Last operational changes and perspectives for ARPEGE/ALADIN

E. Bazile, Y. Bouteloup, F. Bouyssel, S. Malardel, P. Marquet

For more details: Evolution of the physical parametrisations of ARPEGE and ALADIN-MF models. Bouteloup Y., E. Bazile, F. Bouyssel and P. Marquet (2009) Aladin Newsletter Nr35 p48-58

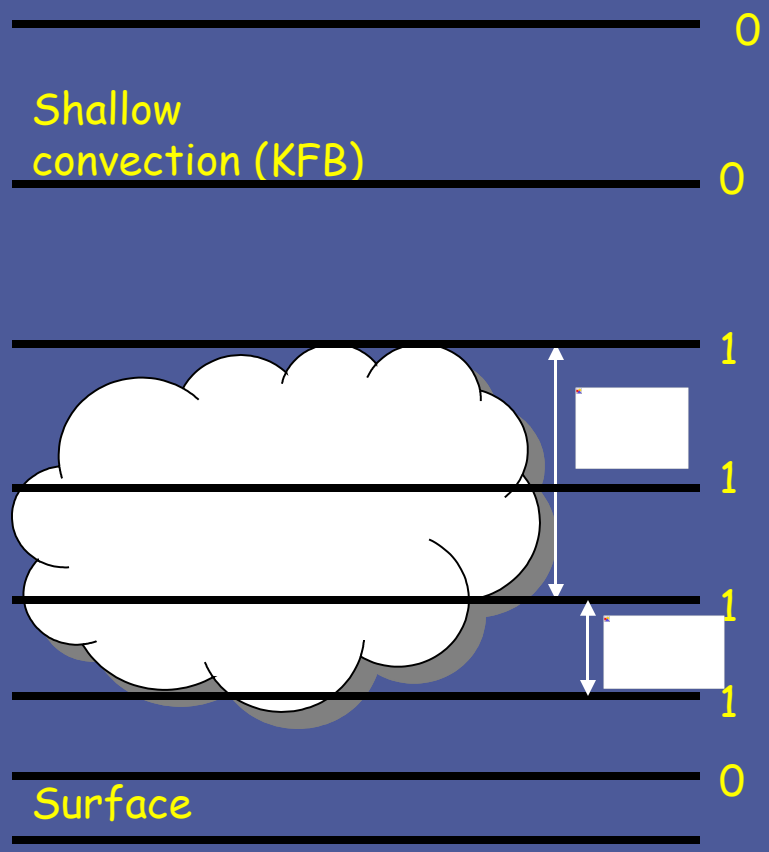
ALADIN/HIRLAM
Utrecht 12-15 May 2009

METEO FRANCE
Toujours un temps d'avance

Physics modifications operational since February 2009

1. **Boundary Layer= TKE (Cuxart et al 2000) with tunings + a top PBL entrainment (Grenier, Bretherton)**
2. **Mixing length (Bougeault and Lacarrere, 89) with a modification from shallow and deep convection.**
3. Shallow convection = mass flux scheme (Bechtold et al 2001)
4. **Production of TKE from shallow convection**
5. Deep convection only if the top of the cloud > 3000m
6. **ECUME = Sea surface fluxes bulk iterative scheme based on field experiments (Belamari, 2005)**
7. Radiation: 6 spectral intervals instead of 2 in short wave
8. **Ozone= New climatological field from Fortuin and Langematz, 1994**
9. Horizontal diffusion : divergence = vorticity

Link between shallow convection and TKE



$$l_{up\_cvpp} = Max(l_{up\,bl89}, l_{up\,KFB})$$

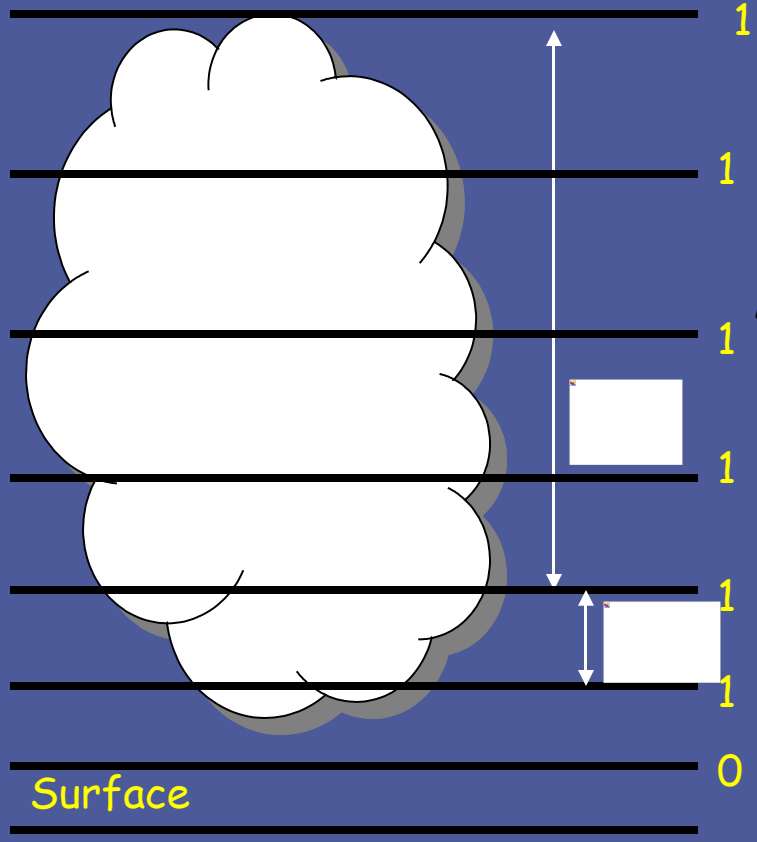
$$l_{dw\_cvpp} = Max(l_{dw\,bl89}, l_{dw\,KFB})$$

$$\frac{g}{\theta_v}\overline{w'\theta_v'}_{shallow}$$

Enhance the mixing

Link between deep convection and TKE

Deep convection



$$l_{up\_cvp} = Max(l_{up\,bl89}, \min(1000, l_{up\,deep}))$$

$$l_{dw\_cvp} = Max(l_{dw\,bl89}, \min(1000, l_{dw\,deep}))$$

Enhance the mixing

$$l_{dw} = Max(l_{dw\,cvpp}, l_{dw\,cvp})$$

$$l_{up} = Max(l_{up\,cvpp}, l_{up\,cvp})$$

$$\lambda = (0.5\pi(\lambda_{b\pi}^{-2/3} + \lambda_{\delta\omega}^{-2/3}))^{2/3}$$

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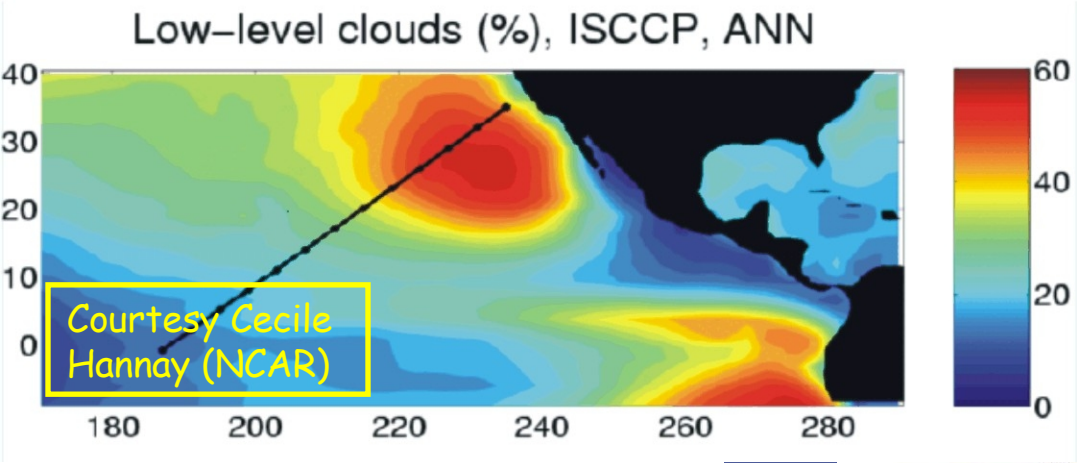
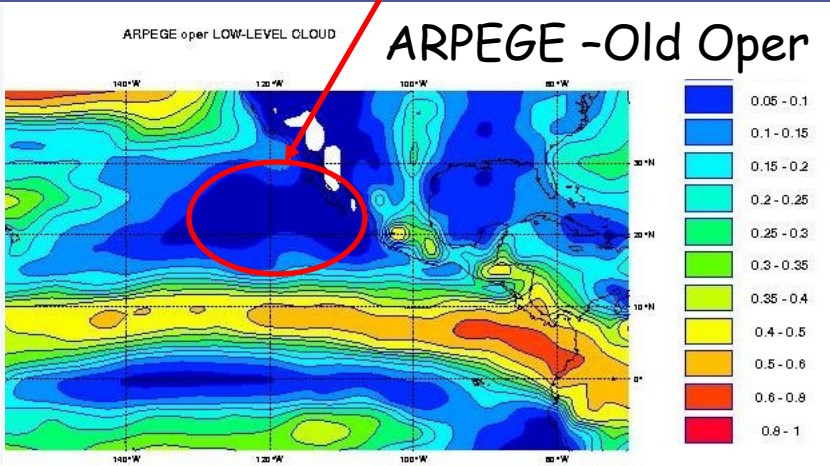
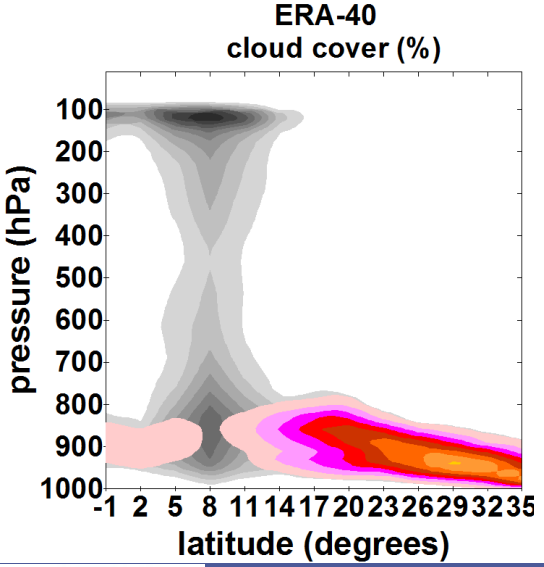
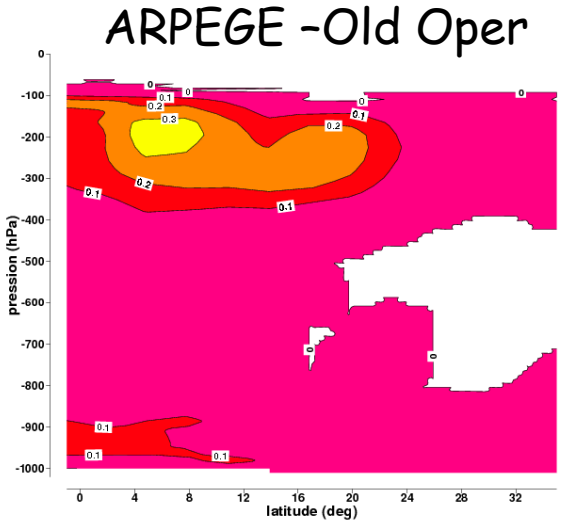
GPCI : Gewex Pacific Cross-section Intercomparison

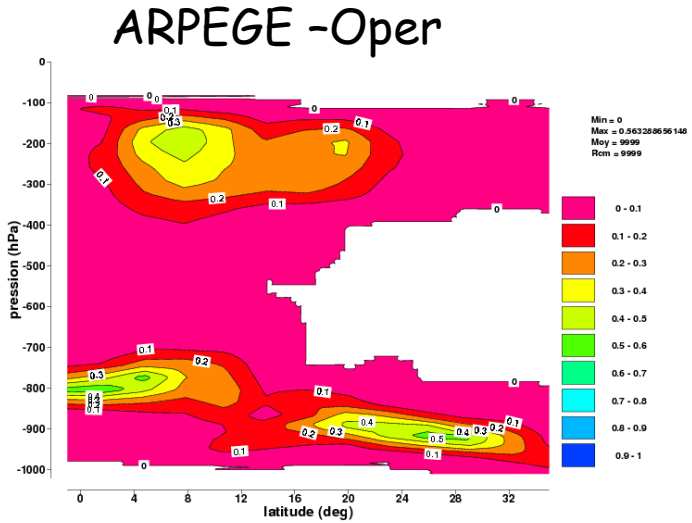
Less than 10%











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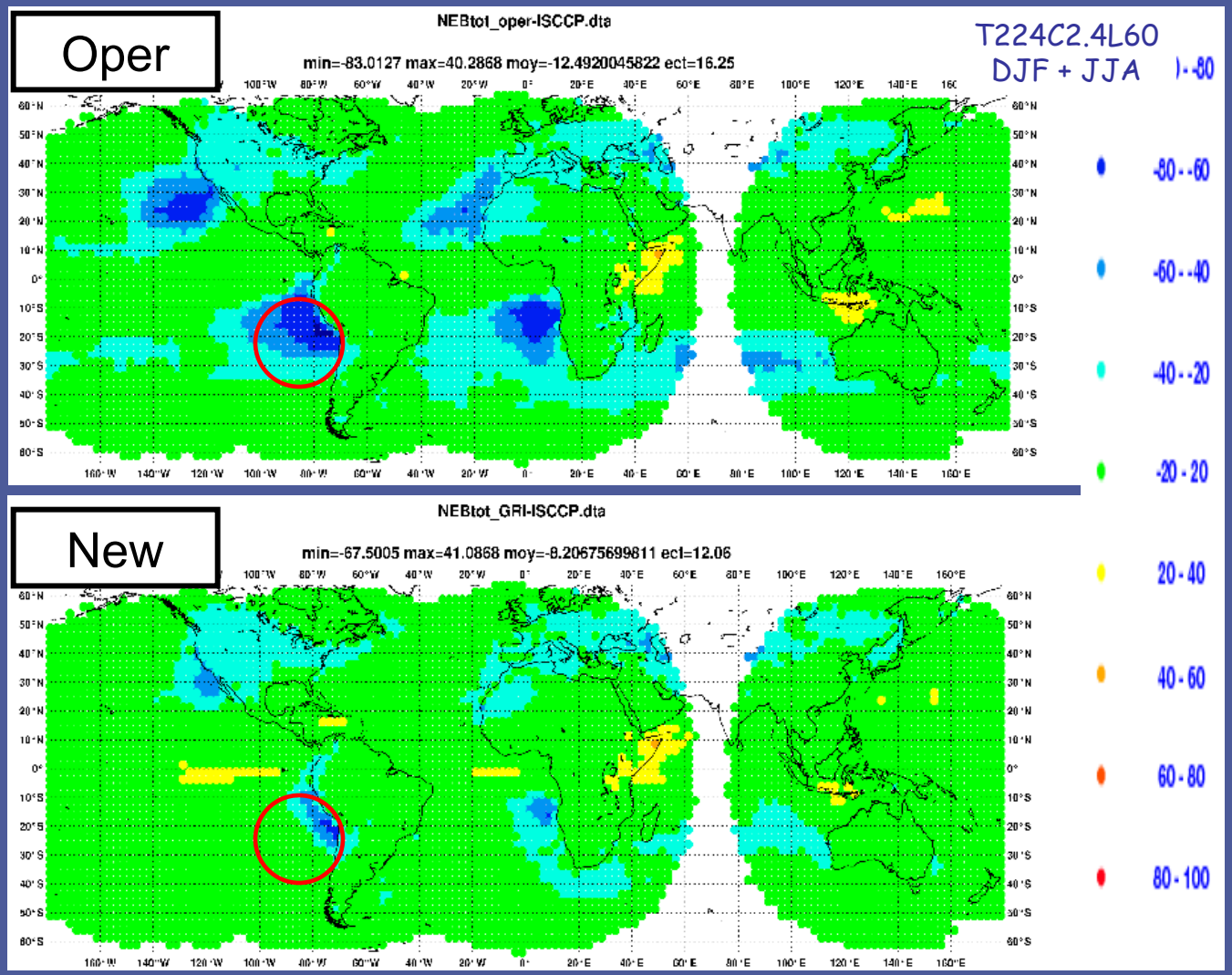
Total Cloud Cover bias Model - ISCCP



better estimation of stratocumulus on the eastern border of anticyclone

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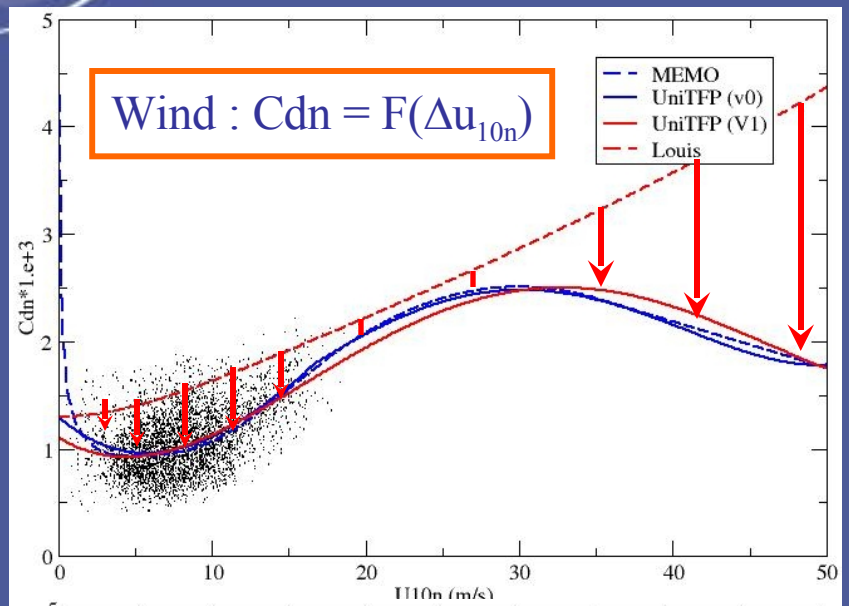
Toujours un temps d'avance

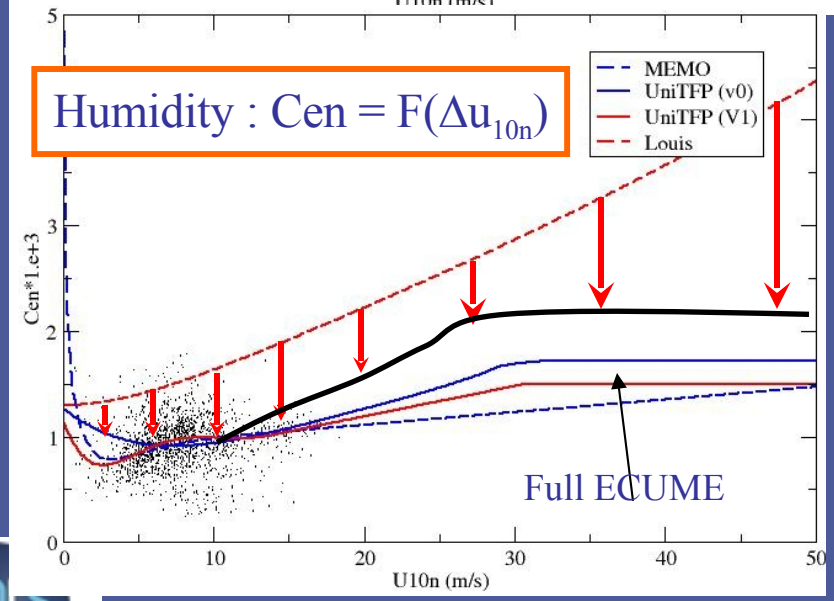
ECUME= Exchange Coefficients from Unified Multi-campaigns Estimates (CNRM/GMGEC/MEMO)

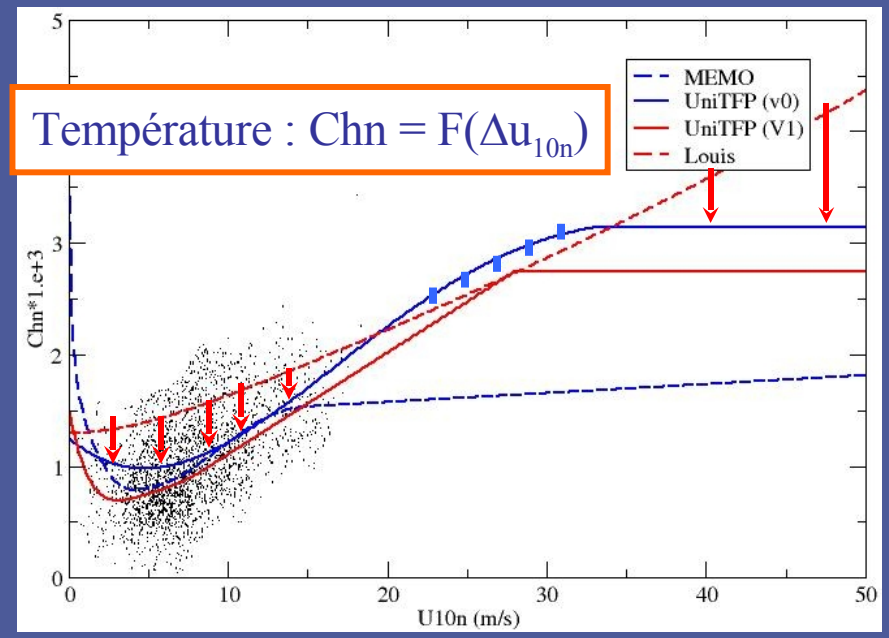


$$Cd = Cd\_ecume$$

$$Ch = Ch\_ecume$$

$$Ce = 0.75 * Ce\_ecume + 0.25 * Ch\_ecume$$





Thanks to Sophie Belamari (CNRM/GMGEC/MEMO)

METEO FRANCE
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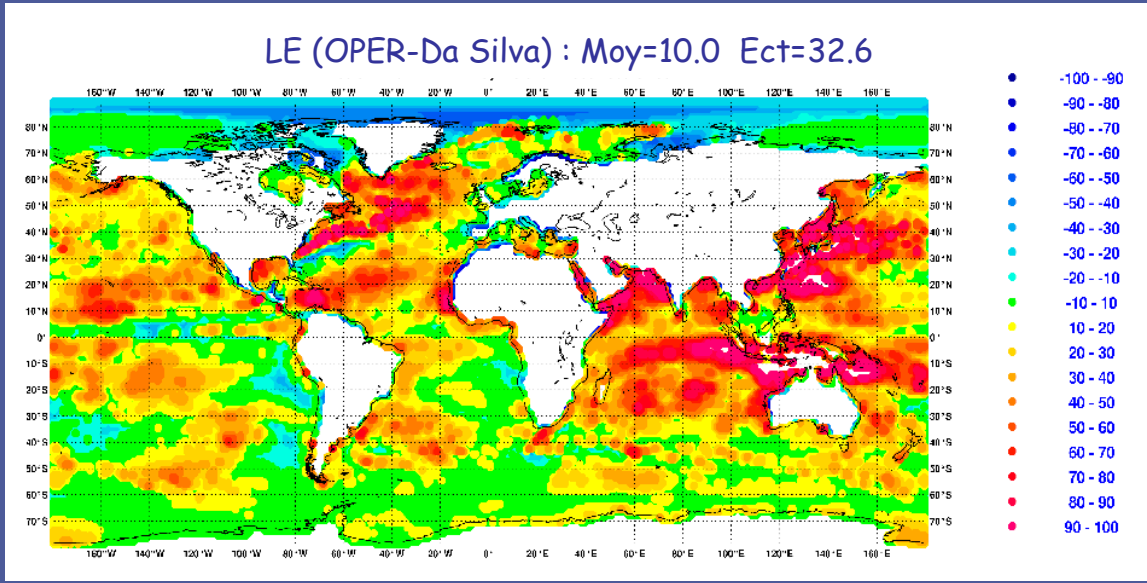
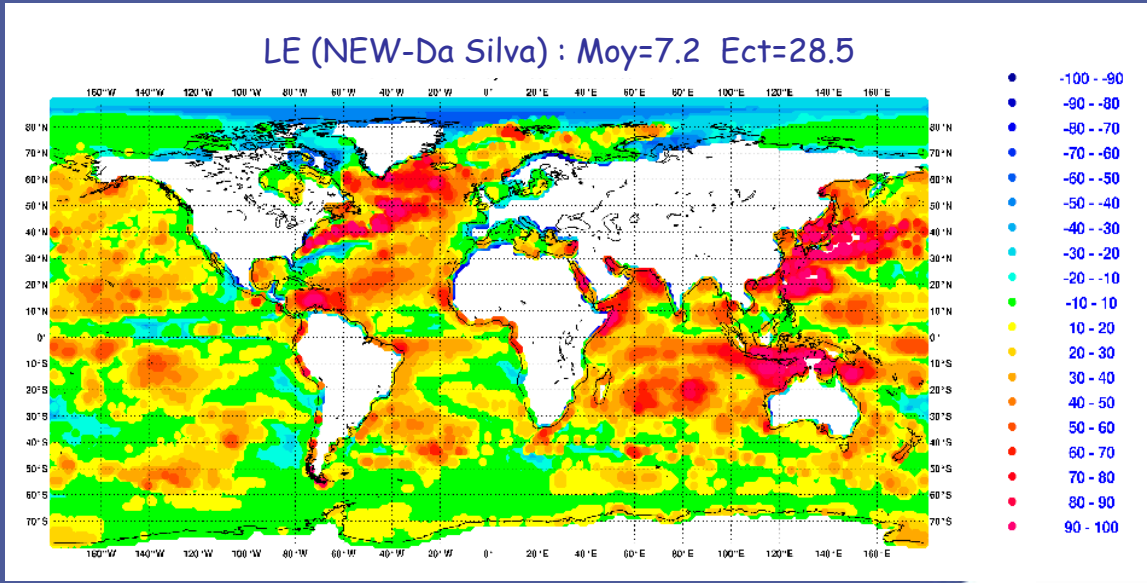
ECUME= Exchange Coefficients from Unified Multi-campaigns Estimates (CNRM/GMGEC/MEMO)

T224C2.4L60
DJF





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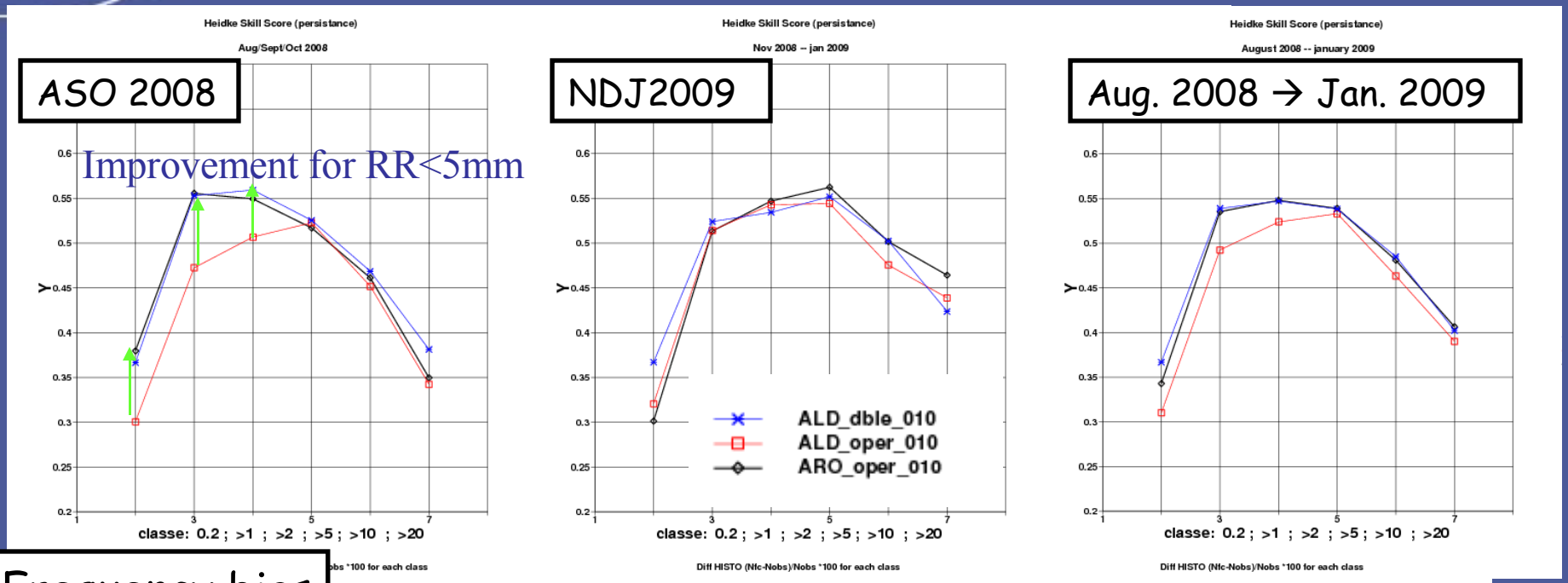
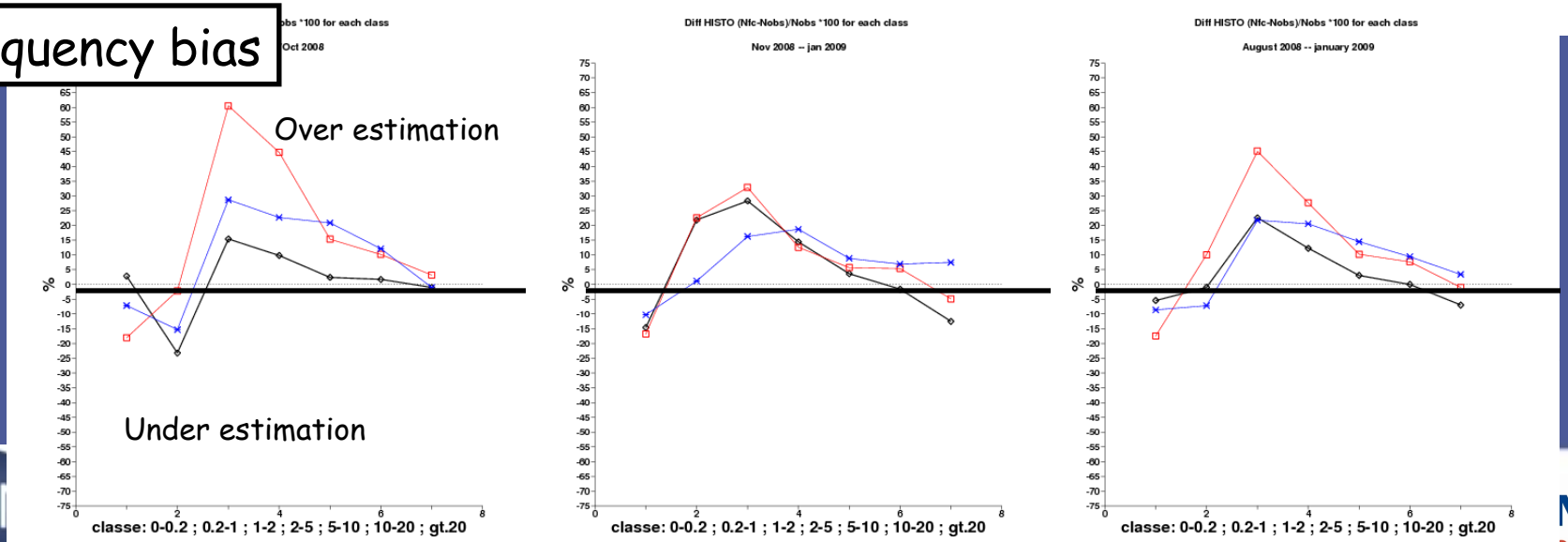
ALADIN Rainfalls 30h-06h

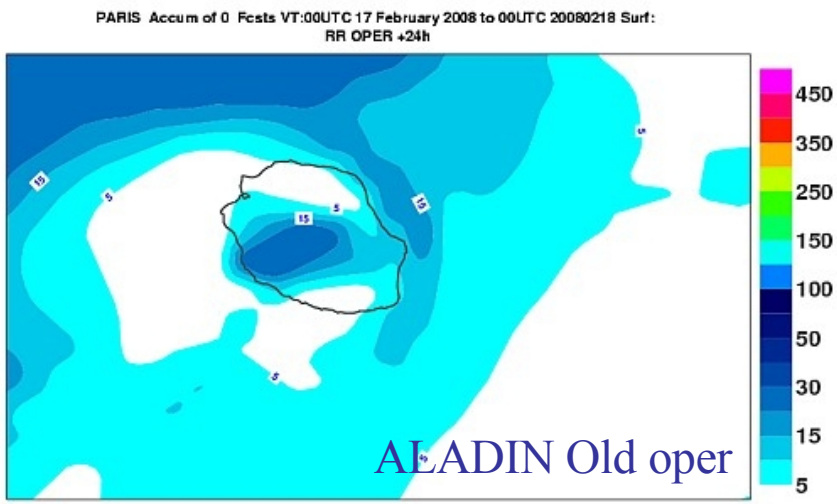
Heidke Skill Score

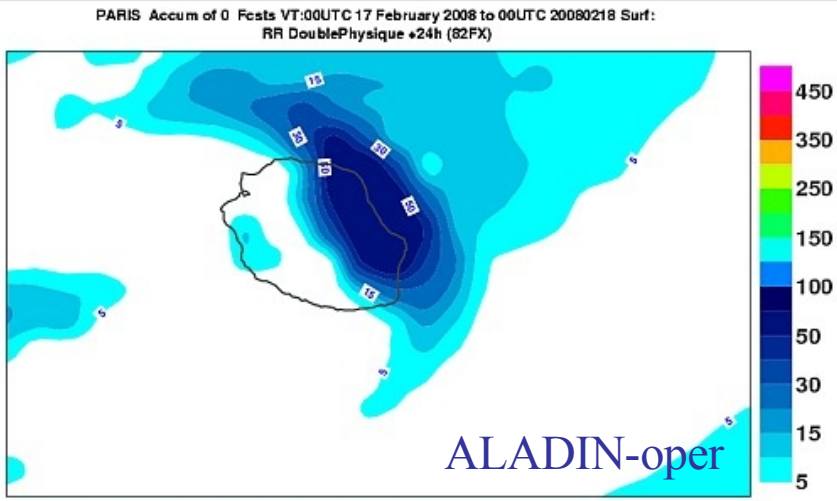


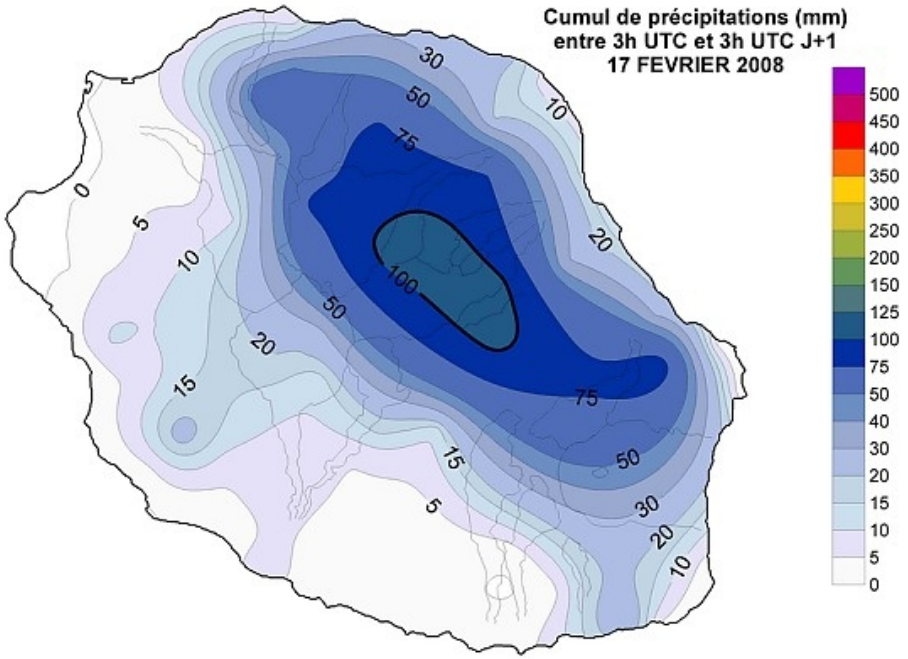
Frequency bias



Improvement of rainfall for ALADIN-Réunion







Thanks to G. Faure, (CRC)

METEO FRANCE
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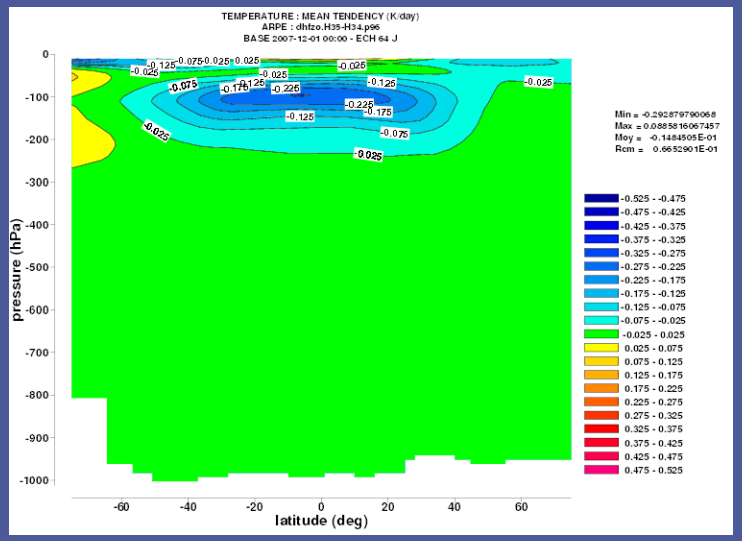
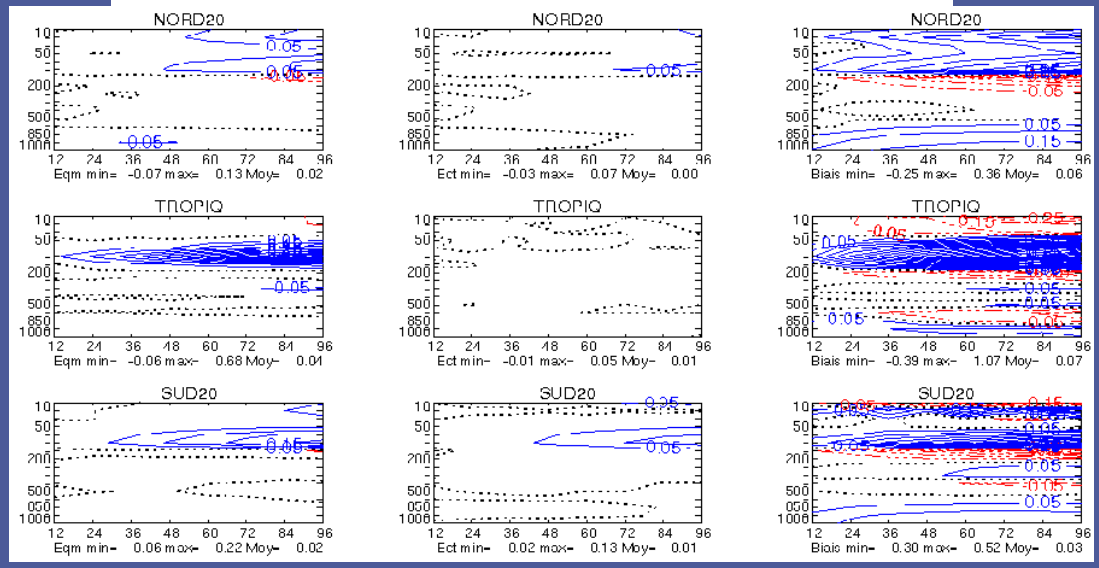
Ozone climatology (Fortuin and Langematz, 1994)

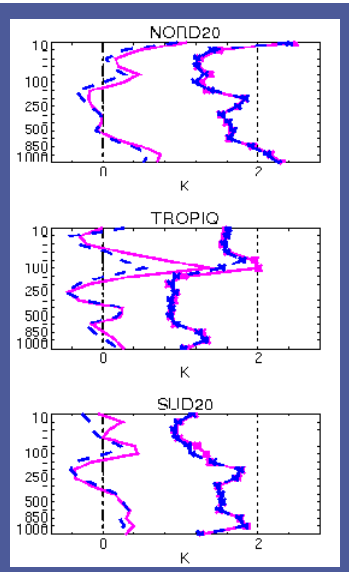
Monthly climatology : $r(O_3) = f$ (latitude , pressure)

Fortuin, J. P. F. and Langematz, U. (1994). An update on the global ozone climatology and on concurrent ozone and temperature trends. Proceedings SPIE. Atmos. Sensing and Modeling, 2311, 207–216.



TEMPERATURE : PH01.r 0/AC-PH35.r 0/AC
(/0.05K)
31 cas, 01/12/2007_12UTC -> 04/01/2008_00UTC





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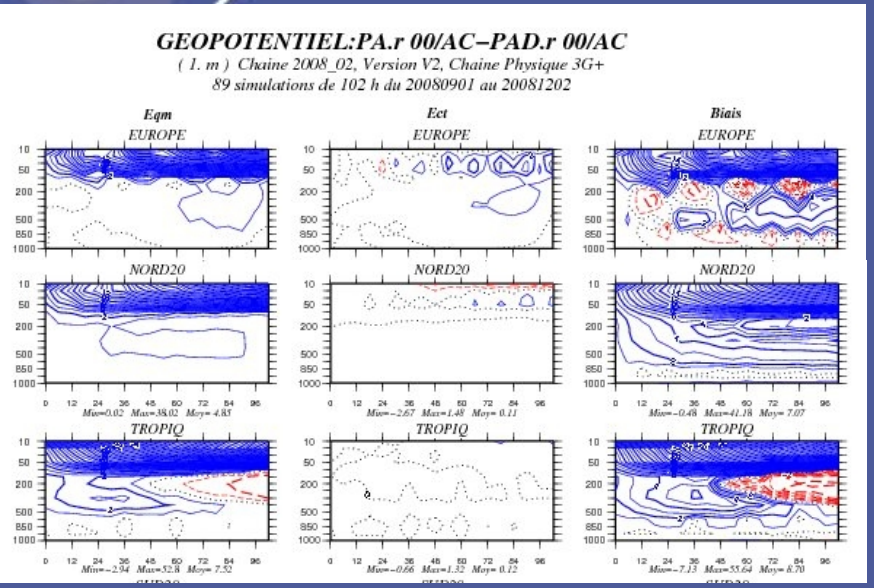
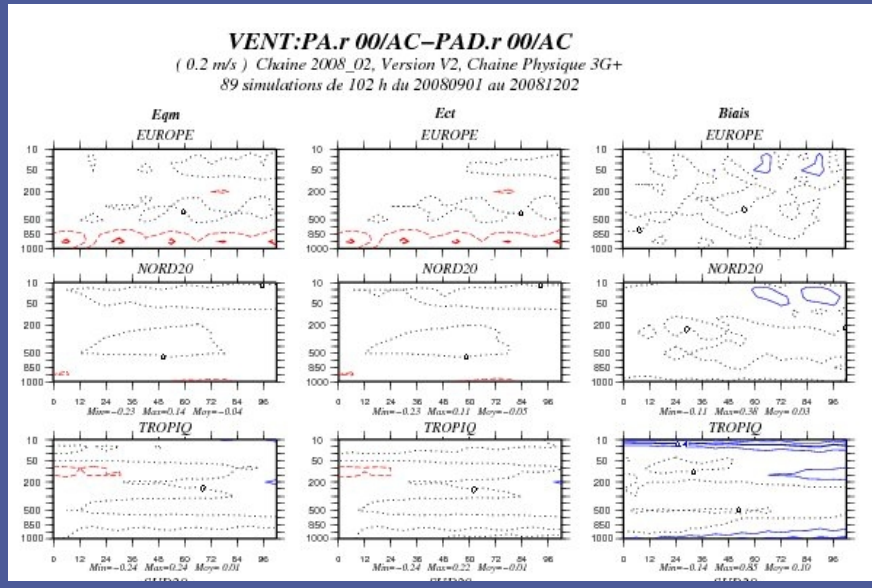
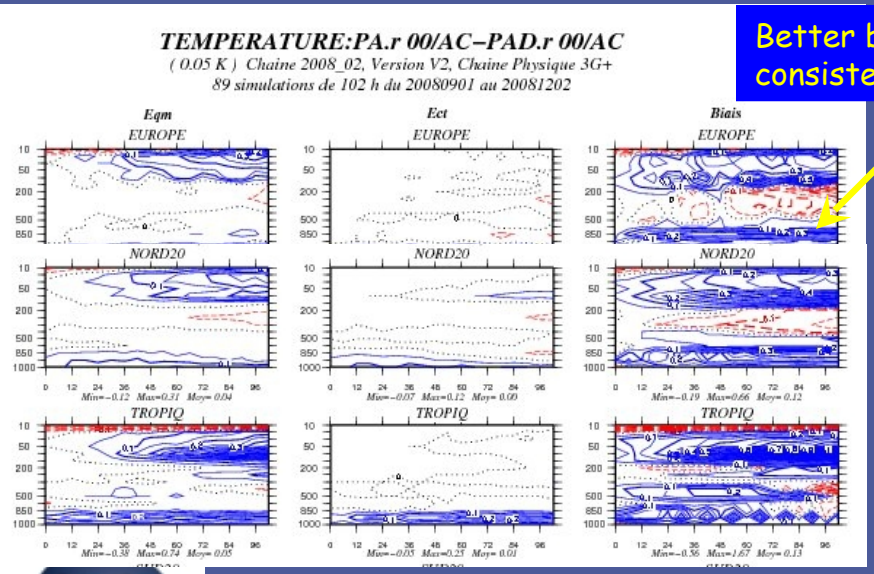
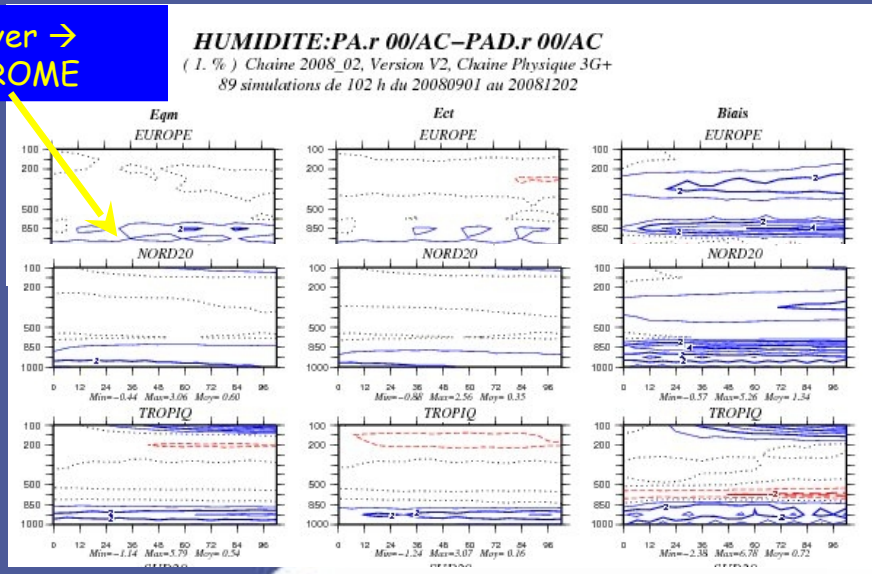
Some scores vs ECMWF analysis







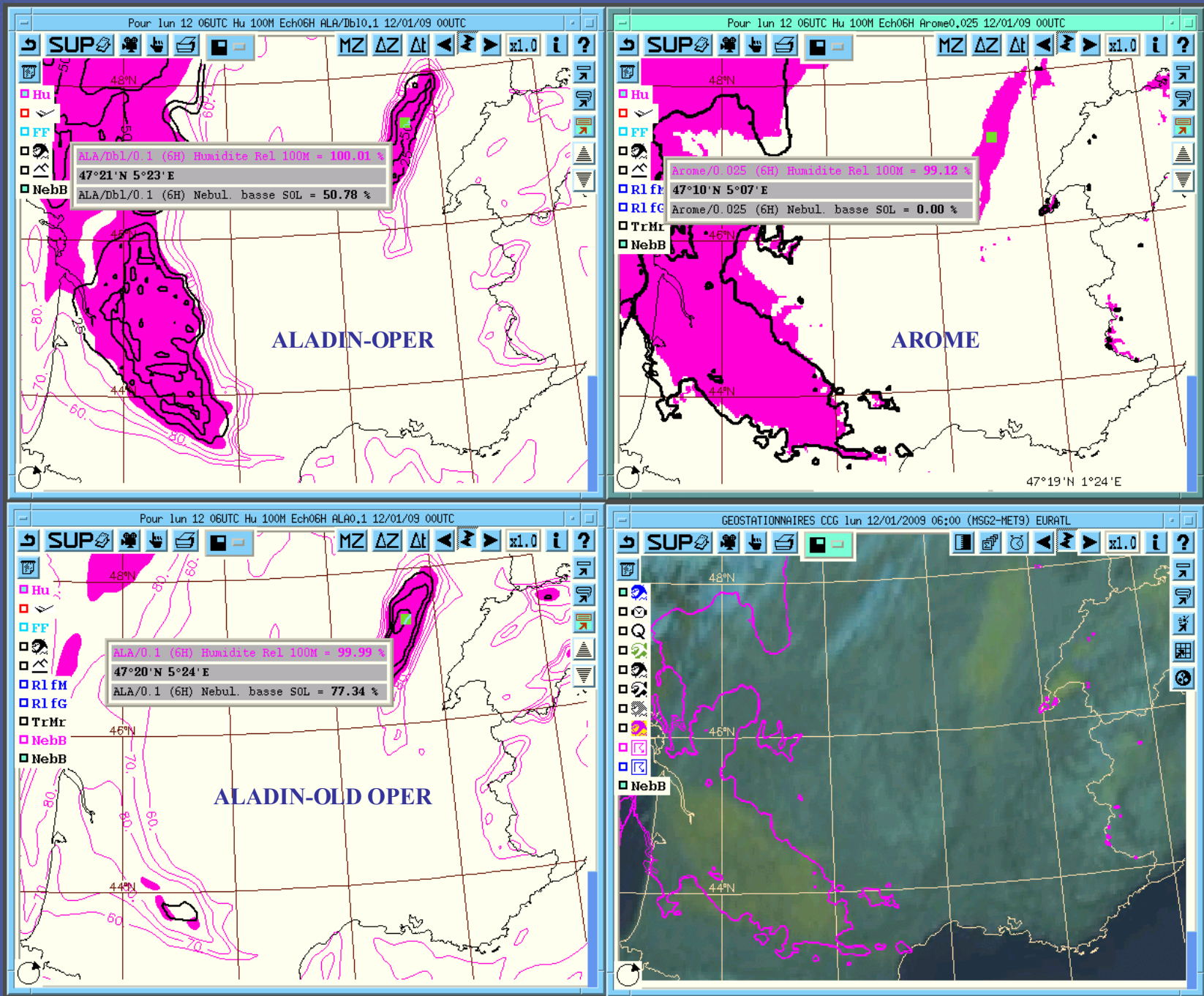
Better boundary layer → consistency with AROME



METEO FRANCE
Toujours un temps d'avance

Fog over south west 12/01/2009

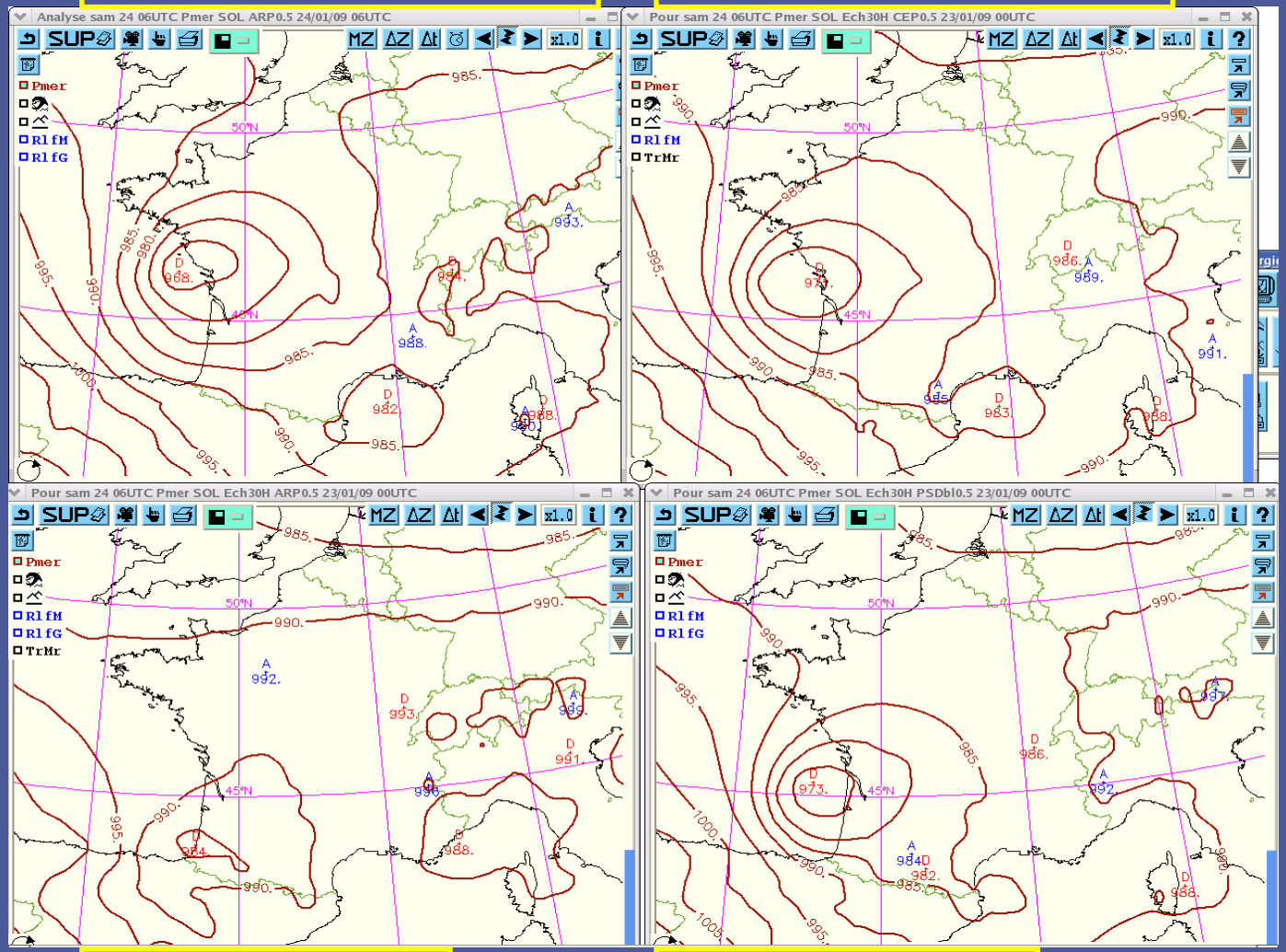
Hu=pink at 100m
Black line=cloud cover



STORM 24/01/2009 (Pmsl)

Analysis 24/01/2009 06TU

ECMWF +30h



ARPEGE Old+30h

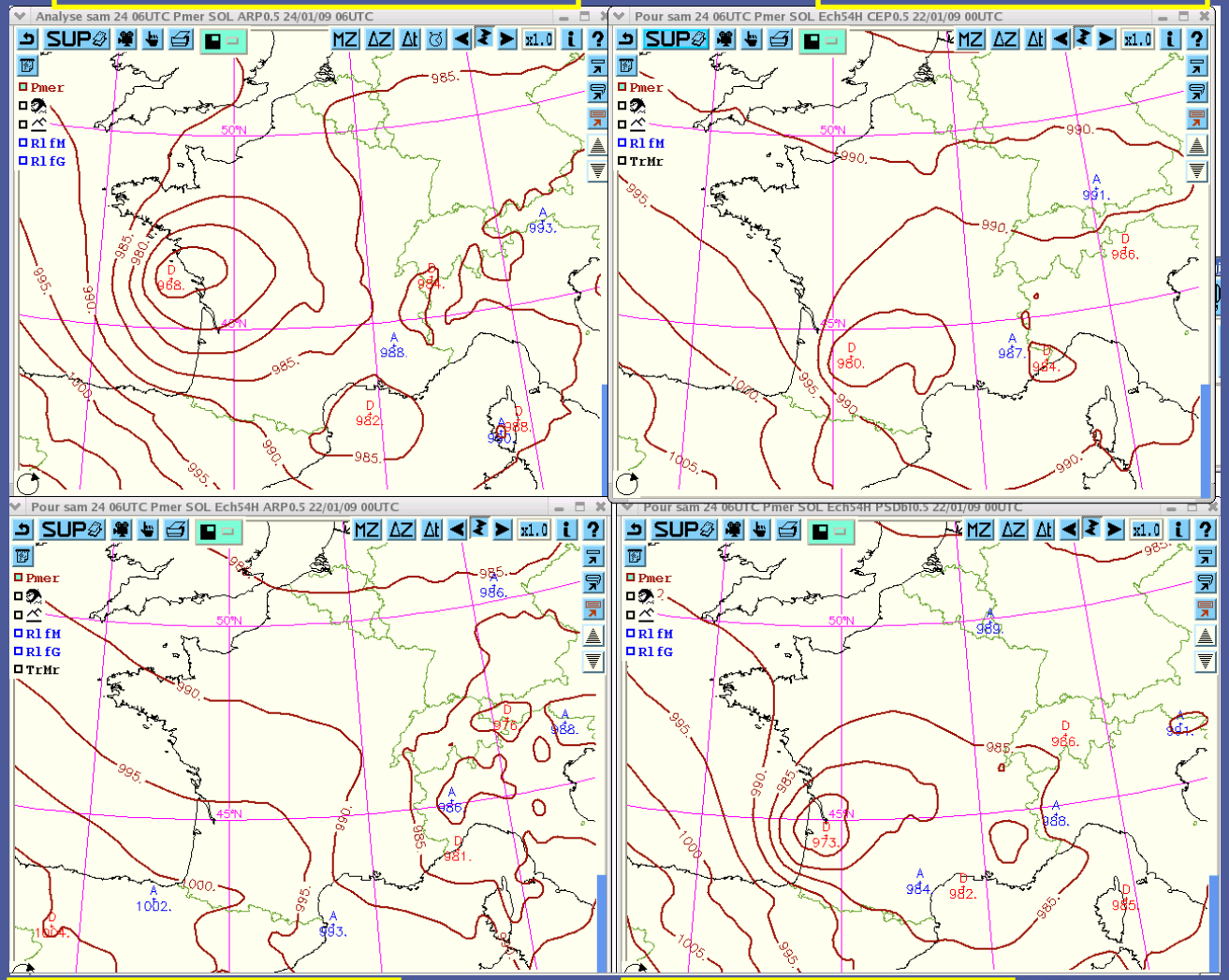
ARPEGE NEW+30h

METEO FRANCE
Toujours un temps d'avance

STORM 24/01/2009 (Pmsl)

Analysis 24/01/2009 06TU

ECMWF +54h



ARPEGE Old+54h

ARPEGE NEW+54h

METEO FRANCE
Toujours un temps d'avance

Perspectives …

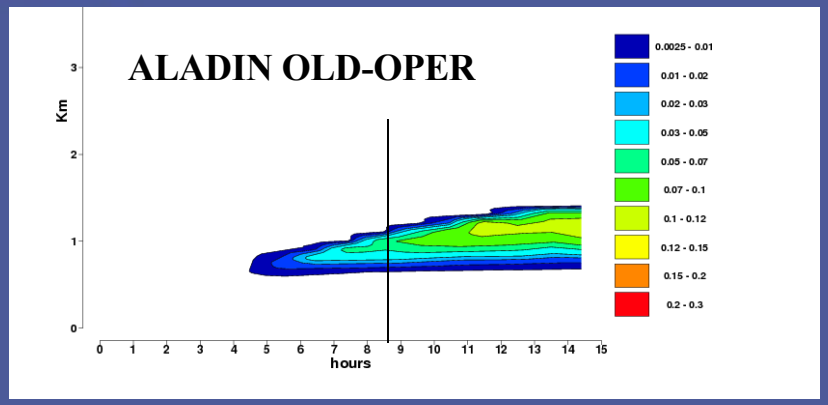
•High resolution for ARPEGE T798L70C2.4 (10km over France) very encouraging results. ALADIN 8km ?

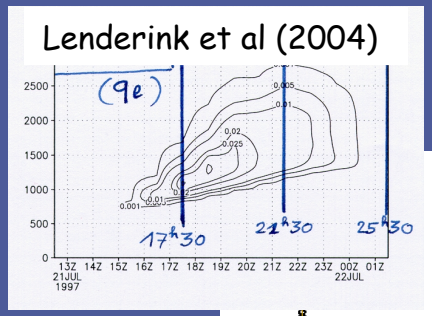
	épaiss. std. km	Arp 46	Arp 60	Arp 70
couche de surface	*0 – 0.15*	2	3	3
couche limite planétaire	*0.15 – 1.5*	8	7	11
troposphère libre	*1.5 – 8.0*	15	15	19
tropopause	*8.0 – 13.0*	6	11	12
stratosphère	*13.0 – 50.0*	12	19	20
mesosphère et au-delà	*50.0 – 80.0+*	3	5	5

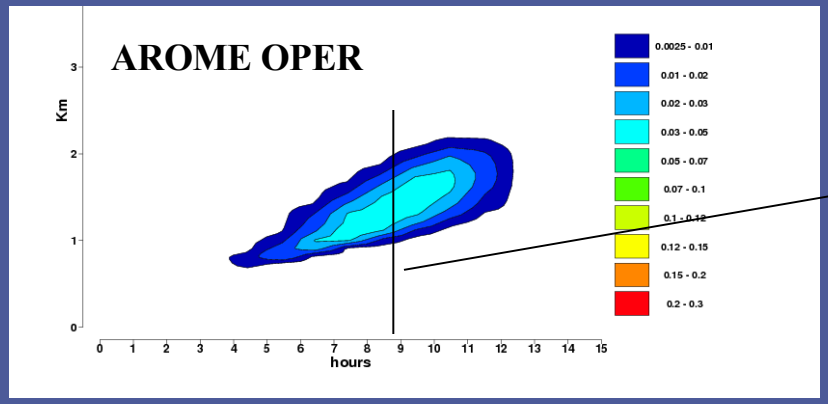
+4 < 1500m

•SURFEX already used in AROME (details in J.F. Mahfouf's talk before)
•Small corrections and modifications in the shallow convection :Wlcl and temperature perturbation function of TKE instead of constant

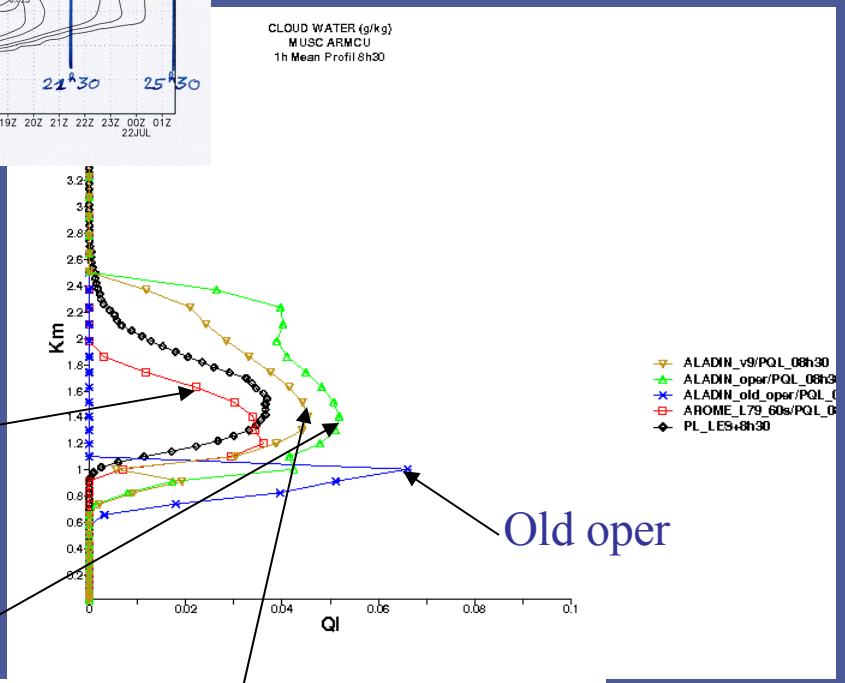
EUROCS/CUMULUS (ARM) 40L below 4000m



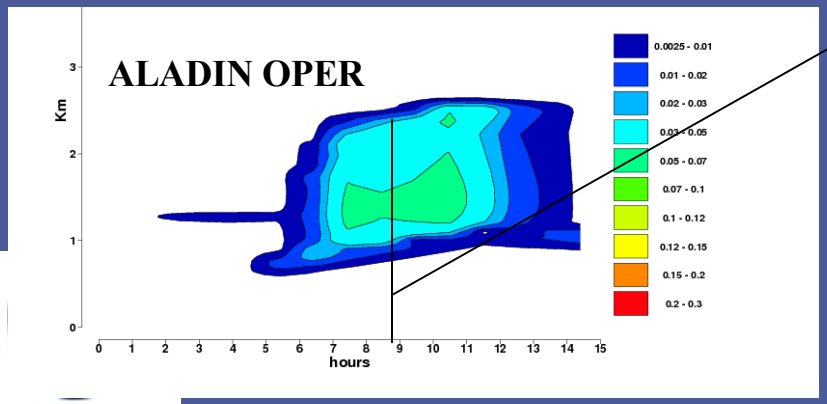


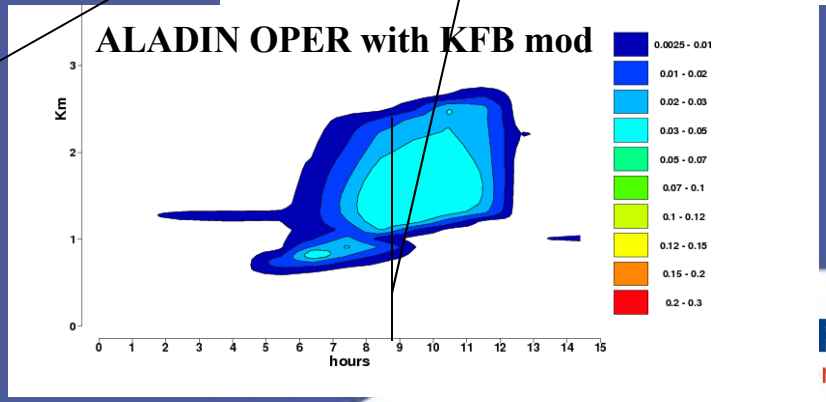


Qc (g/Kg)



Old oper





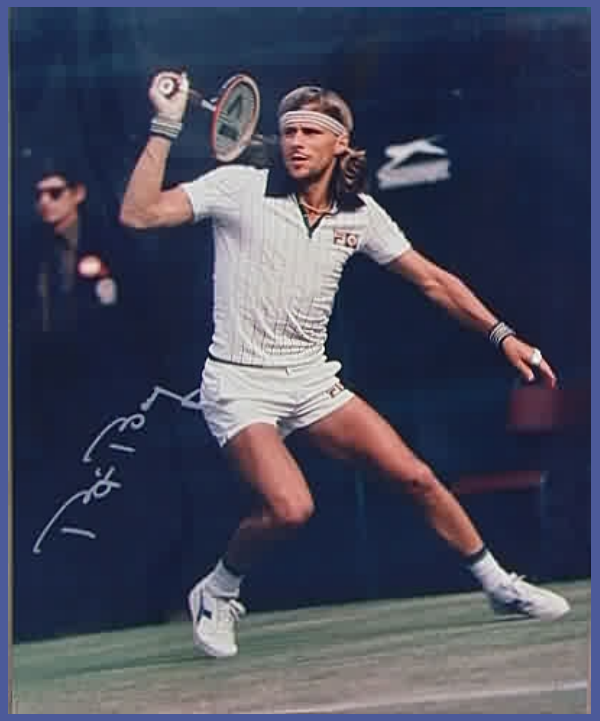
FRANCE
mps d'avance

Perspectives …

- High resolution for ARPEGE T798L70C2.4 (10km over France) very encouraging results. ALADIN 8km ?
- SURFEX already used in AROME
- Small corrections and modifications in KFB (Wlcl and temperature perturbation function of TKE instead of constant)
- 3MT deep
- For cloud scheme: Bougeault's function instead of Smith
- EDKF for the wind mixing and dry mixing : good results on ARMCU, Bomex etc …but problems with time-step > 400s
- Radiation SRTM+McIca : coarser grid for the computation ?

Very short term perspective …

1st TETOC tennis "event" with
many "good player" … from several "model" !



Oh sorry, now it is Nadal-Federer !

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