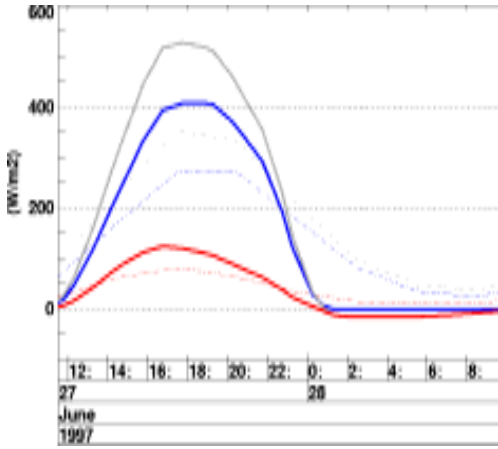
Diurnal cycle of deep convection over land

status of the intercomparison case

- ✓ runs and datasets
- ✓ analysis of the datasets
- ✓ remaining questions & work

runs and datasets



✓ **use of more realistic surface heat fluxes**
to improve the diurnal evolution of the BL

6 SCMs and 3 CRMs runs
+ additional runs (sensitivity tests)

S. Cheinet also tested this case with his BL mass flux scheme (quite encouraging)

model type	lab *(model name)*	participants
SCM	CNRM *(ARPEGE Climat)*	Grenier
SCM	ECMWF *(IFS)*	Chaboureau, Koehler, Bechtold
SCM	LMD *(LMDz)*	Tailleux
SCM	Met Office *(UM)*	Petch
SCM	SMHI *(close to HIRLAM)*	Jones
new SCM	CNRM *(ARPEGE WF)*	Piriou
CRM	CNRM *(mésoNH)*	Chaboureau
CRM	Met Office *(UM)*	Petch
new CRM	NCAR *(UM)*	Grabowski

✓**<u>datasets</u>** (several new items)

SCMs datafiles : time step values (done)

Q1 & Q2 : 1 CRMs , 4 CRMs

radiative fields : 1 SCM , 2 SCMs

convective mass fluxes : everybody

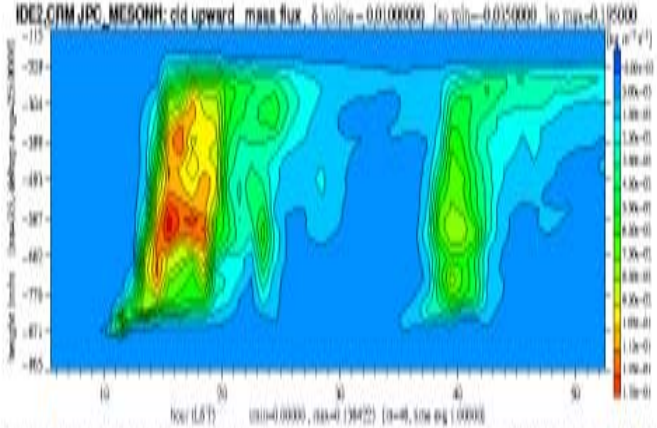
cloud fraction : 3 CRMs & 5 SCMs

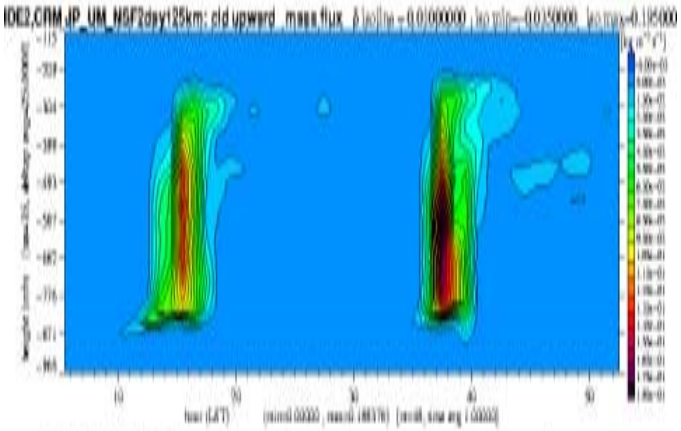
subgrid scale fluxes and $\overline{w'^2}$: not a big succes

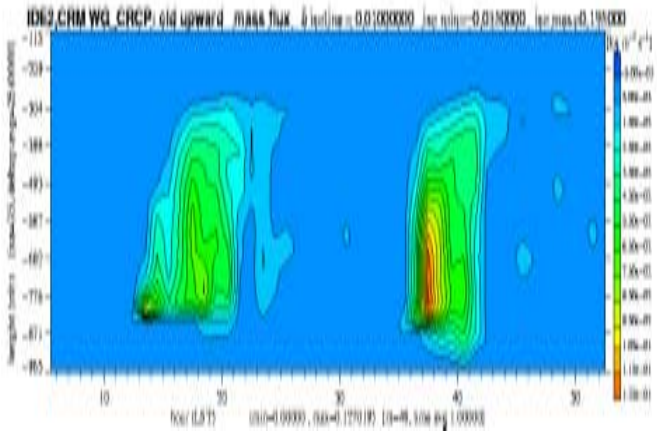
evaporation of rain : still to be done

a lot of material ! (available on this computer)

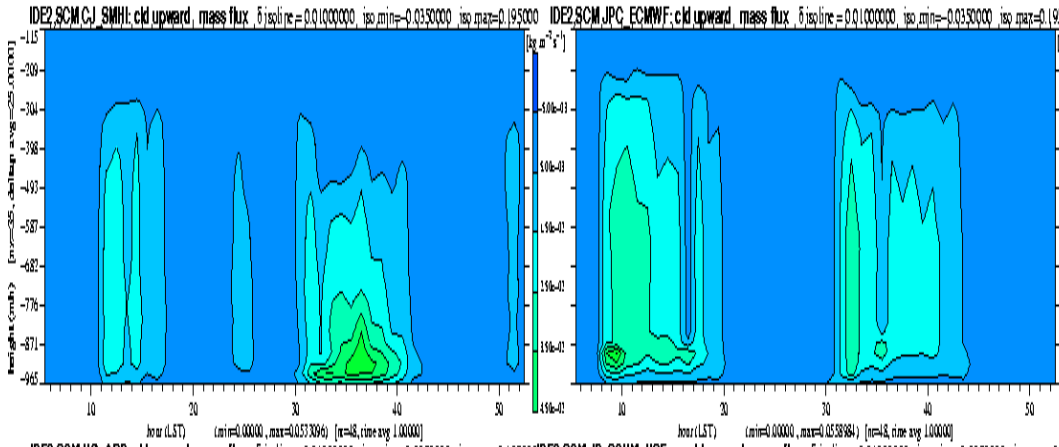
CRMs : massflux_up , 1h avg

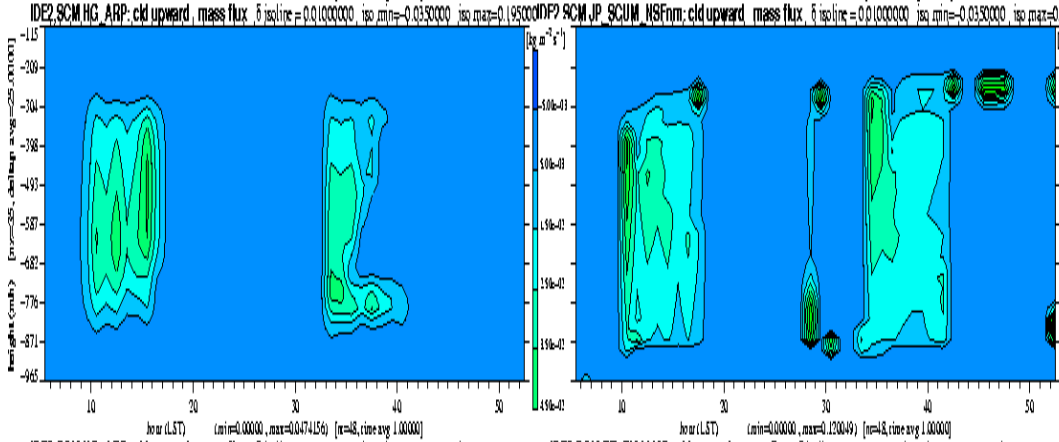


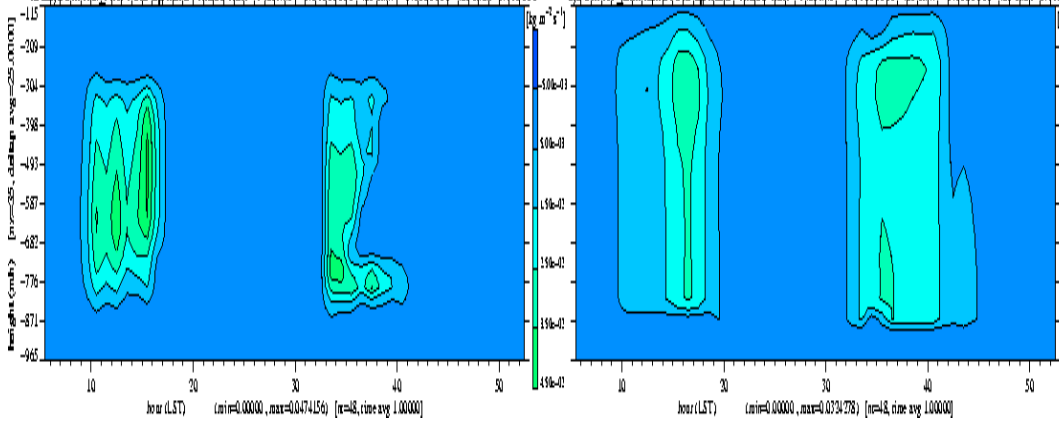




SCMs : massflux_up , 1h avg



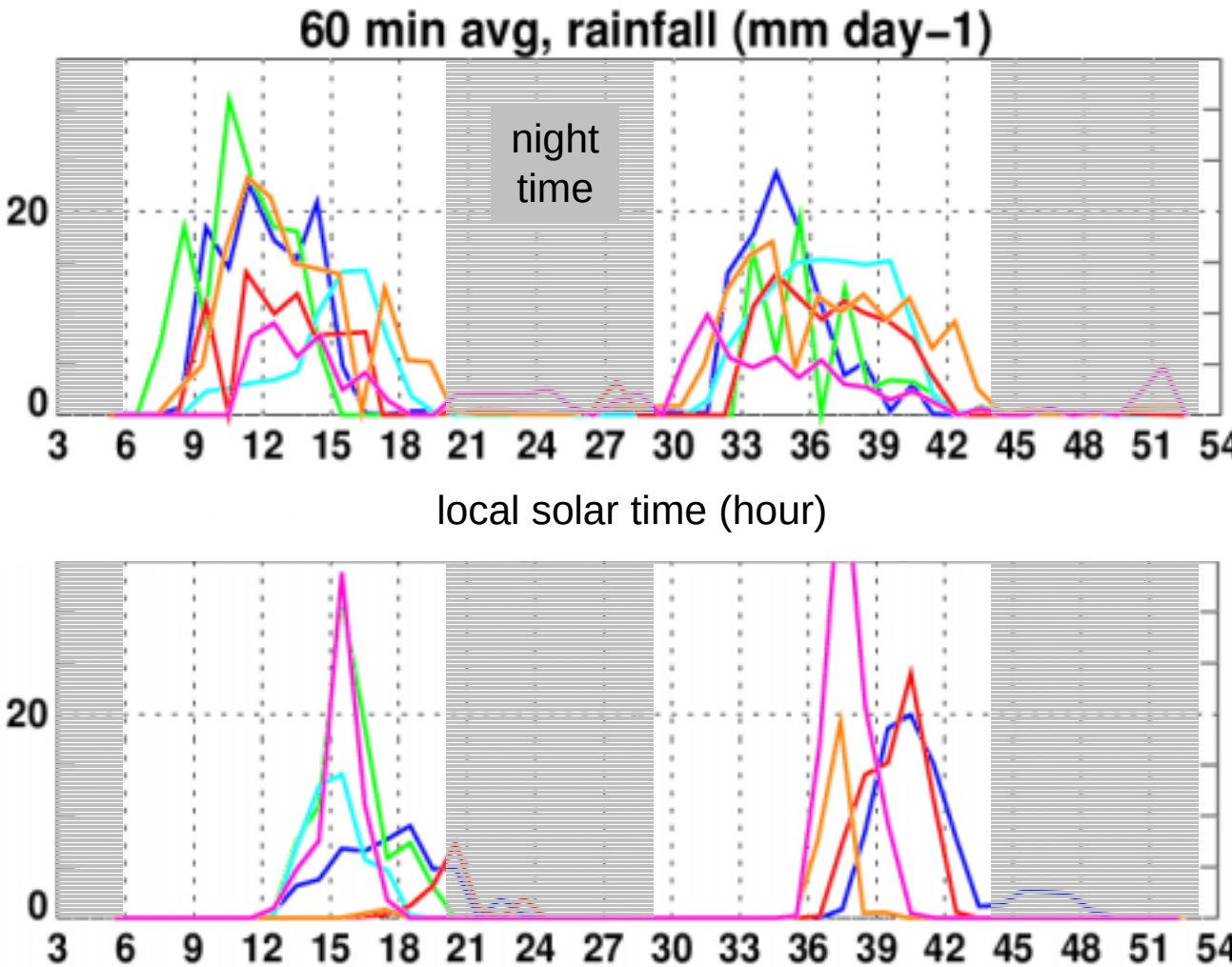




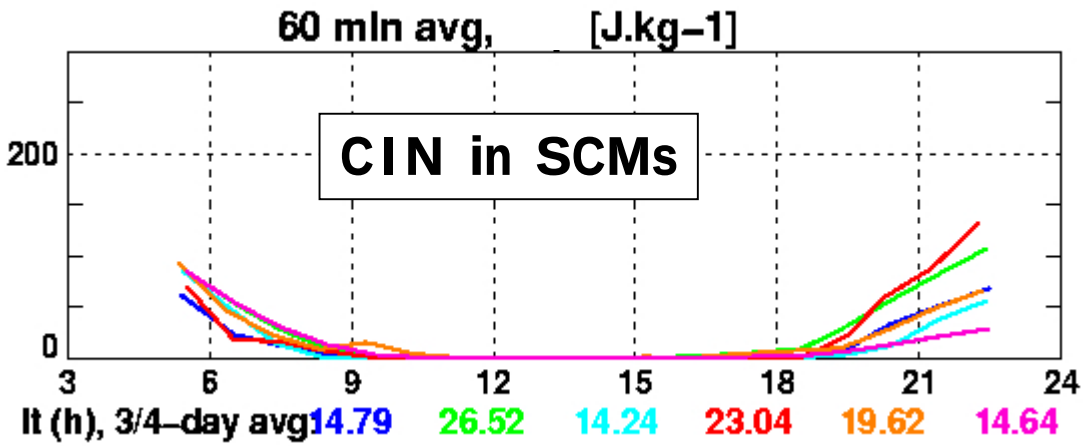
analysis

- ✓again more consistency among CRMs than SCMs
- ✓link between deep convection and clouds very weak in some SCMs
- ✓results which confirm what we suspected in Utrecht last April, but now with the appropriate datasets
- ✓some new analysis (moisture)

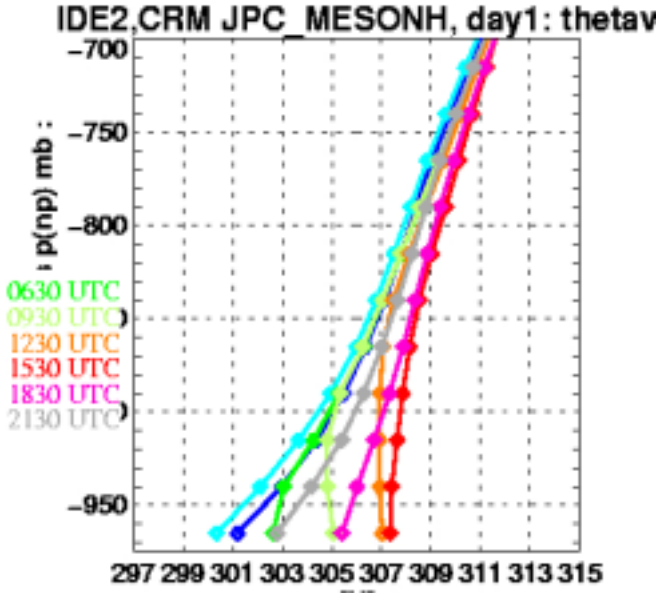
rainfall events still tend to occurs earlier in many SCMs than in CRMs with new surf fluxes too

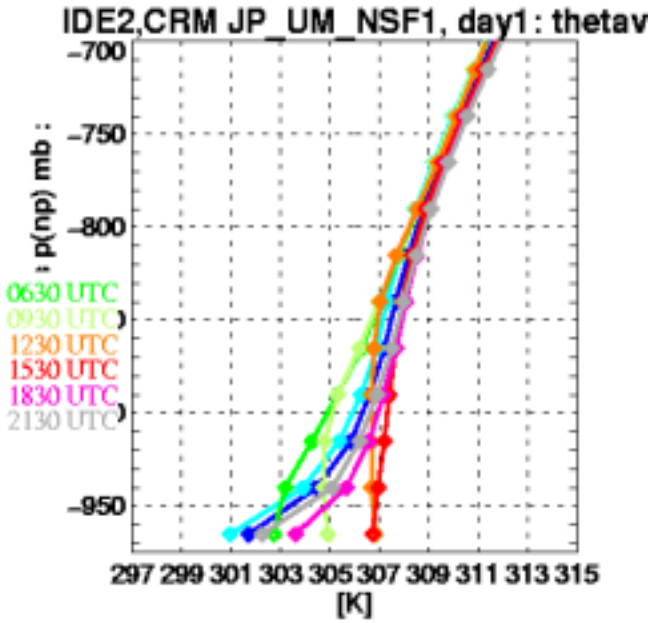


now there is a more realistic diurnal cycle of stability
in particular for SCMs



CRMs


IDE2,CRM JPC_MESONH, day1: thetav
p(np) mb
-700
-750
-800
-950
0630 UTC
0930 UTC
1230 UTC
1530 UTC
1830 UTC
2130 UTC
297 299 301 303 305 307 309 311 313 315


IDE2,CRM JP_UM_NSF1, day1: thetav
p(np) mb
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-750
-800
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0630 UTC
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1230 UTC
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1830 UTC
2130 UTC
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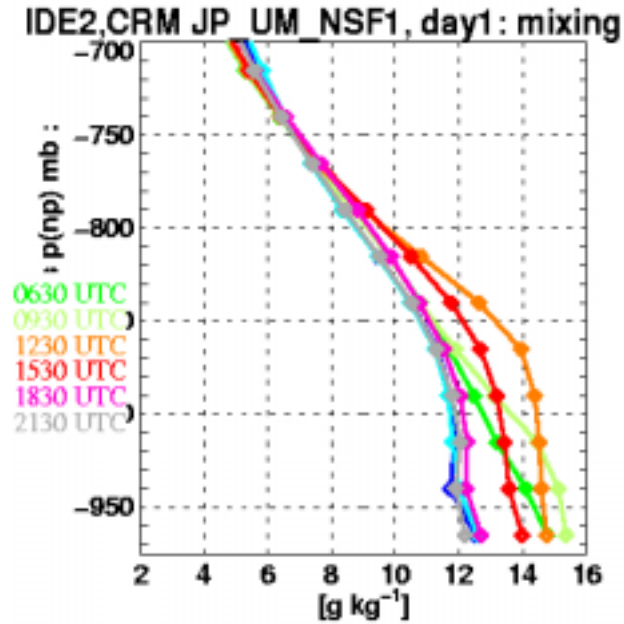
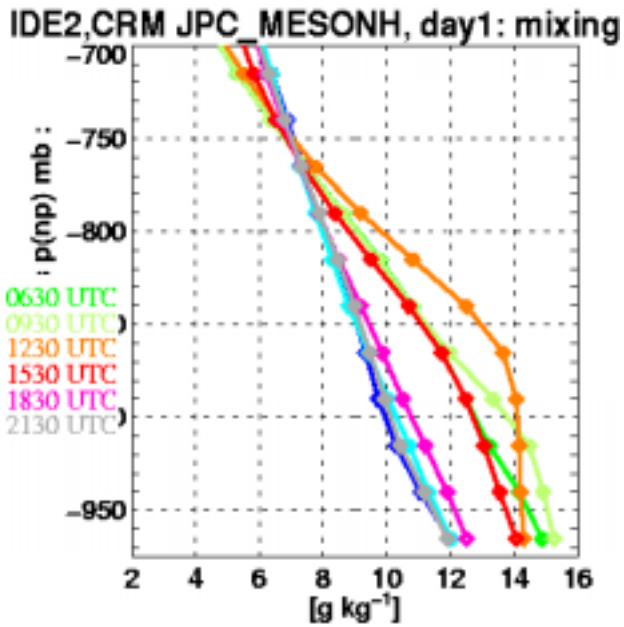
[K]


IDE2,CRM JP_UM_NSF1, day1: mixing
p(np) mb
-700
-750
-800
-950
0630 UTC
0930 UTC
1230 UTC
1530 UTC
1830 UTC
2130 UTC
2 4 6 8 10 12 14 16
[g kg^{-1}]


IDE2,CRM JPC_MESONH, day1: mixing
p(np) mb
-700
-750
-800
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0630 UTC
0930 UTC
1230 UTC
1530 UTC
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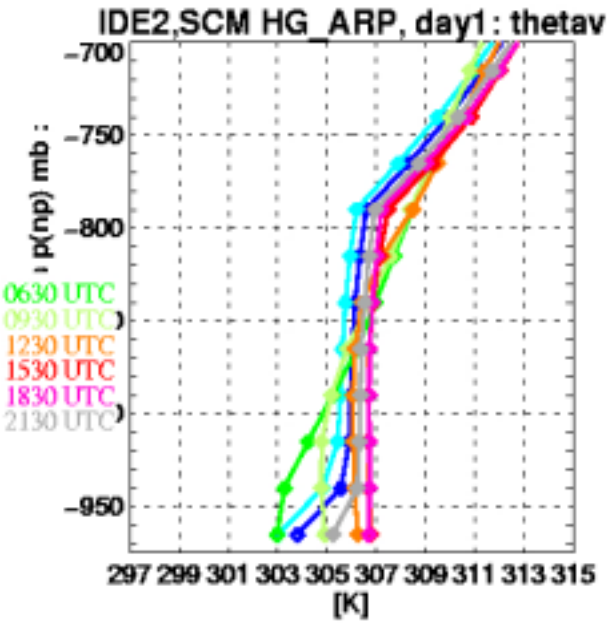
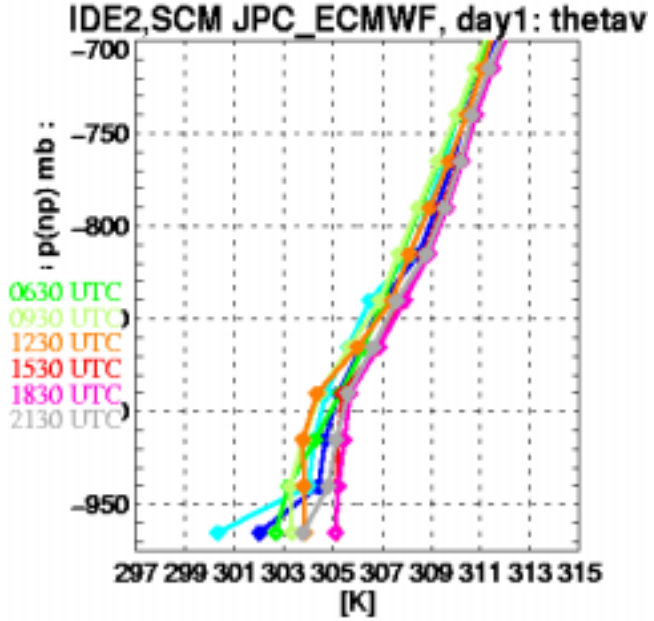
2130 UTC
2 4 6 8 10 12 14 16
[g kg^{-1}]

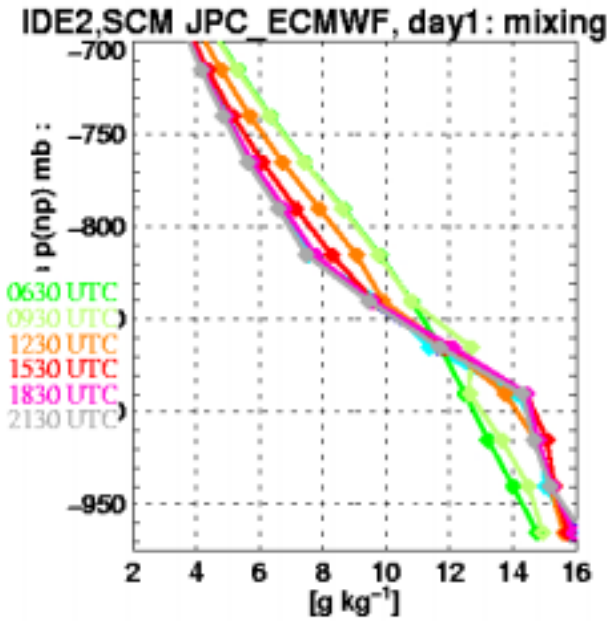
in SCMs

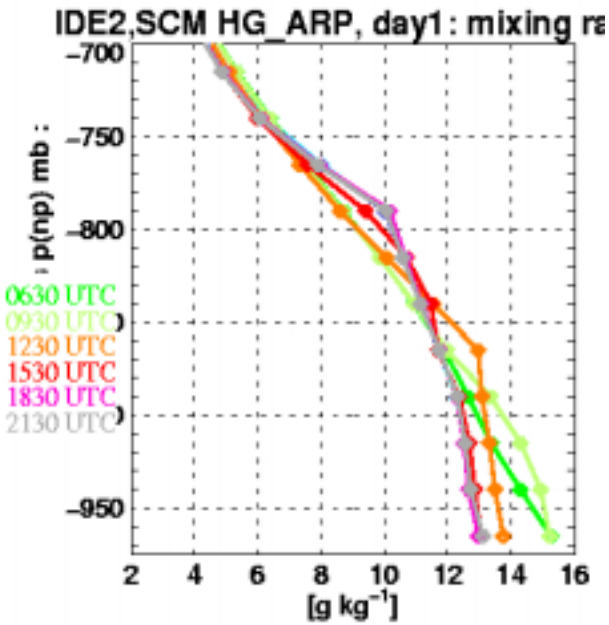
some BLs shallower than others

but most tend to evolve toward a moister BL





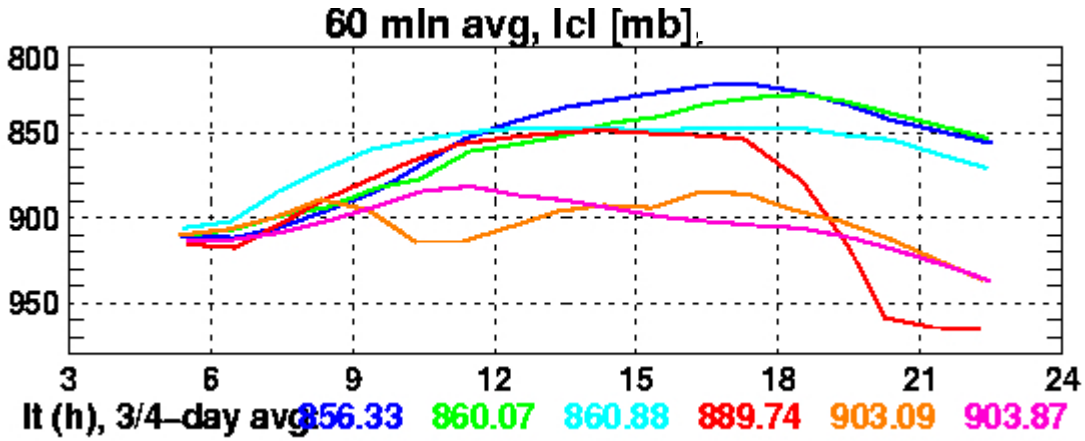




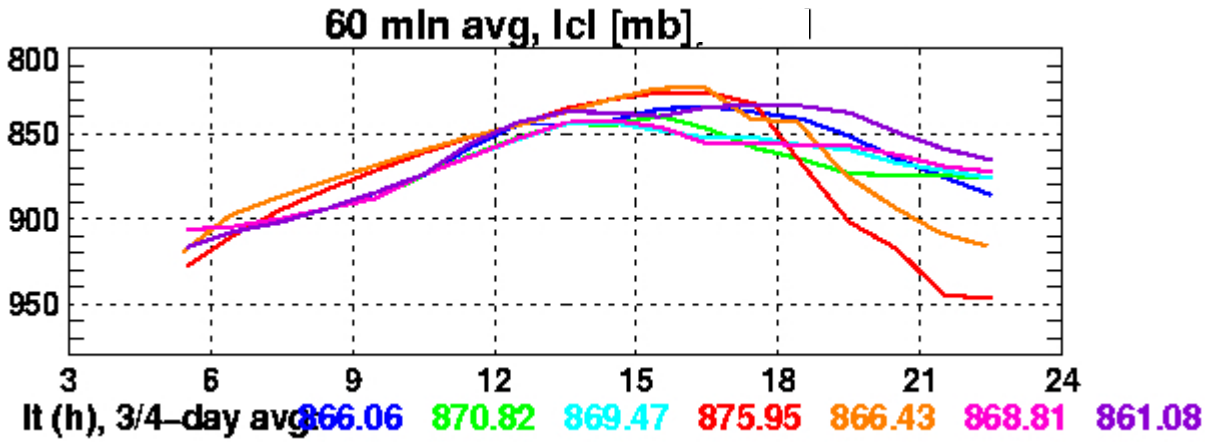
Condensation level

in SCMs

links with BL height diferences

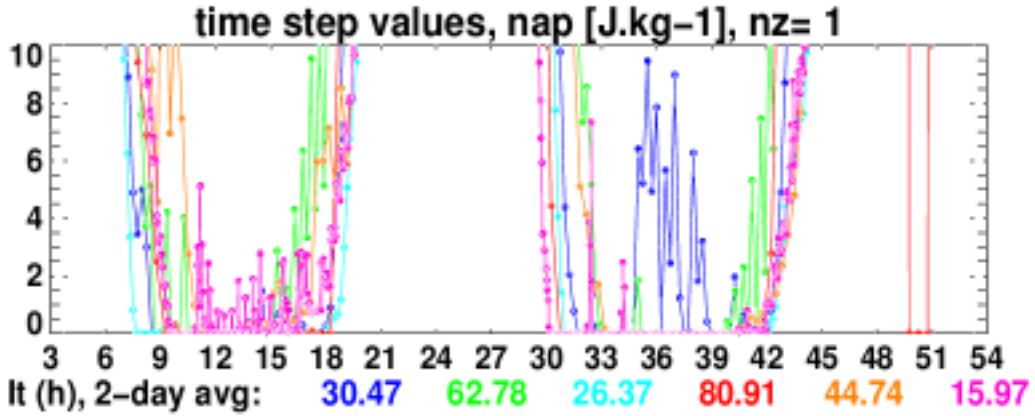


in CRMs

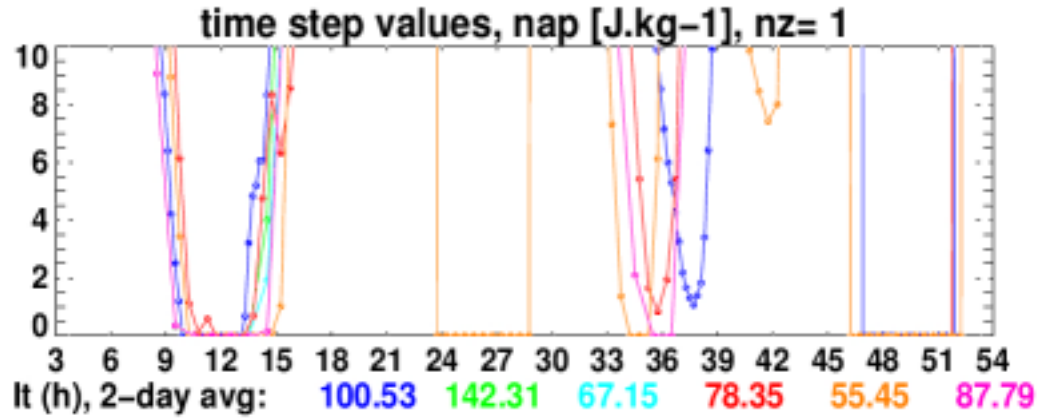


scatter increases after sunset,delicate for both types of models

in SCMs



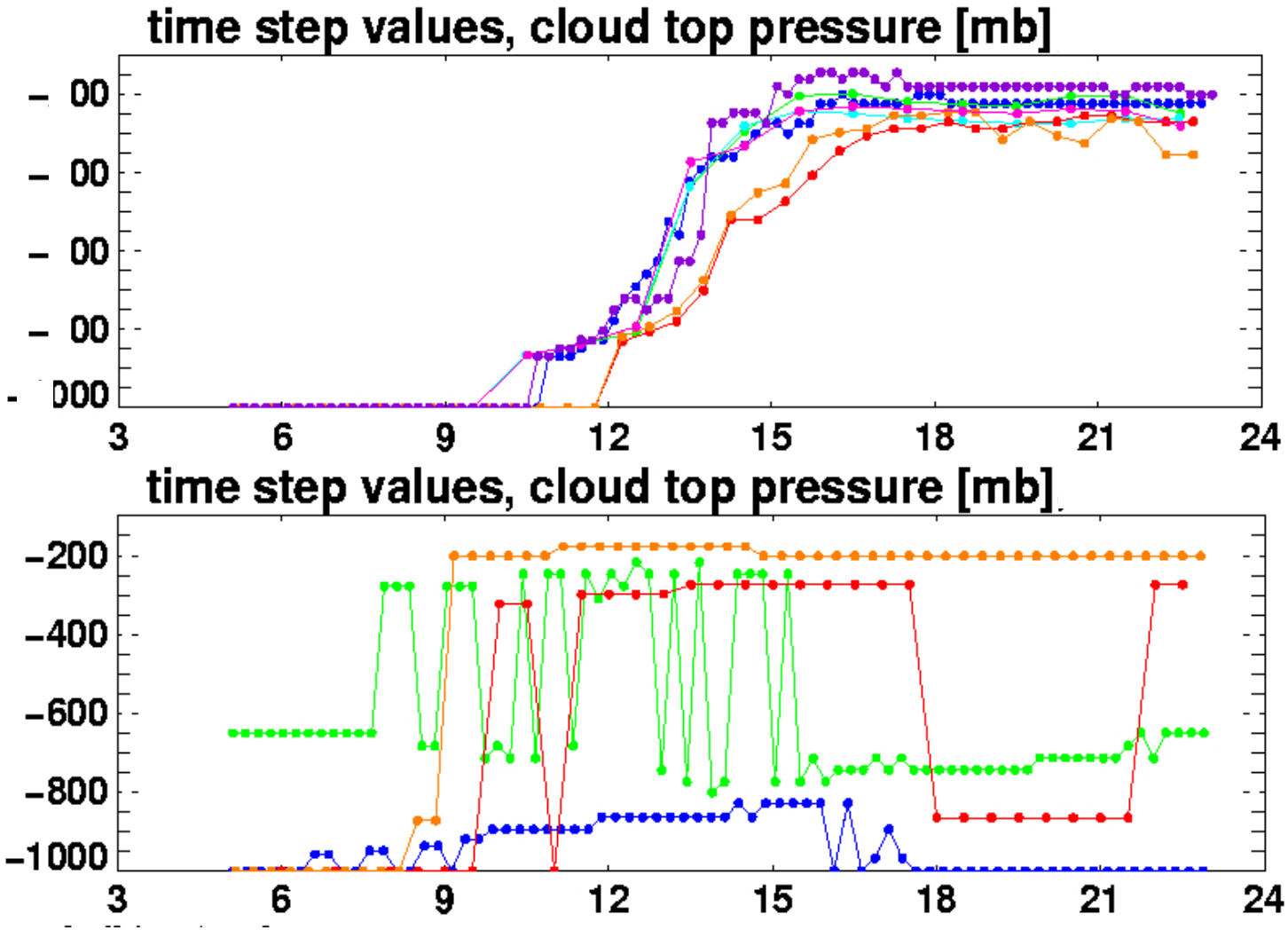
in CRMs



There is a more realistic diurnal cycle of stability but the CIN is still quasi 0 during the full daytime period in SCMs in contrast with CRMs

CIN reaches « quasi-0 » around 9h lst in both types of models

But the CIN does not explains the whole story in CRMS because rains starts after 12h lst



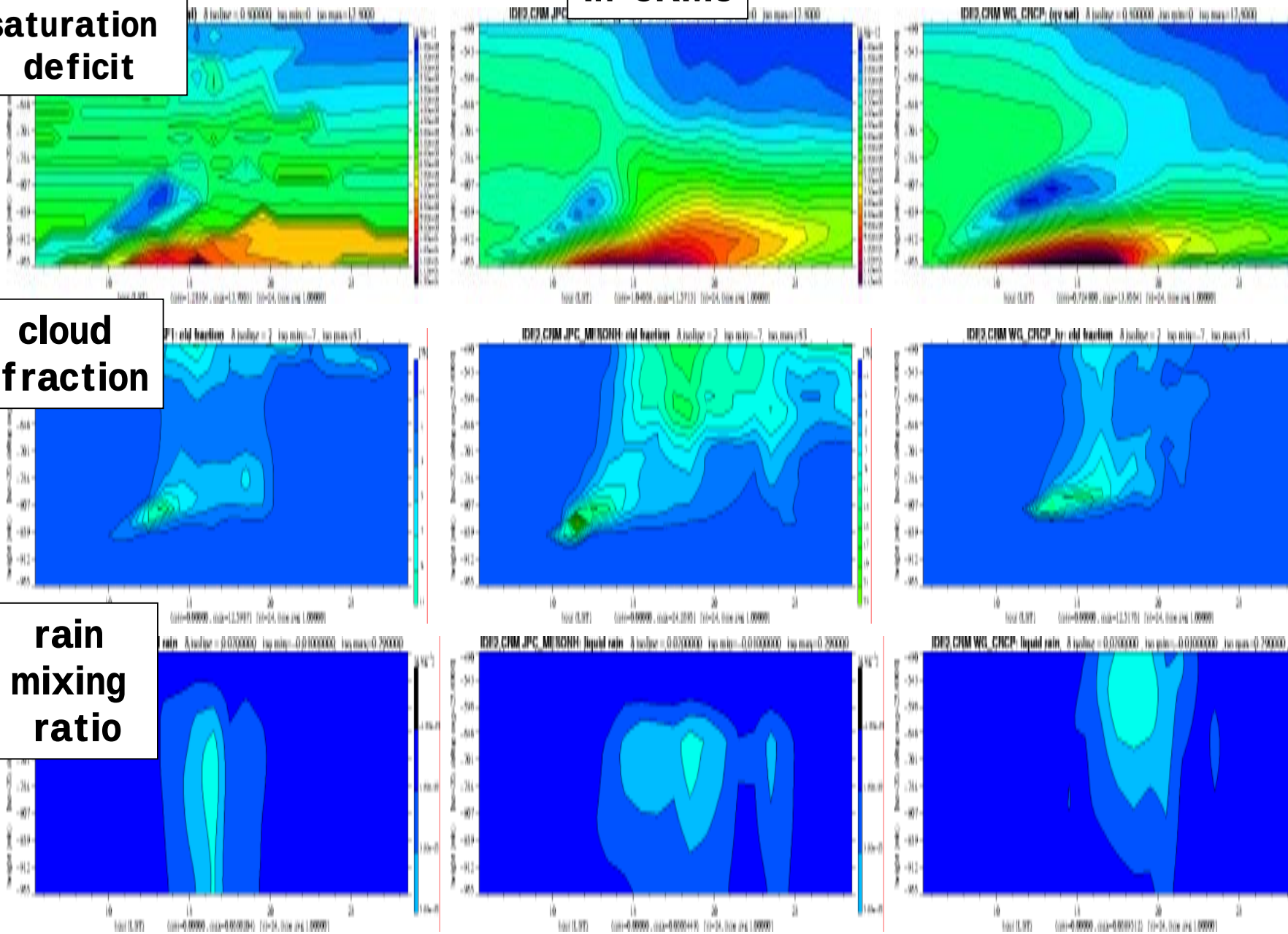
In several SCMs, cloud tops reach high altitude directly within one time step

in CRMs

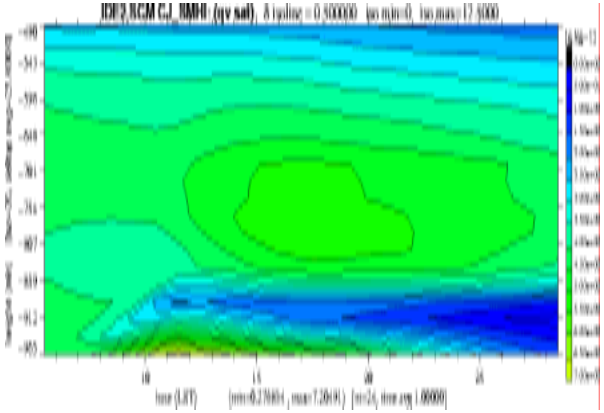
saturation deficit

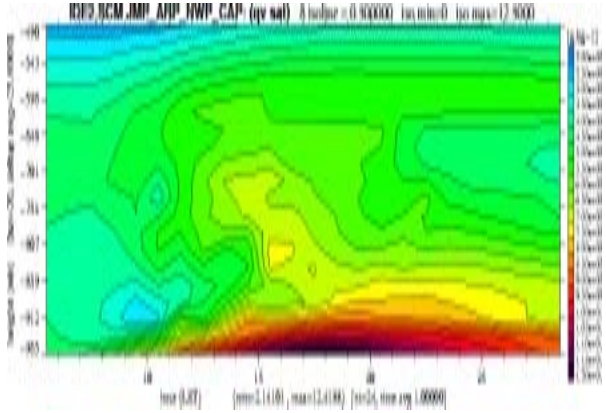
cloud fraction

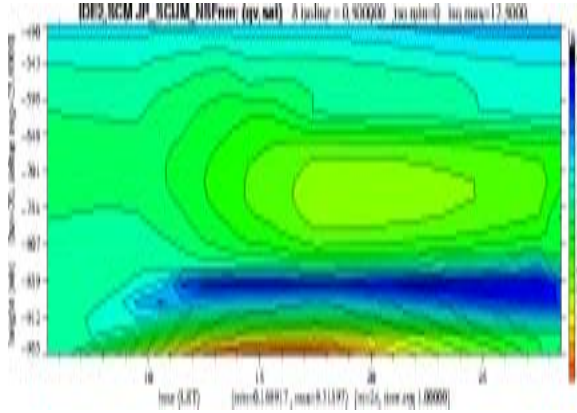
rain mixing ratio

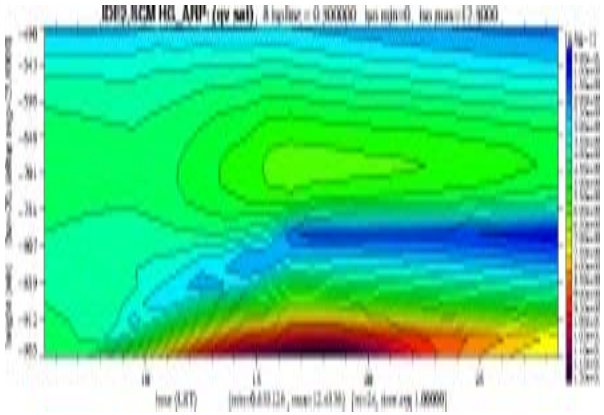


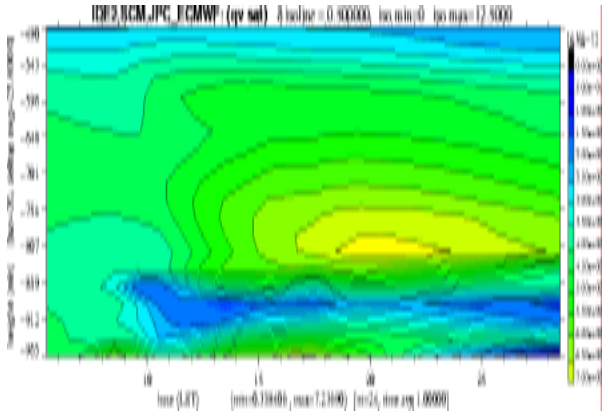
SCMs: saturation deficit (qv-qvsat)

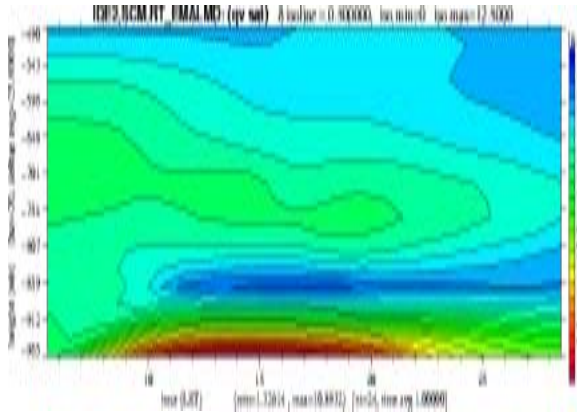




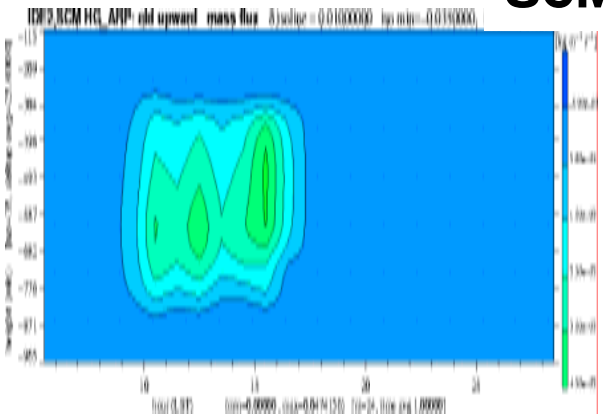


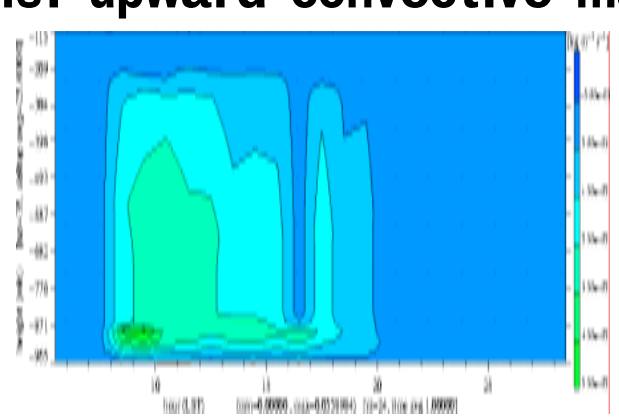


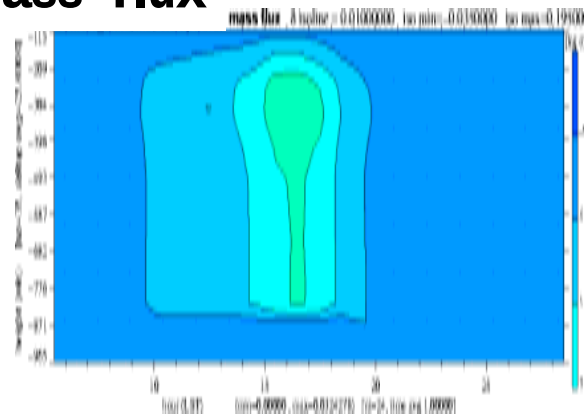




SCMs: upward convective mass flux

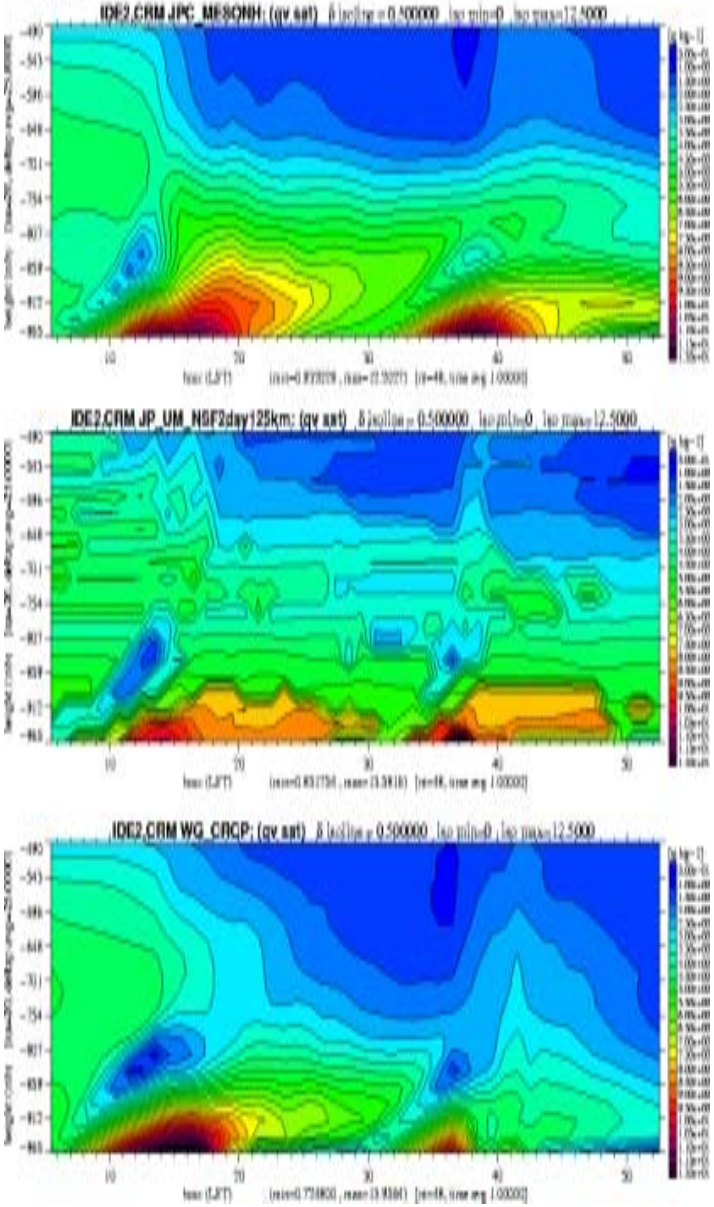




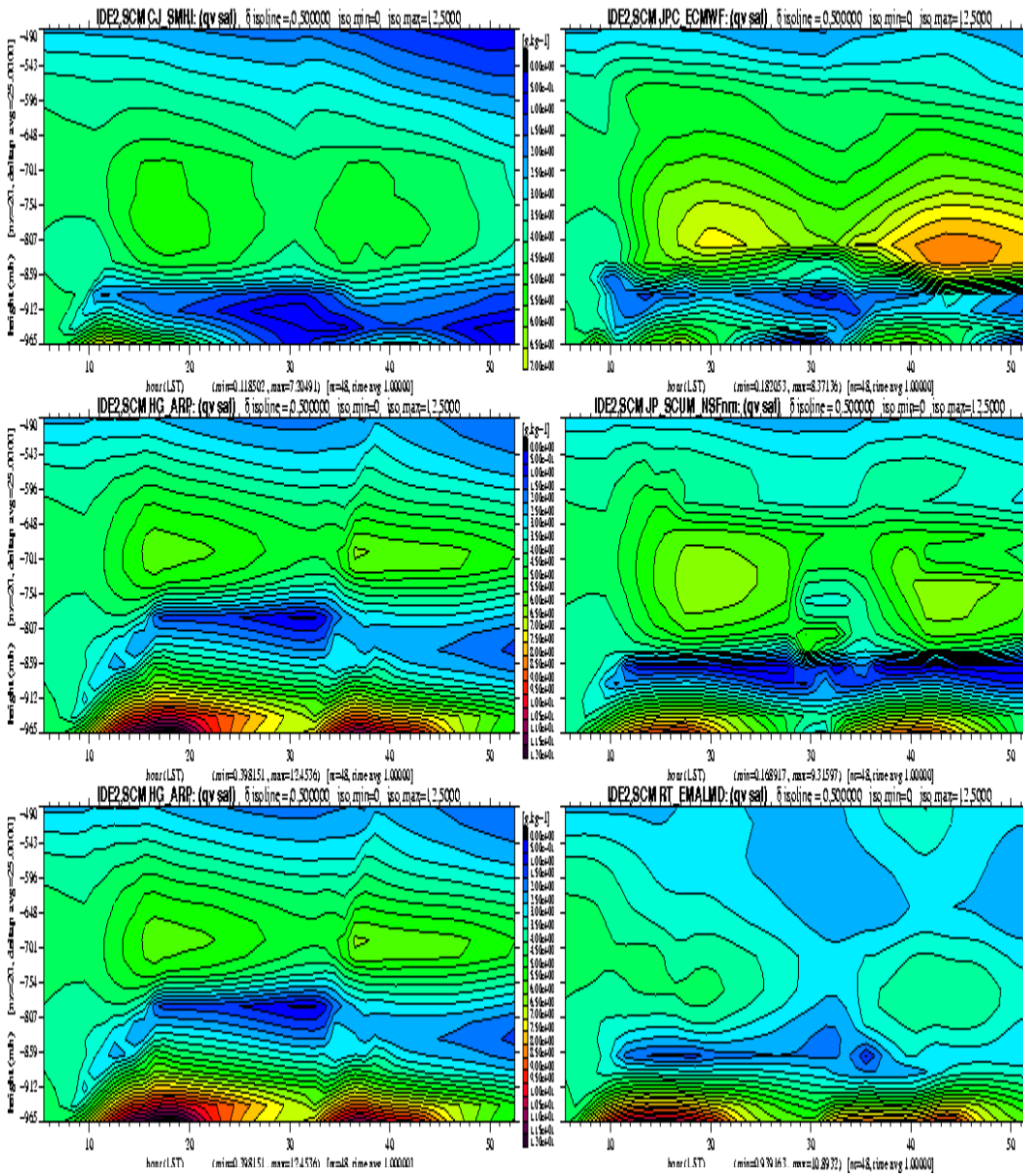


saturation deficit for the 2 days

CRMs : Qvsat_cut , 1h avg

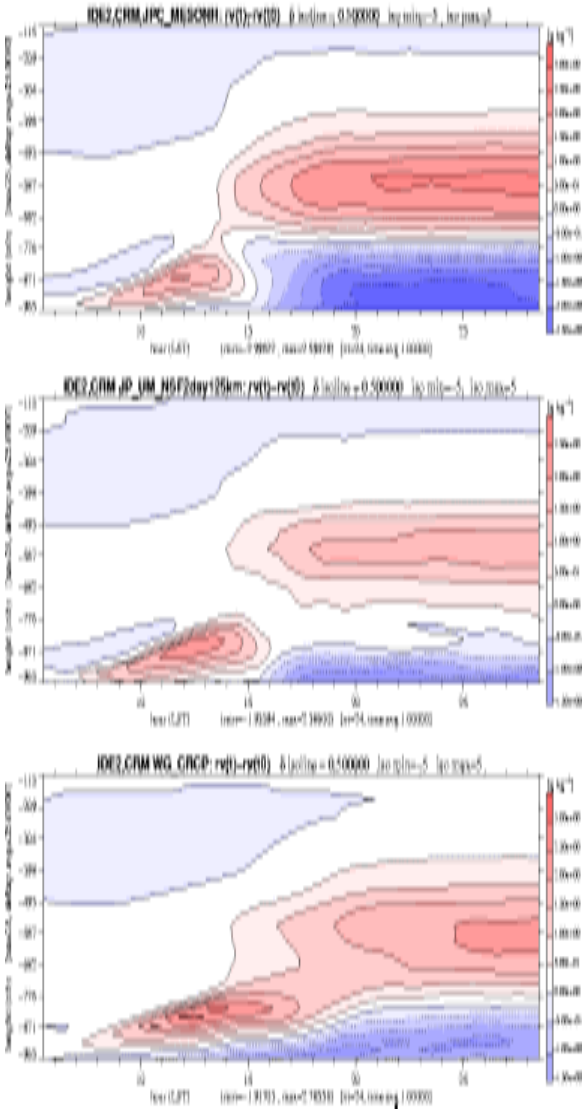


SCMs : Qvsat_cut , 1h avg

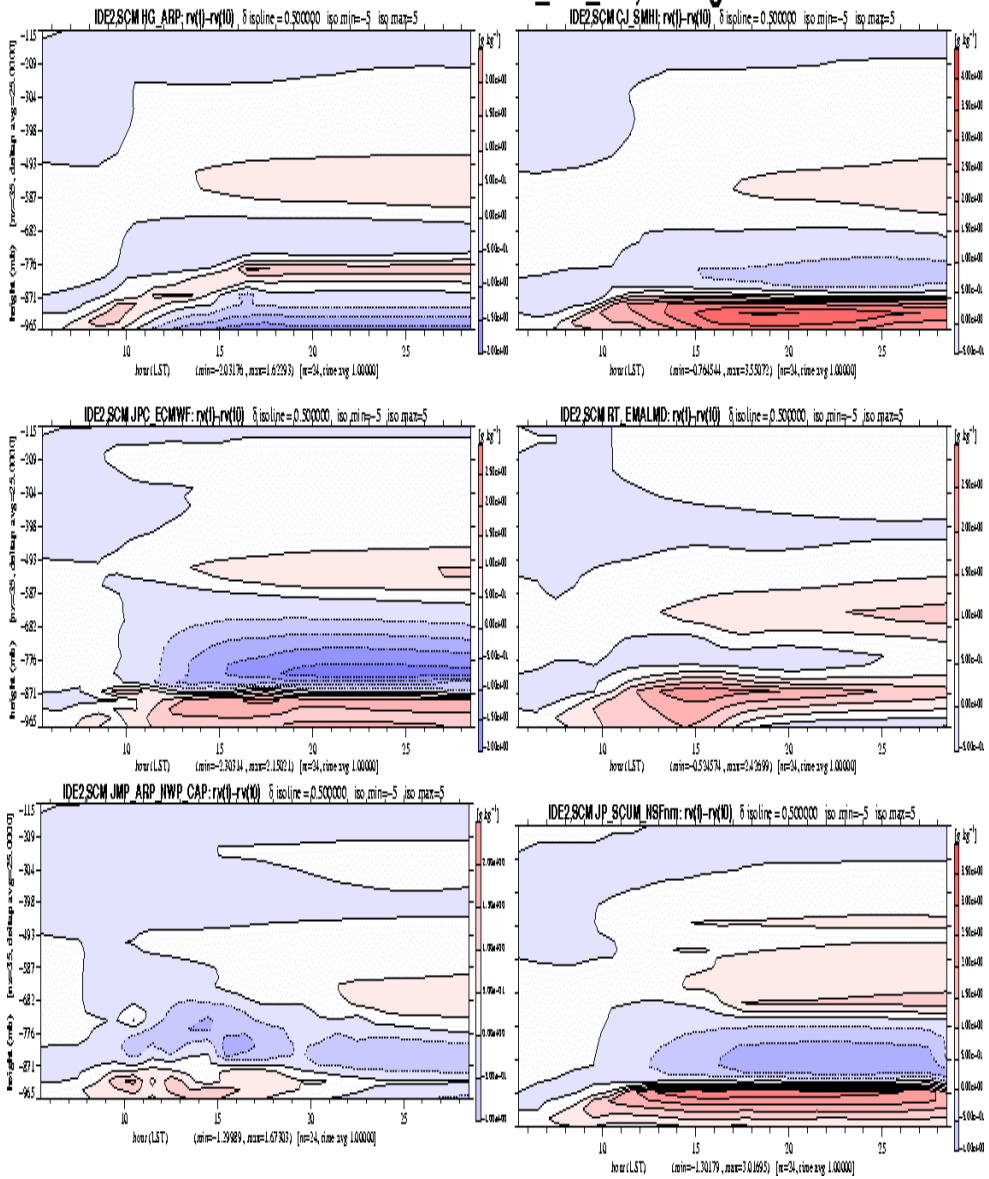


this feature is not as dramatic the second day but still threre

CRMs : rv_diff_ini , 1h avg



SCMs : rv_diff_ini , 1h avg

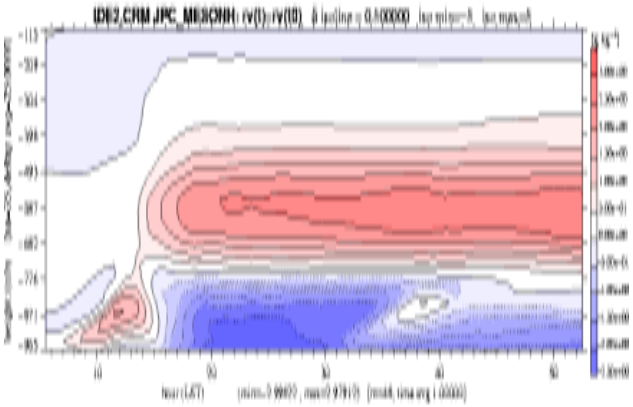


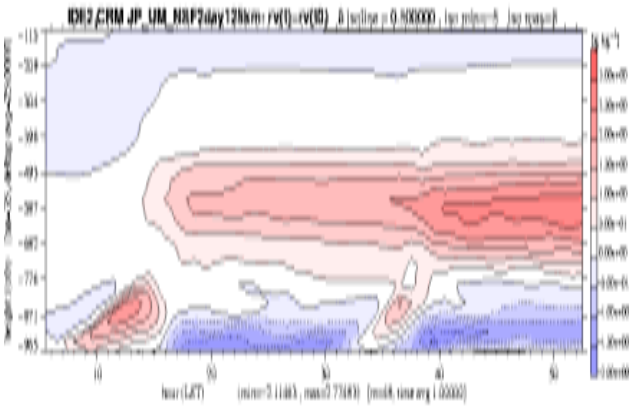
different layerings, probably linked to different convective transport

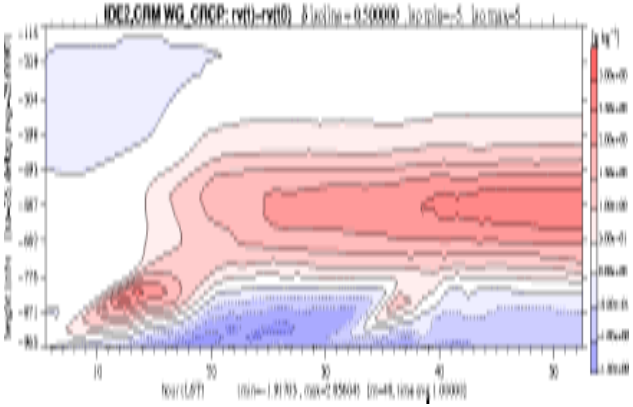
SCMs ofen evolve towards moister low level conditions, not enough transport?

same scenario the second day

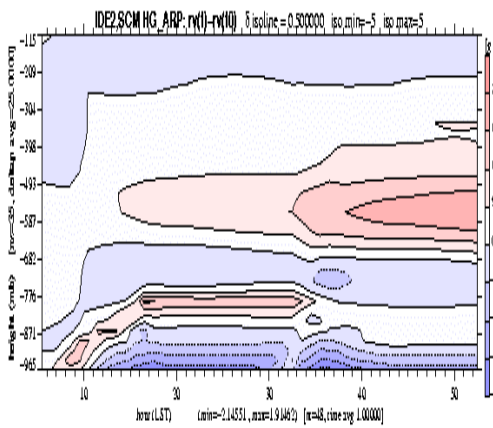
CRMs : rv_diff_ini , 1h avg

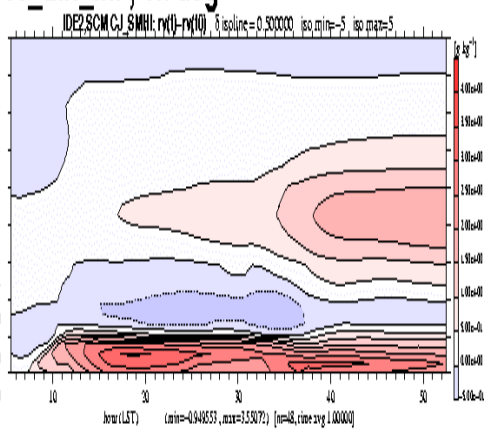


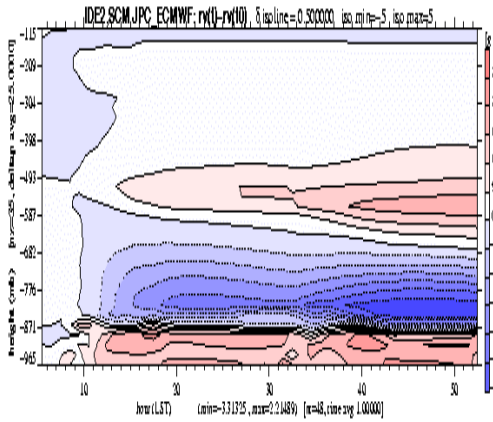


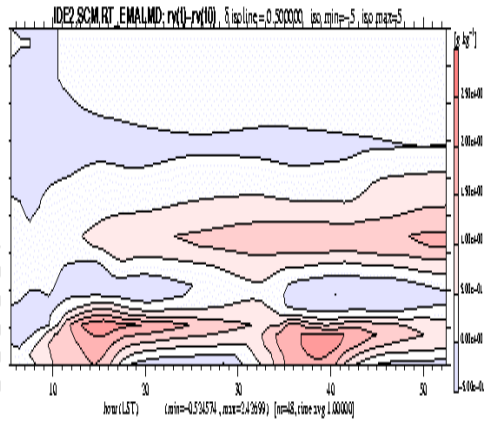


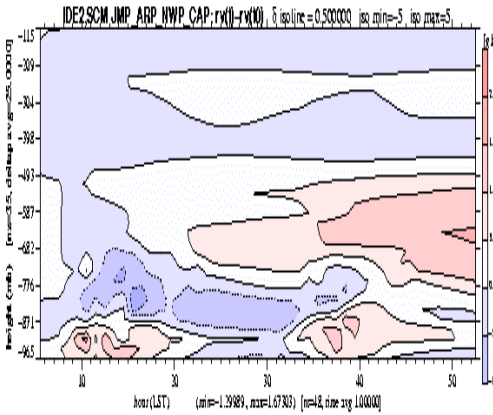
SCMs : rv_diff_ini , 1h avg

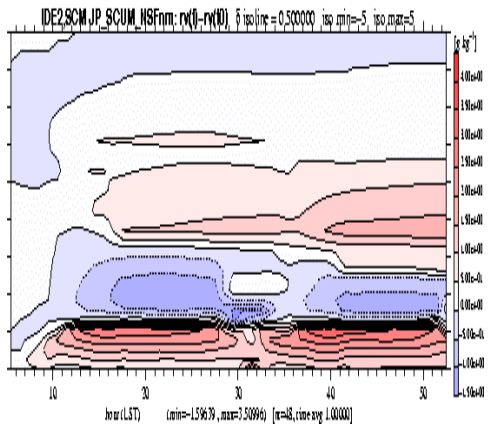




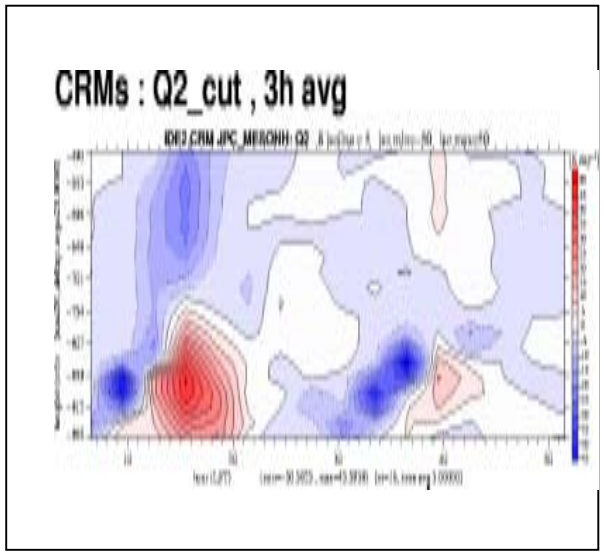


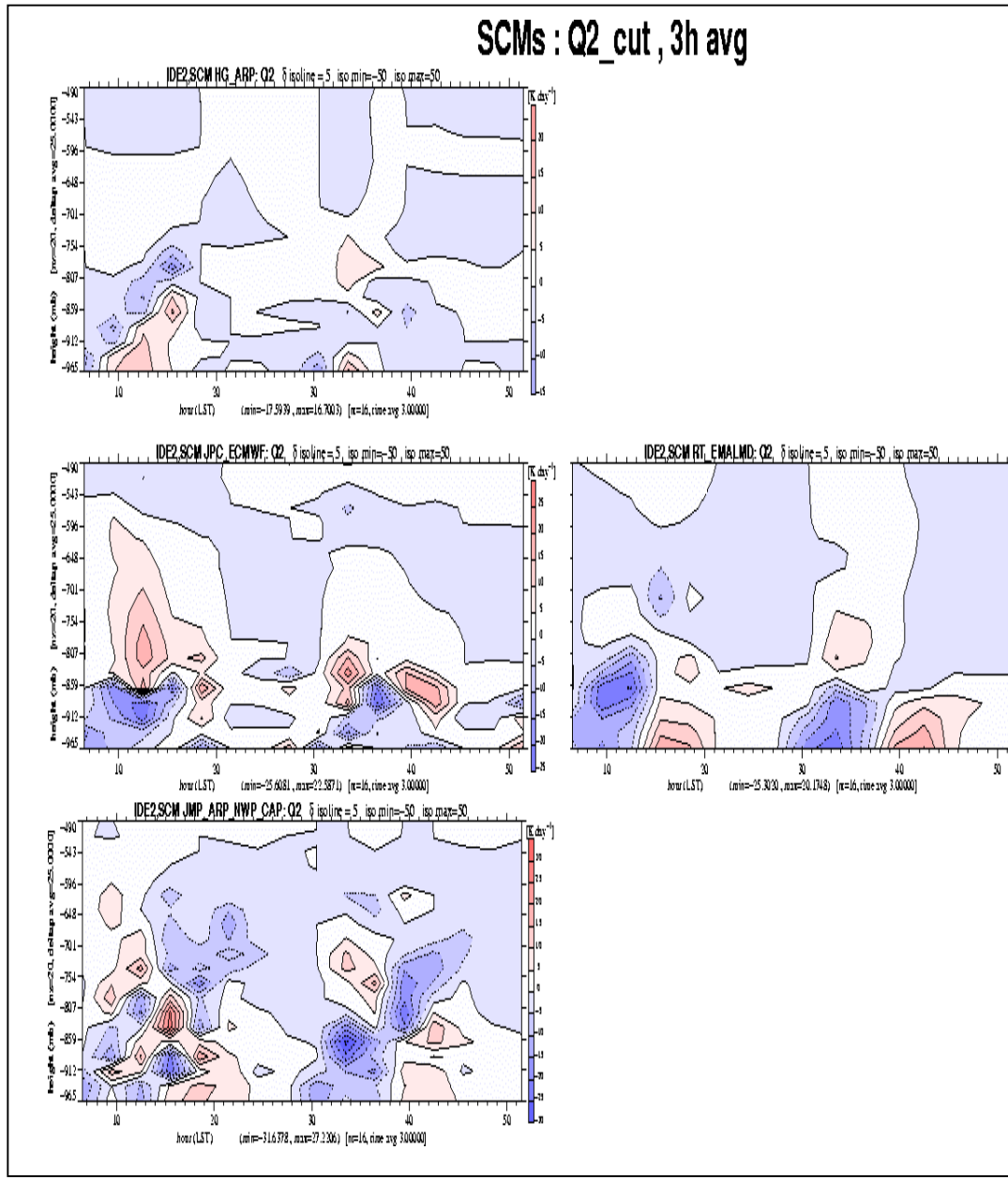




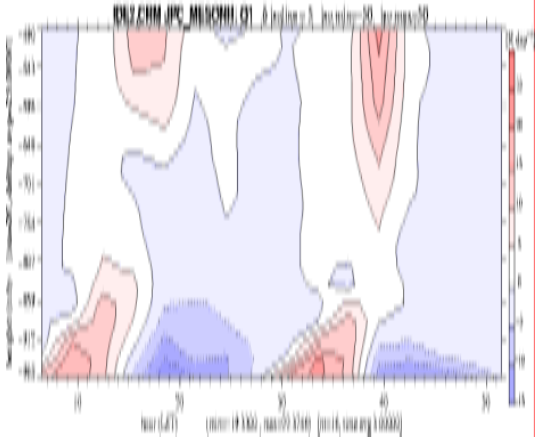


to go further: need to compare Q2 and moisture flux (complex)

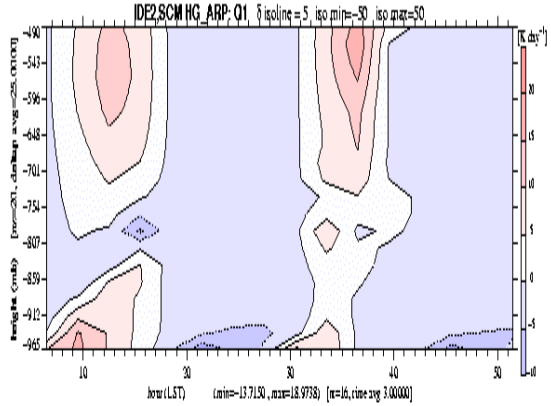


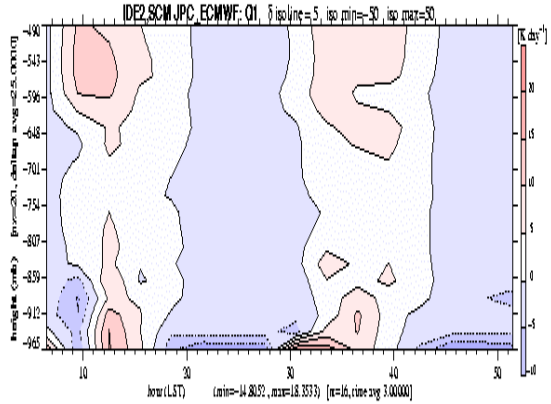


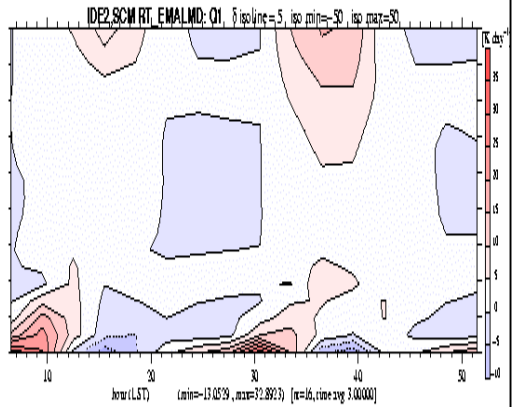
CRMs : Q1_cut , 3h avg

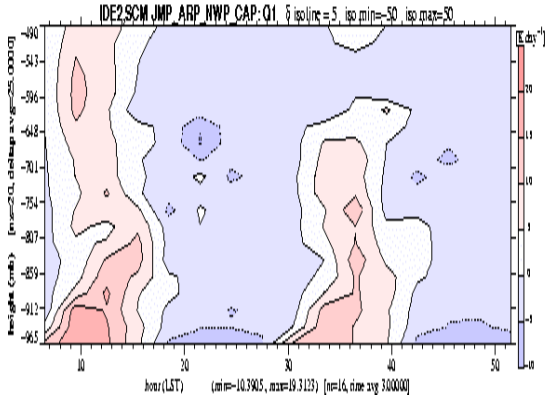


SCMs : Q1_cut , 3h avg



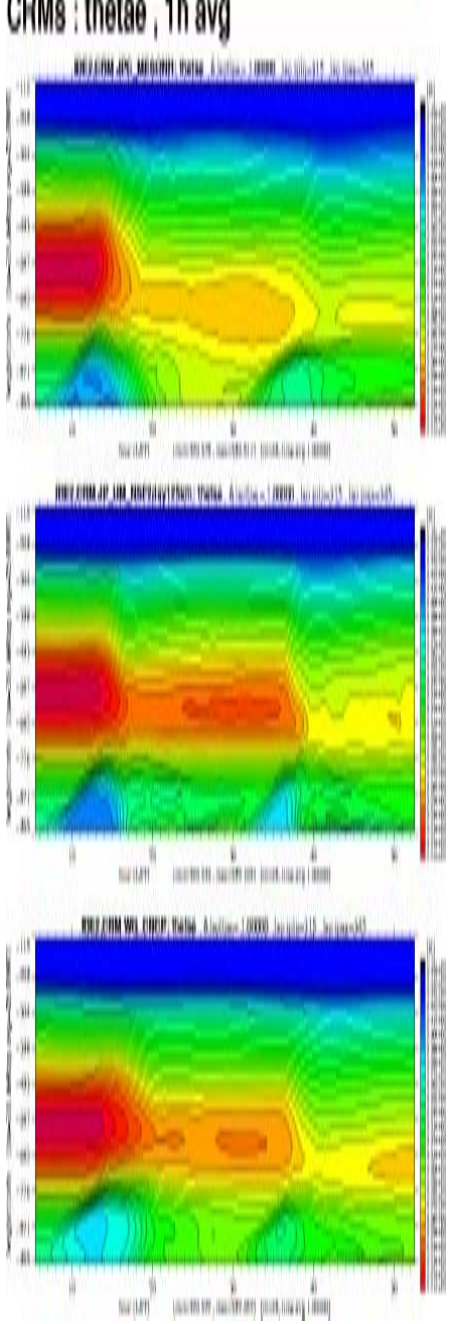


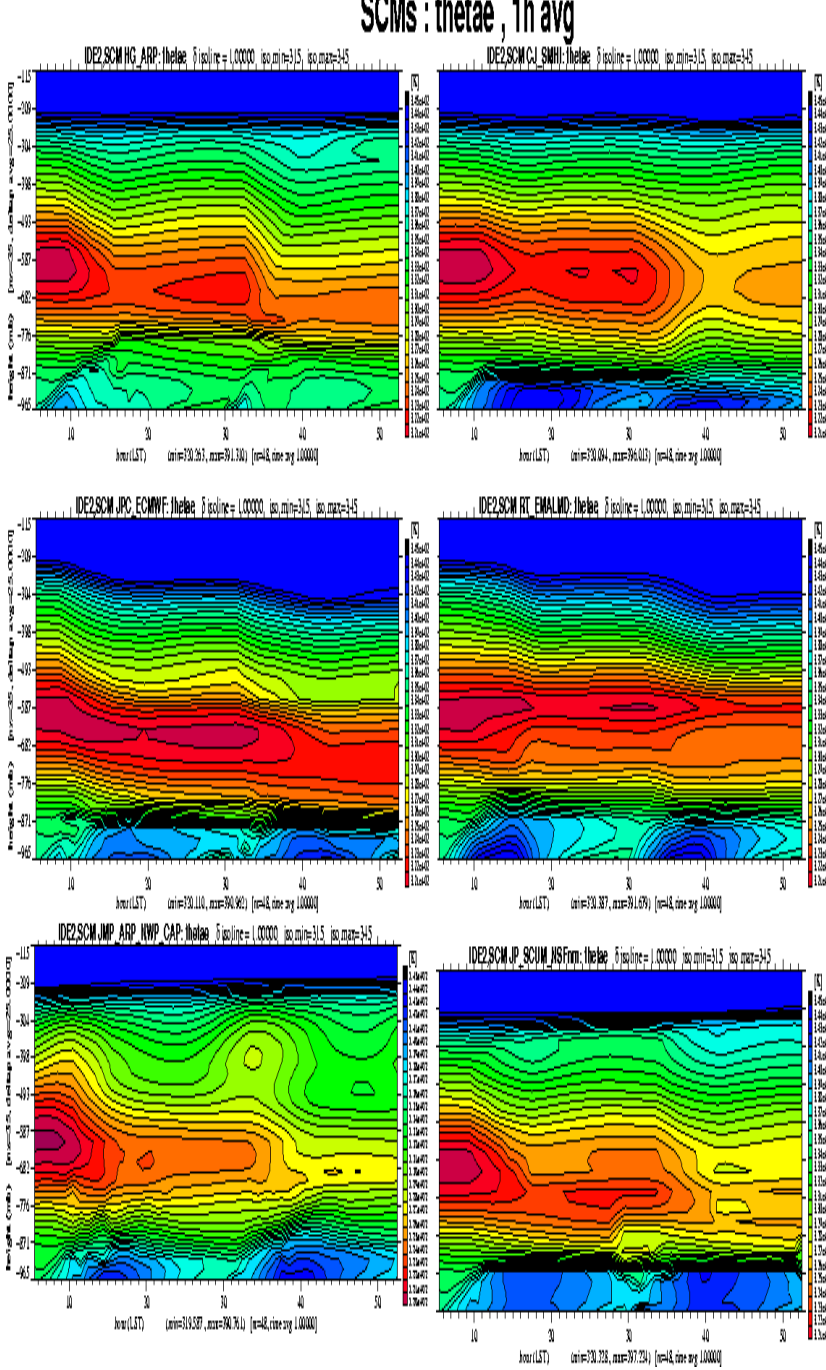




thetae

apparently leads to an atmosphere which is less stable in SCMs than CRMs





questions raised, propositions made in Utrecht

- ✓ **factors controlling the length of the non-precipitating phase?**
  moisture is one factor

- ✓ **impact of downdrafts on stability**:
  they increase the CIN in CRMs
  not so clear in SCMs
  not much impact in some SCMs (because they are already too weak?

- ✓ **systematic sensitivity study to triggering and downdrafts?**
  (partly done, input from C. Jones and J.-M. Piriou)

- ✓ **GCM tests** (partly done, ECMWF model)

- ✓ **SCMs behaviour when convection is turned off?**
  how does it compares to the shallow cumulus case?
  (not been done, H. Grenier moved)

✓ **intercomparison paper** : in preparation

actions: for now mostly myself with some help of Jon Petch

+ for those who did not do it yet :

information concerning the run (version, references…)

links between BL, shallow & deep convection and cloud properties

(1/2 page to 1 page)

…talk more at the end of the session

wrap-up discussion

✓**timetables, deadlines**

end of EUROCS: 1 March 2003
submission of papers, special issue: in 2003 (spring or latter?)

coordinate timetables for reports & papers

✓**reports, data availability, deliverables**

reports will include results from CRMs, SCMs and GCMs
how long?
where do we archive model outputs?
available figures can be put on the web in January

✓**papers, special issue**

PAPERS

« Group » paper with a long list of co-authors

includes results from

- GCMs, RCMS
  material for the introduction, C. Jones & J.-M. Piriou
- CRMs & SCMs (intercomparison)
  discussion rainfall, cloud top height, stability, triggering and downdraughts

(not in depth analysis)

A question: for the intercomparison, do we distinguish between models (different types of curves…) or not?

organisation, your feedbacks: within 1 month, ok?

The « Chaboureau » papers are not far from ready

- the CRM analysis
- the CRM-SCM-GCM study

The GCIN/GCAPE paper , Remi Tailleux

Papers of Jon Petch & Alison Stirling

others?