Axe continents LMDZ6

S.Ait Mesbah, F. Cheruy, B. Diallo, J.L.Dufresne,, A. Sima, l. Mellul,

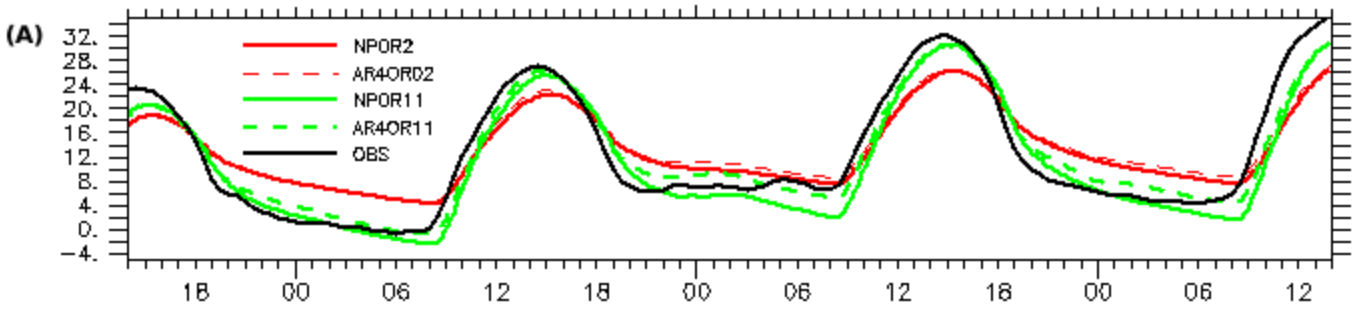
F. Wang + forte interaction avec le groupe ORCHIDEE (A. Ducharne, P.Peylin, N. Vuichard, M. Guimberteau, J. Ghattas, J. Polcher, F. Maignan …)

Objectifs: Capitaliser sur les études récentes des couplages sol-atmosphère pour évaluer et améliorer la représentation des distributions régionales et saisonnières des bilans d'énergie et des températures sur continents.

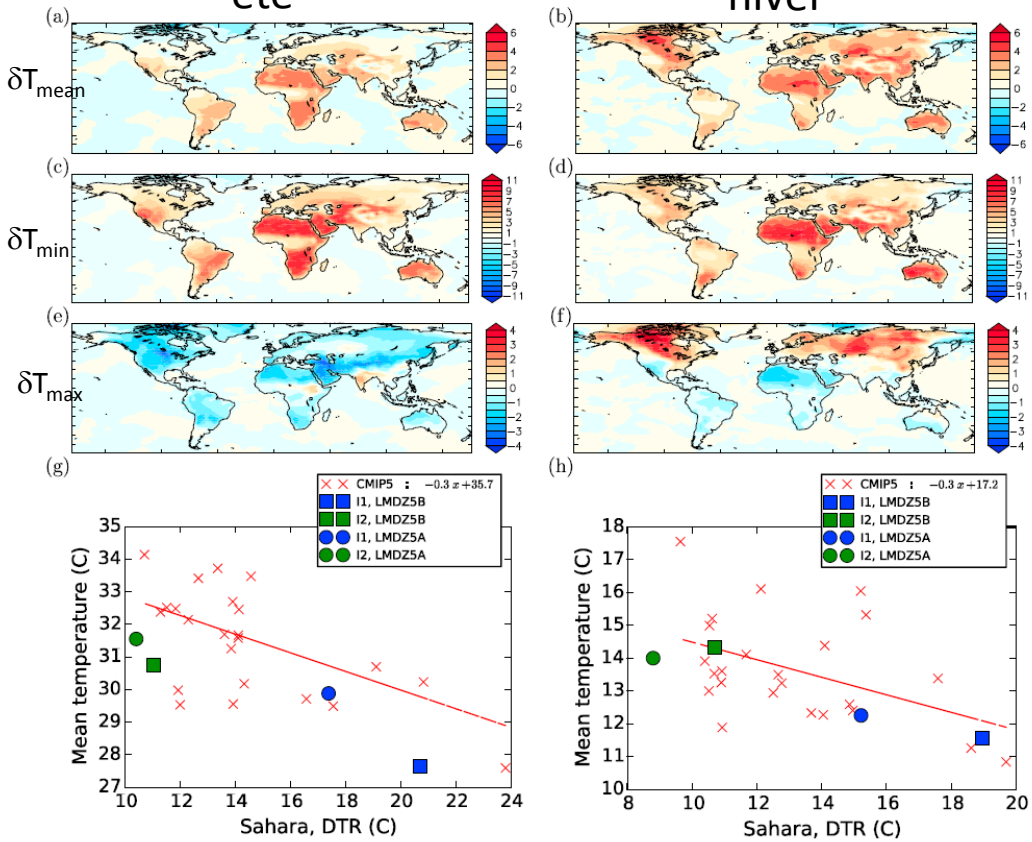
Depuis CMIP5

- Nouvelle nouvelle physique atmosphérique (PBL, convection, nuages)
- Passage de ORCHIDEE2 (schéma conceptuel) a ORCHIDEE11 (schéma diffusif pour l'eau, + tests préliminaires encourageant pour corriger le biais chaud estival partagé par de nombreux modèles de climat dont l IPSL et ayant des conséquences sur les projections)
- Révision du couplage implicite (couche limite/sol)
- nouvelle grille modulable et commune pour l'eau et la température dans le sol (conservation énergie)
- Nouvelles Propriétés thermiques du sol (texture, eau)
- Paramétrisation de l' énergie transportée par l'eau liquide dans le sol.
- Nouveau schéma de neige (multi-couche), révision du schéma de couplage (en cours).

Une invité: l'inertie thermique



ete hiver



CMIP5B

- KANSAS : 37.65N,263.265E
- 23 oct 1400 to 26 oct 1999.
- Dry, no rain, no clouds.

δI=850 a 2400

-Rôle clé de l inertie thermique

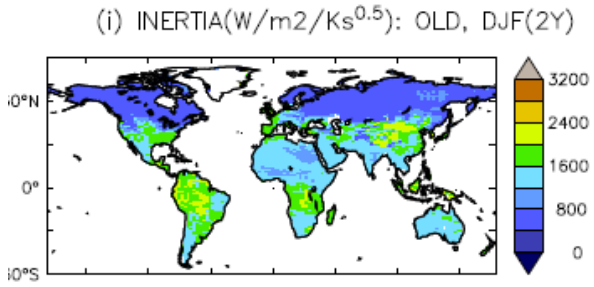
-dans les régions sèches avec une sensibilité de la température plus forte la nuit que le jour en lien avec le contraste de stabilité de la couche limite

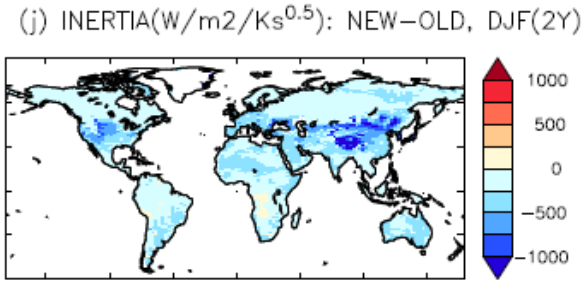
-Importance dans les régions de transition au travers de l'impact de l'humidité du sol sur l inertie thermique.

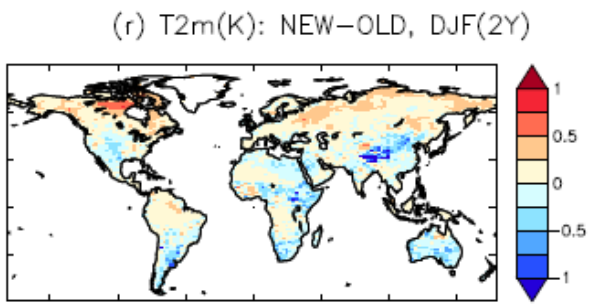
These S. Ait Mesbah > 7 Avril 2016

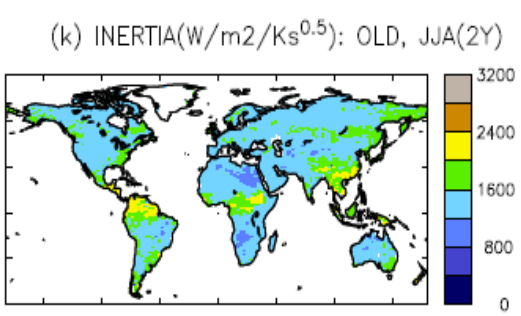
Impact nouvelles propriétés thermiques, nouvelle discretisation verti.

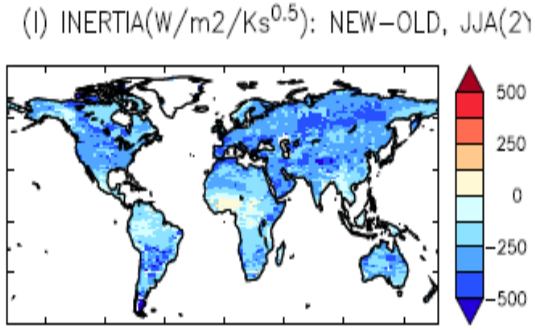
- Simulations guidées (Fuxing)

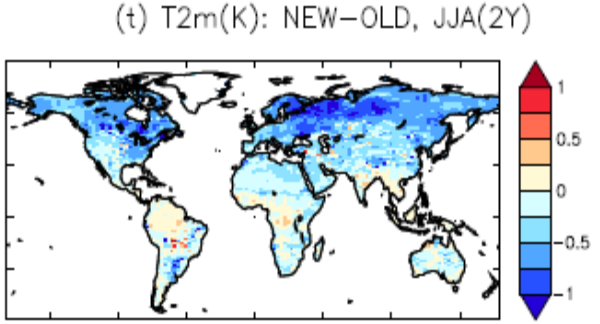








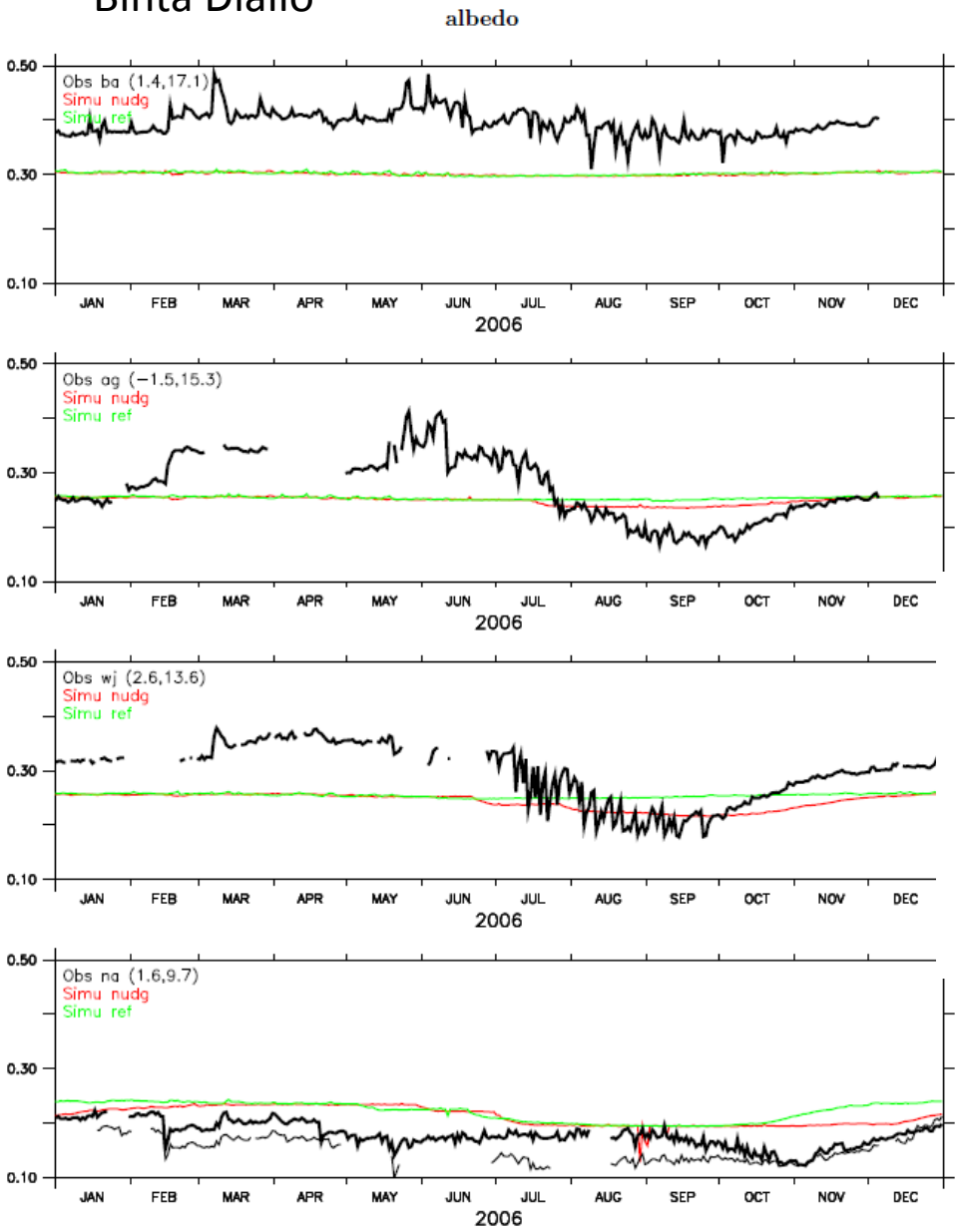


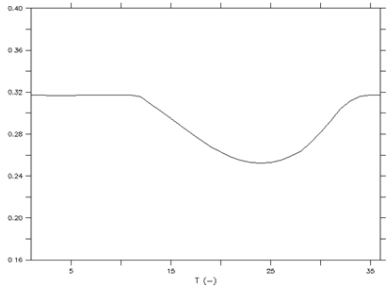


Problèmes identifiés

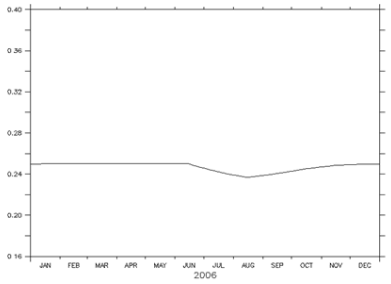
Albedo

Binta Diallo





Donnée ECOCLIMAP



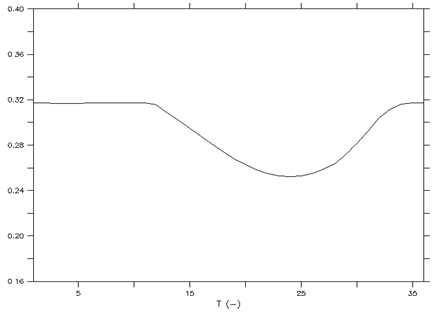
Simu ALMIP2

Albédo sol nu

1	2	3	4	5	6	7	8	9
0.27	0.25	0.25	0.24	0.21	0.1775	0.145	0.1125	0.35

Light - - - - - - - - - > *dark deserts*

Agoufou (2003) : 1,5 W , 15,3 N (2006)



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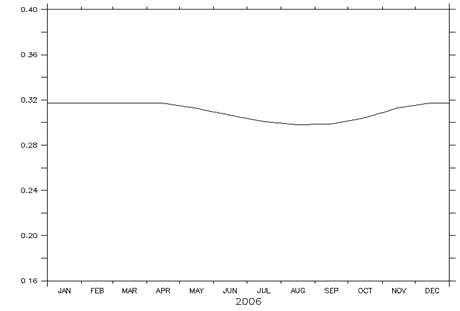
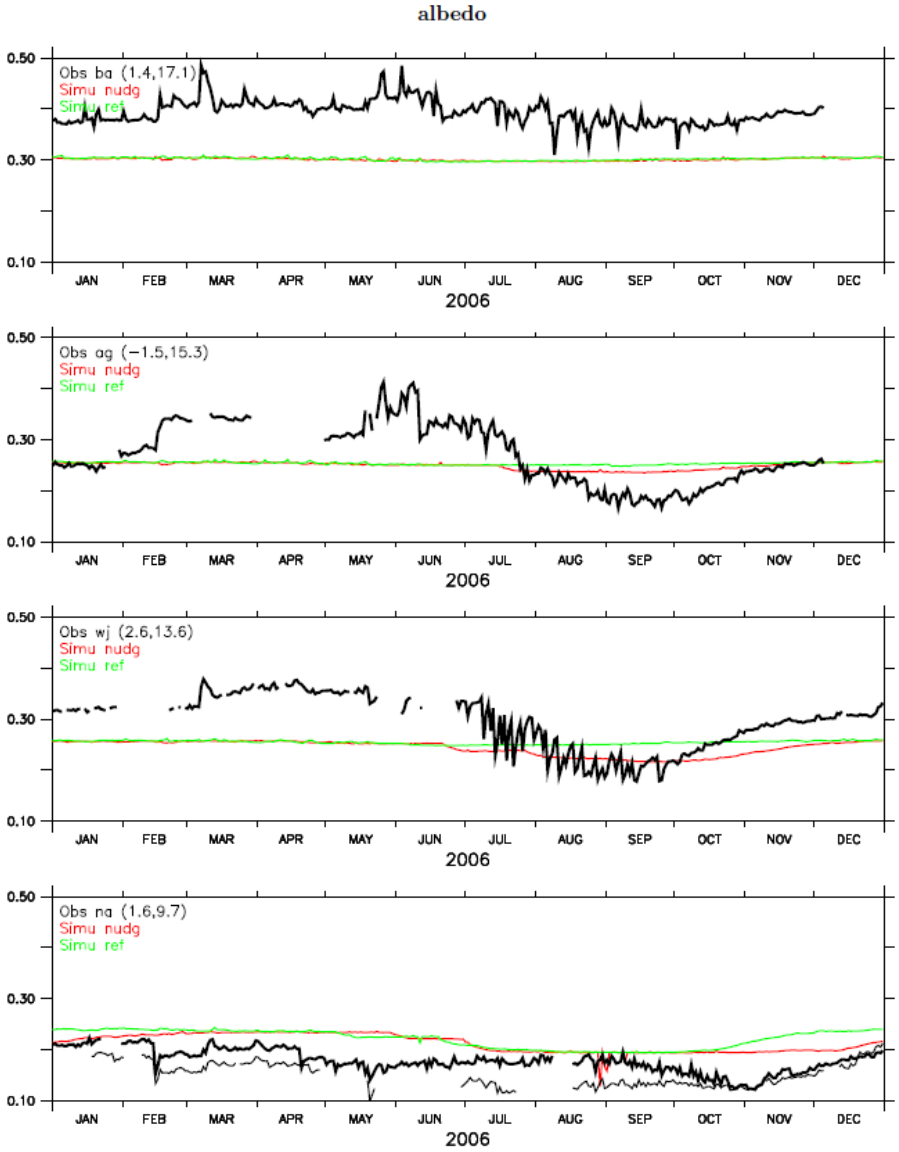
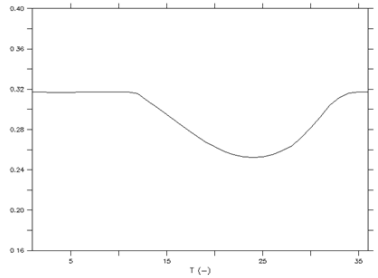


Simu ALMIP2

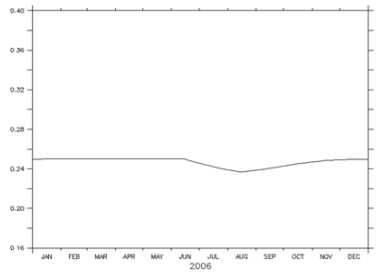
Sonia Ait Mesbah

Albedo





Donnée ECOCLIMAP



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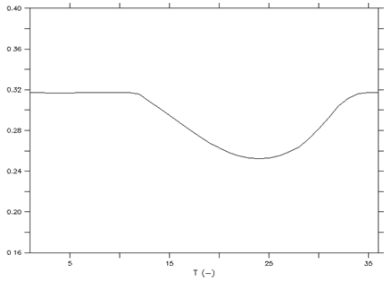

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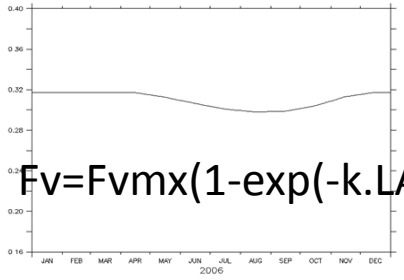
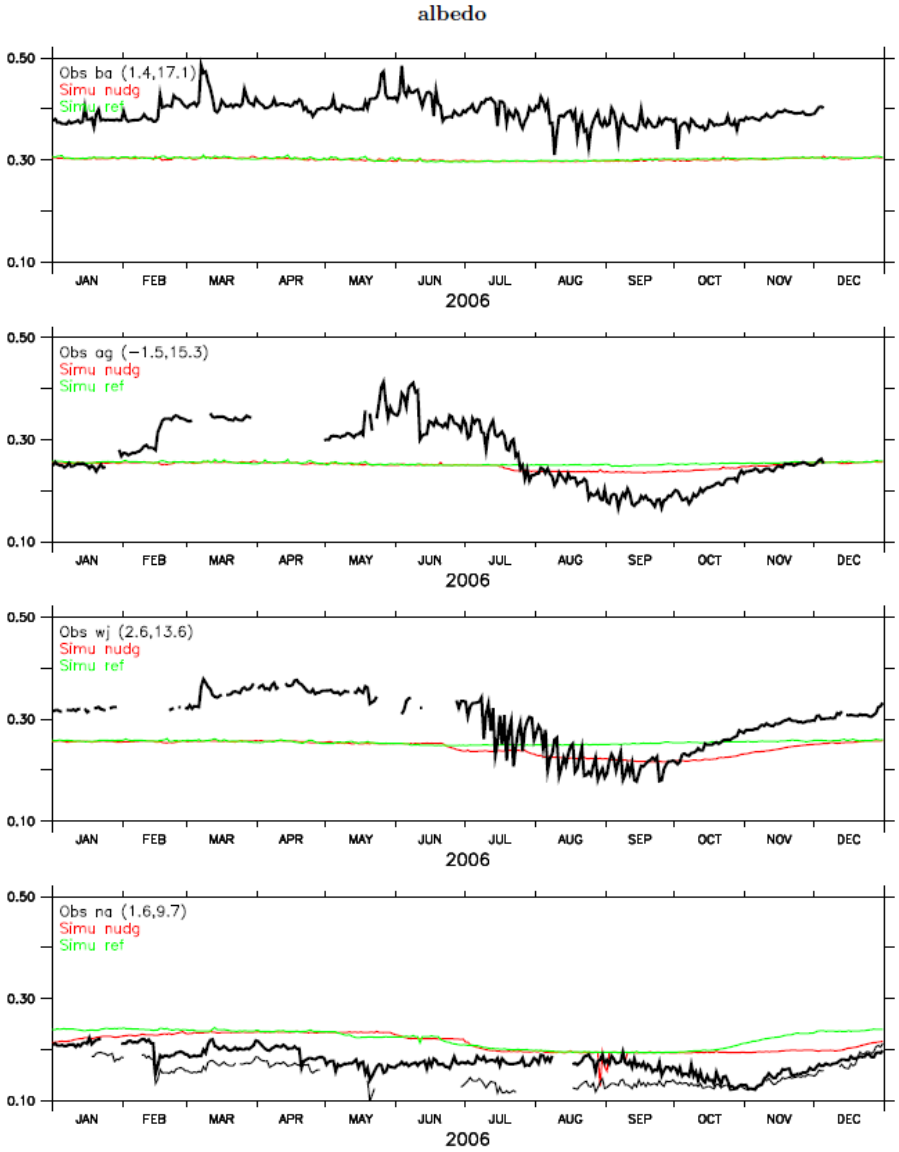


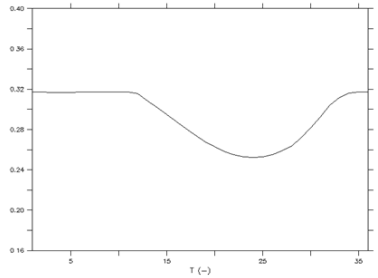
Simu ALMIP2

$$Fv=Fvmx(1-\exp(-k.LAI))$$

Végétation effective fausse?
Albedo sol nu faux?
Carte de végétations?
Dépendance a l'humidité du sol

Albedo





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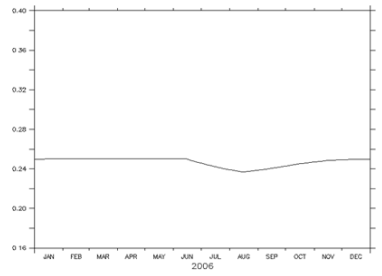

Simu ALMIP2

Albédo sol nu

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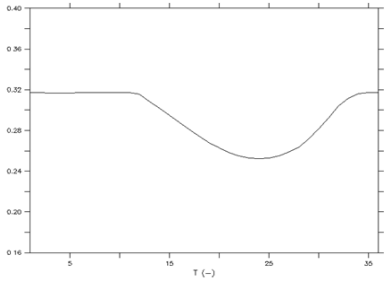
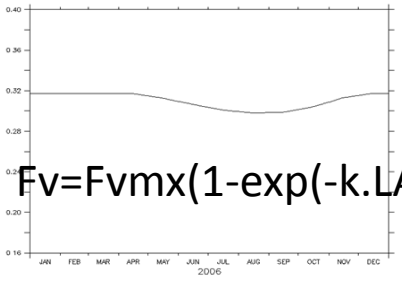


Donnée ECOCLIMAP



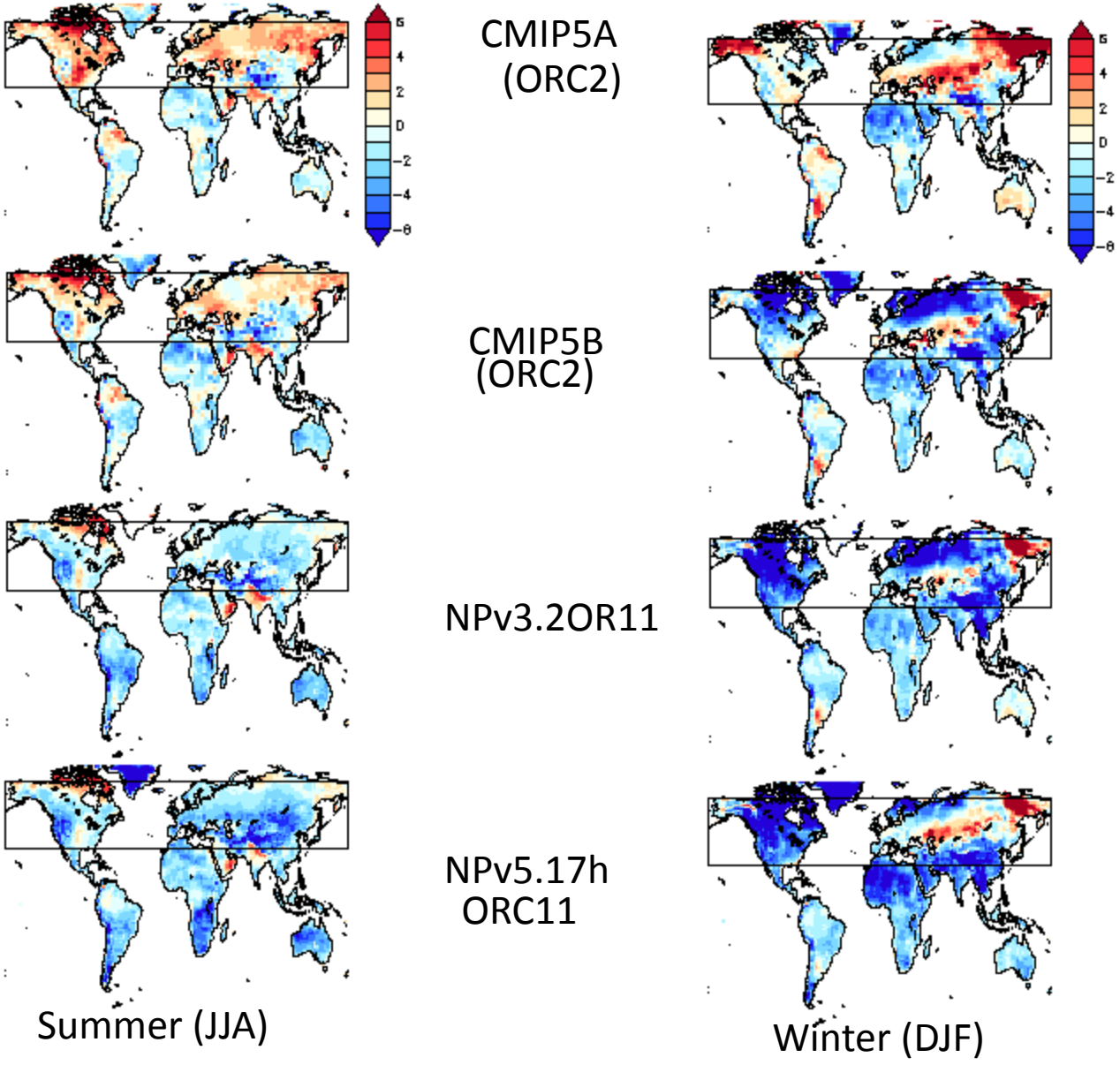
Simu ALMIP2

$$Fv=Fvmx(1-exp(-k.LAI))$$

Végétation effective fausse?
Albedo sol nu faux?
Carte de végétation?
Dépendance a l' humidité du sol

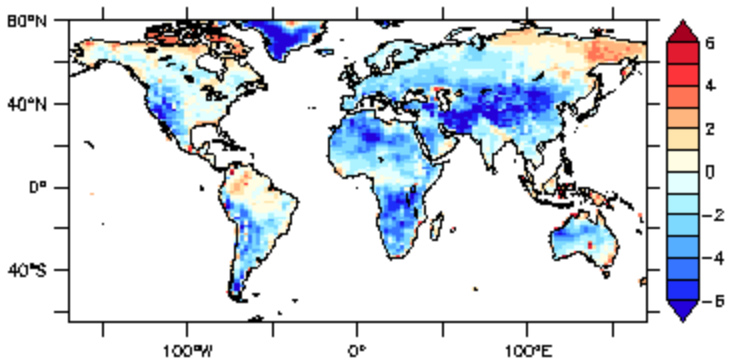
Albedo > Philippe
Carte de végét. > Fabienne M.
Végét. Effective > Binta, Nicolas, Orchidee

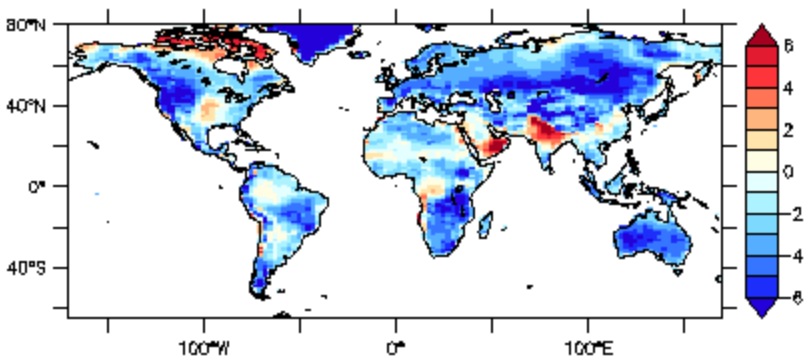
Near surface air temperature

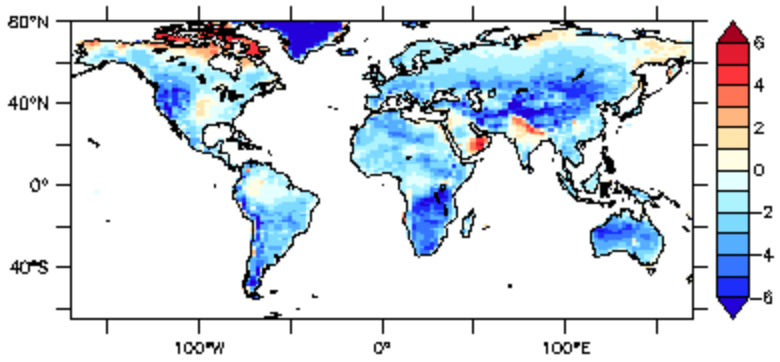


Bias Tmin

Bias Tmax





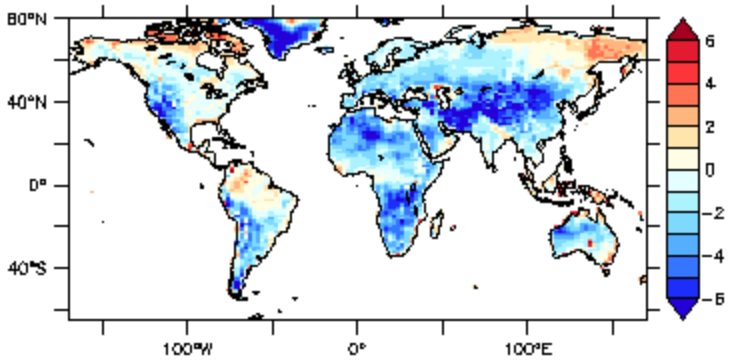


Day night compensation

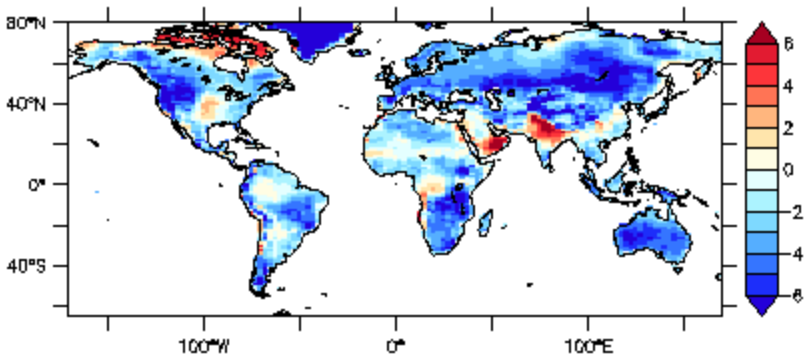
NPv5.17h (ORC11)

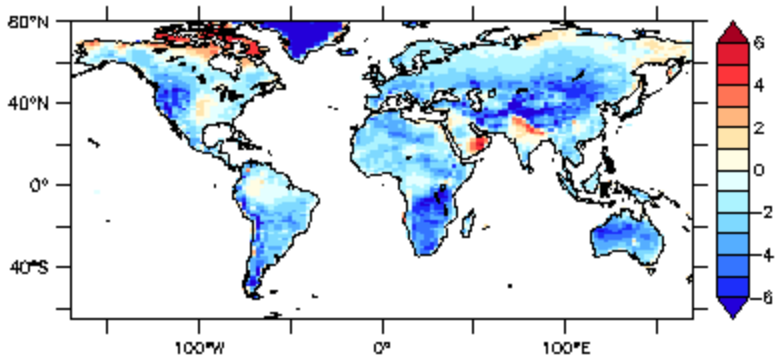
JJA

Biais T_{min}



Biais Tmax





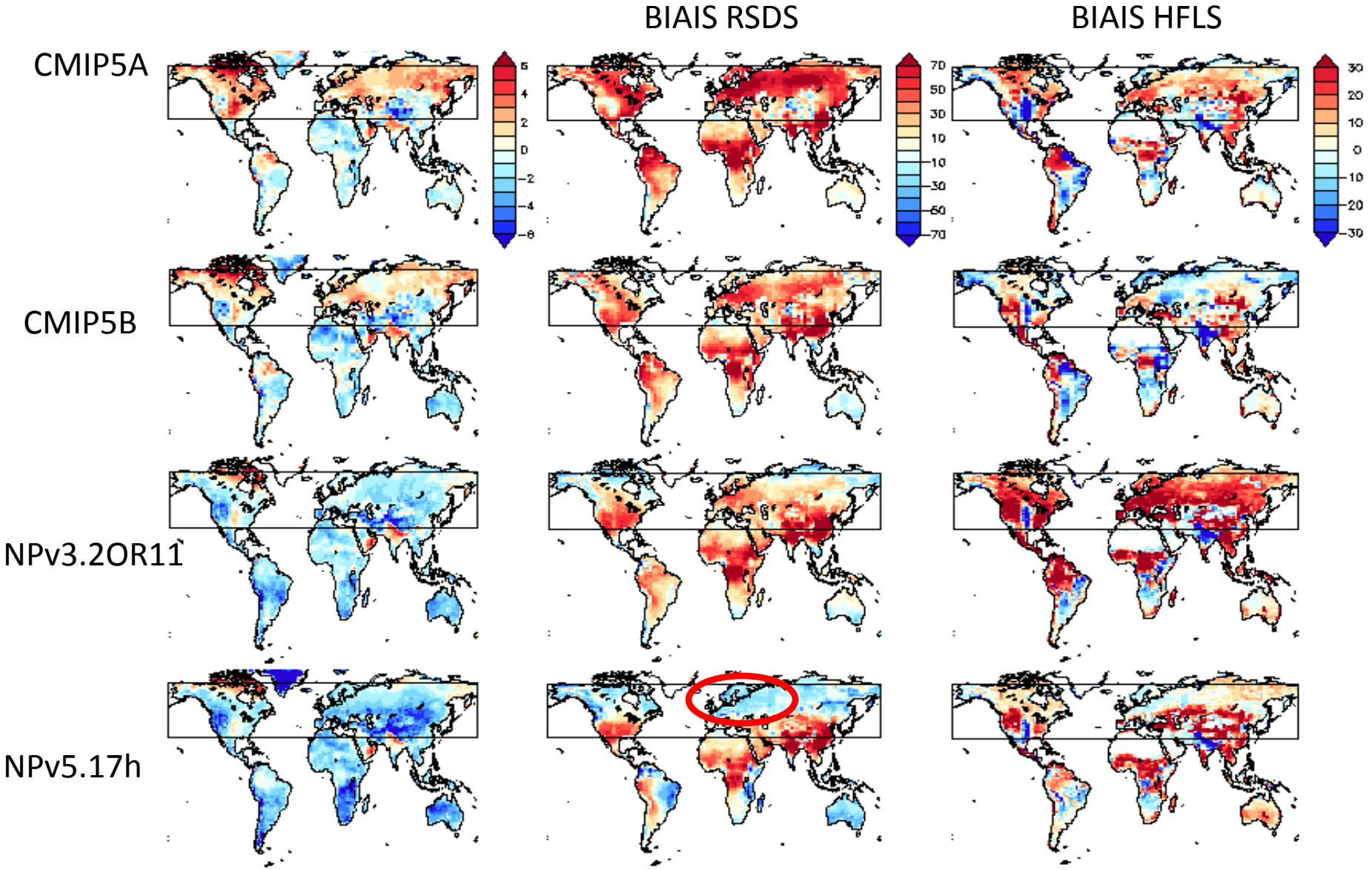
Day night compensation

NPv5.17h (ORC11)

Température a 2m

Bilan d'énergie a la surface: R_{net} - G = L + H

Tendances couche limite: turbulence rayonnement


BIAIS RSDS
BIAIS HFLS
CMIP5A
CMIP5B
NPv3.2OR11
NPv5.17h
6
4
2
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-2
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50
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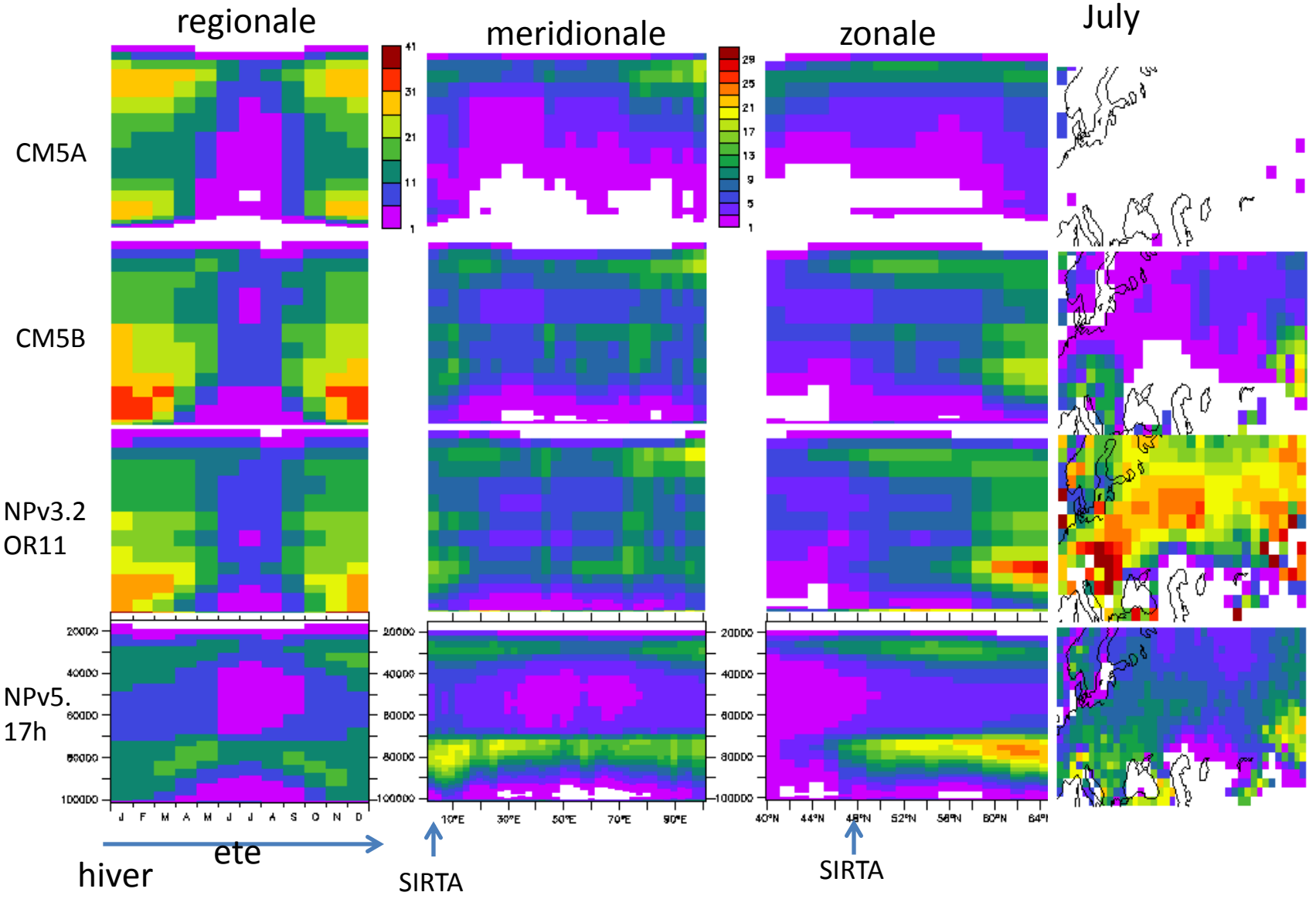
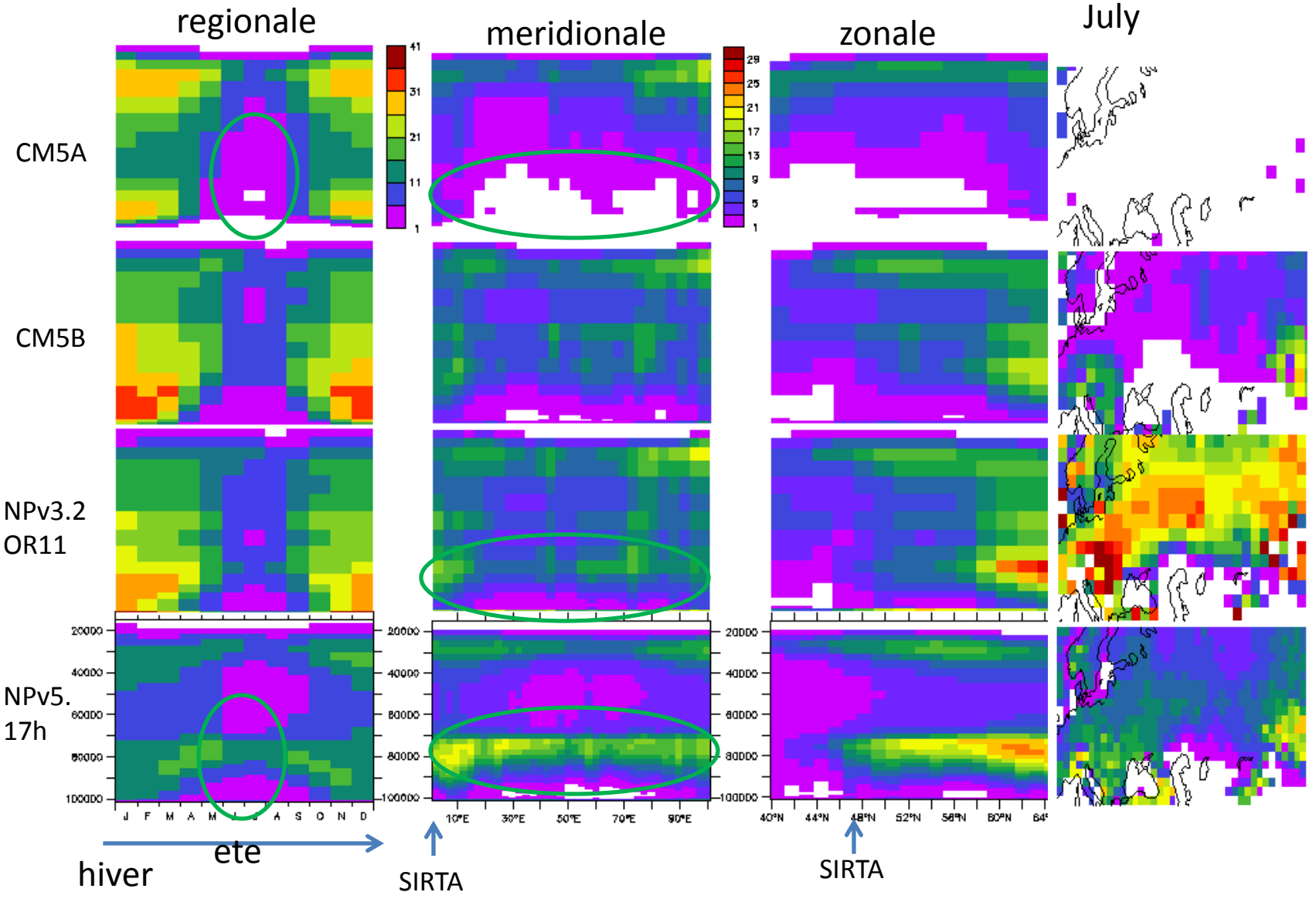
-30

Distribution verticale couverture nuageuse moyenne Europe du Nord

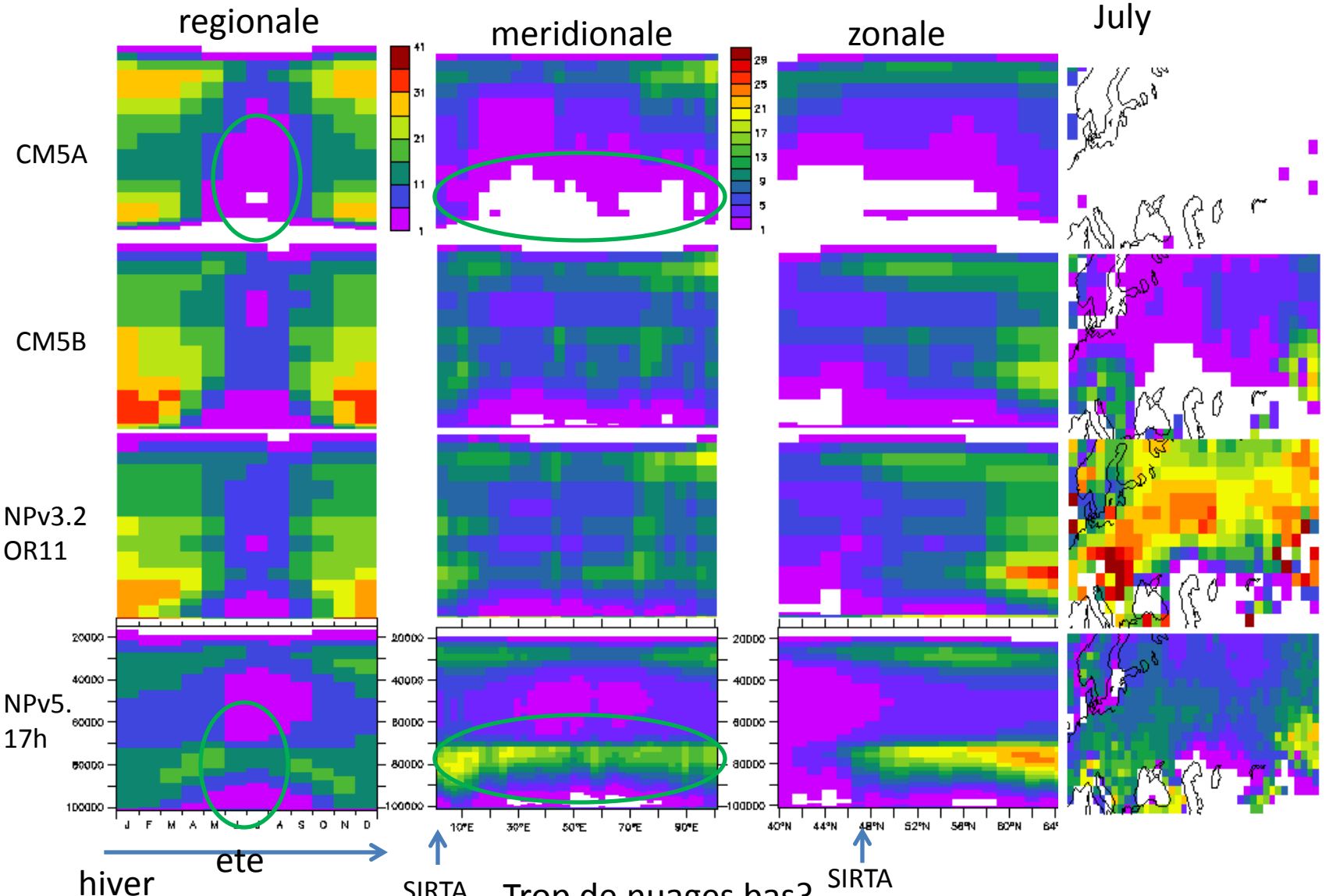


Distribution verticale couverture nuageuse moyenne Europe du Nord



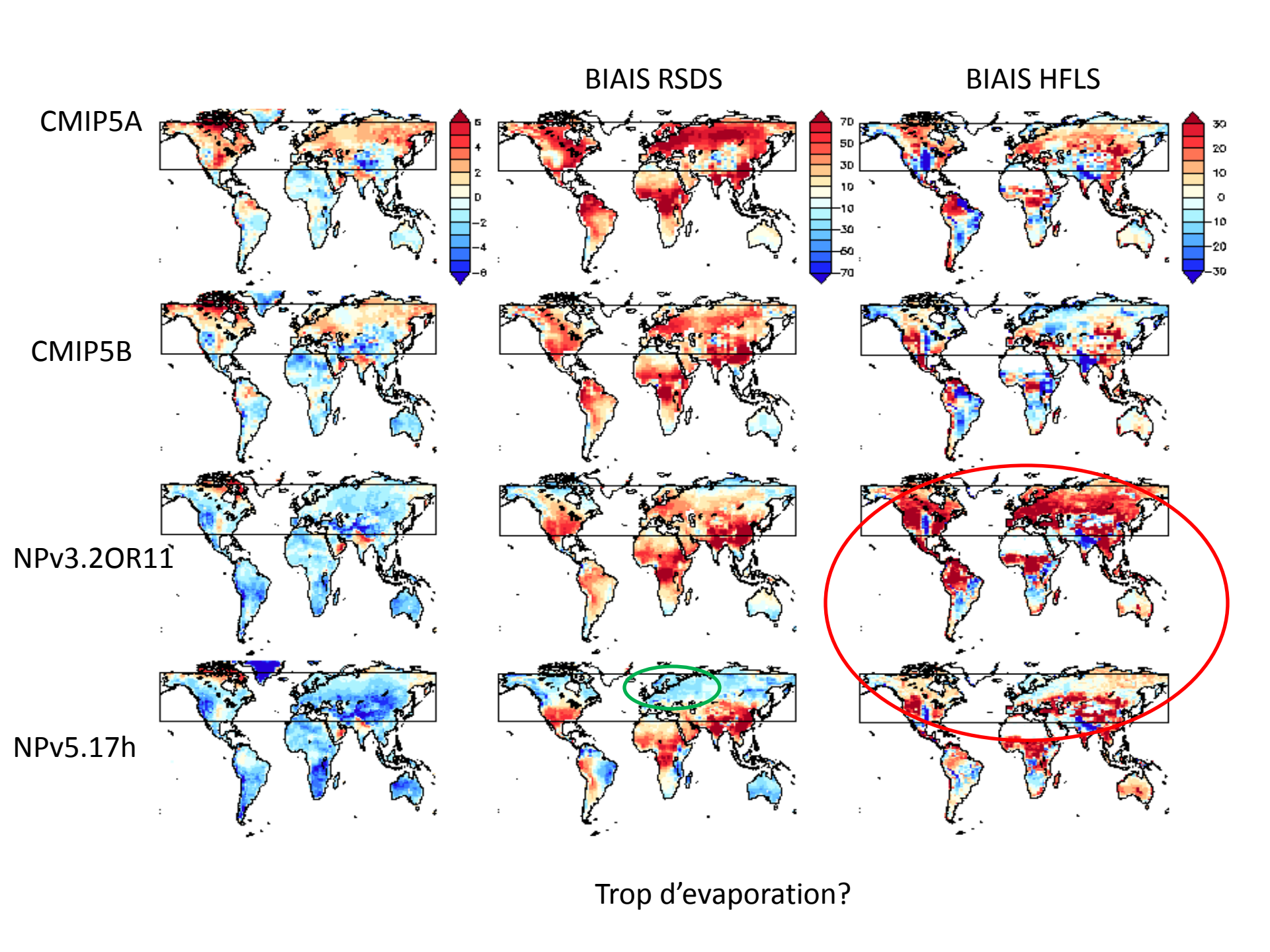
Distribution verticale couverture nuageuse moyenne Europe du Nord

First atm. Layer July



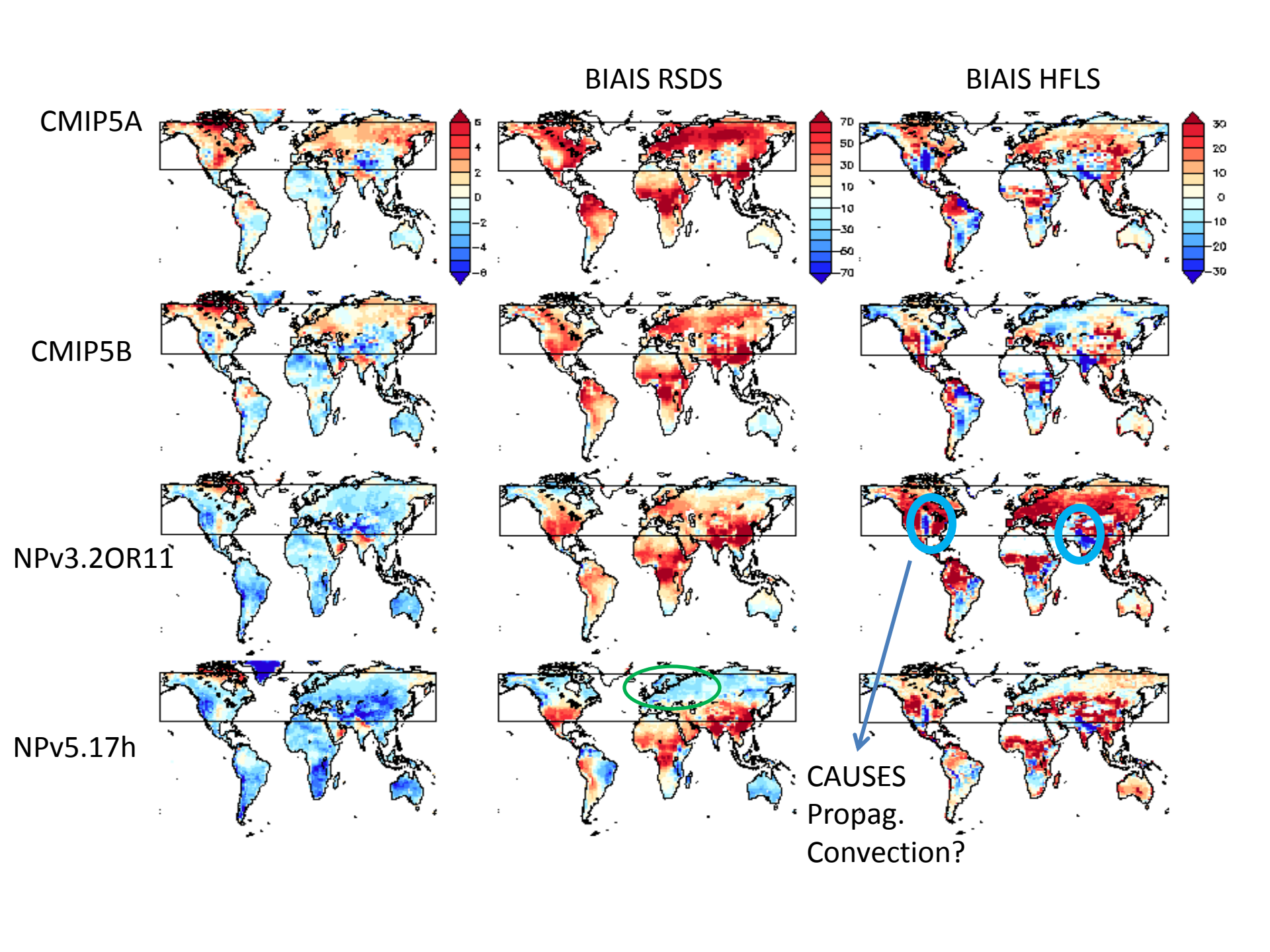
Trop de nuages bas?

Brouillard? Trop humide ?



Trop d'evaporation?

- Des pistes actuellement testées pour réduire l'évaporation
  - ✓ Le sol nu évapore trop longtemps au taux potentiel
  - ✓ Résistance a l évaporation pour le sol nu
  - ✓ longueur de rugosité (Fuxing, Nicolas)
    - Distinguer (z0m et Z0h dans LMDZ ORCHIDEE)
    - longueur de rugosité « dynamique »
  - ✓ Trop de sol nu (végétation effective, cartes)
  - ✓ Stress hydrique


BIAIS RSDS
BIAIS HFLS
CMIP5A
CMIP5B
NPv3.2OR11
NPv5.17h
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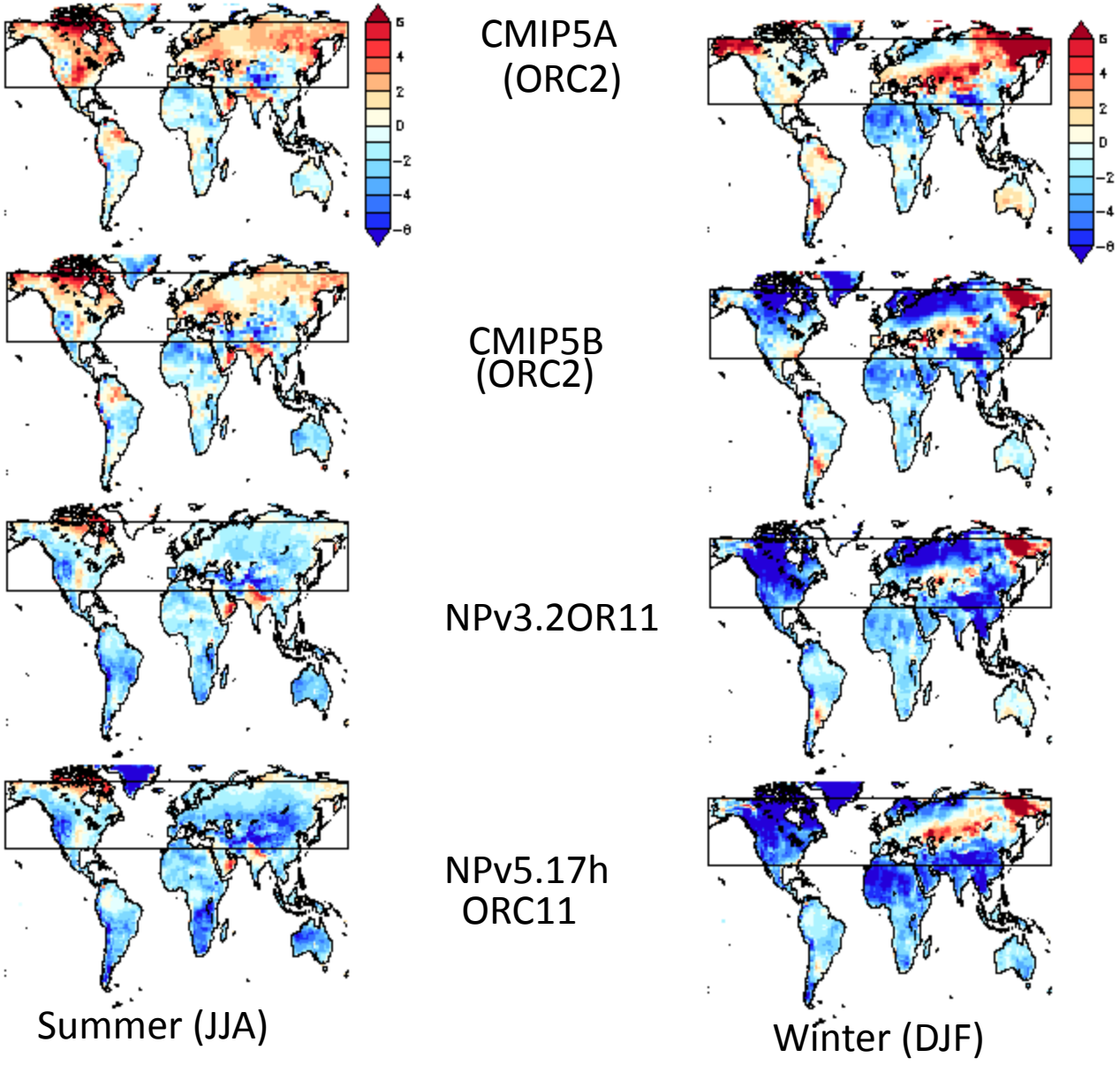
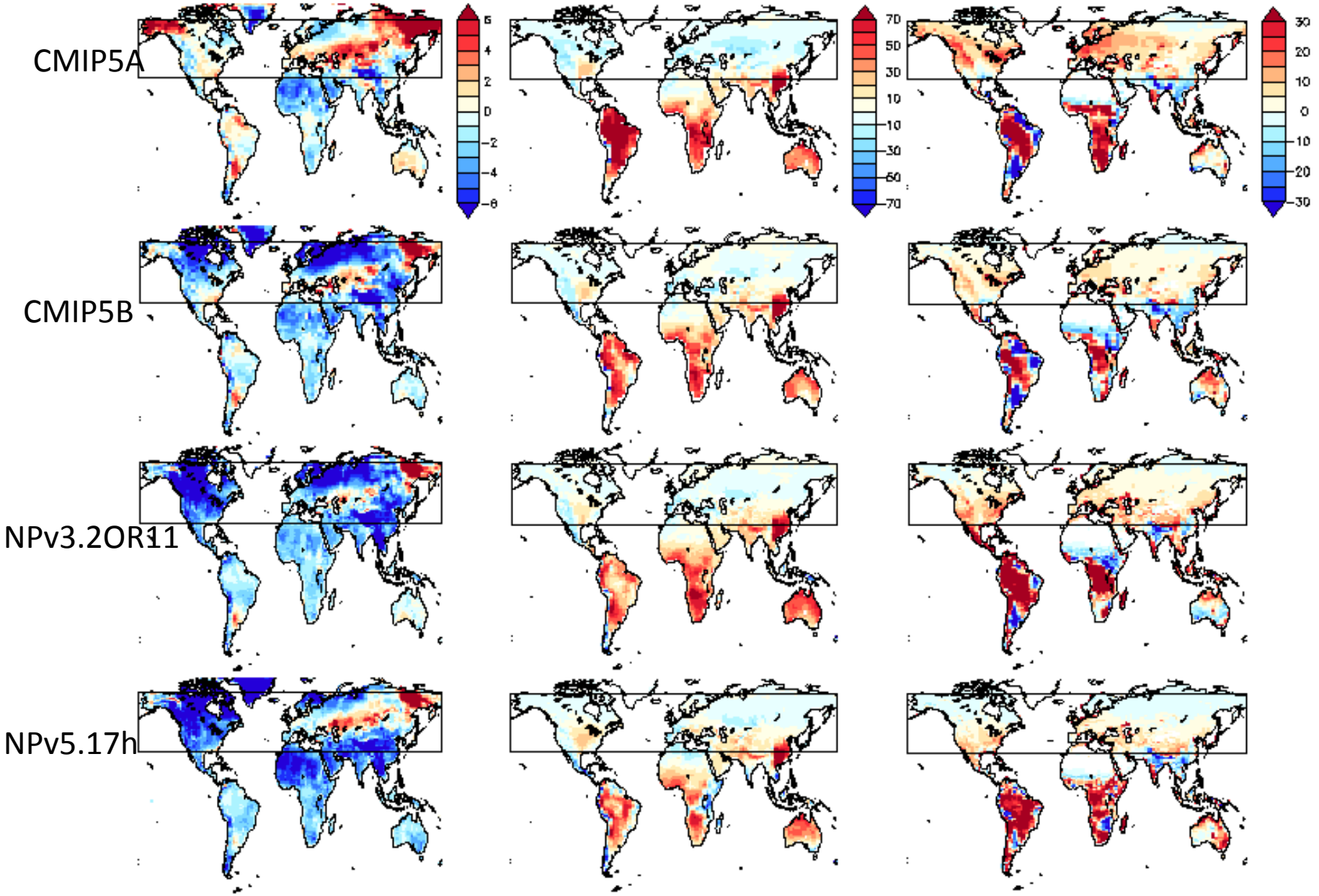
CAUSES
Propag.
Convection?

Near surface air temperature




CMIP5A
CMIP5B
NPv3.2OR11
NPv5.17h
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-6
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-10
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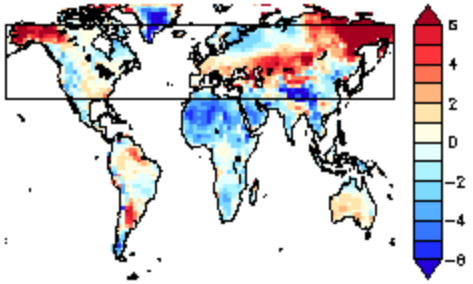
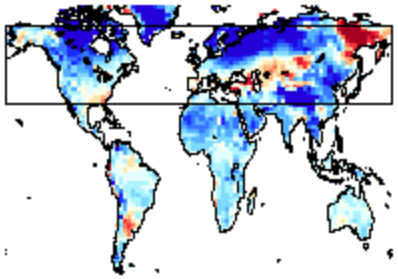
-30

Near surface air temperature

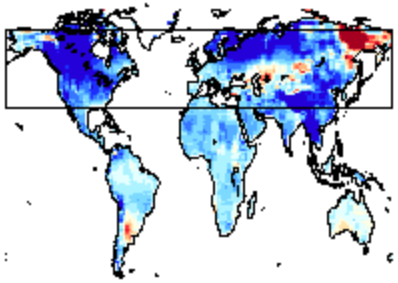
CMIP5A
(ORC2)



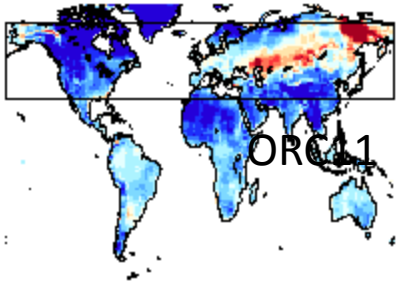
CMIP5B
(ORC2)



NPv3.2OR11

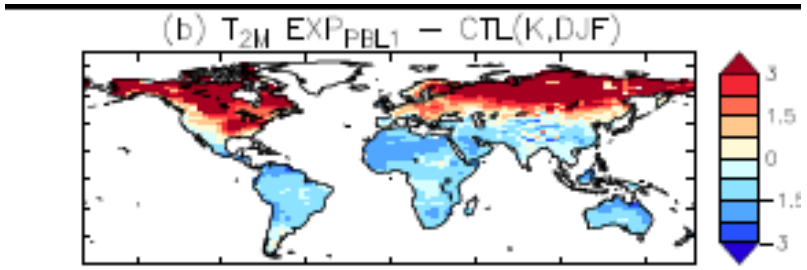


NPv5.17h

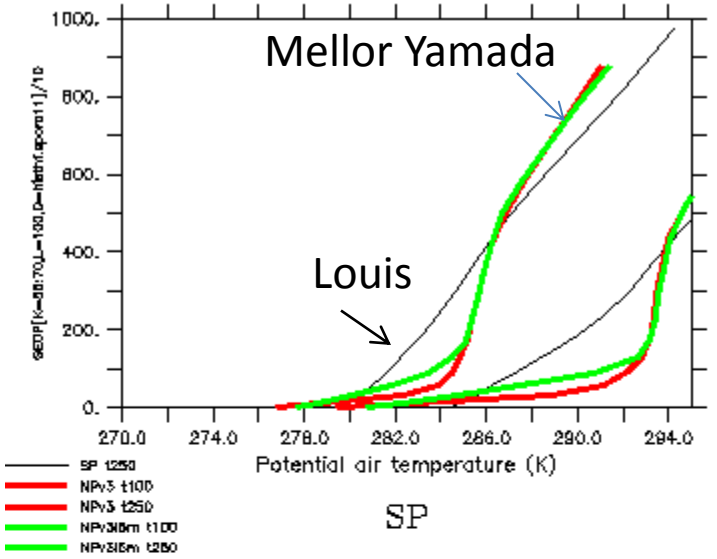


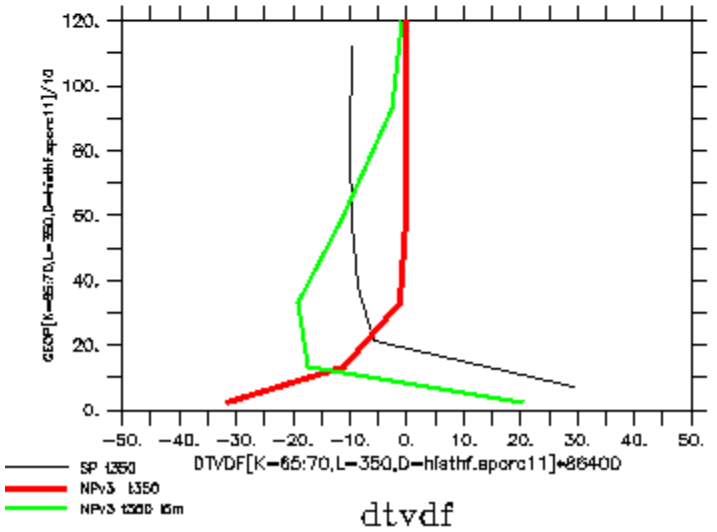
ORCA1

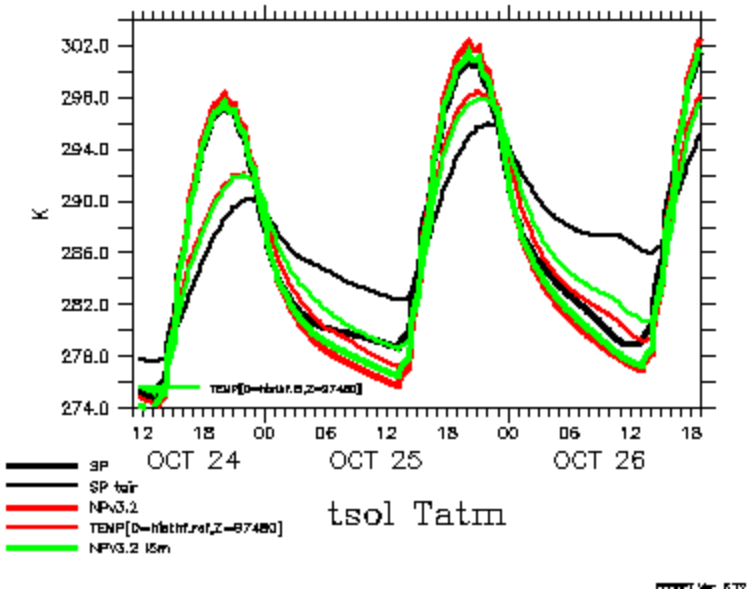
Thermiques
+
Diffusion verticale



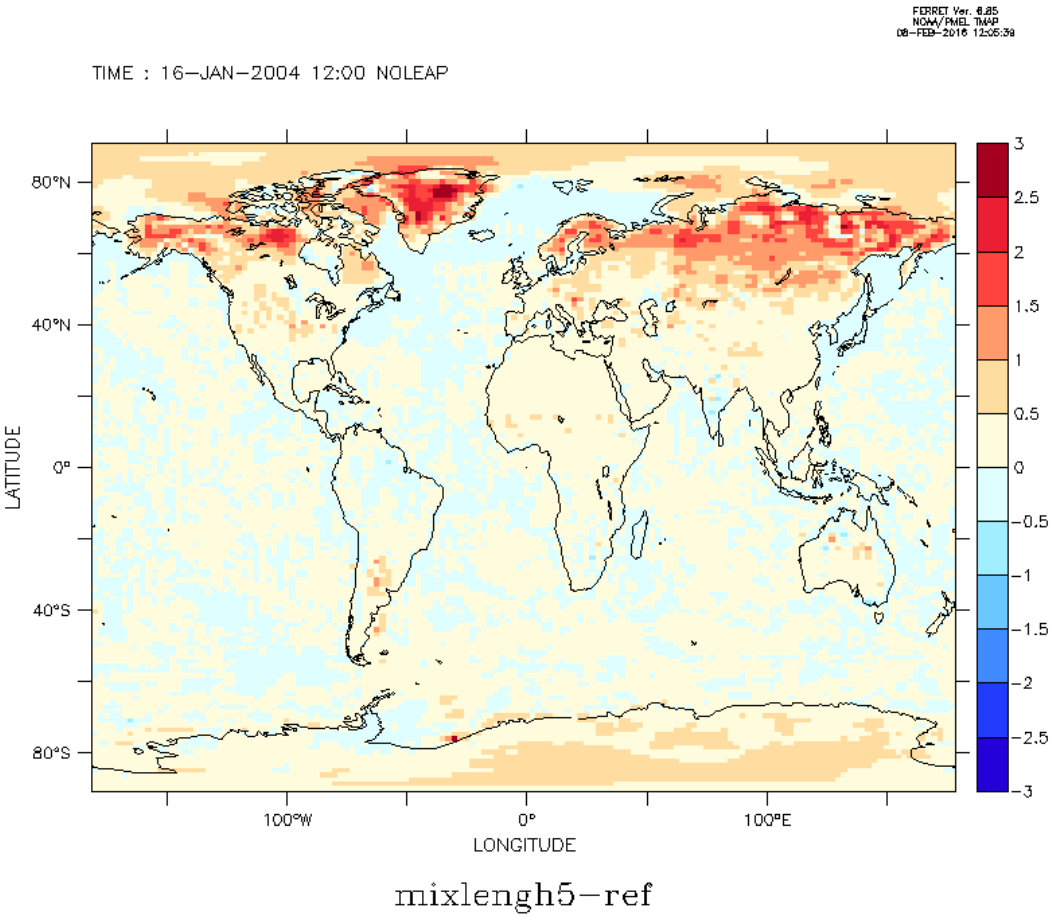
Cas DICE, sensibilité a la longueur de mélange



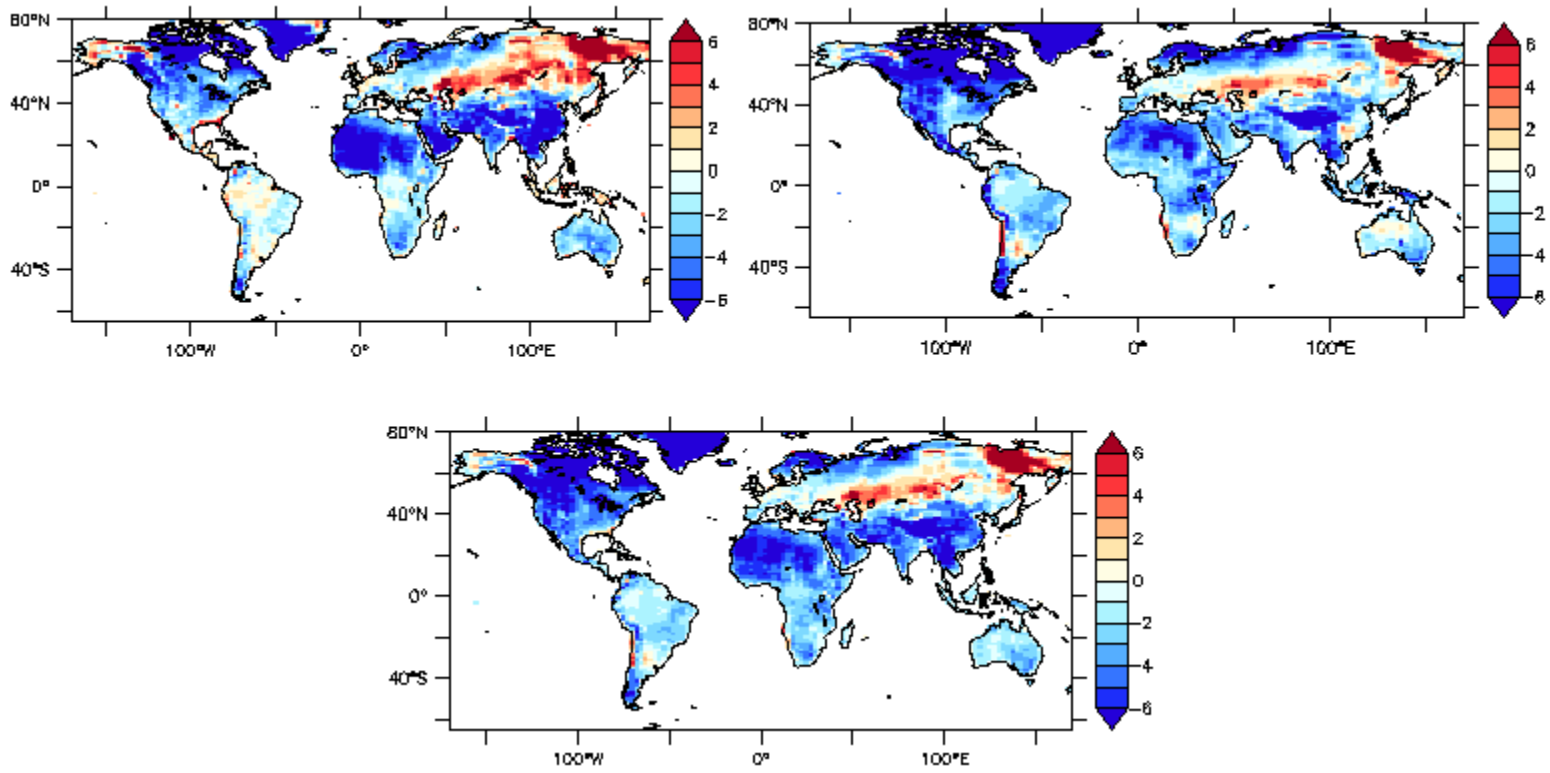


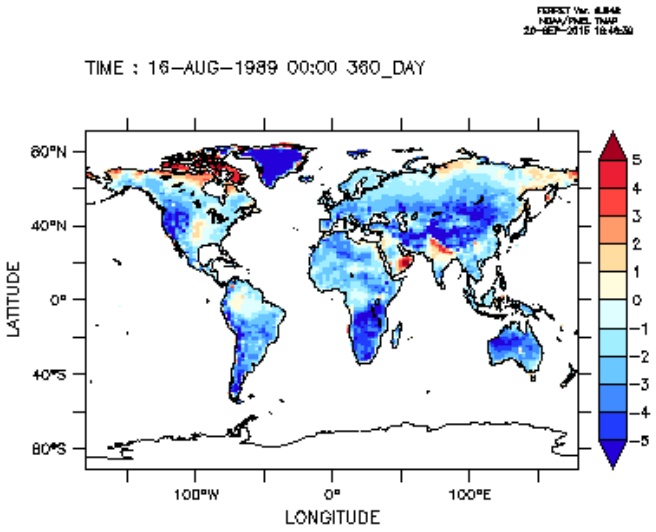


Simulations guidees (NPv3.2. ORC11)
Lmix=5m - Lmix=1m

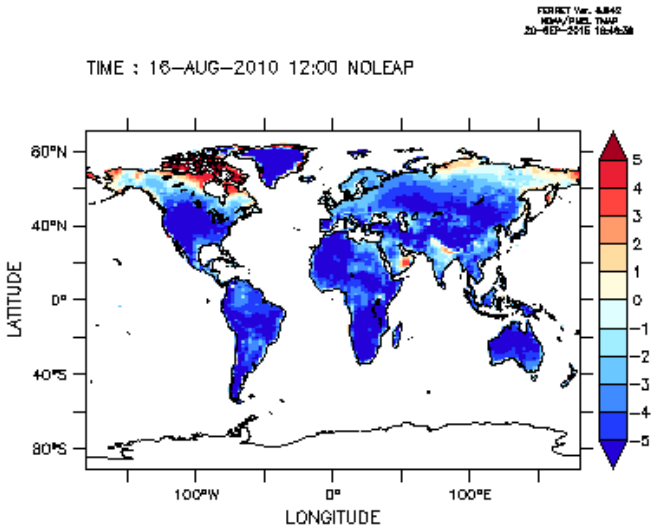


- Biais froids : LSM et Atmosphère
  - ✓ Régler l'évaporation (sol nu, transpiration, evap. potentielle/z0)
  - ✓ Vérifier/ régler le réalisme de la couverture nuageuse
  - ✓ Autoriser plus de mélange diffusif pour les couches limites stables
- Biais chauds
  - ✓ CAUSES (Site ARM), propagation convection?
  - ✓ Neige?
- Bilan d'énergie a la surface:
  - ✓ Inertie thermique (textures)
  - ✓ Albedo (cycle saisonnier)
  - ✓ Transfert radiatif (emissivite de surface).

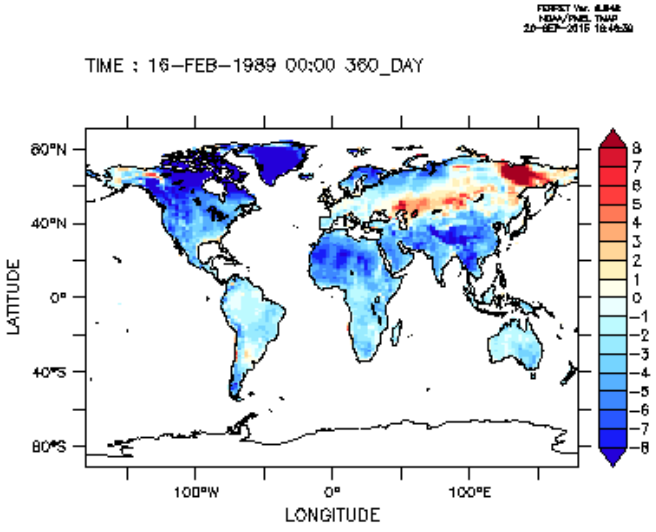

80°N
40°N
0°
40°S
100°W
0°
100°E
6
4
2
0
−2
−4
−6



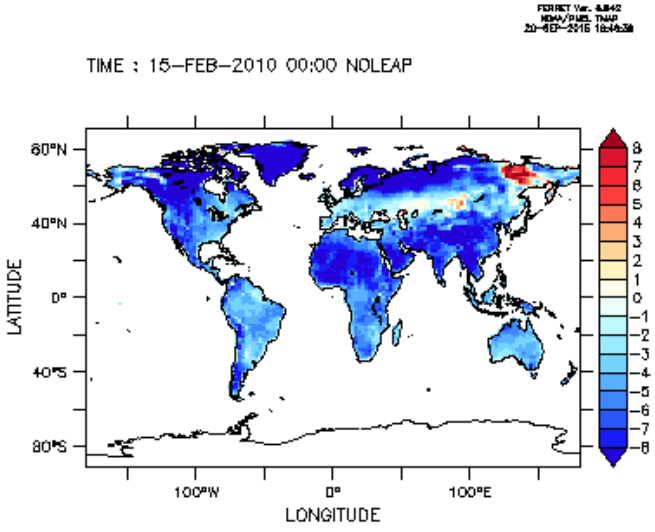
t2m -CRU 10yrs JJA



t2m -CRU cpl JJA 30yrs

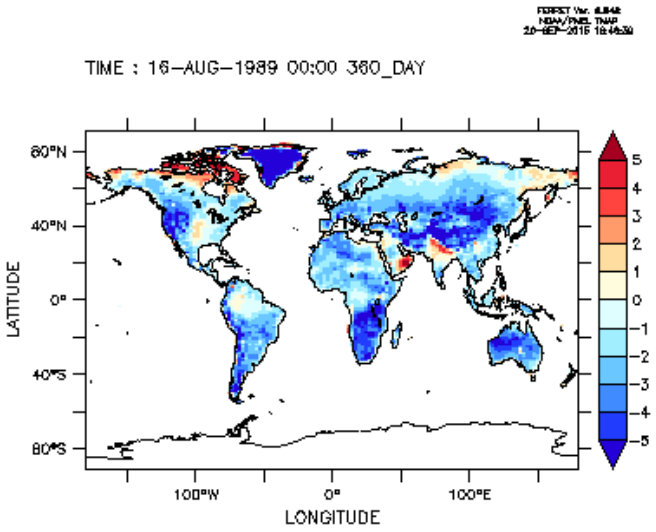


t2m -CRU 10yrs DJF

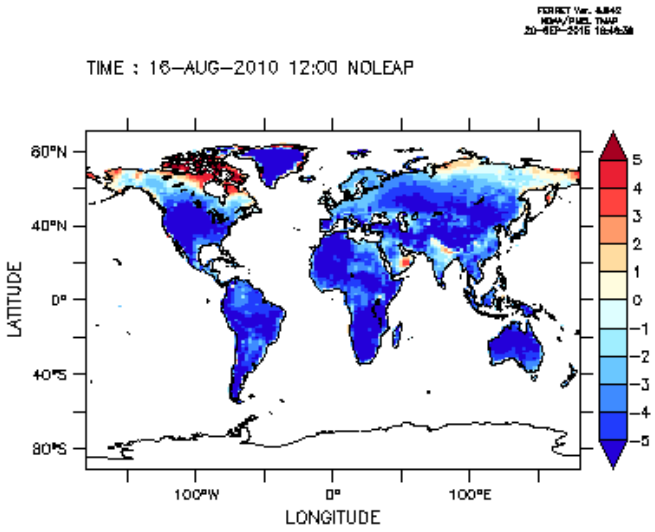


t2m -CRU cpl 30yrs DJF

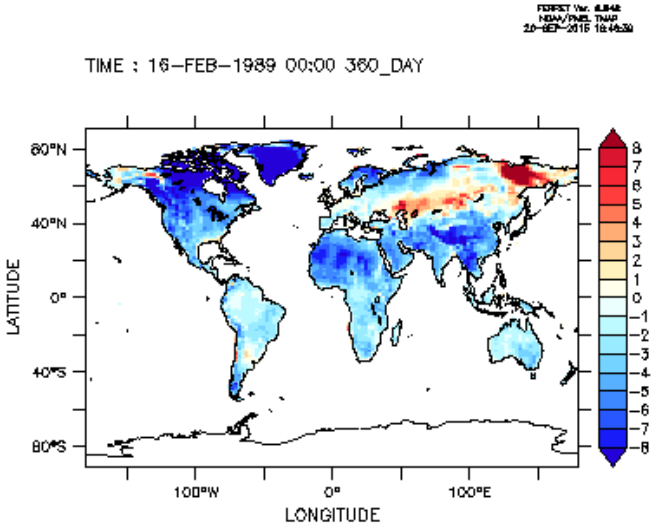
NPv5.17h



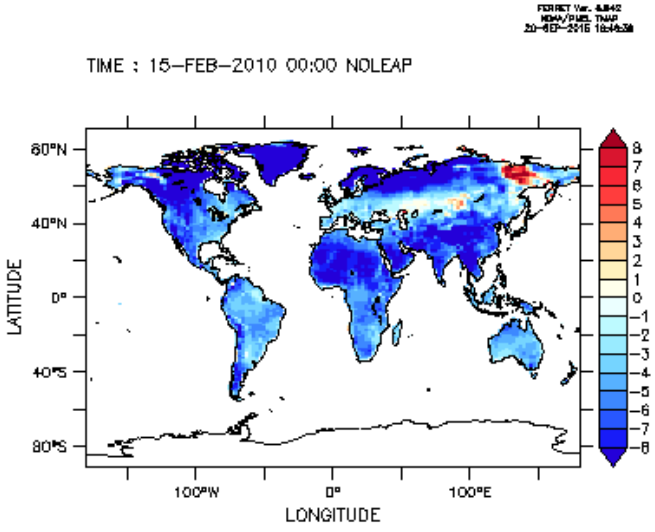
t2m -CRU 10yrs JJA



t2m -CRU cpl JJA 30yrs



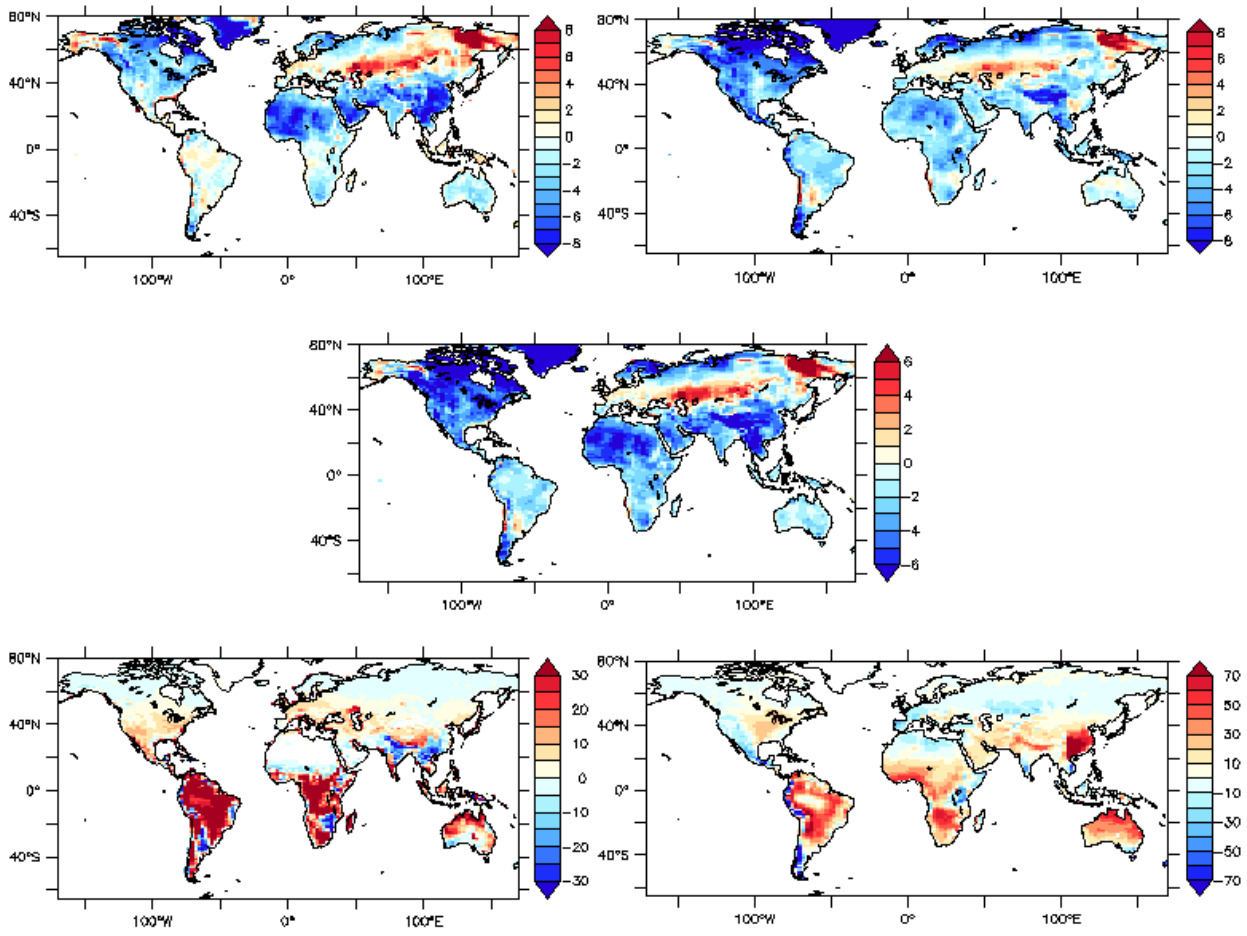
t2m -CRU 10yrs DJF



t2m -CRU cpl 30yrs DJF

Bias Tmin

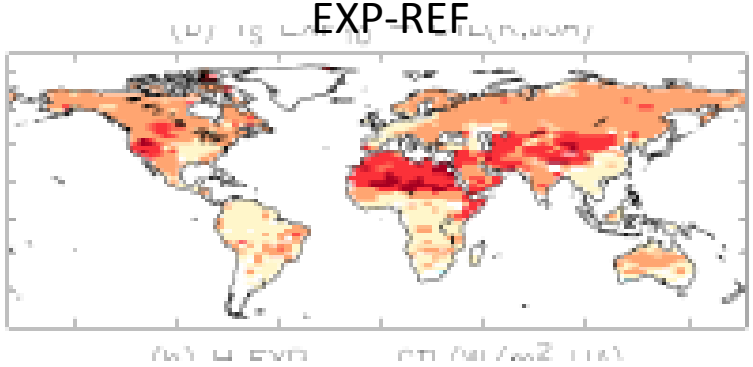
Bias Tmax



Winter

TESTS longueur de rugosite

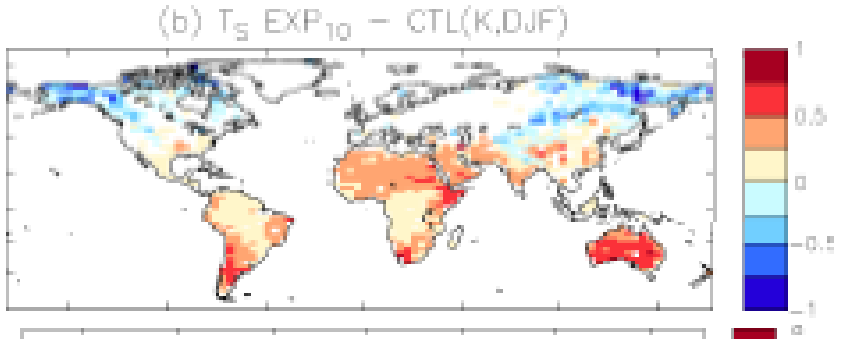
EXP-REF



1K

-1K

summer



winter

TESTS reduction evap. Sol nu

T2M (K)