Sensitivity of the QPF with physics and … dynamics

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and
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With special thanks to Filip, Jean-Francois and Radmila

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Toujours un temps d'avance

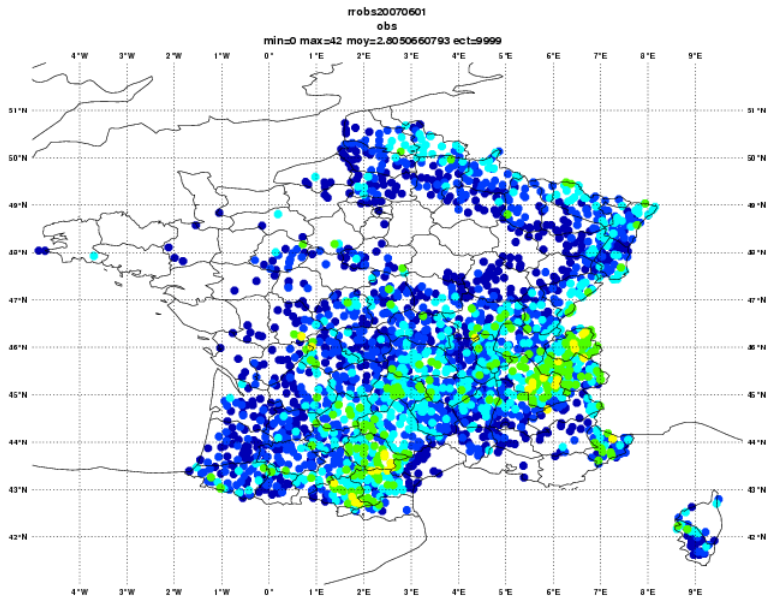
or
Do we underestimate the RR ?
Do we need a deep or "something else " at 2.5km ?

- A deep convection scheme ?
- A shallow = KFB, EDKF, EDMF etc …
- Some thing in between:

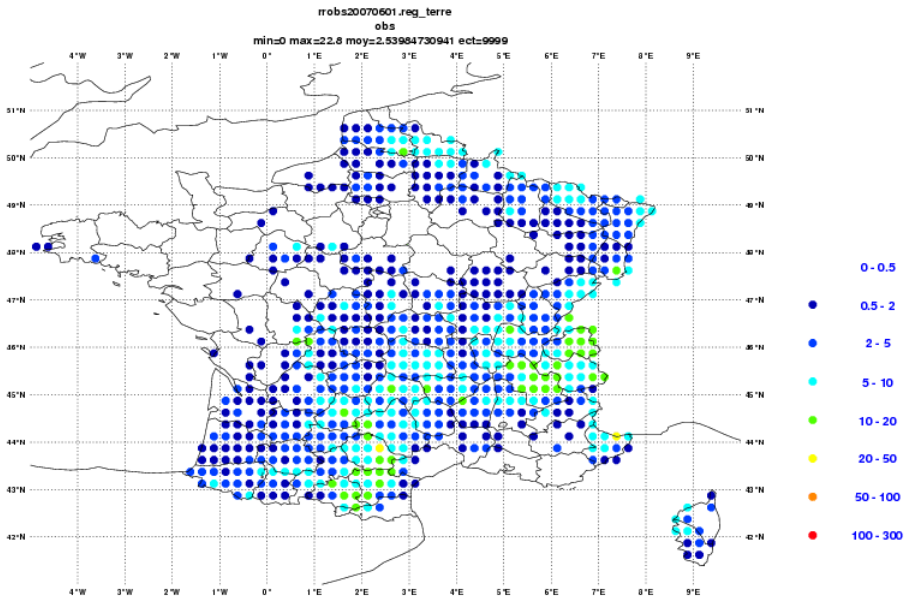
- A "medium" (also clairvoyant !) scheme

Context

· Period June and November 2007 over France. 24H cumulated rain. 4080 observations →regular grid 0.25°



Max=42mm



Max=22.8mm

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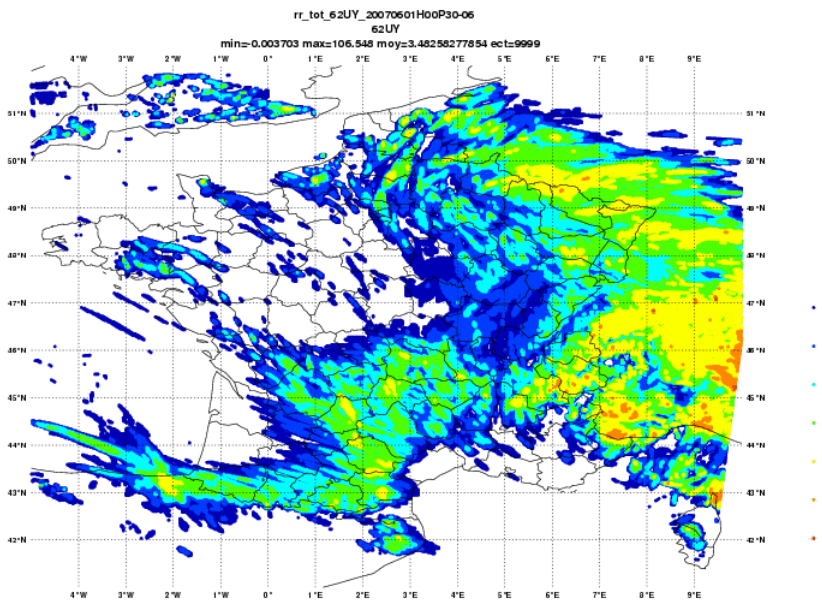
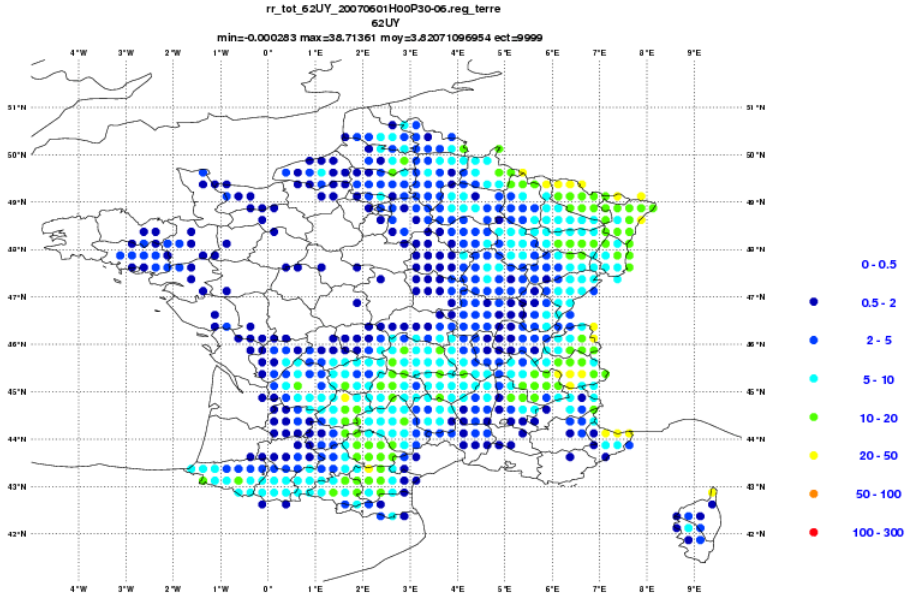
Context

- Model 2.5km, NH, time step=60s, same LBC, same initial fields, same domain etc .. →regular grid 0.25° only on the observation point.





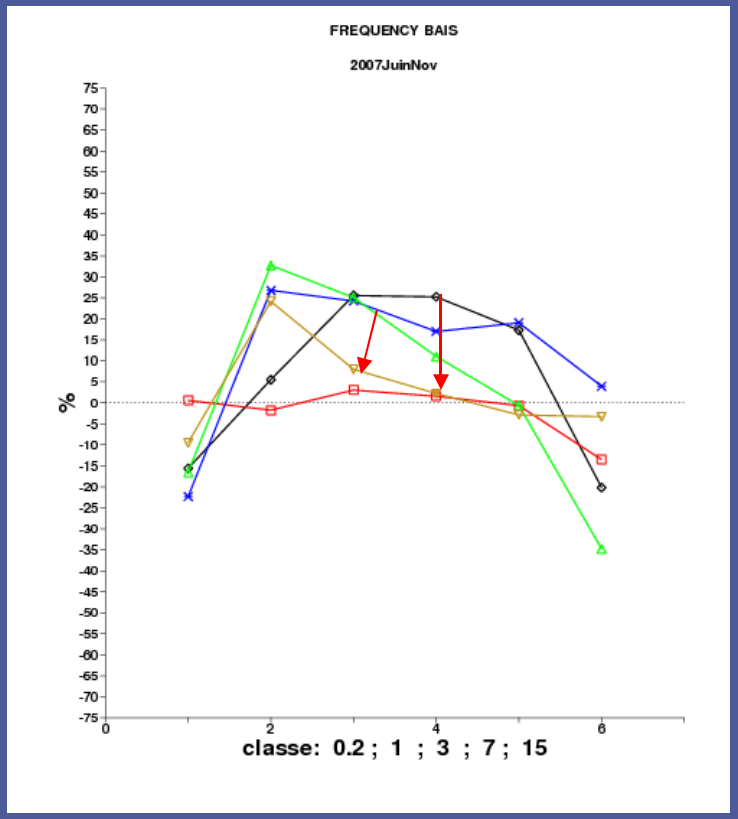
Some physics options in the HAAA Galaxy …

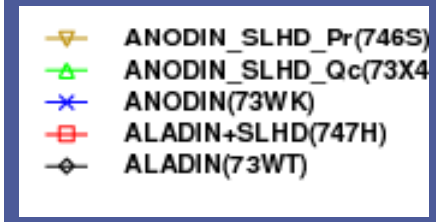
	Aladin/MFoper	Aladin-test since August 2008 = ANODIN	ALARO0	ALARO0 +3MT	AROME
Coeff K diffusion	Louis 79	CBR2000 (HL) With CCH02	Louis histo via p-TKE	Louis histo via p-TKE	CBR (FL) With CCH02
L Mixing length	Int. HCLA Troen & Mahrt	BL89	Int. HCLA Ayotte	Int. HCLA Ayotte	BL 89
Shallow convection	Modified Ri Geleyn 87	KFB	Geleyn 87 With p-TKE	Geleyn 87 With p-TKE	EDKF
Clouds	Smith (90)	f0, f1, f2 Bougeault	Xu & Randall	Xu & Randall	f0, f1, f2 Bougeault
Micro-Physics	Lopez mod ql,qi,qr,qs (PCS)	Lopez mod ql,qi,qr,qs (PCS)	ql,qi,qr,qs (PCS)	ql,qi,qr,qs (PCS)	Ice3 5 variables
Convection	Bougeault 85 SWITCH OFF	Bougeault 85 SWITCH OFF	Bougeault 85 SWITCH OFF	3MT	No
Ray.	ECMWF	ECMWF	New-Geleyn	New-Geleyn	ECMWF

Models

- AROME= 6 versions :
  - first prototype with KFB and no SLHD = 62SR
  - with SLHD only on Ql,Qi,Qr,Qs,Qg = 62UB
  - with SLHD and EDKF = 62UY
  - with EDKF (no SLHD) = 63AB
  - with SLHD and EDKF only on Ql,Qi = 63BA
  - with SLHD (Pr_tunings) and EDKF on T,W,SVD,Qv,Ql,Qi = 63BL
- ALADIN= 5 versions :
  - Oper. physics no SLHD = 73WT
  - Oper. physics with SLHD (Prague tunings) on T,W,SVD,Qv,Ql,Qi = 747D
  - Test physics (Anodin) no SLHD = 73WK
  - Test physics (Anodin) + SLHD only on Ql,Qi,Qr,Qs = 73X4
  - Test physics (Anodin) + SLHD (Prague tunings) on T,W,SVD,Qv,Ql,Qi = 746S
- ALARO-0 physics = 5 versions
  - without 3MT and no SLHD = 73WY
  - without 3MT and SLHD (Prague tunings) on T,W,SVD,Qv,Ql,Qi = 741N
  - with 3MT and no SLHD = 73XH
  - with 3MT and SLHD (Prague tunings) on T,W,SVD,Qv,Ql,Qi = 747X
  - with 3MT and full namelist from Prague (SLHD, PC) = 741X

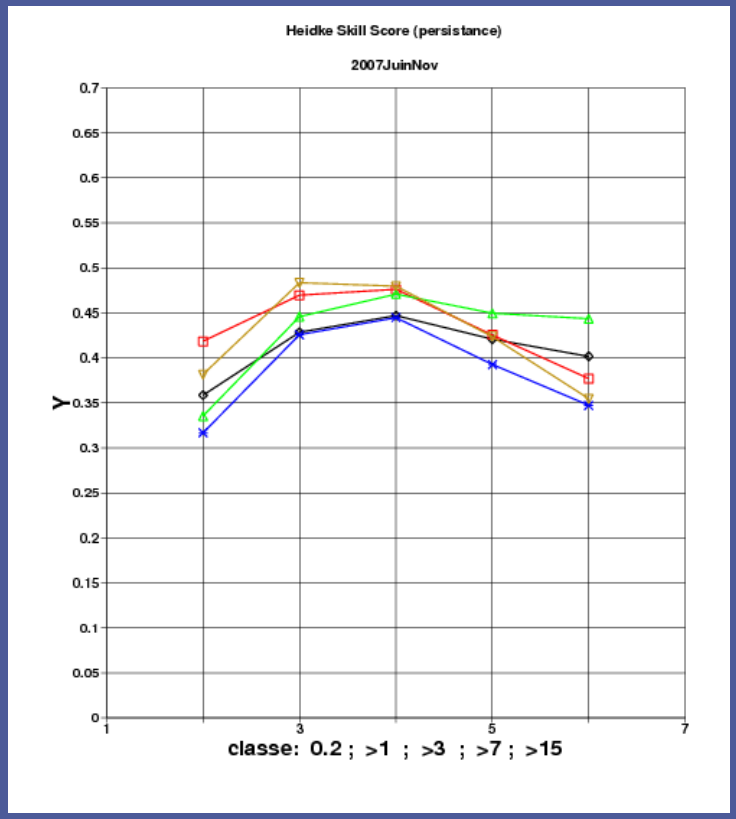
Frequency bias and HSS RR 24h (06TU-30TU) over France
June and November 2007
ALADIN with MF physics





Impact of the SLHD almost bigger than the boundary layer parameterization !

(Louis versus TKE+KFB)



No underestimation of the rainfall in terms of the model climatology, except for RR>15mm. SLHD (Pr options) improves the FB and HSS

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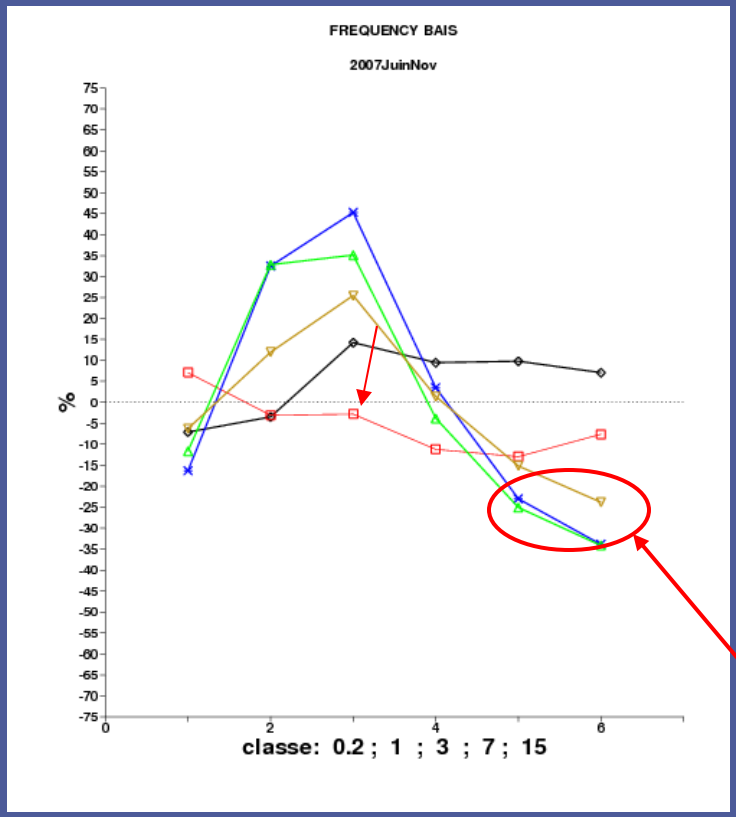
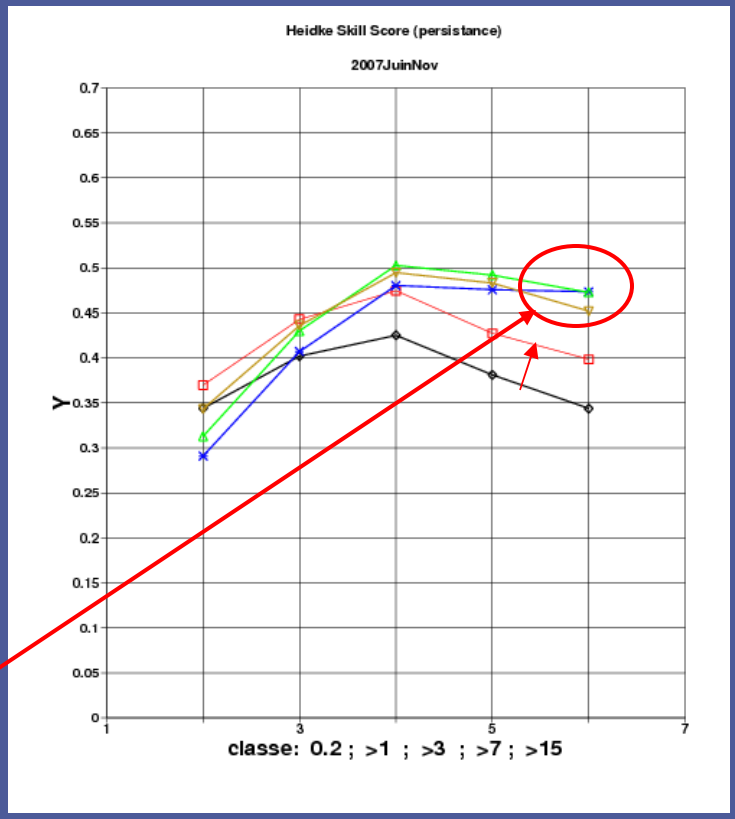
Frequency bias and HSS RR 24h (06TU-30TU) over France
June and November 2007
ALARO-0 physics

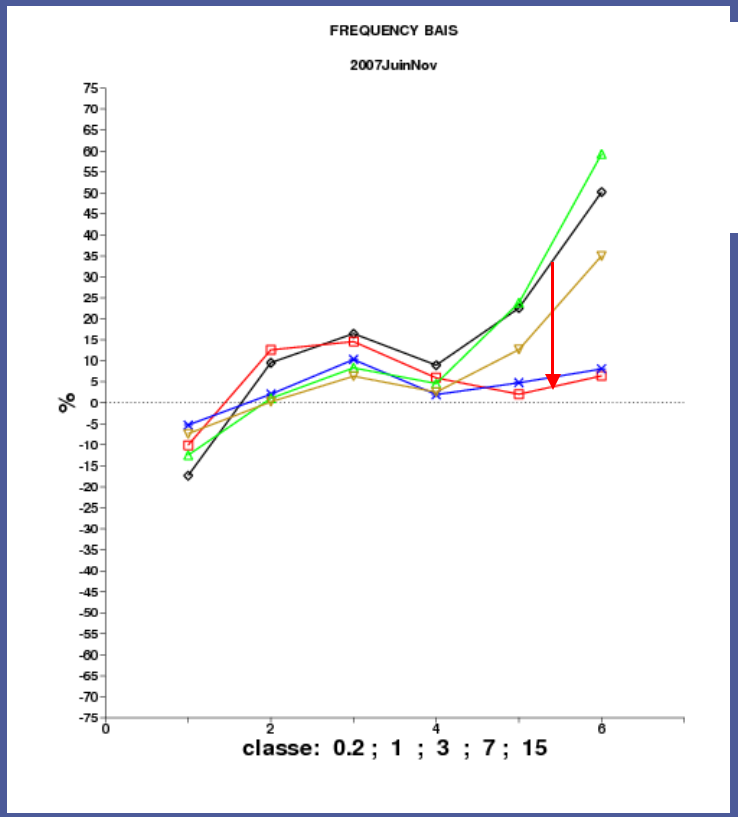


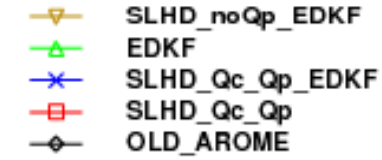
Without 3MT and SLHD ➔ underestimation of the rainfall but improves the HSS



With 3MT = improvement of the HSS but there is a clear under estimation of the frequency of the RR > 7mm

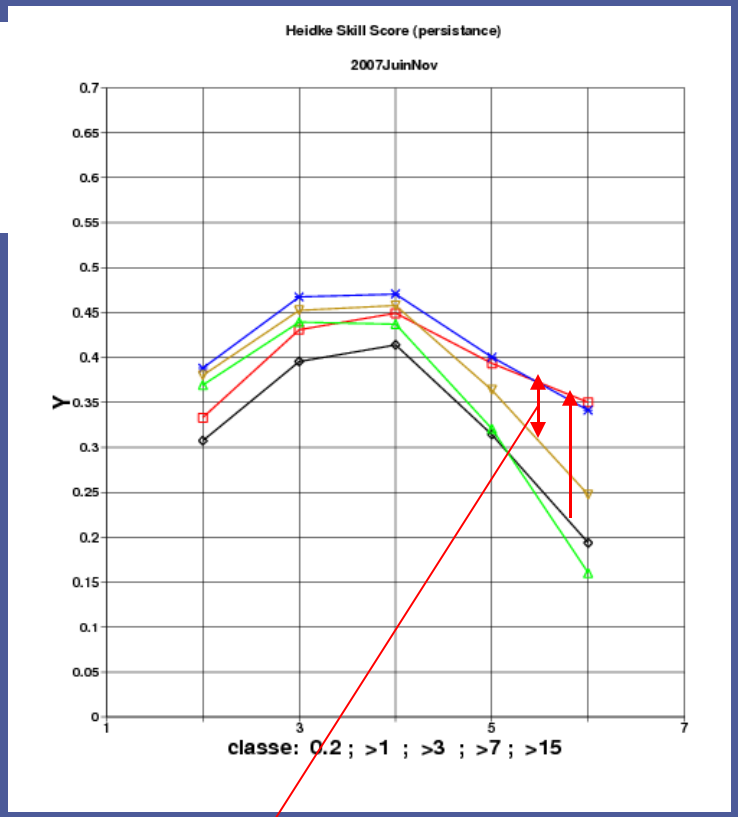
Frequency bias and HSS RR 24h (06TU-30TU) over France
June and November 2007
AROME physics





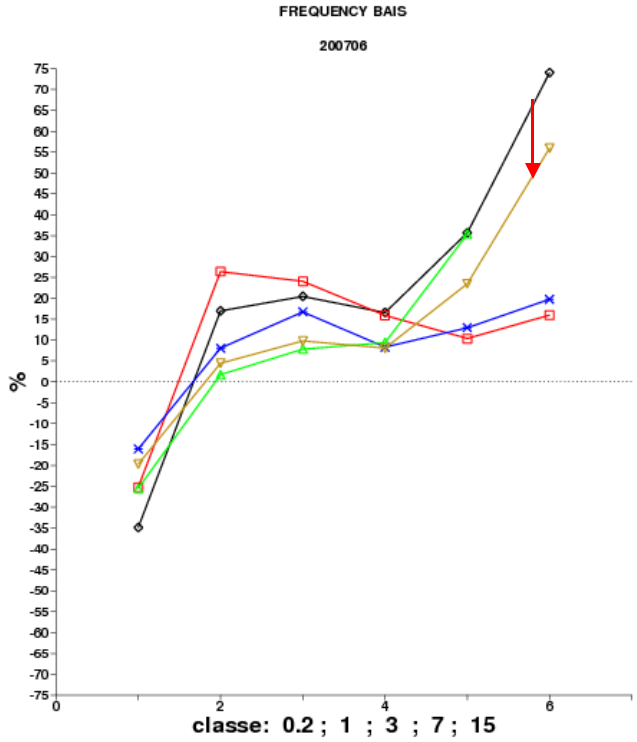
SLHD on all the hydrometeor reduces RR > 7mm

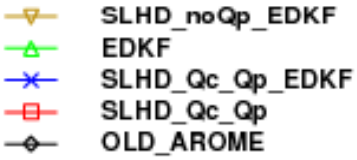
EDKF Without 3MT and SLHD ➔ underestimation of the rainfall but improves the HSS



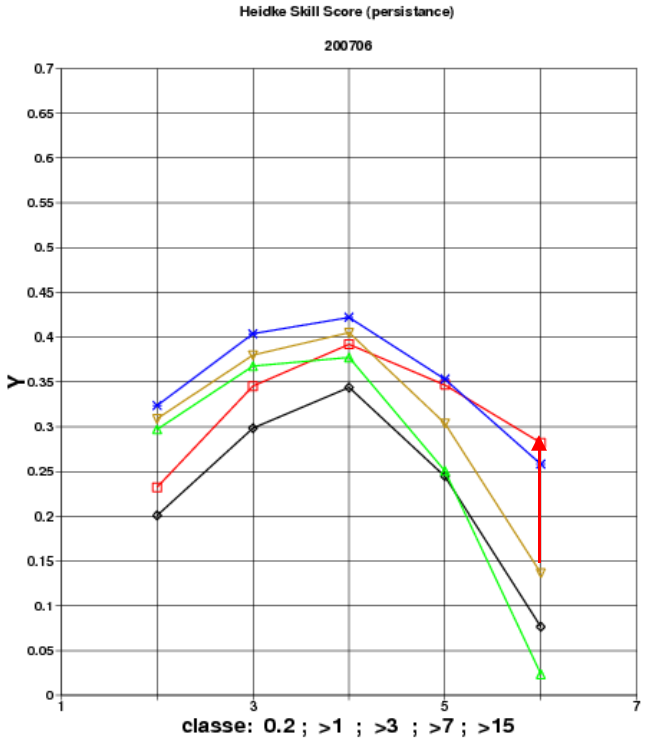
EDKF improves the small RR < 3mm
Big and positive impact of the SLHD on Qr,Qs, Qg ???!!!

Frequency bias and HSS RR 24h (06TU-30TU) over France
June 2007
AROME physics





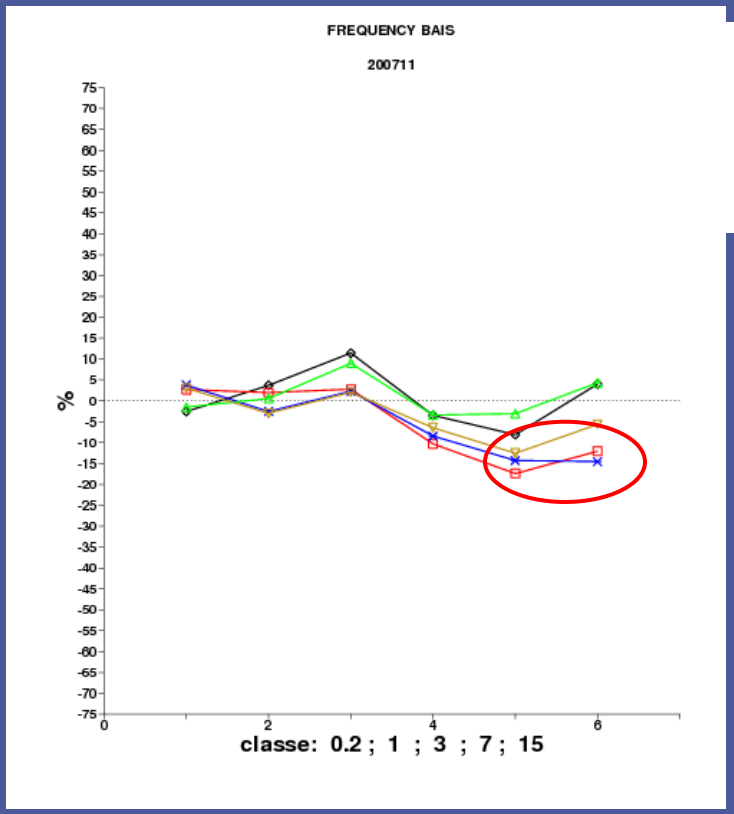
SLHD on Qi,Ql,→ small impact

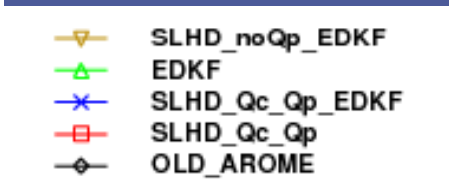


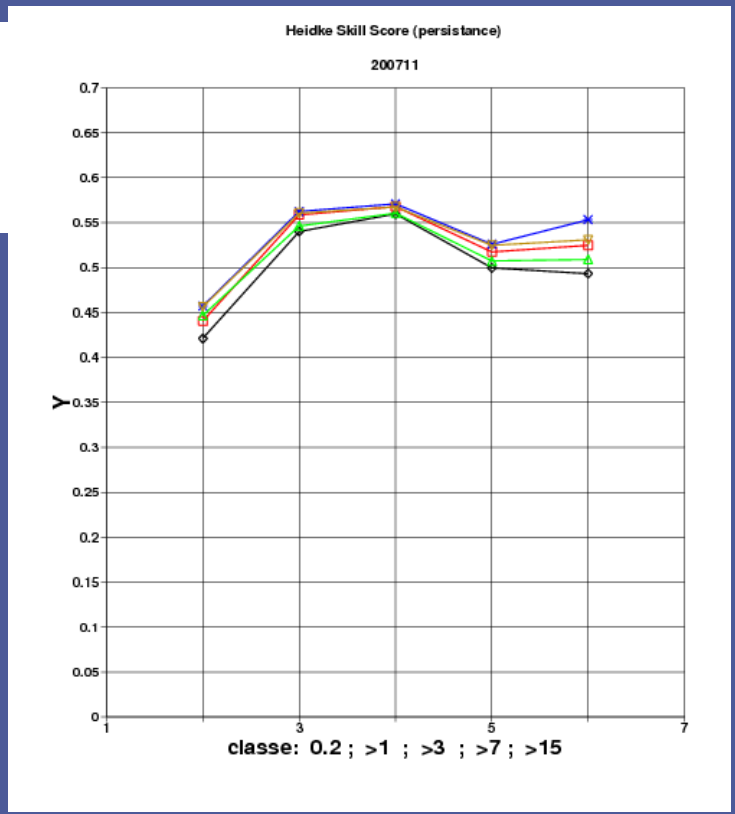
In fact, it is "only" the SLHD on the Qr,Qs,Qg which reduces the intense rainfall !

Frequency bias and HSS RR 24h (06TU-30TU) over France November 2007

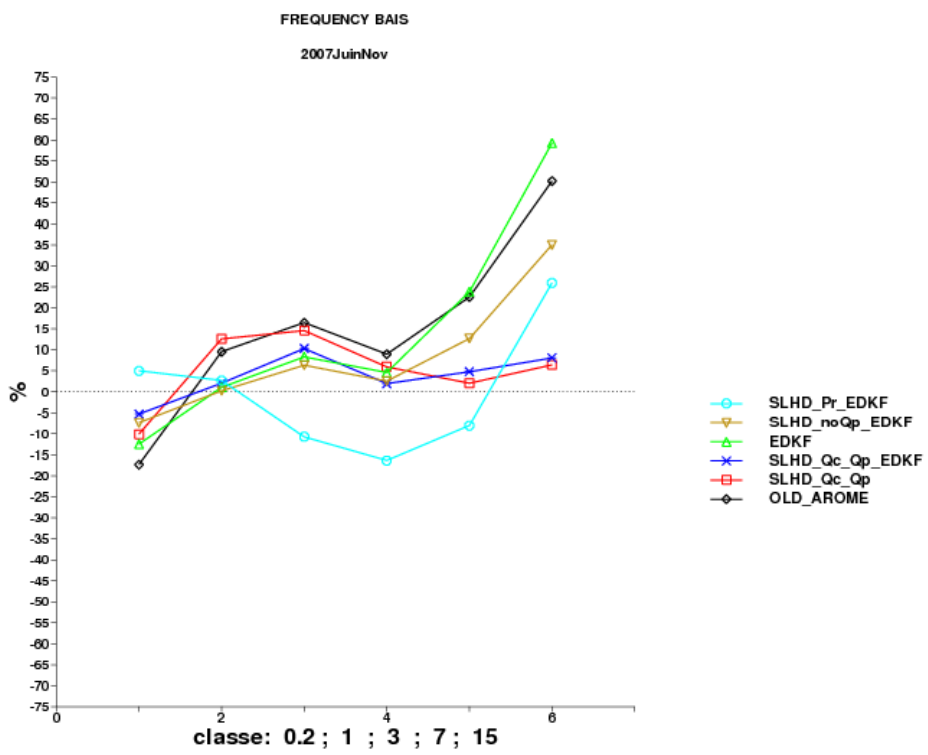
AROME physics

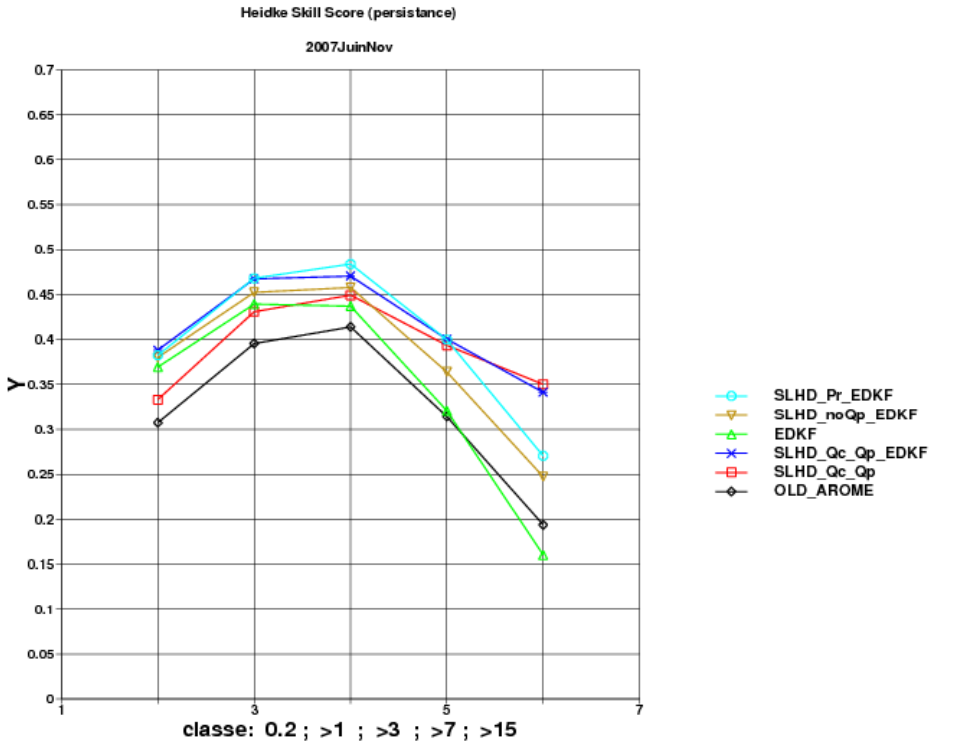






In November, the positive impact of SLHD is less and even unclear





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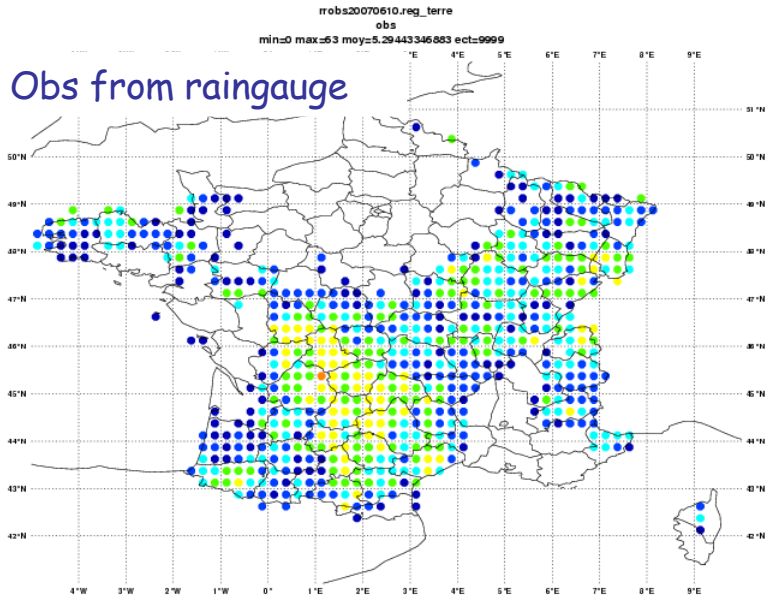
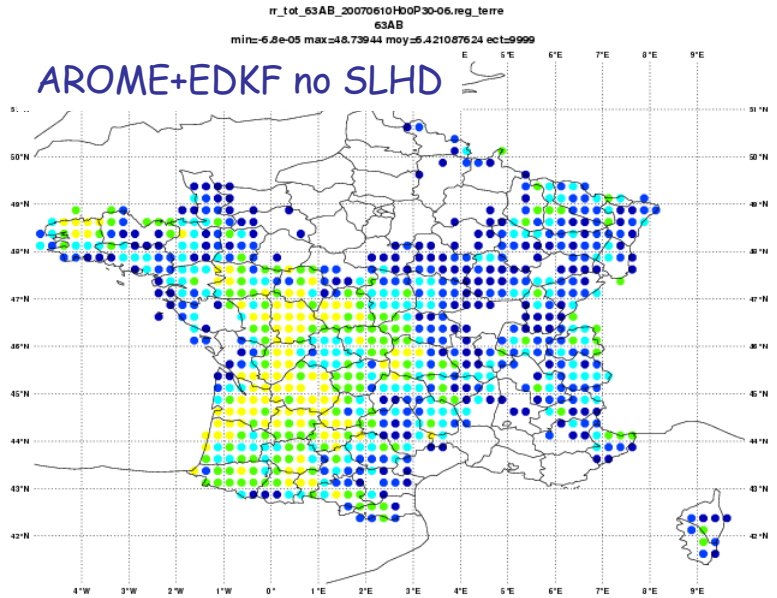
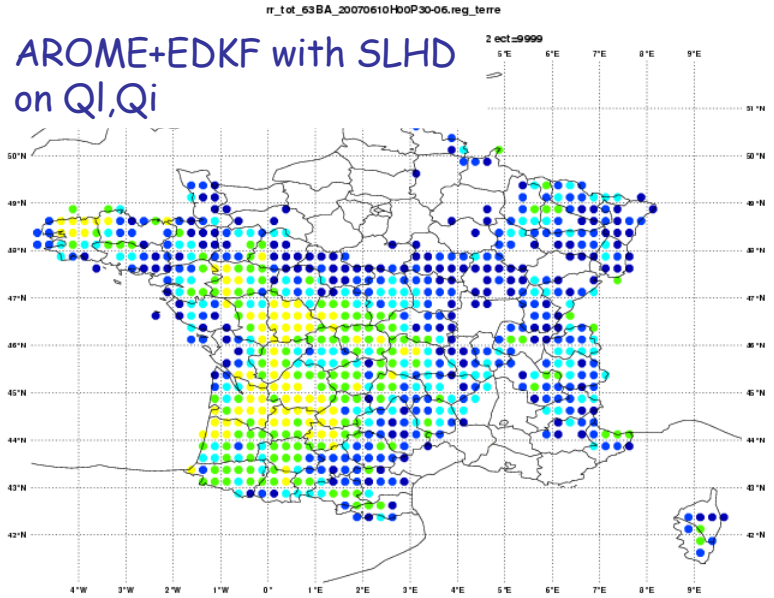
10/06/2007 RR 30h-06h
AROME



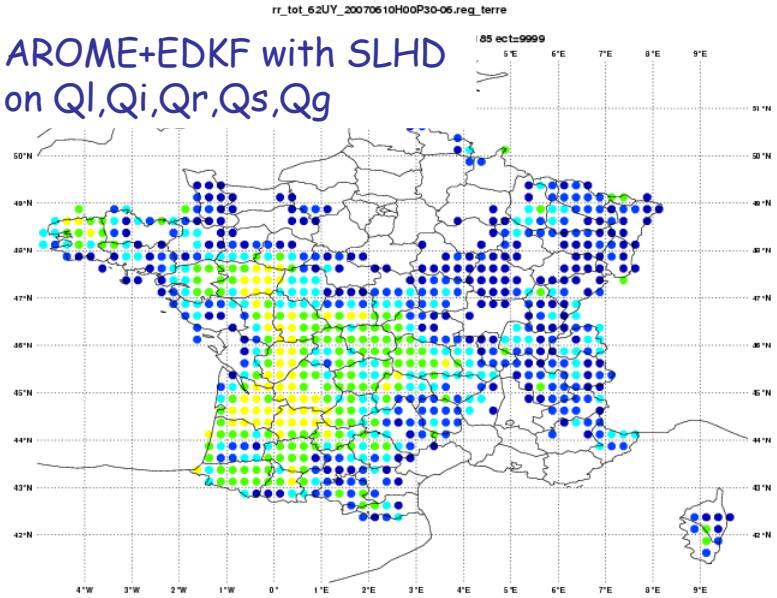
Obs from raingauge



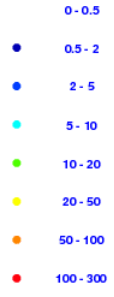
AROME+EDKF no SLHD



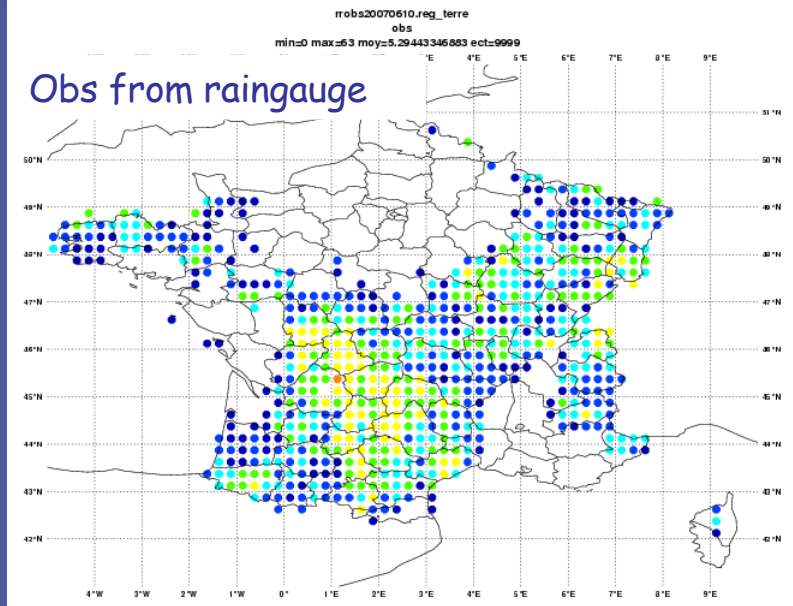
AROME+EDKF with SLHD on Ql,Qi

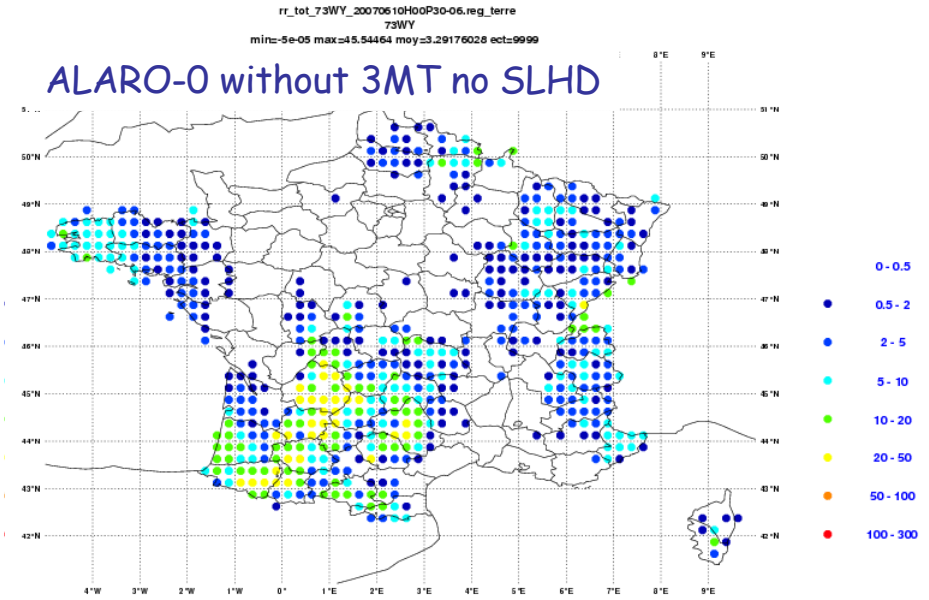


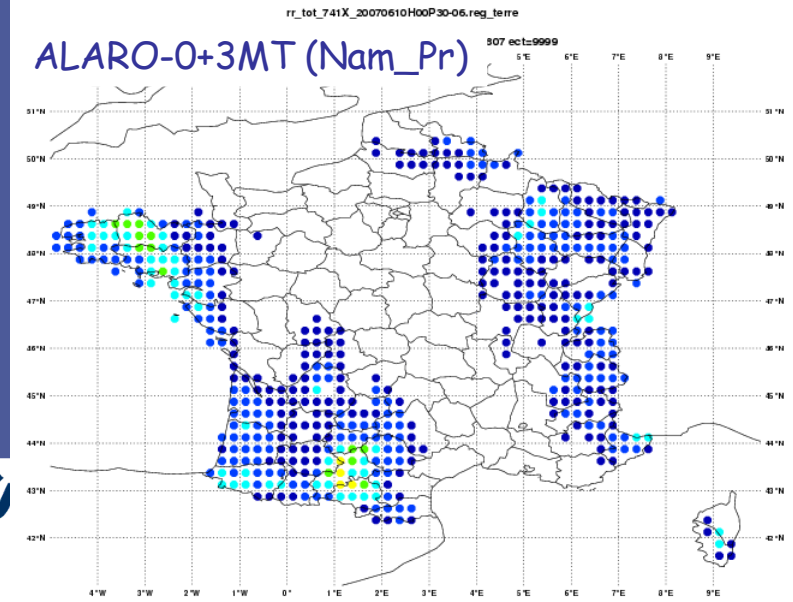
AROME+EDKF with SLHD on Ql,Qi,Qr,Qs,Qg

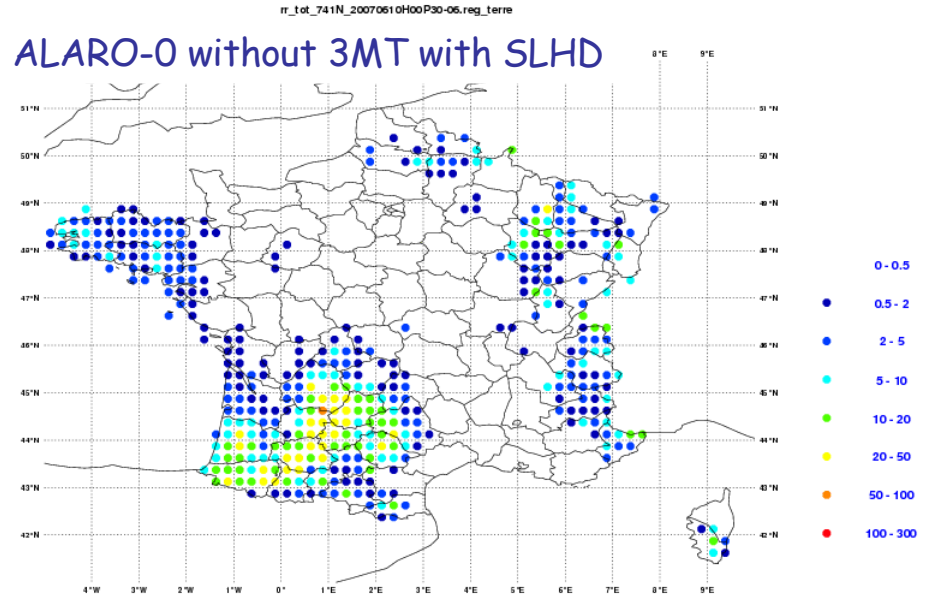


10/06/2007 RR 30h-06h
ALARO-0 !









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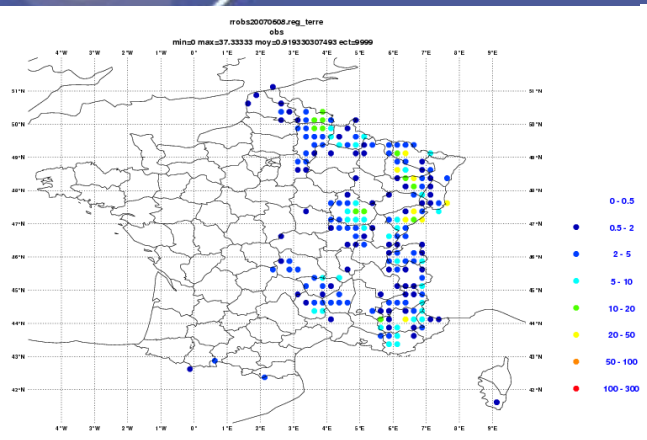
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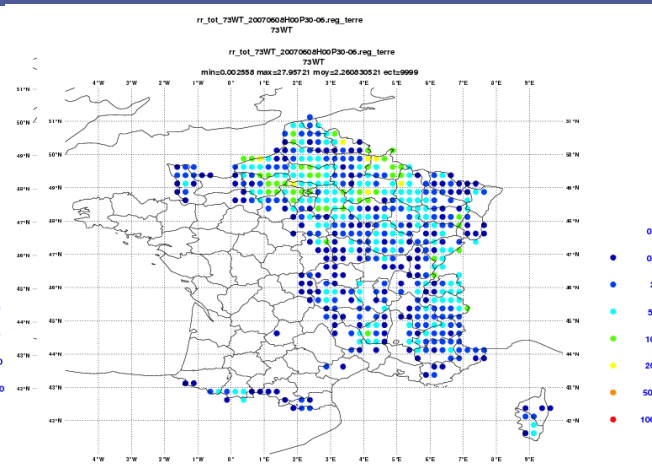
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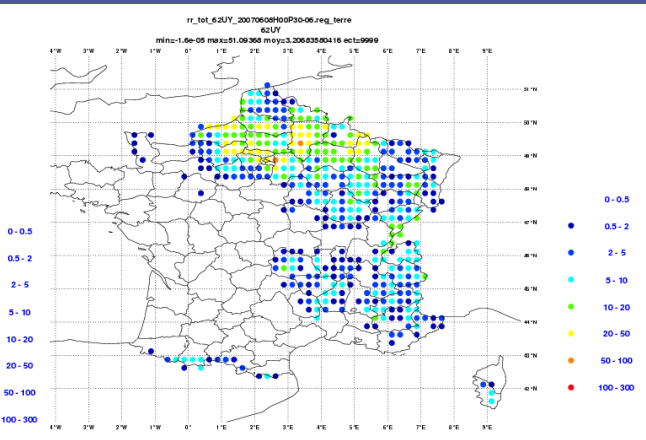
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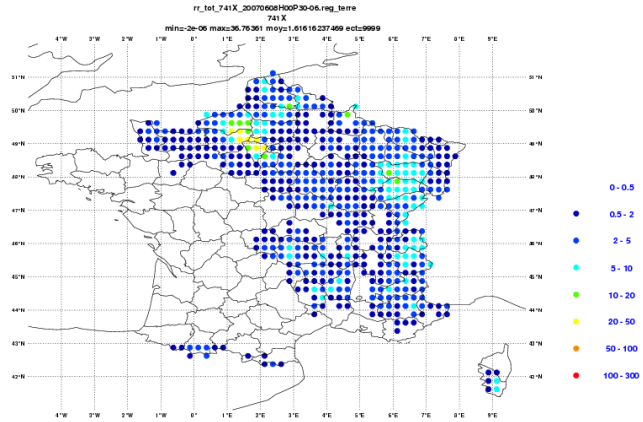
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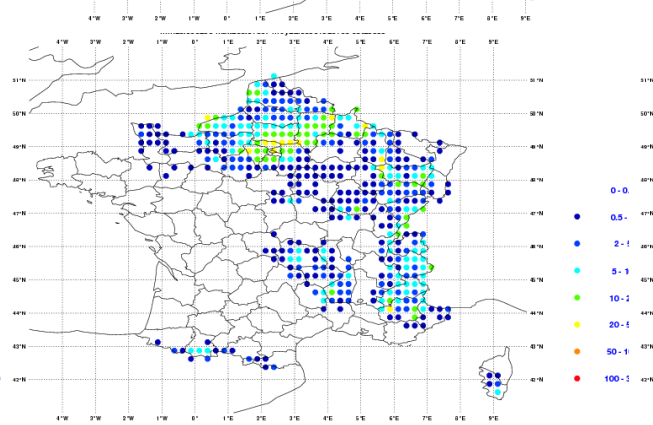
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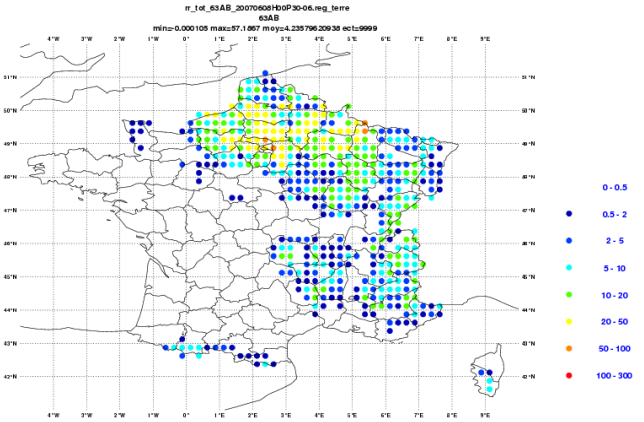
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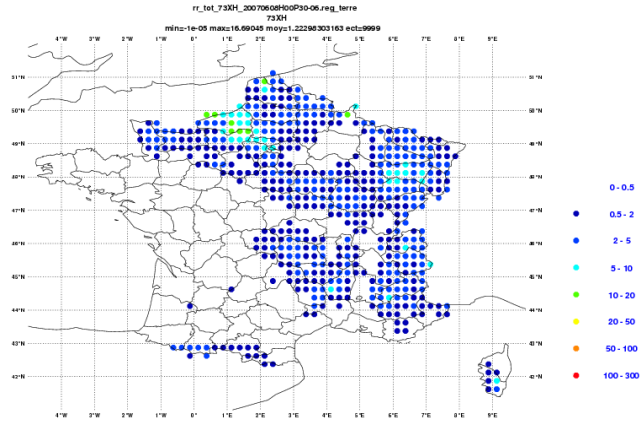
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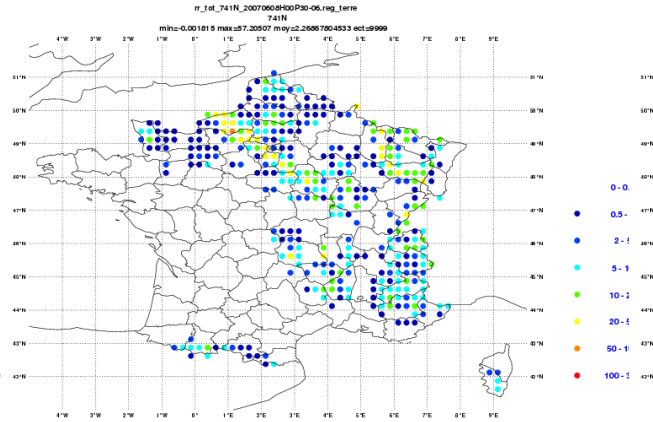
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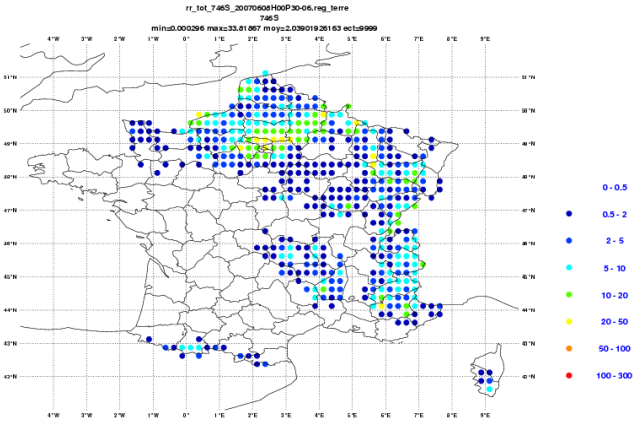
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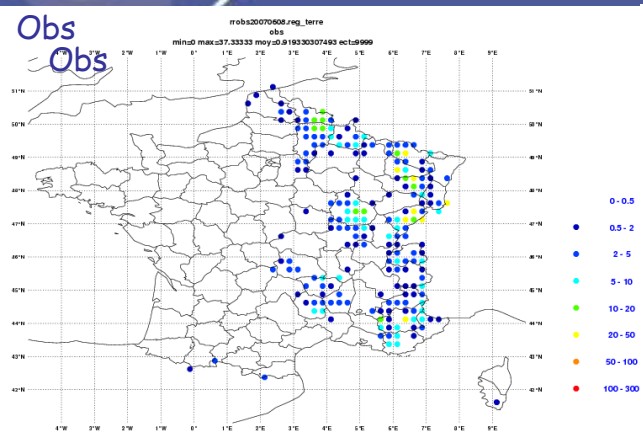
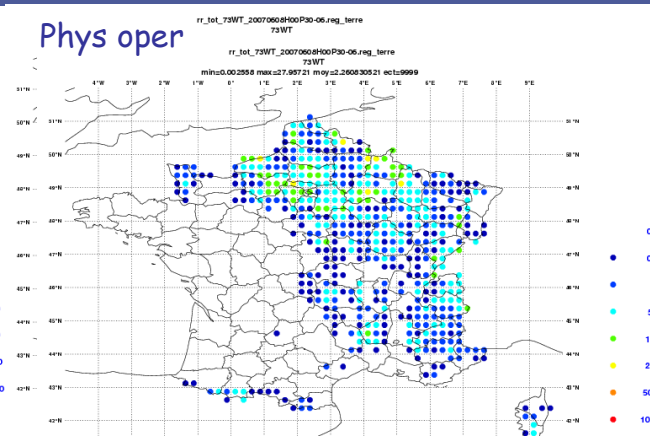
08/06/2007

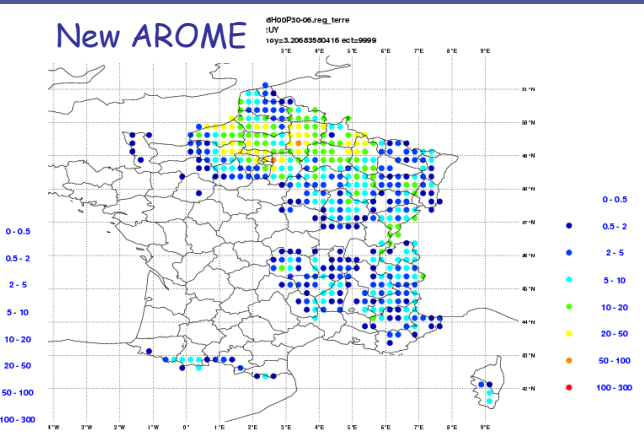
Obs



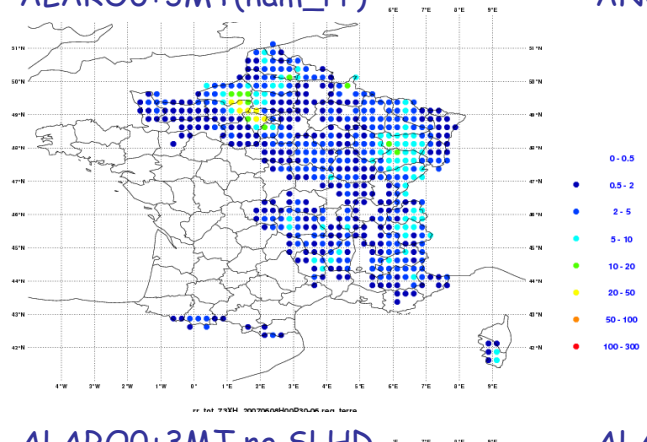
Phys oper



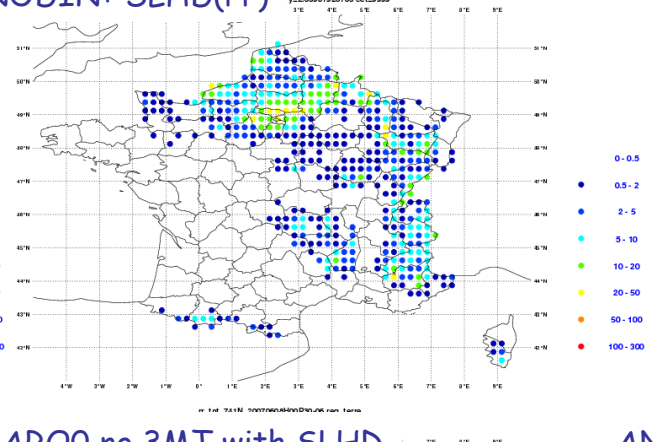
New AROME



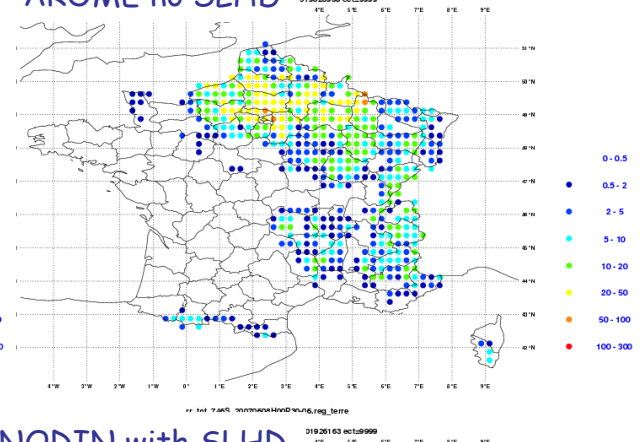
ALARO0+3MT(nam_Pr)



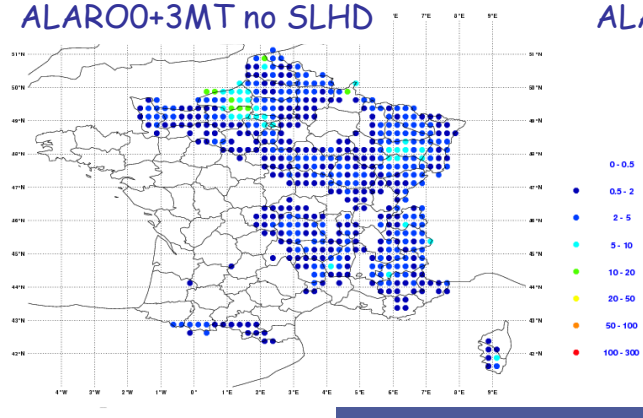
ANODIN+ SLHD(Pr)



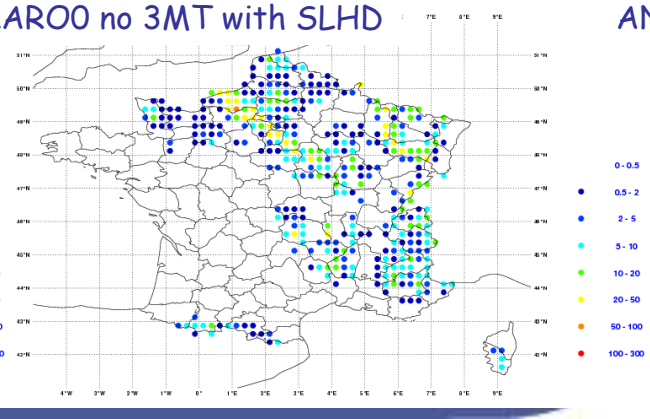
AROME no SLHD



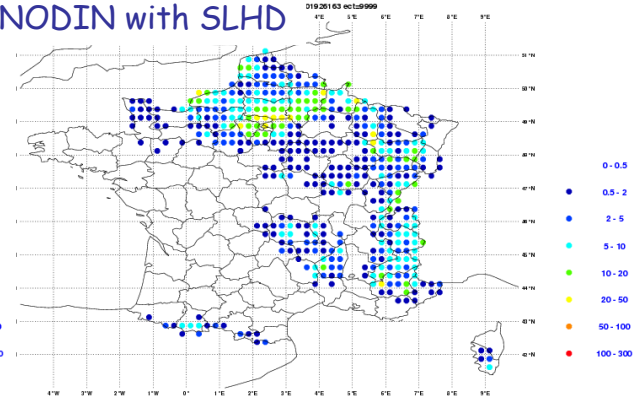
ALARO0+3MT no SLHD



ALARO0 no 3MT with SLHD



ANODIN with SLHD



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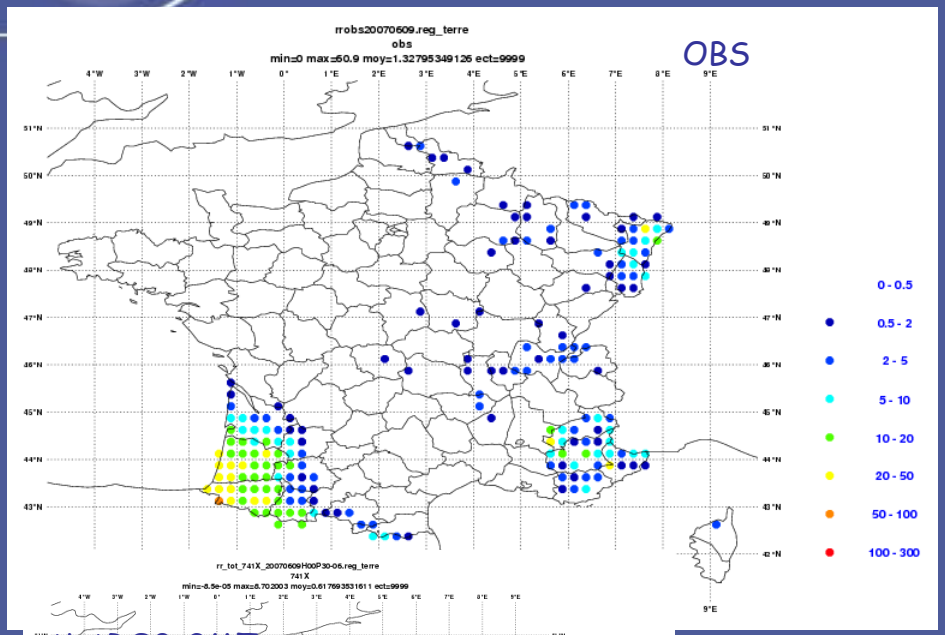

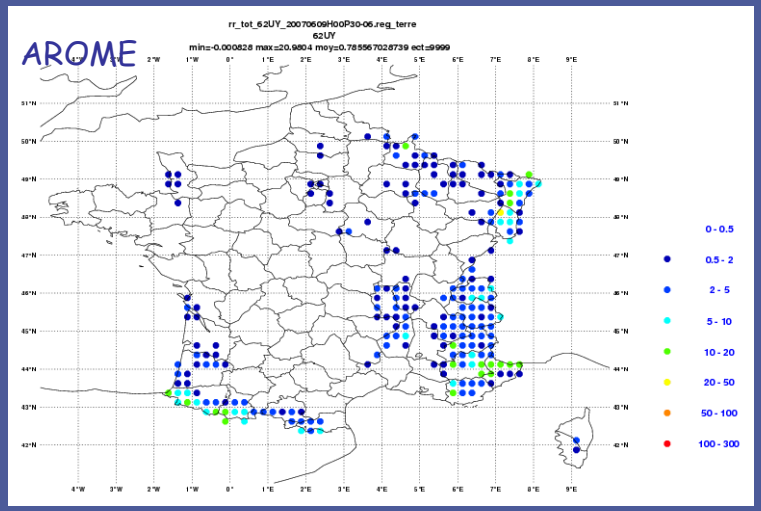

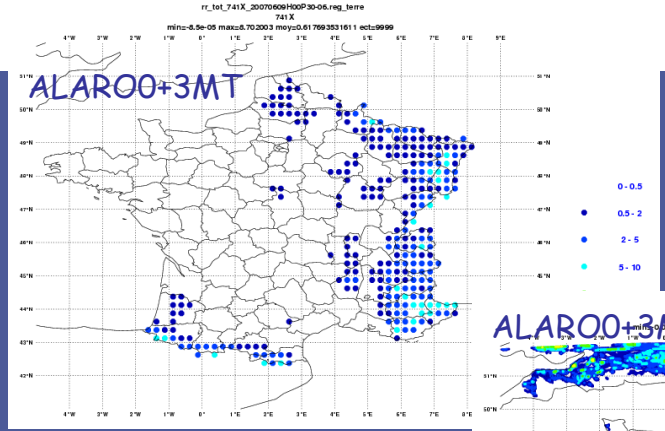

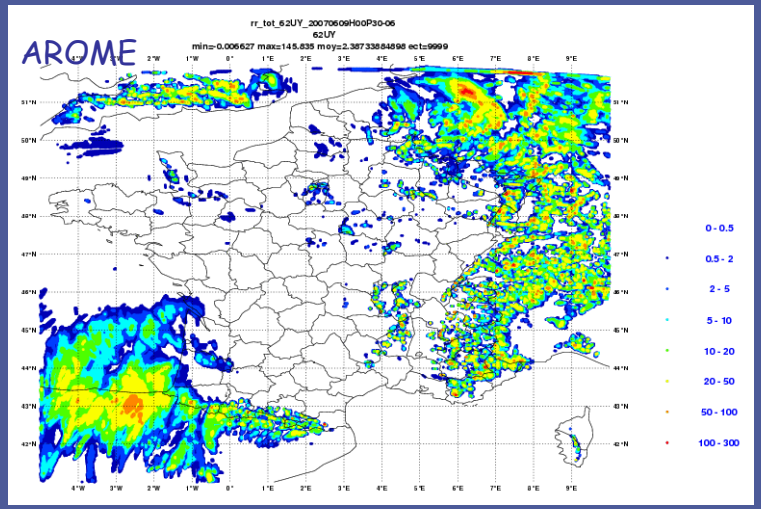

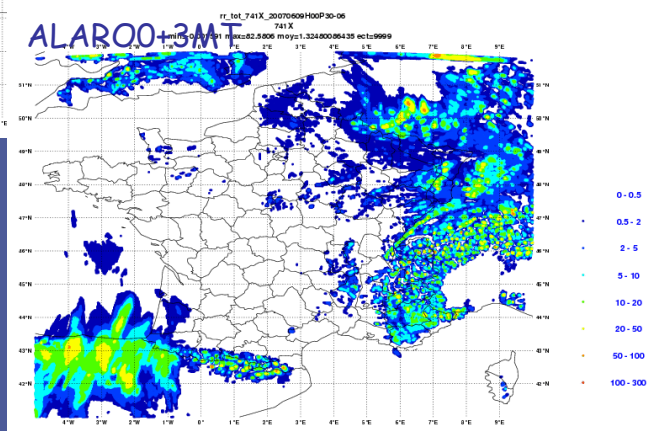

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Toujours un temps d'avance

CONCLUSIONS

If your model overestimates the intense rainfall → please try SLHD !

If your model underestimates the rainfall → please tune your SLHD and …

at the end if you don't solve the problem, may be try to play with the physics parametrization !

It is logical with increasing the resolution, we increase the resolved part vs the parametrized one !

CONCLUSIONS

So for me now,
is it necessary to work and develop new parameterization for micro-physics, shallow convection, computes sophisticated mass flux, trigger function, etc …?

if after we don't understand what we are doing with SLHD and its interaction with the physics ?!

Can we apply SLHD on hydrometeor without SLHD on T and W ?

Physics generate noise for dynamics (Aidan Mac Donald)
and SLHD remove the physics impact so

please help a poor man working on physical parameterization !

CONCLUSIONS

In fact in HAAA galaxy we have an EPS system at 2.5 km based on multi-physics and multi-dynamics !