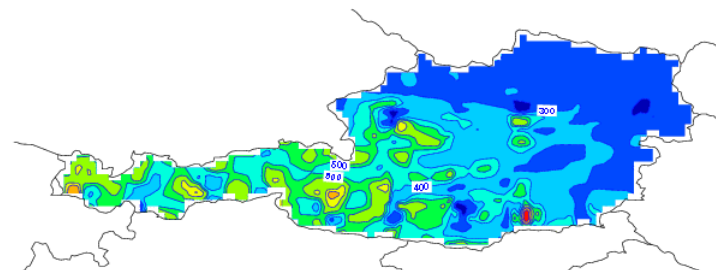
## ALADIN-SHMU



## ALADIN-FR PCS



## ALADIN-ZAMG





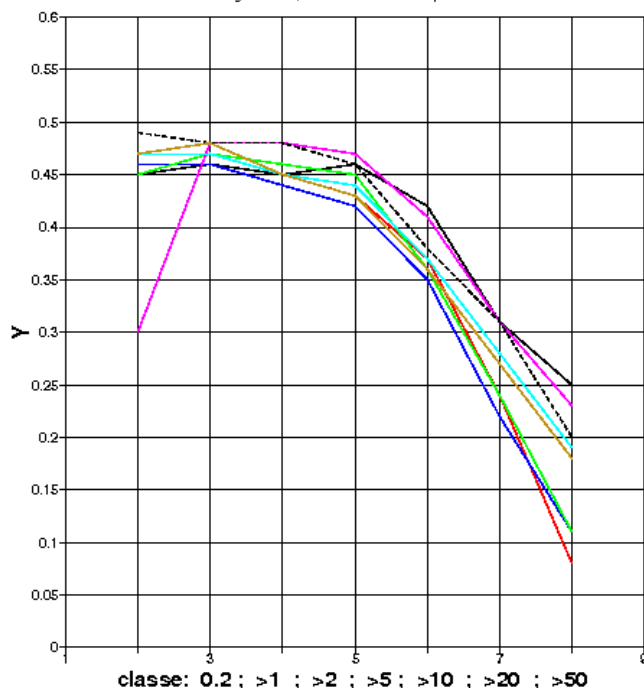
# ETS

August, October 2005 and April 2006

20km , 24h cum

Equitable Threat Score (20km grid and 24h rain)

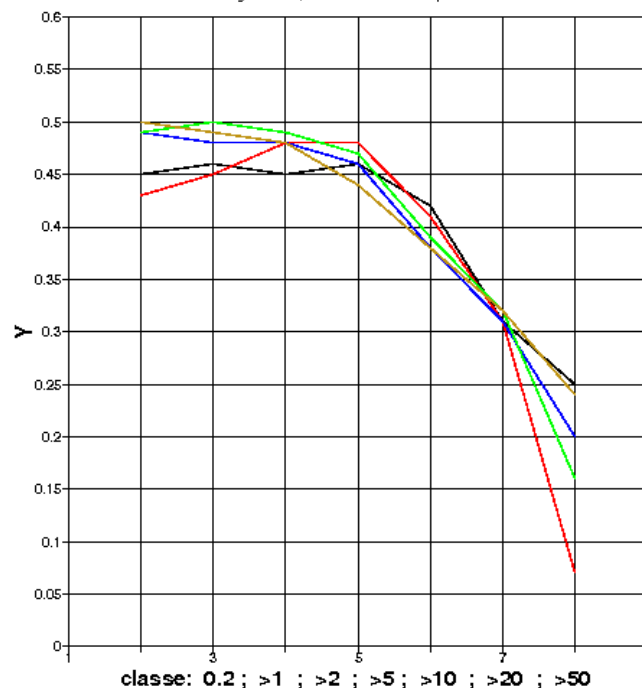
August2005, October2005 and April 2006



- ARPEGE
- HIRLAM\_INM
- HIRLAM\_KNMI
- HIRLAM\_RCR
- ALADIN-CHMI
- - - ALADIN-MF
- ALADIN-SHMU
- ALADIN-ZAMG

Equitable Threat Score (20km grid and 24h rain)

August2005, October2005 and April 2006

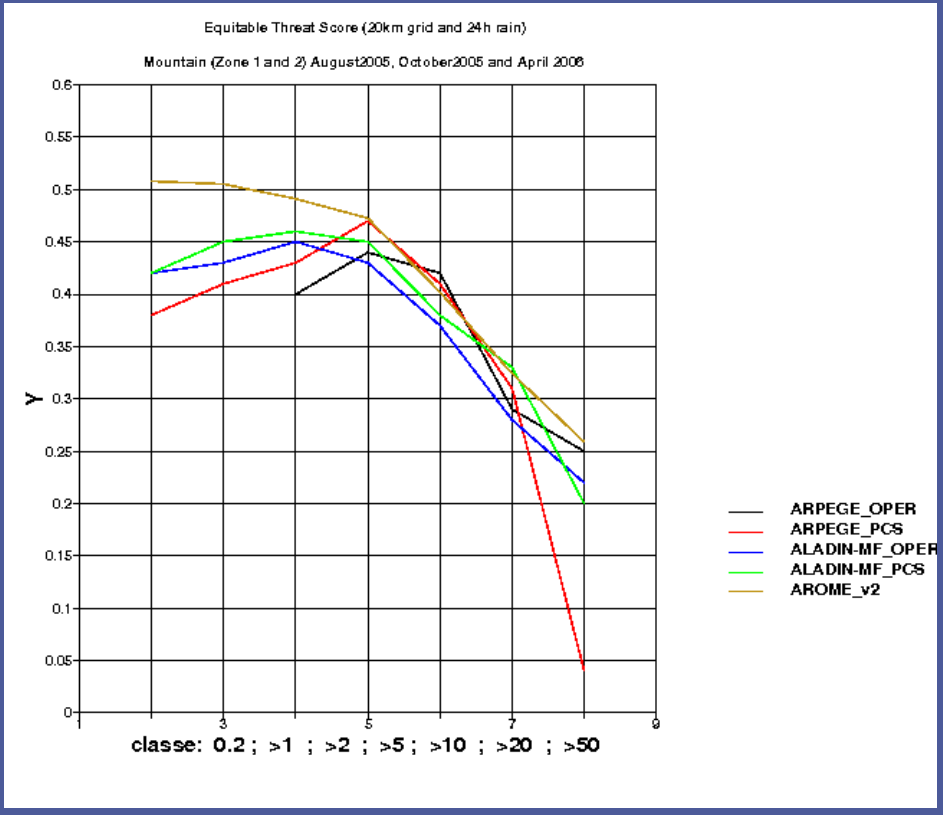
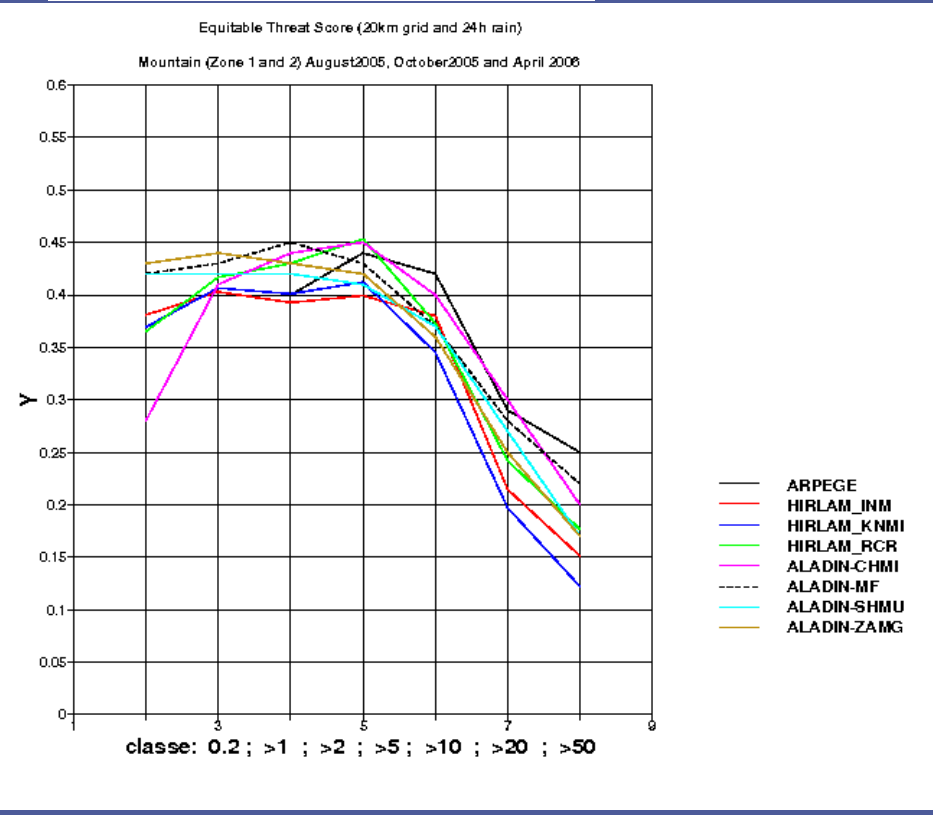
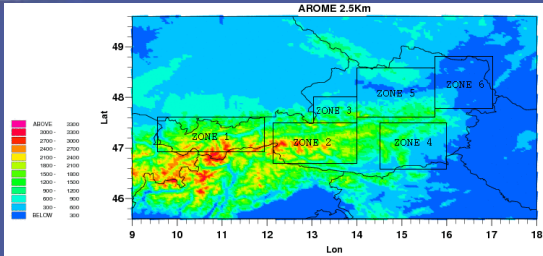


- ARPEGE\_OPER
- ARPEGE\_PCS
- ALADIN-MF\_OPER
- ALADIN-MF\_PCS
- AROME\_v2



# ETS

August, October 2005 and April 2006  
 20km , 24h cum  
 Mountain (Zone1 and 2)



## Remarks:

- The project is finished.
- Were the INCA analysis and the project interesting and useful to validate RR ?  
ARPEGE, ALADIN, HIRLAM and AROME

If yes how to continue ?  
Validation group ?

If no

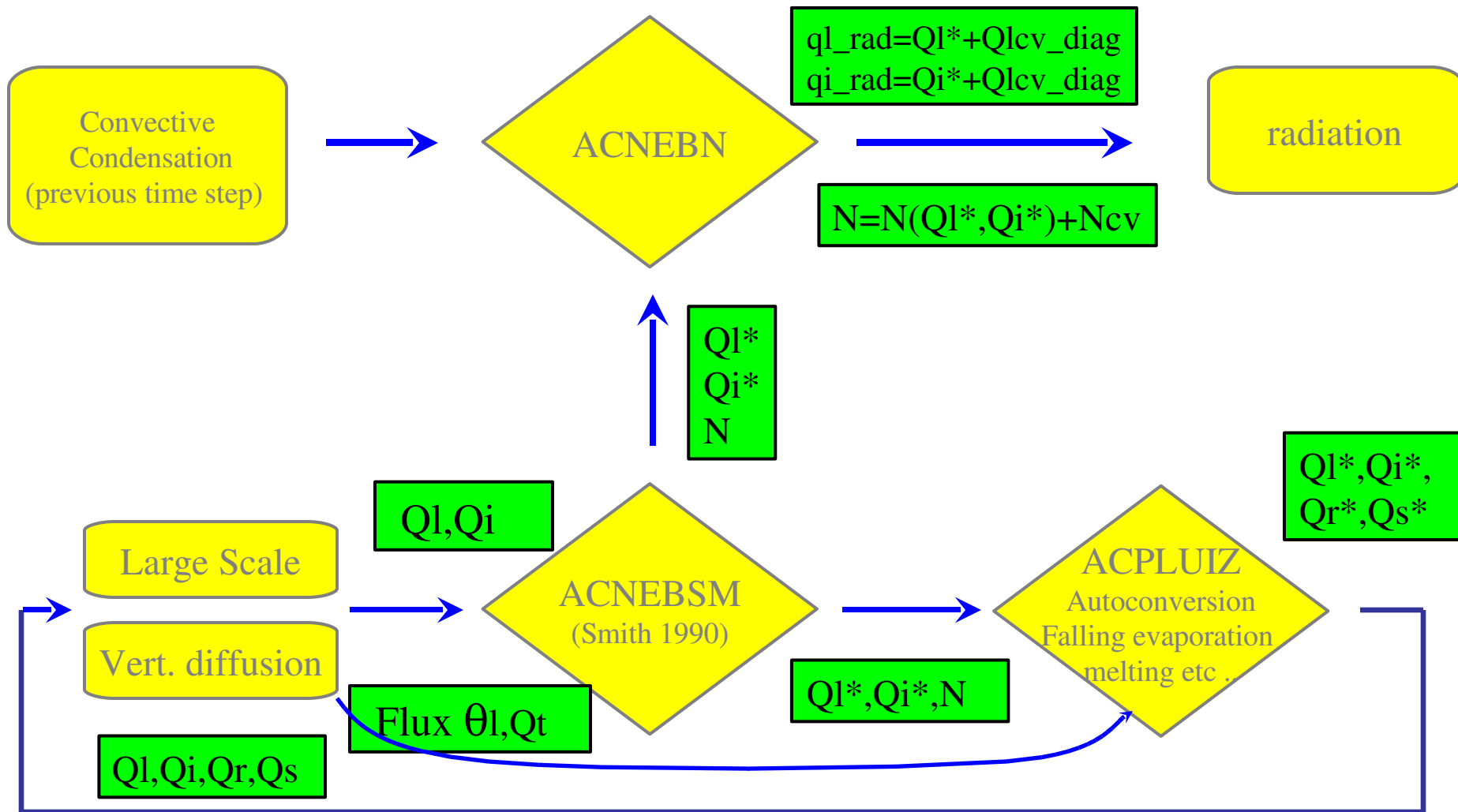


ALADIN Web Site <http://www.cnrm.meteo.fr/aladin> and daily outputs

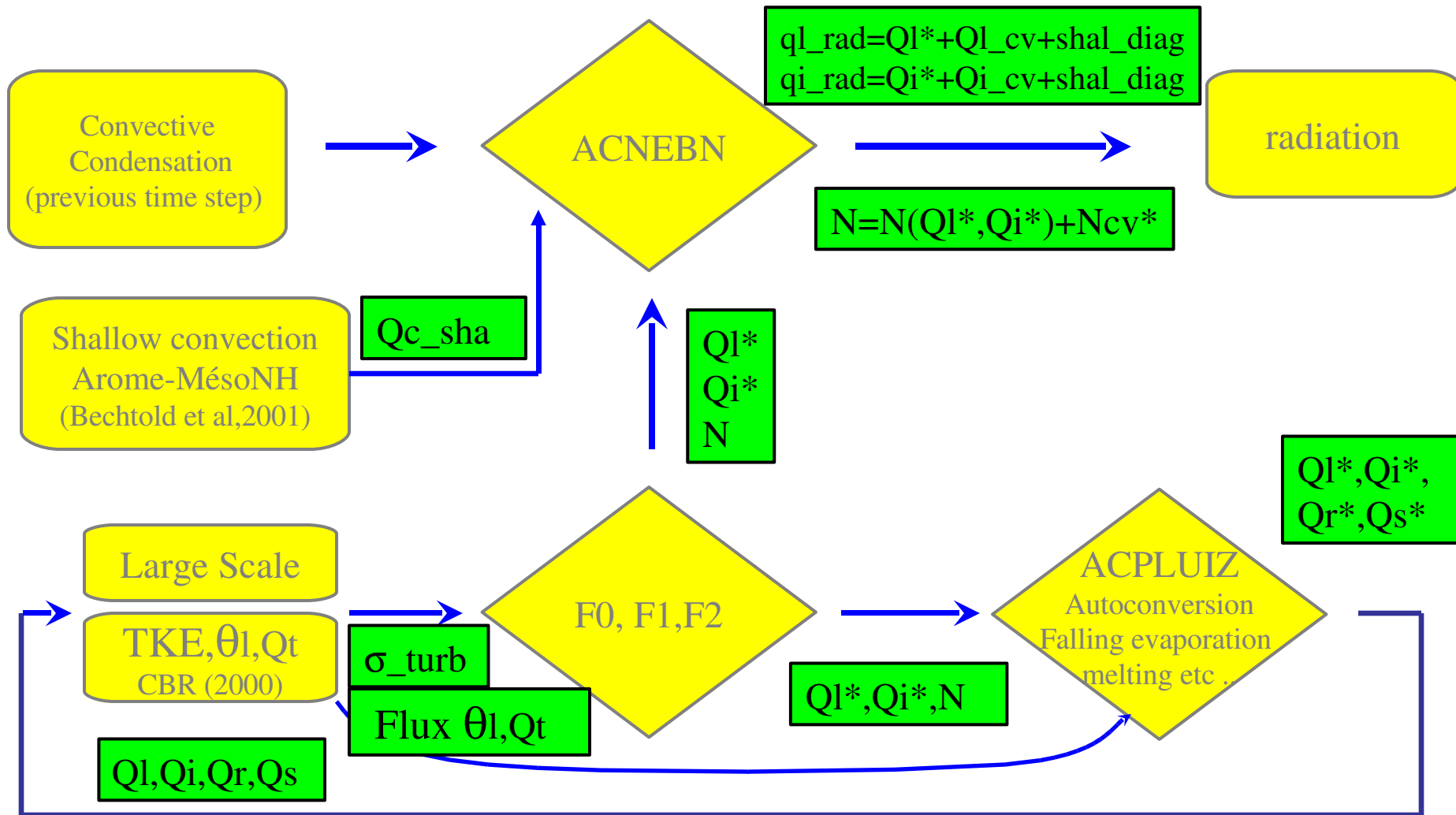
# TKE + Shallow convection

- TKE = CBR(2000) + BL (89) = same scheme as AROME but not the same code
- Shallow convection KFB 2001 = exactly the Méso-NH/AROME code
- ARPEGE/ALADIN Boundary layer scheme == AROME BL scheme → better consistency for the coupling file
- 1D validation on GABLS (1 and 2), BOMEX, Eurocs Cu (ARM)
- 3D experiment in ARPEGE and in ALADIN-MF
- Problems
- Perspectives

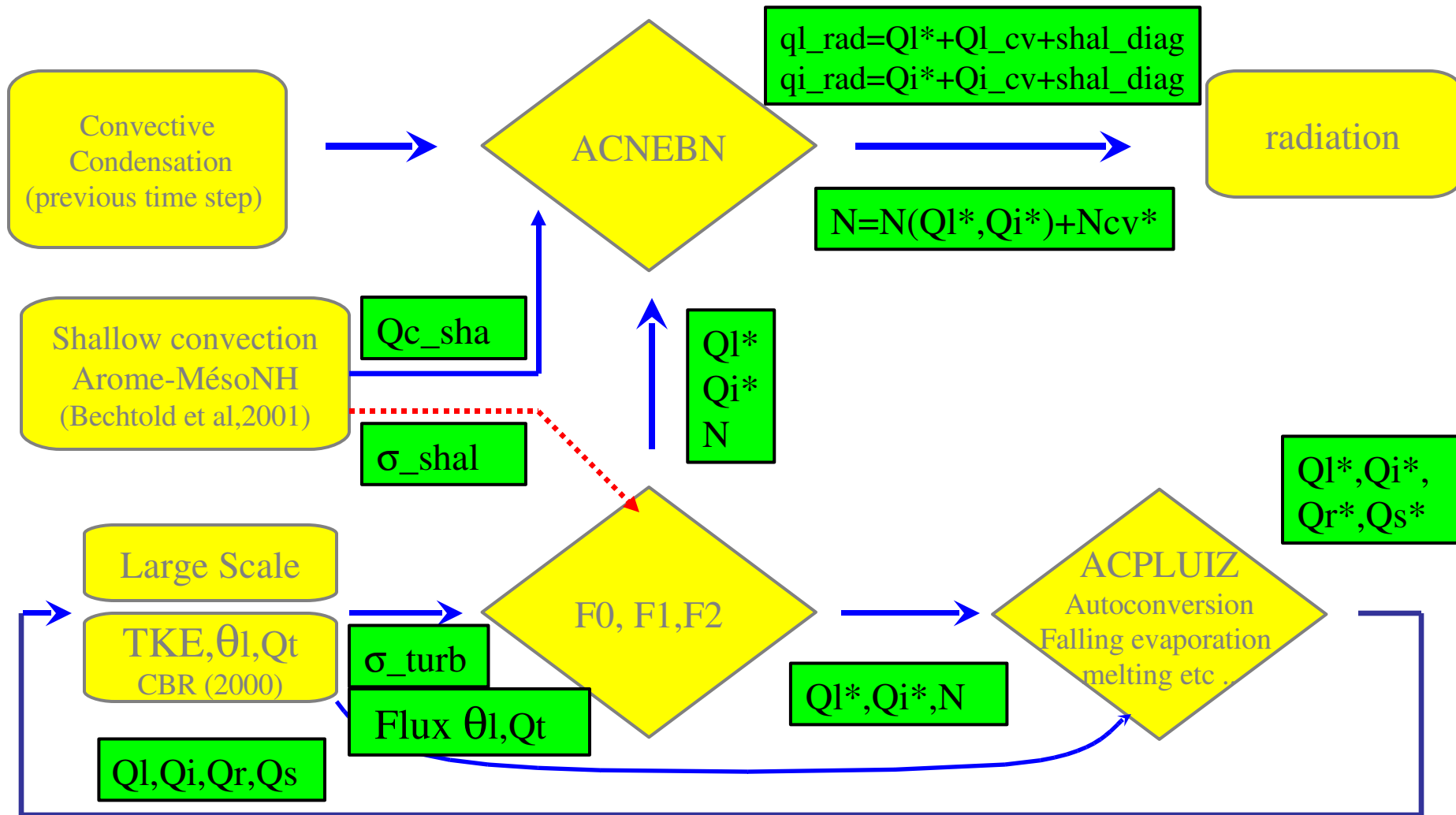
# Precipitation and cloudiness



# Precipitation and cloudiness with TKE and Méso-NH/AROME shallow convection



# Precipitation and cloudiness with TKE and Méso-NH/AROME shallow convection

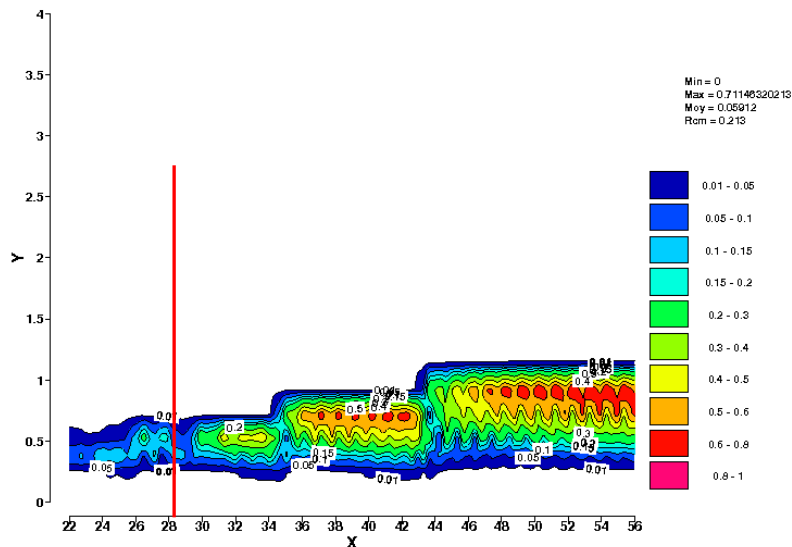


# GCSS WG-1 BOMEX case: Shallow cumulus clouds Fc +36h

dt=900s operational vertical resolution 19l below 5000m..

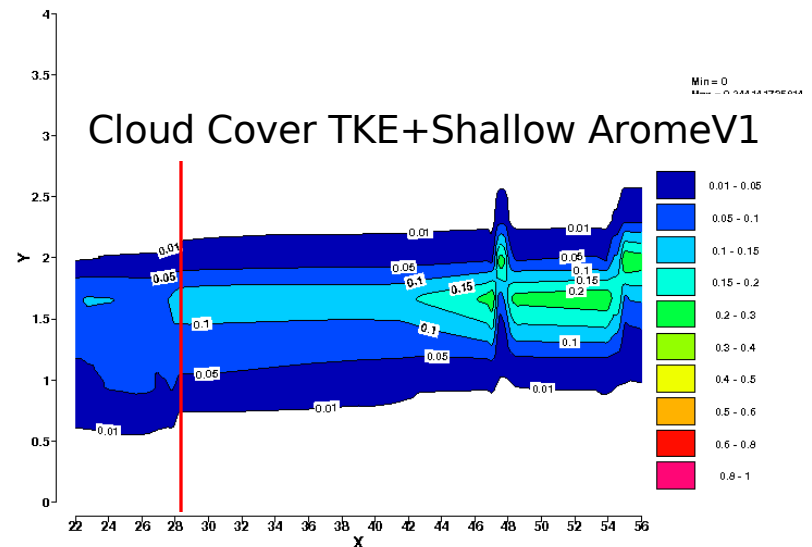
0-500m	5
500m-1000m	3
1000m-1500m	2
1500m-2000m	2
2000m-3000m	2

### Cloud Cover Arpege/Aladin-MF



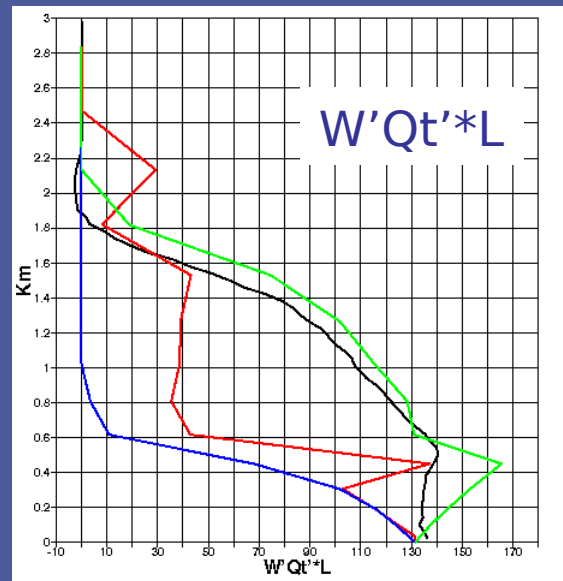
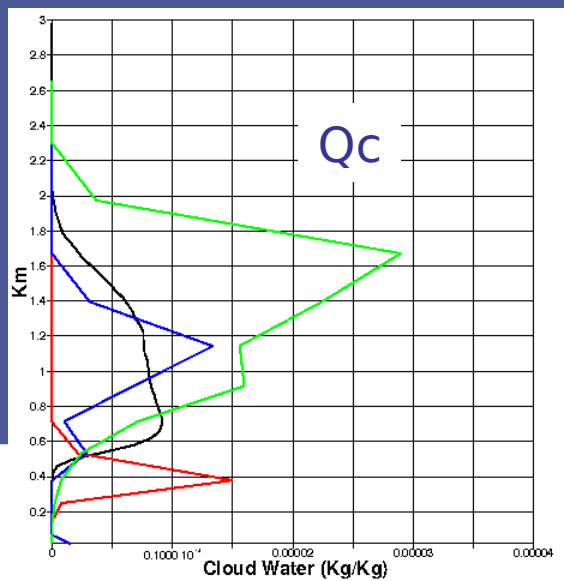
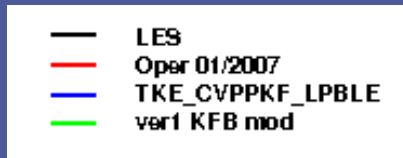
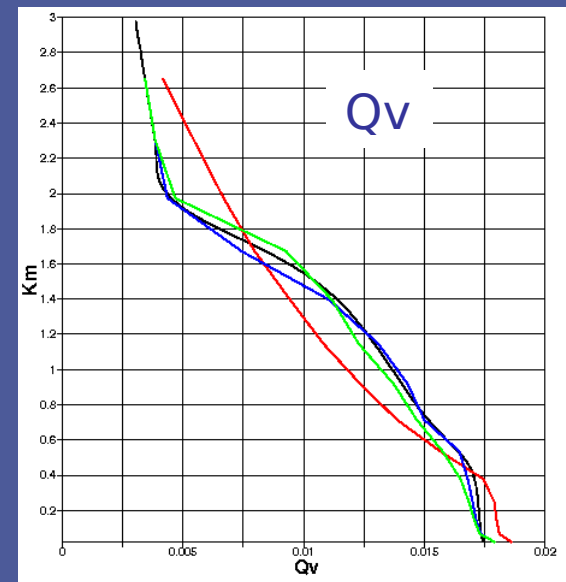
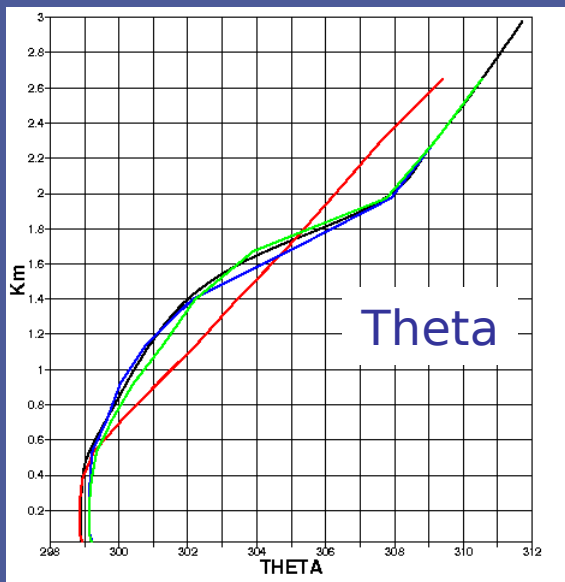
ver1/FNEB.tmp.ev01  
ARPEGE/ALADIN

### Cloud Cover TKE+Shallow AromeV1





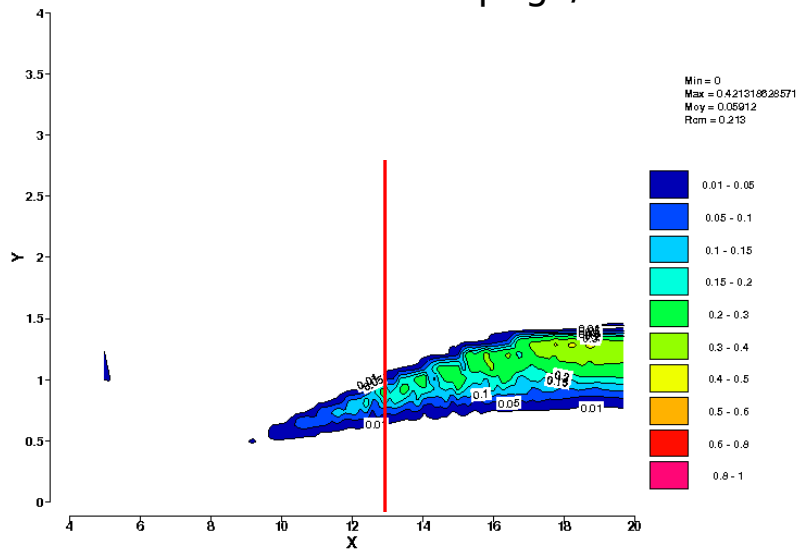
# GCSS WG-1 BOMEX case: Shallow cumulus clouds Fc + 5-6h.



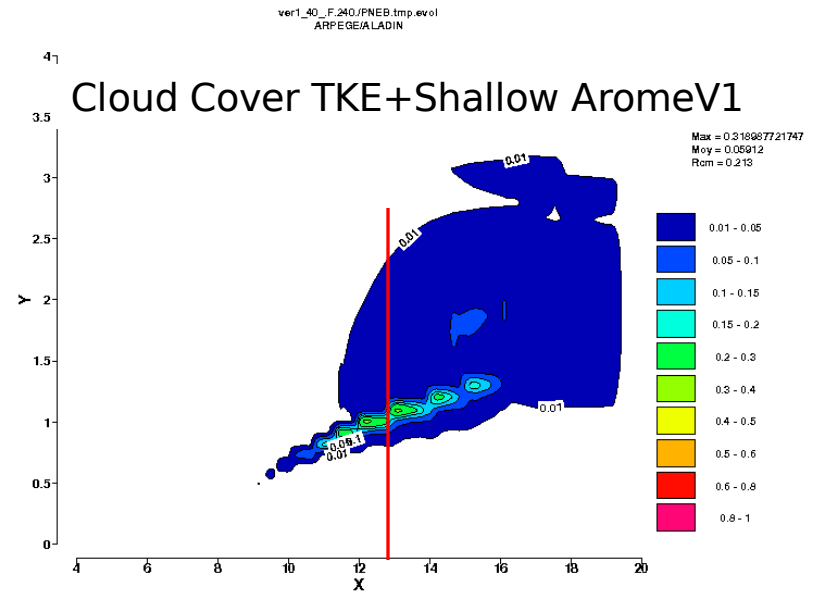
# EUROCS/CUMULUS (ARM) 40L below 4000m dt=240s

0-500m	10
500m-1000m	6
1000m-1500m	5
1500m-2000m	5
2000m-3000m	7

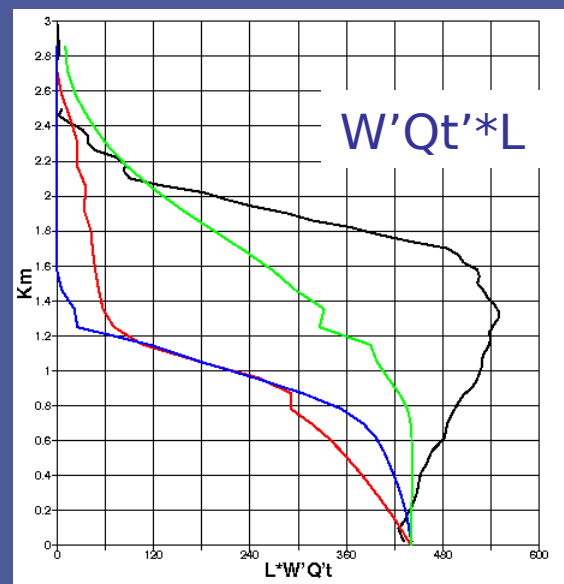
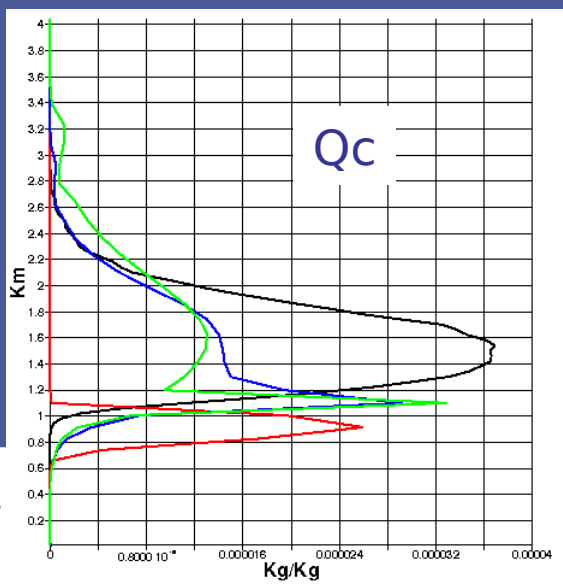
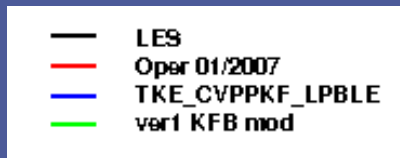
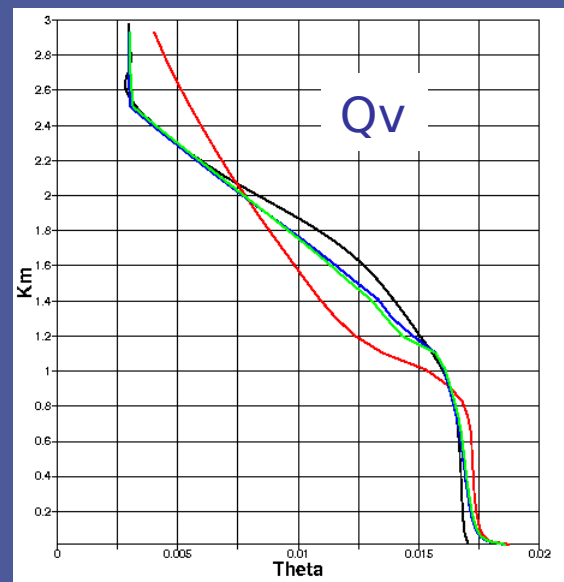
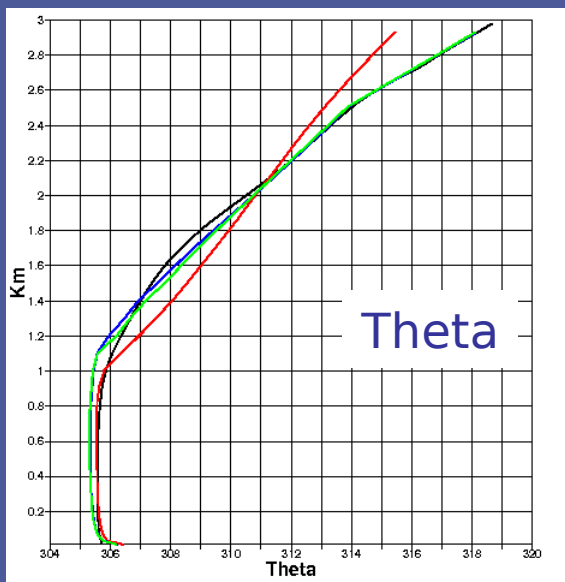
## Cloud Cover Arpege/Aladin-MF



## Cloud Cover TKE+Shallow AromeV1

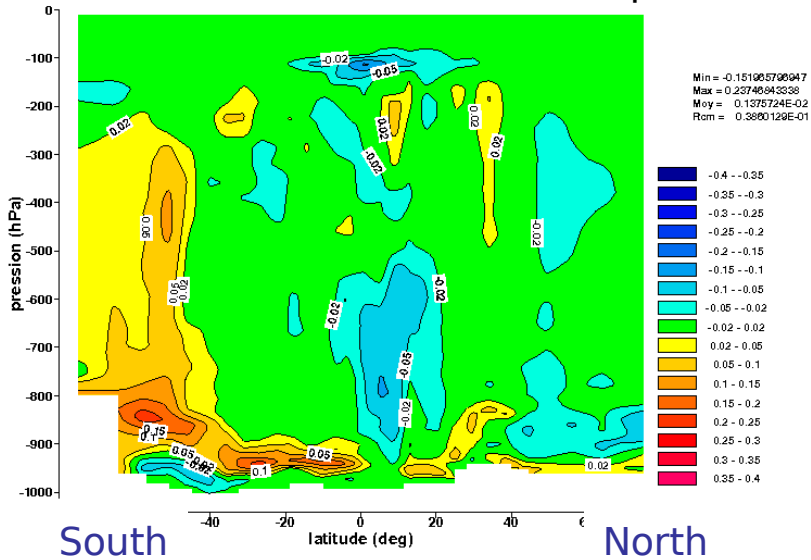


# EUROCS/CUM (ARM) 40L below 4000m dt=240s Fc +8h-9h

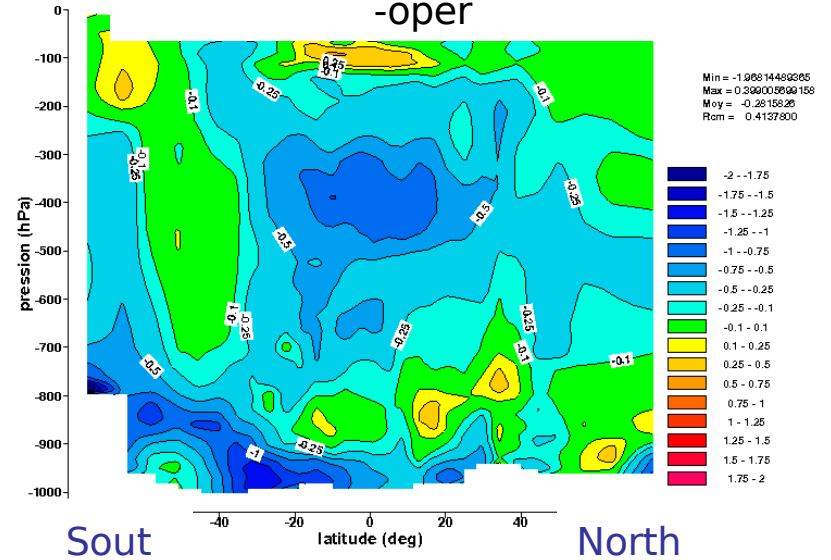


# 3D Experiment

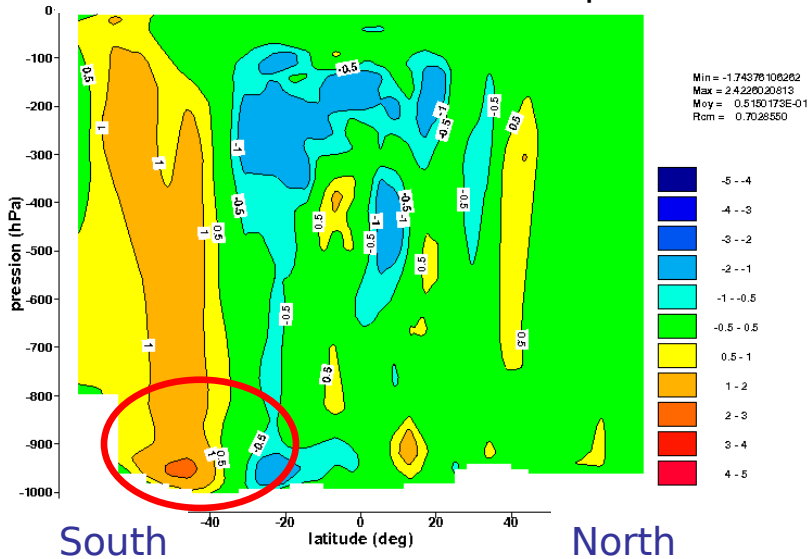
## Cloud Cover : (TKE+shal)-oper



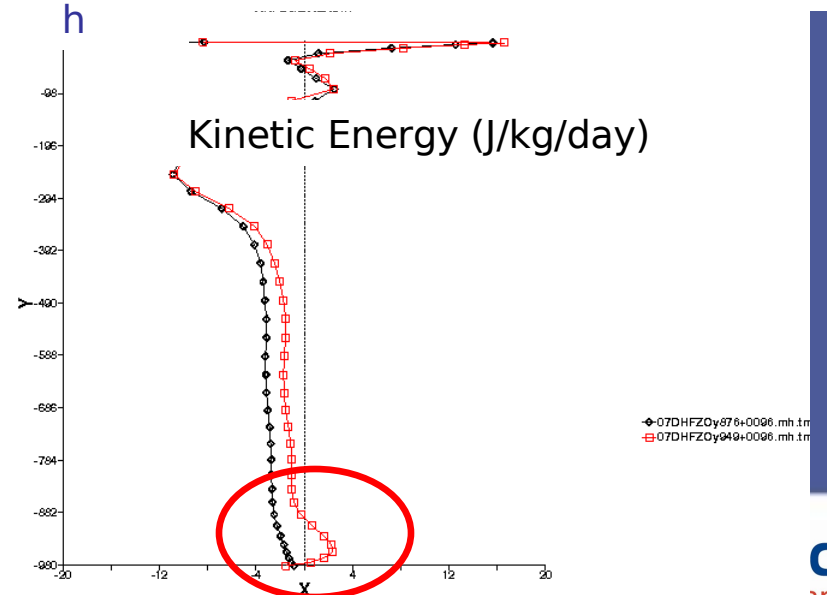
## Temperature: (TKE+shal) -oper



## Zonal Wind : (TKE+shal)-oper

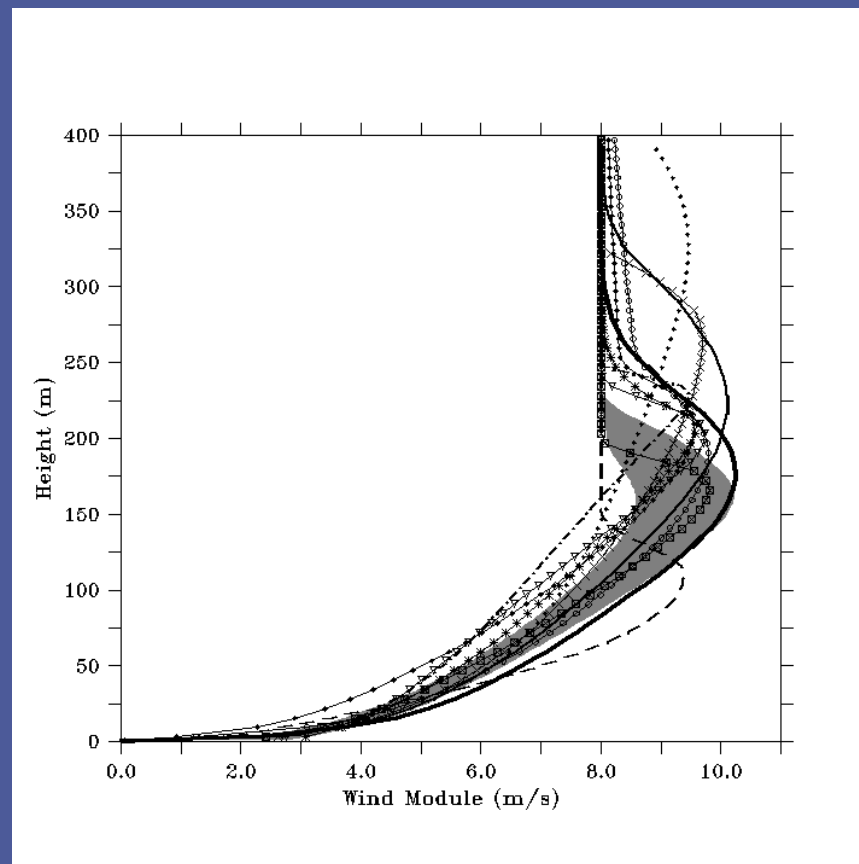
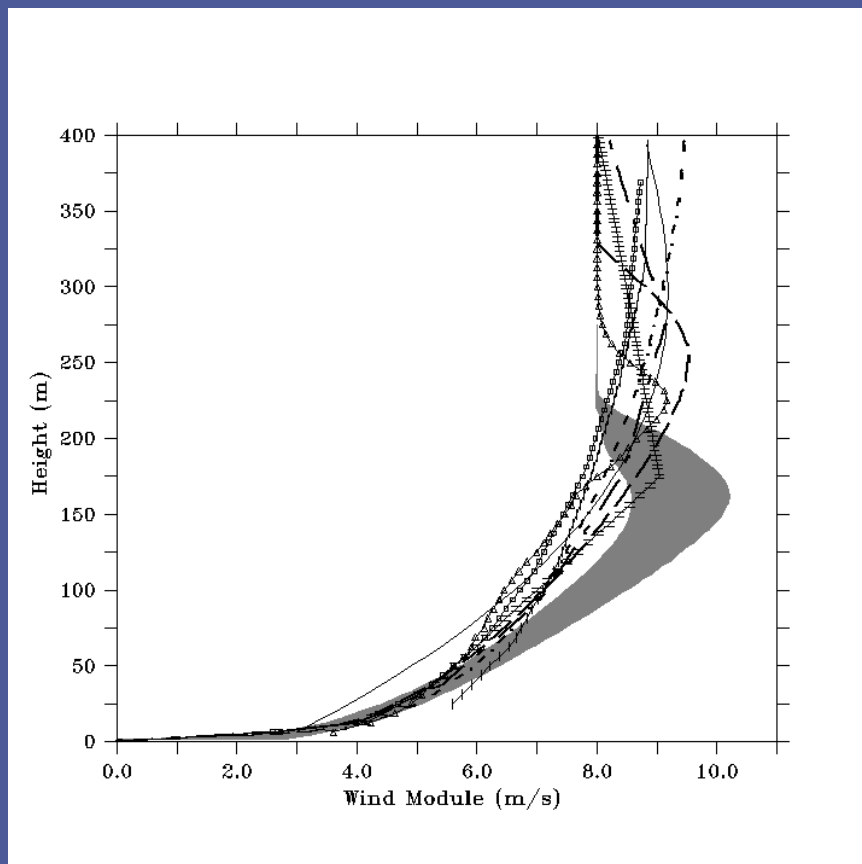


## Kinetic Energy (J/kg/day)



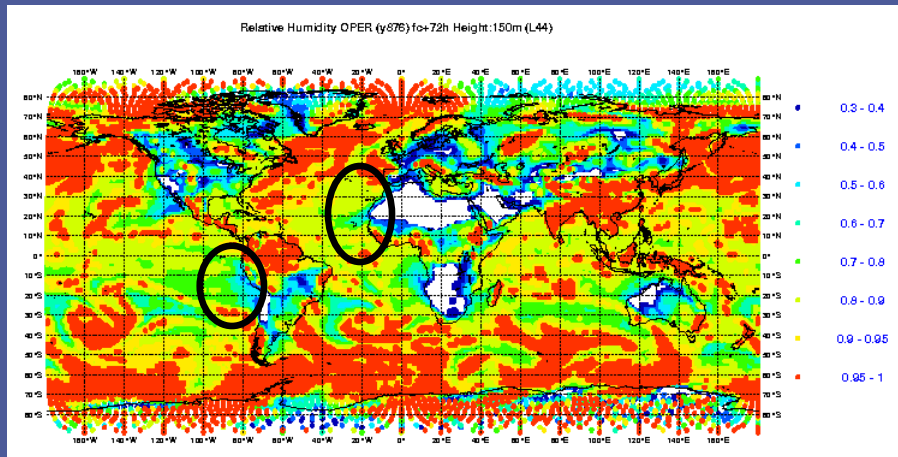
# 3D Experiment

GABLS I Cuxart et al, 2006 BLM

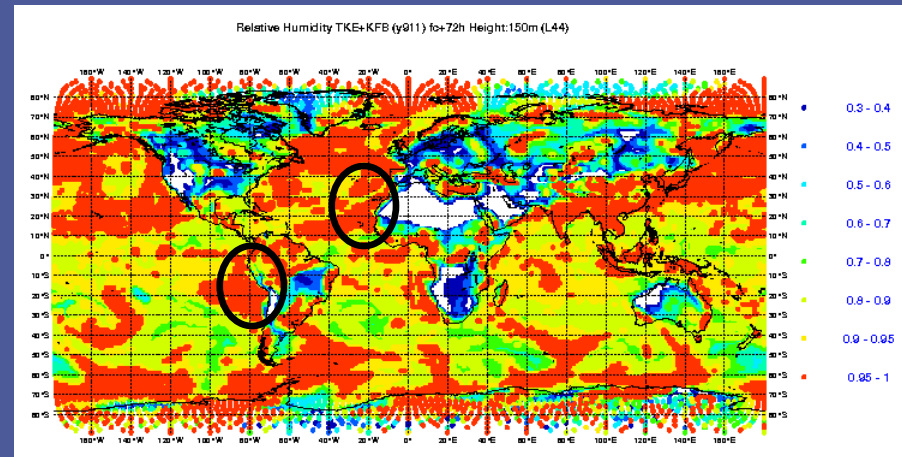


# 3D Experiment

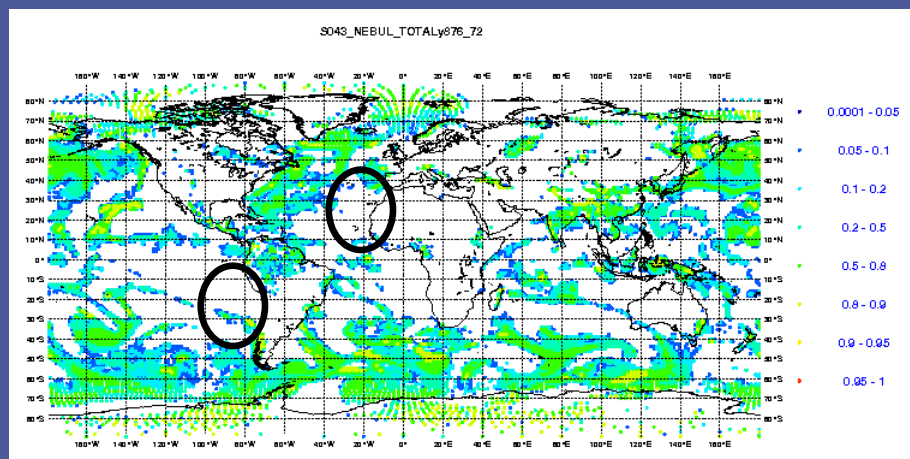
## Relative humidity Oper (150m)



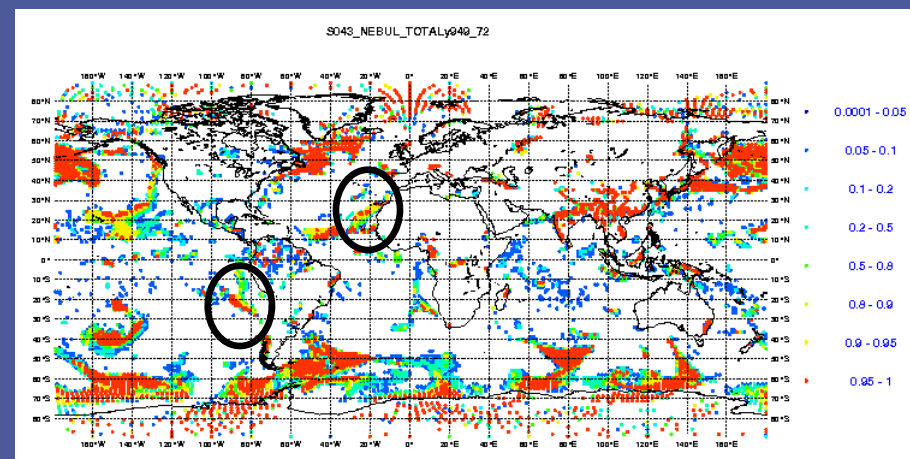
## Relative humidity (150m) ver1



## Cloud Cover (220m)



## Cloud Cover (220m) ver1



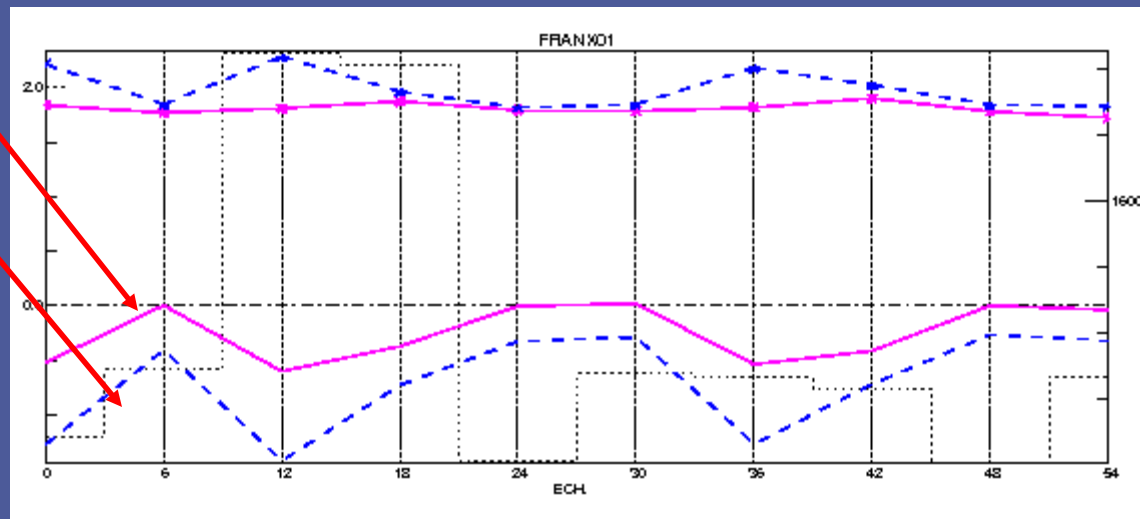
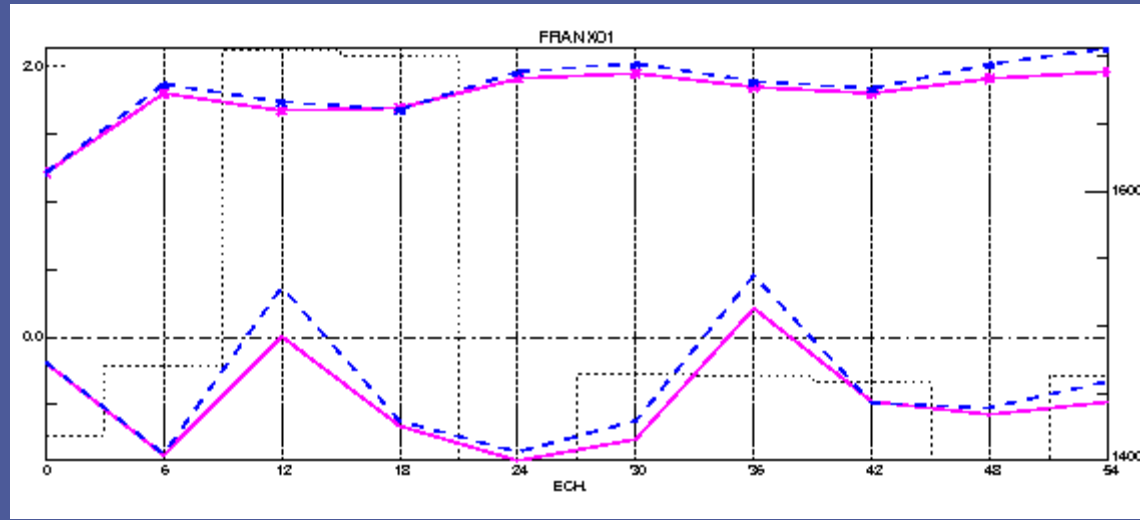
# 3D Experiment ALADIN-MF

2m temperature

Oper

TKE+Shall

Wind Speed 10m





# Problems ...

- **Wind in the PBL only in 3D .**
  - **Winter hemisphere.**
  - **Related with the stable conditions? With GWD or orography?**
- **Cloud cover 0 or 1 near the surface (below 300m):**
  - **Problem with the pdf function ? Sigma ? Do we need also a Sigma\_shallow ? Probably ?**
  - **shallow convection: not enough active, problem with the trigger function ?**

# Perspectives

- **Short term :**
  - **Evaluation of the new shallow scheme (EDMF) of AROME and comparison with KFB in our context: ARPEGE/ALADIN microphysics, time-step, horizontal resolution**
  - **Other Mixing length ? (Hirlam, CMC ...)**
  - **F0, F1, F2 are very important.**
  - **Many interactions (mixing length, TKE, cloud cover function of L via sigma ) ? Do we need more constraints ?**
  
- **Medium and long term:**
  - **when the short term will be finished !**
  - **3MT**