

Perturbation de Paramètres

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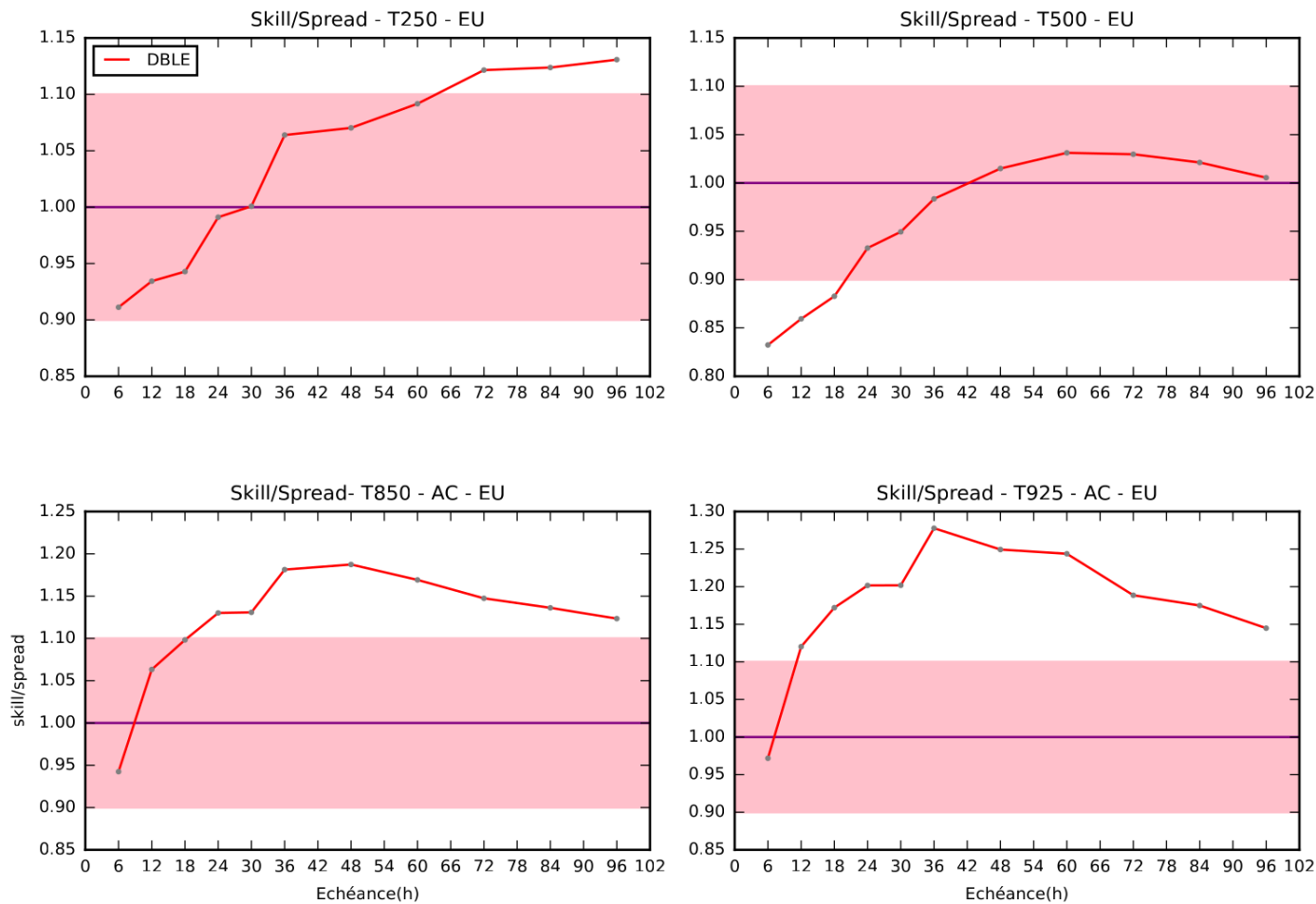
Points à aborder

Contexte : Nouvelles variables/équations dans Tiedtke -> Suppression d'un paramètre à perturber dans la PEARP

Liste Param

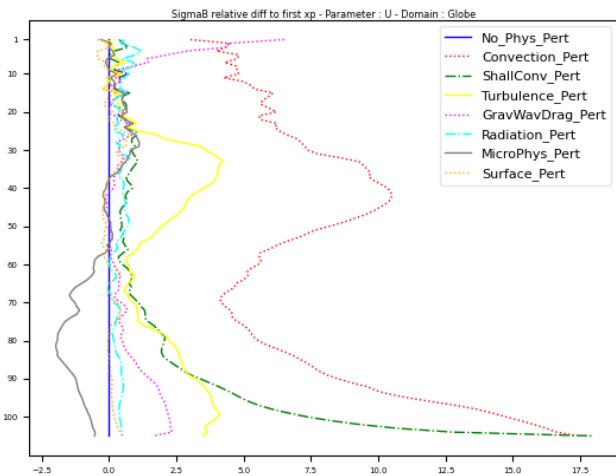
- Problème de cohérence entre ASSIM et PREV
 - PEARP/AEARP:
 - RTAUFAC, ALPHAT, ALMAVE, XFRACZ0, XBW (abs)
 - CUDUV (intervalle différent)
 - AEARO/PEARO :
 - VSIGQSAT (distribution différente)
- Problème de cohérence entre ARPEGE/AROME pour des paramétrisations identiques :
 - dans EcRad : 7 paramètres pour ARPEGE, 2 pour AROME
 - SURFEX : intervalle différent de XFRACZ0
 - Turbulence : mêmes équations, peut-être même paramètres ?
- Nouvelle physique à venir
 - Nouveaux paramètres dans SURFEX/MASCOT ?
 - CMO (Stage ?)
 - Aérosols ?
 - AROME : ICE3, EDKF ?
 - ARPEGE : MO, sursaturation ?
- Utilisation de HighTunes ?
- PEARO-OM :
 - Perturbation des flux océaniques
 - Perturbation de la dynamique

PEARP

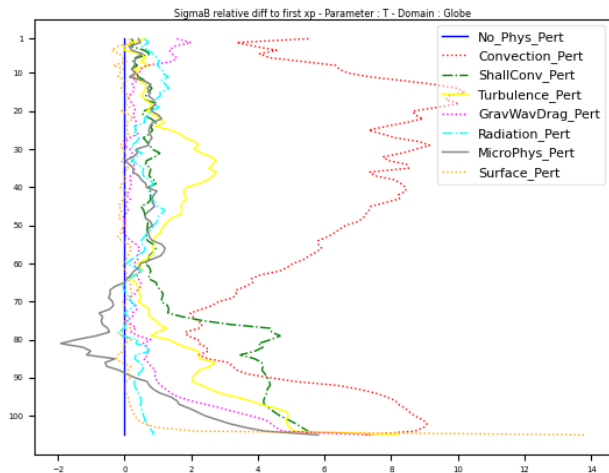


AEARP

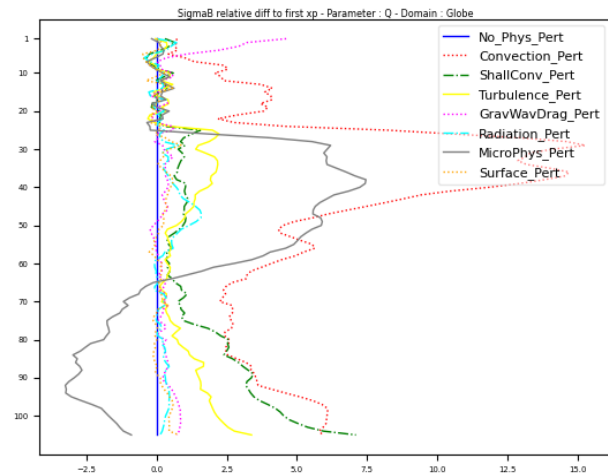
Comparison of Random Parameters for different physic schemes



Comparison of Random Parameters for different physic schemes



Comparison of Random Parameters for different physic schemes

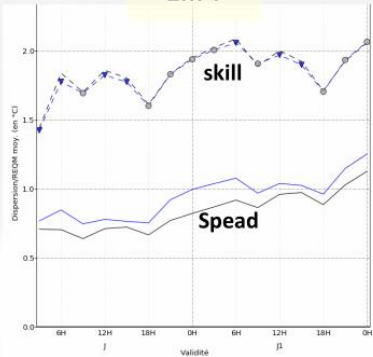


Skill/spread for 2024

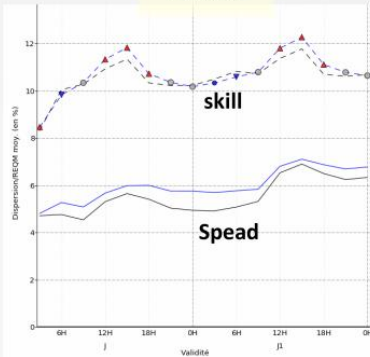
Winter 2024

Summer 2024

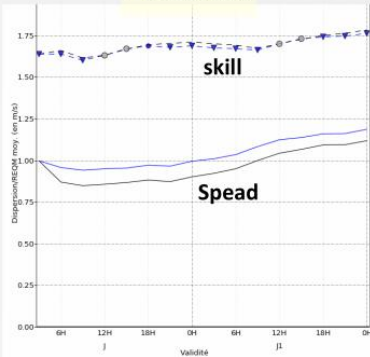
2m T



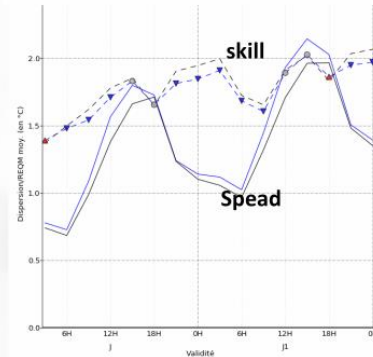
2m RH



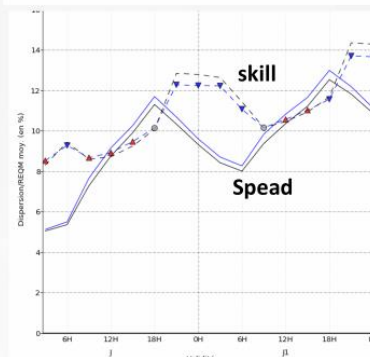
10m Wind



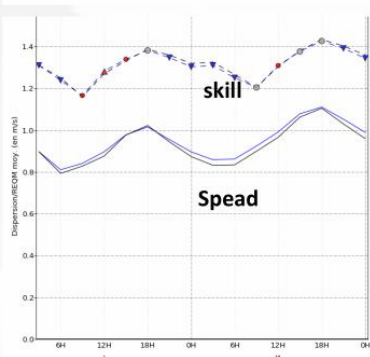
2m T



2m RH



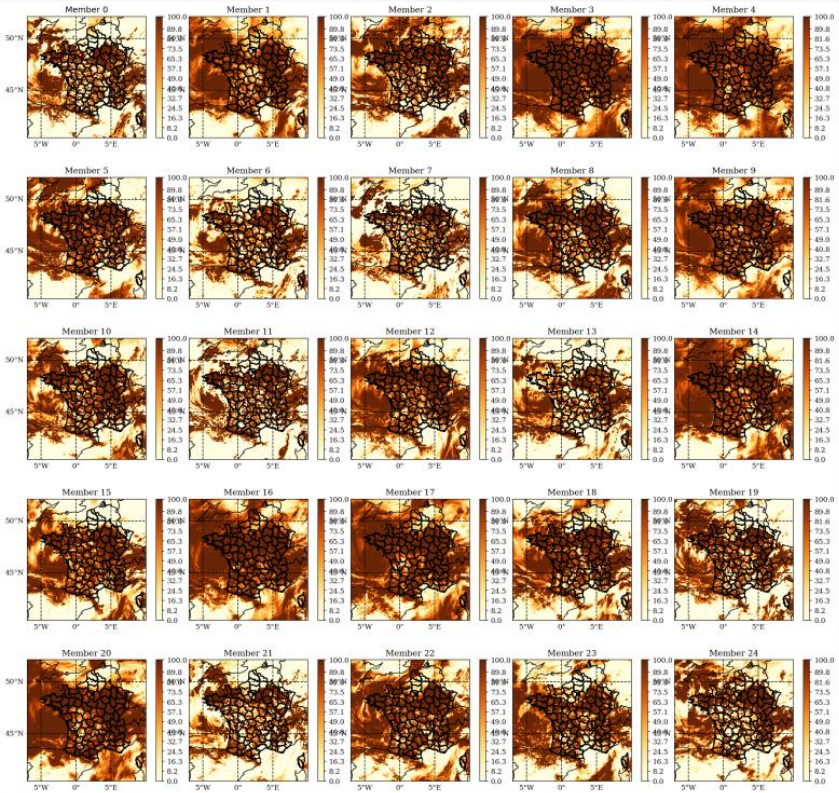
10m Wind



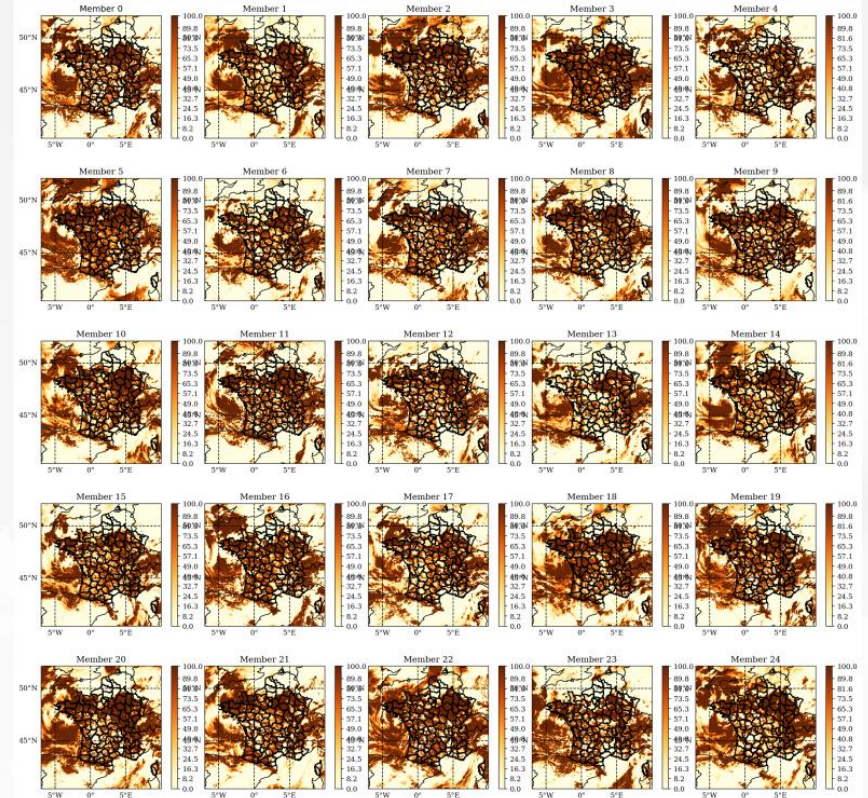
Blue : RPP / Black : NO RPP / Triangle : statistically significant

Nébul basse couche 20/08/2025

- RPP with uniform distribution for VSIGQSAT

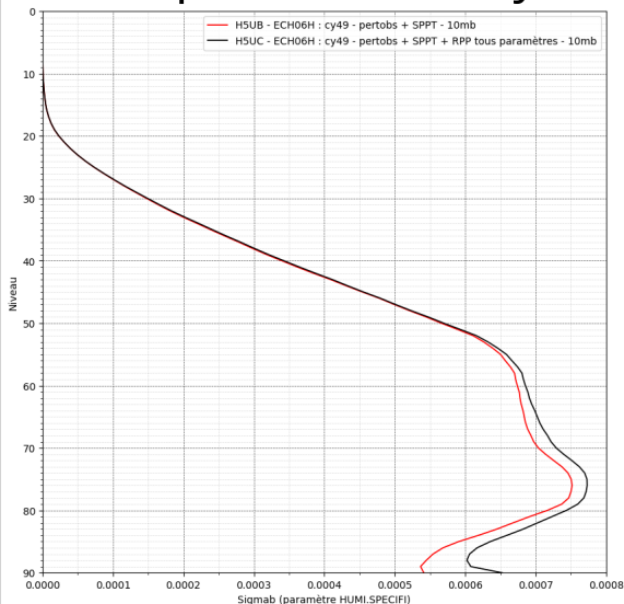


- RPP with gaussian distribution for VSIGQSAT

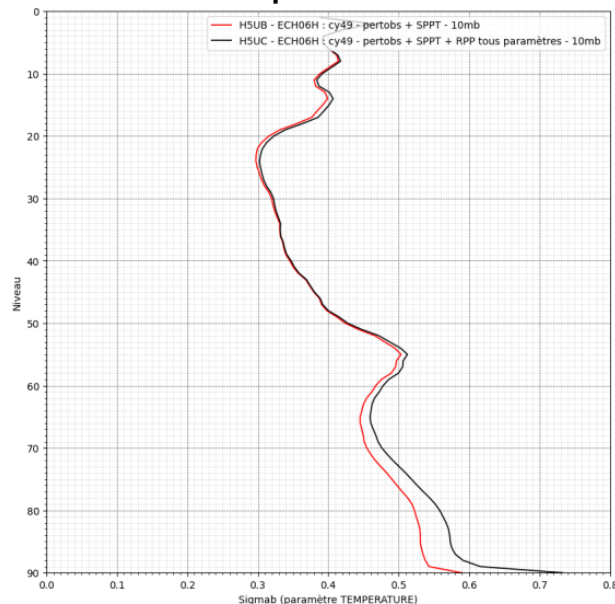


Profil verticaux de sigmab AEARO - Perturbation de tous les schémas avec bornes [min-max]

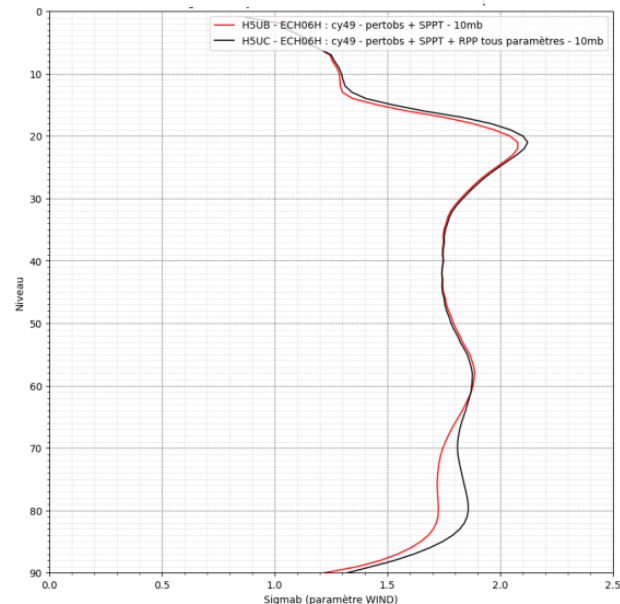
Specific Humidity



Temperature



Wind



Red: NoRPP
Black: RPP_all

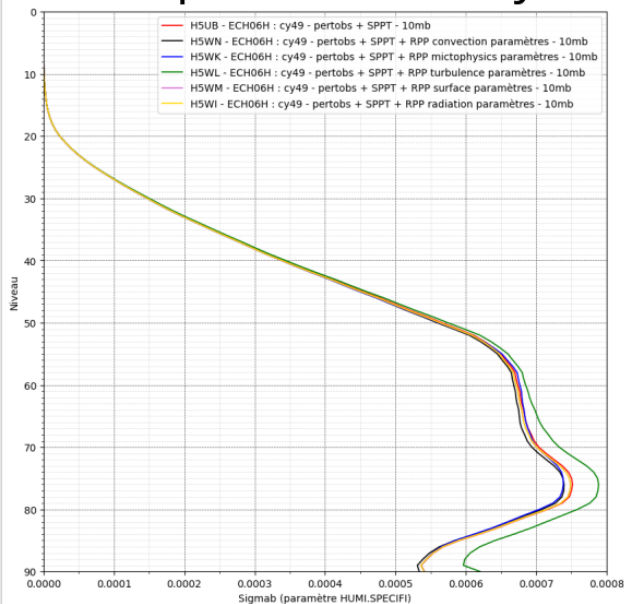
RPP increases the ensemble spread mostly in the boundary layer.

$$\sigma_{wind}^b = \sqrt{(\sigma_u^b)^2 + (\sigma_v^b)^2}$$

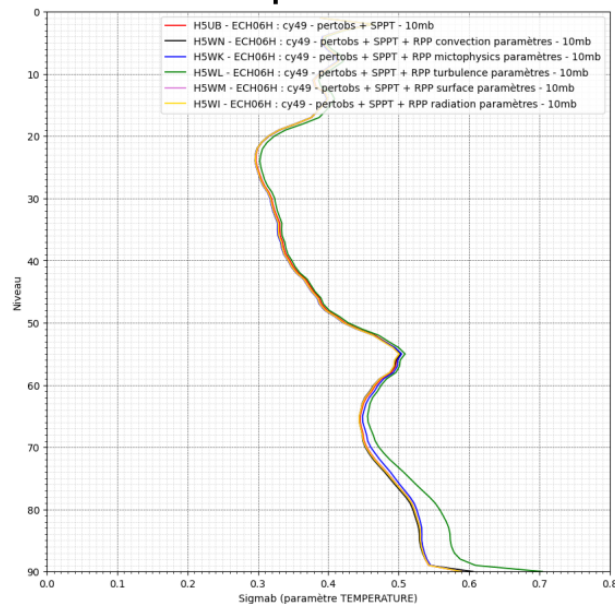
Période : 20250824-20250901 / AEARO 10 membres

Profil vertical de sigmab AEARO - Perturbation 1 schéma à la fois avec bornes [min-max]

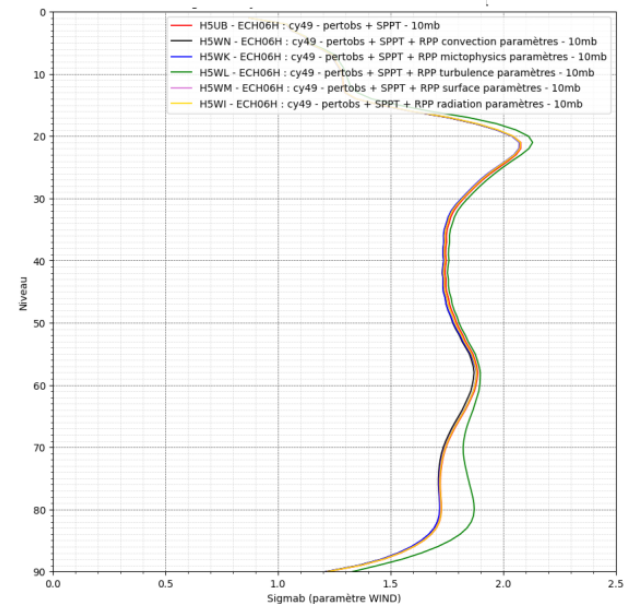
Specific Humidity



Temperature



Wind

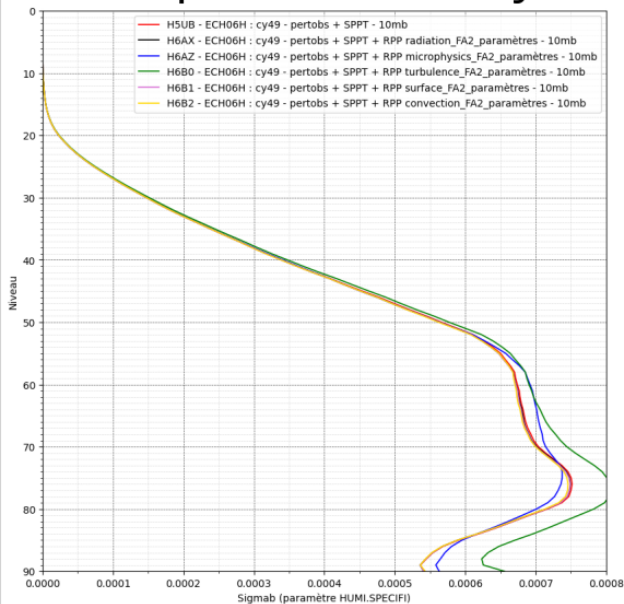


NoRPP, RPP_rad, RPP_microphys, RPP_turb, RPP_surf and RPP_conv

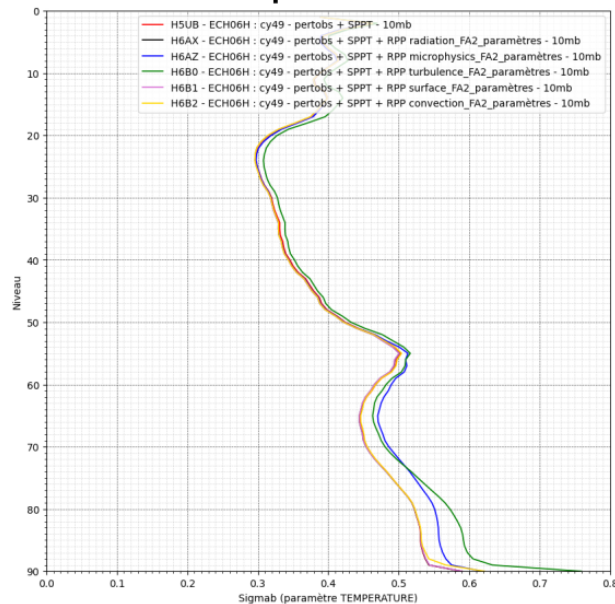
La perturbation du schéma de turbulence est la plus impactante sur la dispersion de l'AEARO
La perturbation des autres schémas n'a pas d'impact (voire un impact négatif) sur cette période
A noter, qqs plantages numériques (conv et microphys)
=> Revisite de la liste des paramètres/schémas perturbés ?

Profil vertical de sigmab AEARO - Perturbation 1 schéma à la fois avec bornes $[\text{min}/2 - \text{max} * 2]$

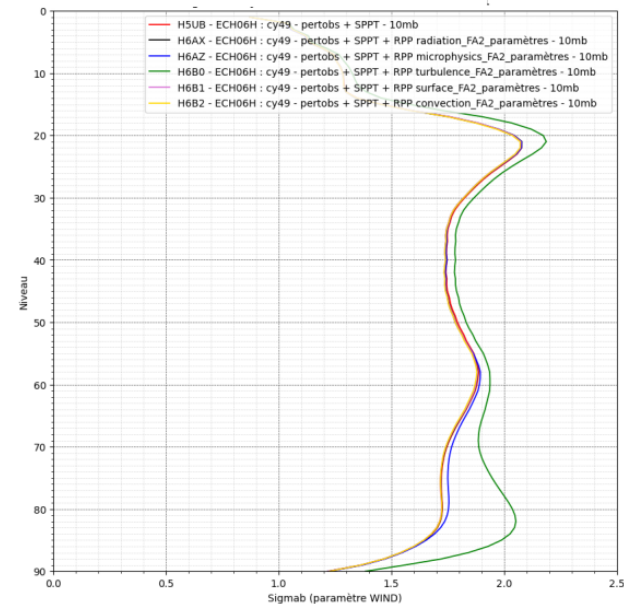
Specific Humidity



Temperature



Wind

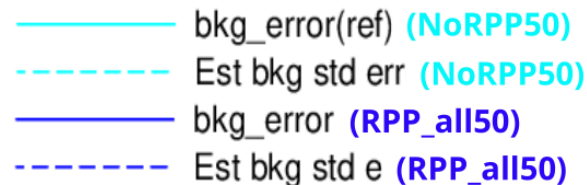


NoRPP, RPP_rad, RPP_microphys, RPP_turb, RPP_surf and RPP_conv

En augmentant la plage de tirage, impact visible de la perturbation de la microphysique (qqz plantages numériques supplémentaires pour microphys et turb, beaucoup plus pour conv)
=> Un autre réglage des bornes possible pour augmenter la dispersion ?

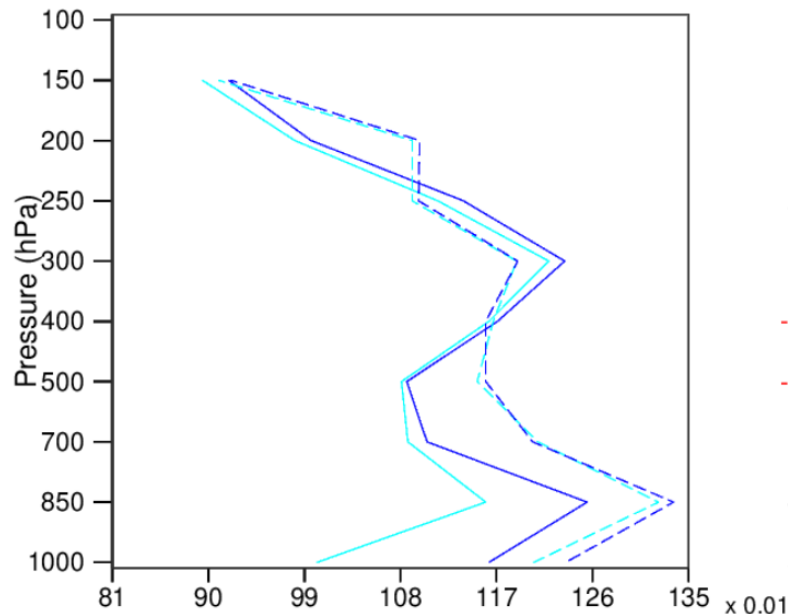
Desroziers diagnostics (Desroziers et al. (2005))

"Validation" of ens. spread (50 members EDA expes) :
in RPP-EDA (dark blue), ensemble spread (full line) is more
consistent with the diagnosed background error (dashed line).



Aircraft Wind U

Desroziers diag. fg

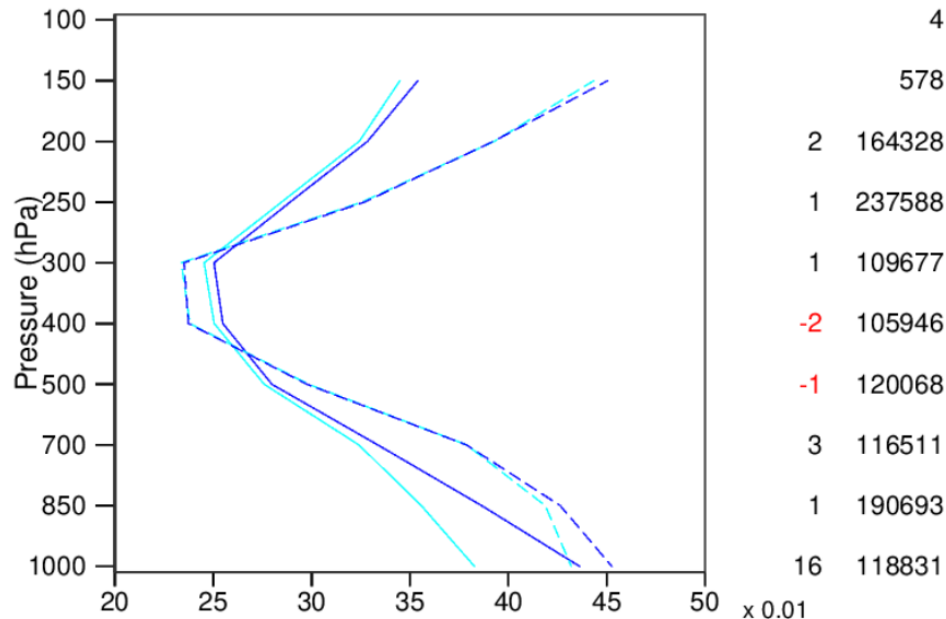


Aircraft Temperature

Desroziers diag. fg

nb obs
exp - ref exp

4		
579		
160216		
2	231856	
1	107163	
-1	102793	
-1	115514	
1	110831	
4	181463	
5	108980	

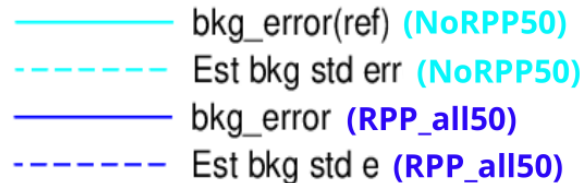


nb obs
exp - ref exp

4		
578		
2	164328	
1	237588	
1	109677	
-2	105946	
-1	120068	
3	116511	
1	190693	
16	118831	

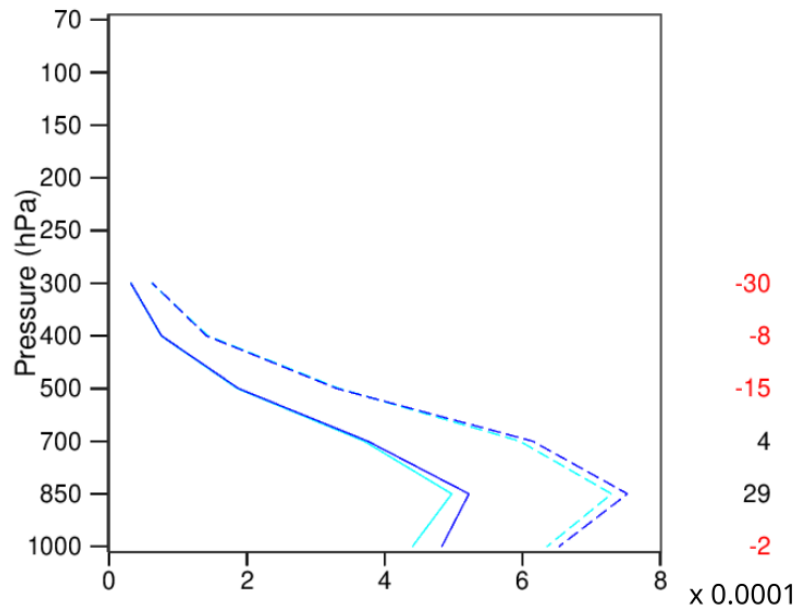
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Radiosonde Specific Humidity

Desroziers diag. fg

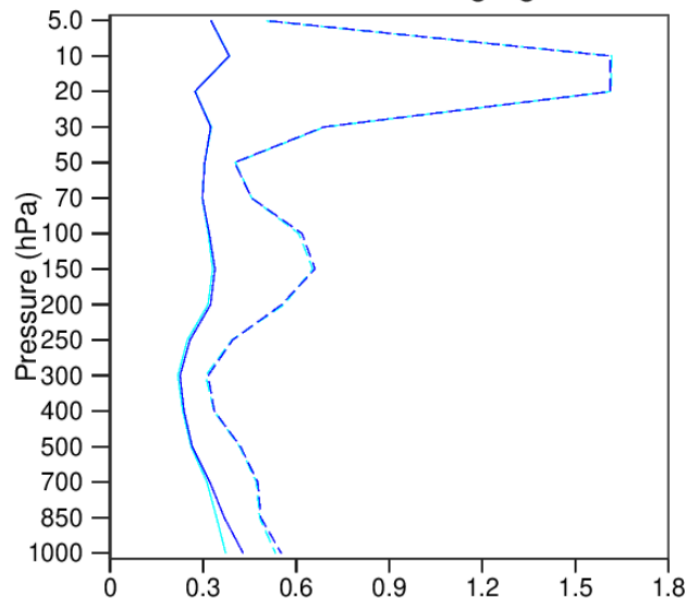


nb obs
exp - ref exp

-30	27960
-8	48557
-15	60941
4	68561
29	77520
-2	66460

Radiosonde Temperature

Desroziers diag. fg



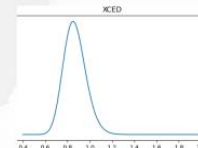
nb obs
exp - ref exp

	2080
-1	14254
1	16263
	20721
	23083
	26620
	47760
	54116
	44112
	36195
	44625
	49005
2	61381
	68780
	77532
6	65011

Model errors in Arome-EPS : RPP

Scheme	Parameter	Physical meaning	Default	Range
Radiation	RCADDECOR	First coeff in the eq of Decorrelation	0,75	0,375-1,125
	RCBDECOR	Second coeff in the eq of Decorrelation	2,149	1,0745-3,2235
Microphysics	RCRIAUT	Snow Autoconversion threshold	0.2e-3	0.2e-4 - 0.25e-3
	RCRIAUTC	Rain Autoconversion threshold	1e-3	0.4e-3 - 1e-3
	VSIGQSAT	Constant for subgrid condensation	0.02	0 - 0.1
Turbulence	XLINI	Minimum mixing length	0	0 - 0.2
	XCTD	Constant for dissipation of temperature and vapor pressure fluctuations	1.2	0.98 - 1.2
	XCTP	Constant for temperature and vapor pressure correlations	4.65	1.035 - 22.22
	XCEP	Constant for wind-pressure correlations	2.11	0.225 - 4.0
	XCED	Constant for dissipation of TKE	0.85	0.4 - 2
	XPHI.LIM	Threshold value for Sc^{-1} and Pr^{-1}	3	1 - 4.5
	XCET	Constant for transport of TKE	0.4	0.072 - 1.512
Surface	XRIMAX	Critical Richardson Number	0.2	0 - 0.3
	XFRACZ0	Coefficient of orographic drag	5	2 - 10
Convection	XCMF	Closure coefficient at bottom level	0.065	0 - 0.1
	XABUO	Coefficient of the buoyancy	1	0.7 - 1.5
	XBDETR	Coefficient of the detrainment	1e-6	0 - 1
	XENTR.DRY	Coefficient for dry entrainment	0.55	0.1 - 0.699

- Selected configuration:
uniform distribution for 17 parameters, Gaussian distribution for XCED and VSIGQSAT



Tests RPP dans AEARO

Scheme	Parameter	Physical meaning	Default	Range
Radiation	RCADDECOR	First coeff in the eq of Decorrelation	0,75	0,375-1,125
	RCBDECOR	Second coeff in the eq of Decorrelation	2,149	1,0745-3,2235
Microphysics	RCRIAUTI	Snow Autoconversion threshold	0.2e-3	0.2e-4 - 0.25e-3
	RCRIAUTC	Rain Autoconversion threshold	1e-3	0.4e-3 - 1e-3
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Turbulence	XLINI	Minimum mixing length	0	0 - 0.2
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	XCTP	Constant for temperature and vapor pressure correlations	4.65	1.035 - 22.22
	XCEP	Constant for wind-pressure correlations	2.11	0.225 - 4.0
	XCED	Constant for dissipation of TKE	0.85	0.4 - 2
	XPHI_LIM	Threshold value for Sc^{-1} and Pr^{-1}	3	1 - 4.5
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	XFRACZ0	Coefficient of orographic drag	5	2 - 10
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	XABUO	Coefficient of the buoyancy	1	0.7 - 1.5
	XBDETR	Coefficient of the detrainment	1e-6	0 - 1
	XENTR_DRY	Coefficient for dry entrainment	0.55	0.1 - 0.699

- Même configuration RPP (liste des paramètres perturbés, bornes, loi de tirage) que pour PEARO double 49 (sauf VSIGQSAT qui a un tirage uniforme)