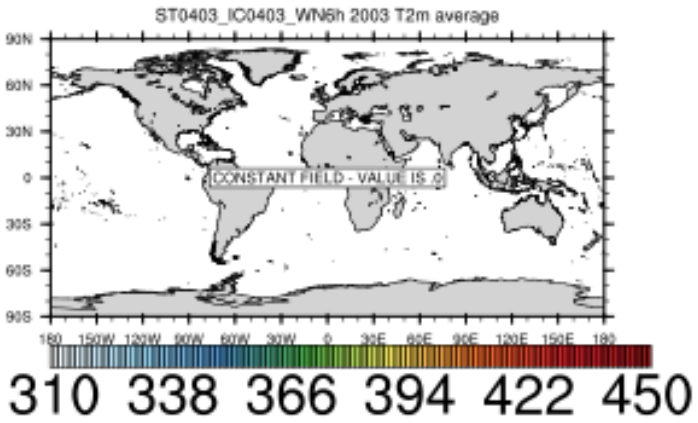
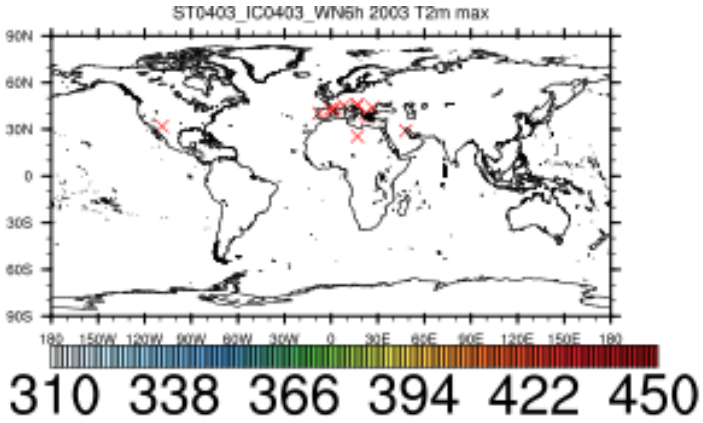
Température et humidité à 2m

F.Cheruy, I. Musat , F. Hourdin



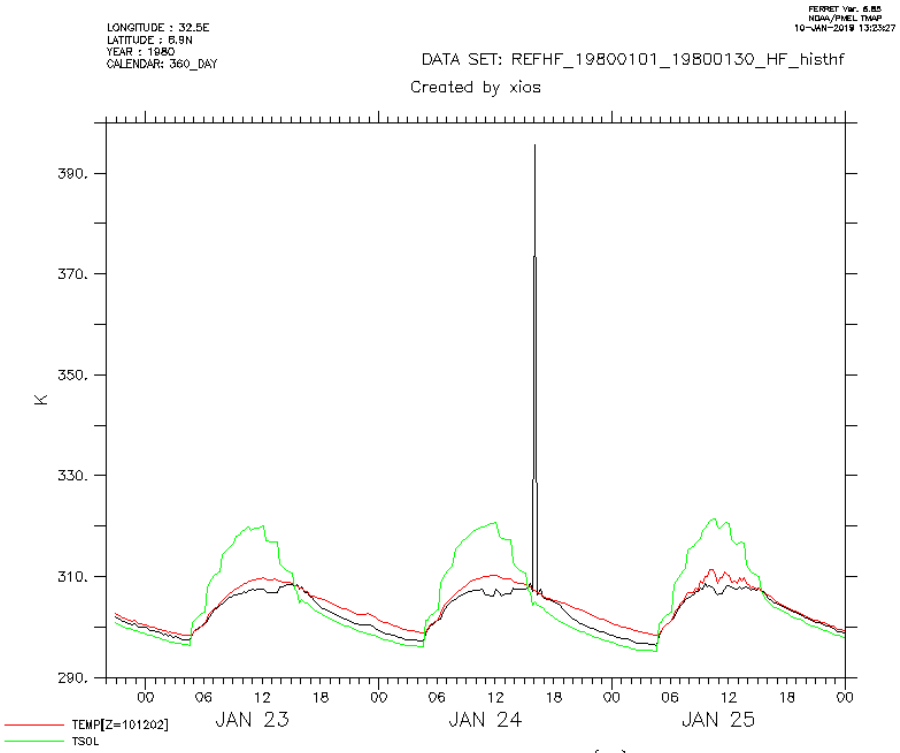
TAS (daily)



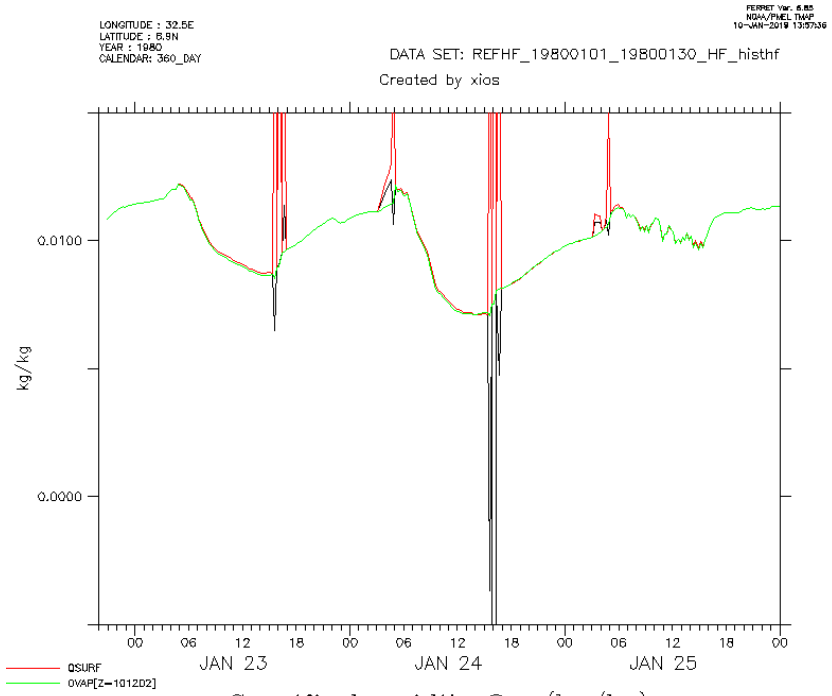
Tasmax
August 2003
nudged

Diagnostique d'évènements extremes (Vagues de chaleur)

Yanfeng Zhao



Temperature 2m (K)



Specific humidity 2m (kg/kg)

- Valeurs interpolées entre le premier niveau du modèle (Env. 10m) et la surface
- Schéma d'interpolation probablement dans d'autres modèles

(vient des premiers AMIP)

- Fondé sur variables star et flux constants dans la couche de surface

  first guess- Dyer Businger, LMO- , variables star,

  itération fonction de stabilité Fonction de Ri (Louis)

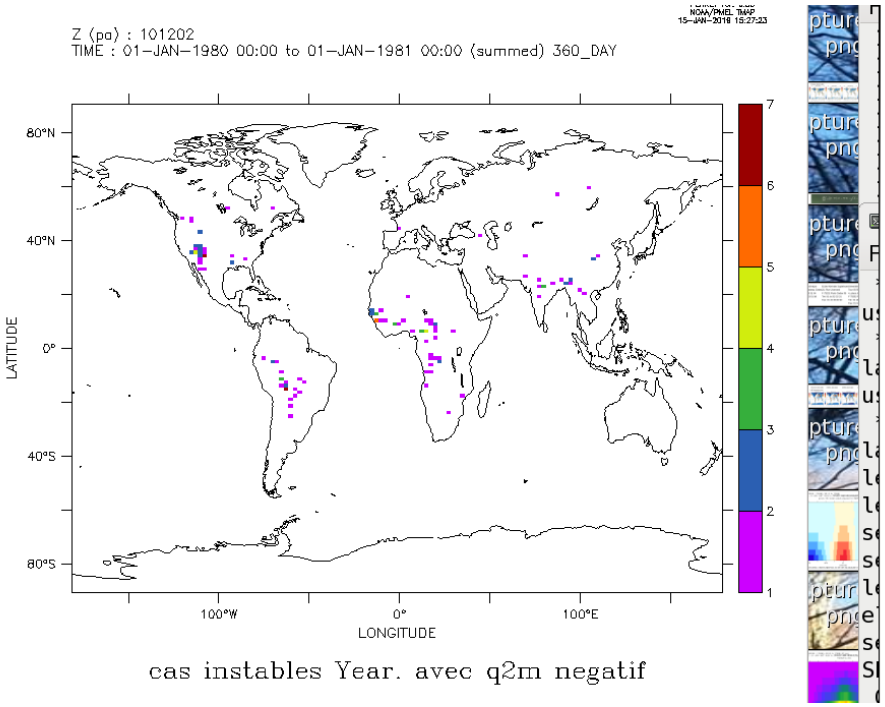
Problemes quand

Vent dans la première couche faible et

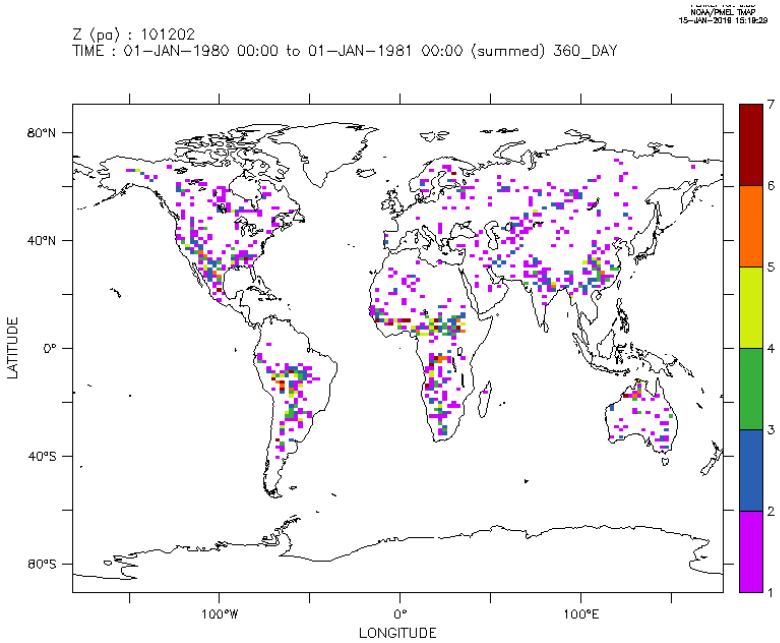
Changement de régime Turbulent (lever du jour, coucher du soleil), Tair > tsurf

atmosphere seche

la première couche de sol a au moins une texture humide



cas instables Year. avec q2m negatif



cas stables Year. avec q2m negatif

About the values interpolated at a reference level near the surface (e.g. 2m)

Principle: Constant flux in the surface layer and similarity laws: Non dimensional vertical gradient of horizontal wind, potential temperature, specific humidity are assumed to be universal function of a stability parameter z/L (L= Monin-Obukhov law) or of the Richardson Number.

$$\frac{kz}{u_*}\frac{\partial u}{\partial z} = \phi_m\left(\frac{z}{L}\right) \quad ; \quad \frac{kz}{\theta_*}\frac{\partial \theta}{\partial z} = \phi_H\left(\frac{z}{L}\right) \quad ; \quad \frac{kz}{q_*}\frac{\partial q}{\partial z} = \phi_\varphi\left(\frac{z}{L}\right)$$

integrating these equations gives

$$\frac{ka}{u_*} = \ln\left(\frac{z}{z_0}\right) - \Psi_M\left(\frac{z}{L}\right) + \Psi_M\left(\frac{z_0}{L}\right)$$

$$\frac{k(\theta-\theta_0)}{\theta_*} = \ln\left(\frac{z}{z_0}\right) - \Psi_H\left(\frac{z}{L}\right) + \Psi_H\left(\frac{z_{0H}}{L}\right)$$

Louis shows that one can use the Richardson (bulk) number instead of the monin obukhov length

$$\frac{ka}{u_*} = \frac{\ln(z/z_0)}{F_M^{1/2}\left(R_i^b, \frac{z}{z_0}\right)}$$

$$\text{II} \quad \frac{k(\theta-\theta_0)}{\theta_*} = \frac{\ln\left(\frac{z}{z_0}\right)}{F_H\left(R_i^b, \frac{z}{z_0}\right)} F_M^{1/2}\left(R_i^b, \frac{z}{z_0}\right)$$

Ancienne methode :

$F^u(L)$ ← $F^n(R_i)$

$$\delta\theta_{ref} = \theta_* \frac{\sqrt{C_{d\,ref}}}{C_{h\,ref}}.$$

$$\delta q_{ref} = q_* \frac{\sqrt{C_{d\,ref}}}{C_{h\,ref}}.$$

$$u = \frac{u_*}{\sqrt{C_d}}$$

Méthode corrigée :

$$u_x = u_1 \sqrt{Cd_1} = u_{ref} \sqrt{Cd_{ref}} \rightarrow u_{ref} = u_1 \frac{\sqrt{Cd_1}}{\sqrt{Cd_{ref}}}$$

$$C_{H1} (\theta_1 - \theta_s) u_1 = C_{Href} (\theta_{ref} - \theta_s) u_{ref}$$

$$\theta_{ref} = \theta_1 + (1-\alpha)\theta_s$$

$$\alpha = \frac{C_{H1}}{C_{Href}} \frac{\sqrt{Cd_{ref}}}{\sqrt{Cd_1}}$$

$$C_D = f(z_0, Ri) \; ; \; C_H = f(z_0, z_{0h}, R$$

$$q_{ref} = q_1 + (1-\alpha) q_{surf}$$

$$q_{surf} = (1-\beta) q_1 + \beta q_{sat}(T_s) \quad [\beta = \frac{E}{E_{pot}}$$

ORCHIDEE : $\beta \propto \frac{h_{canopy}}{(1 + u_1 C_{D1} (r_{veget} + r_{struc})}$

si $u_1 \to 0$ et $C_{D1} \to 0$ ⟹ $\beta \to \beta_{max}$

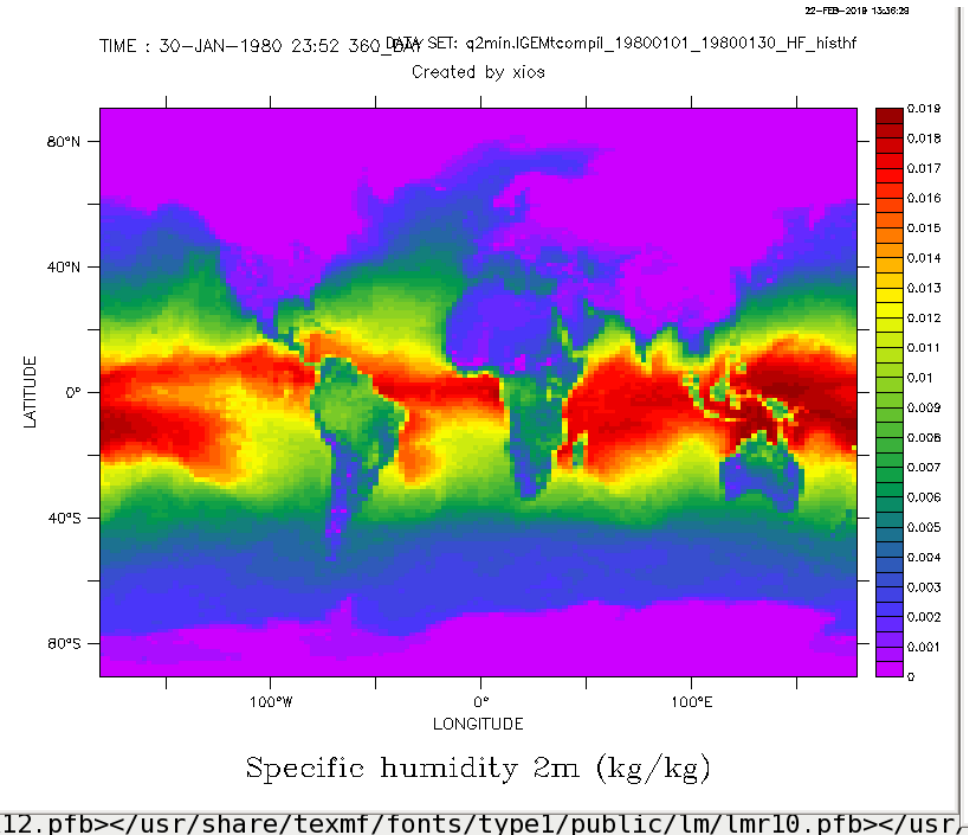
pas de turbulence
pas de vent

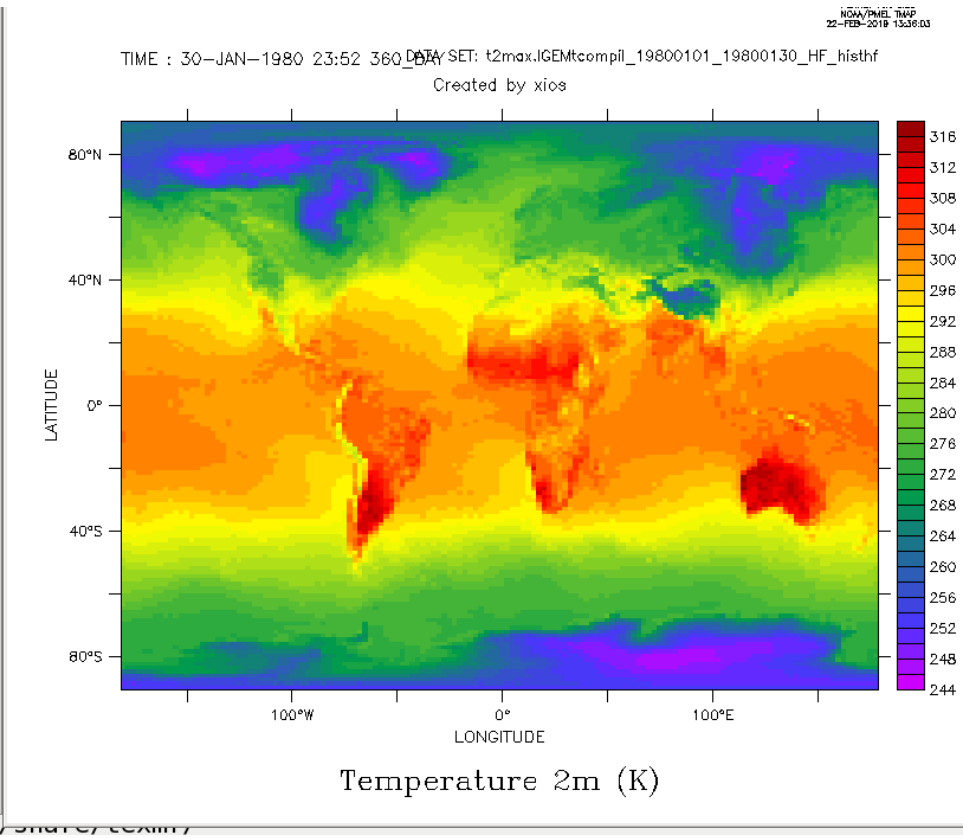
mais β fort ⟹ $q_{surf} \to q_{sat}$

Nouveau si $u_1 \to 0$, $C_{D1} \to 0$ ($u_1 C_D < 10^{-4}$) ⟹ $\beta = 0$ ⟹ $q_{surf} \to$

Une solution borner le vent pour le calcul du drag pour les diagnostiques

speed=max(speed,1)





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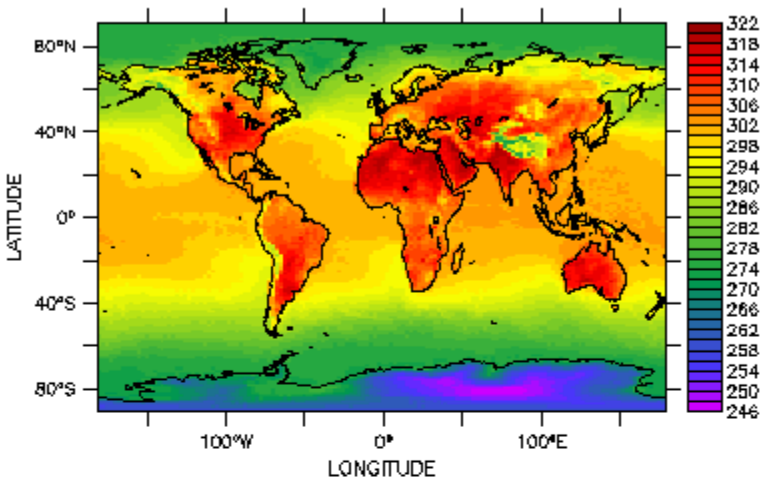
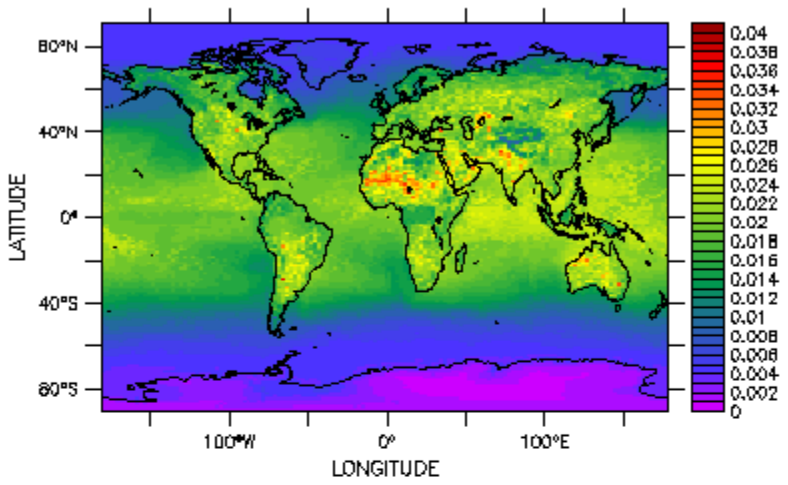
Q2m_min

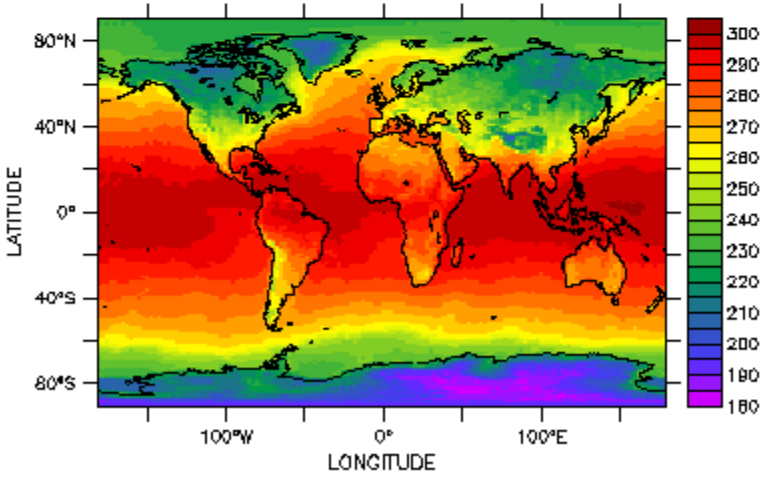
T2m_max



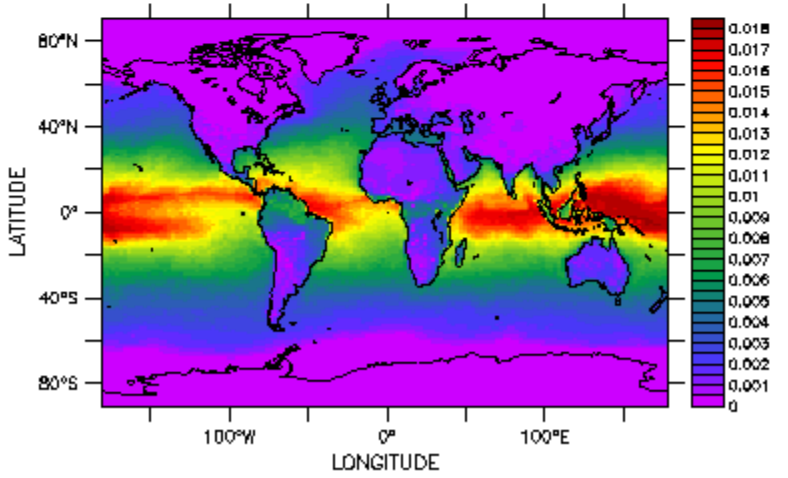
Temperature 2m (K)



Specific humidity 2m (kg/kg)



Temperature 2m (K)



Specific humidity 2m (kg/kg)

- oSchéma d’interpolation fondé sur variables star et flux constants dans la couche de surface
  first guess- Dyer Businger, LMO- , variables star,
  itération fonction de stabilité Fonction de Ri (Louis)
- Nouveau : pas variables star, assure cohérence des Fonctions. Stabilité
- Que vaut qsurf, lorsque il n’y a pas de vent ni de turbulence et que le sol contient de l’eau?

Avant: qsurf = qsat

Corrigé: qsurf= qair (humidité de la première couche)