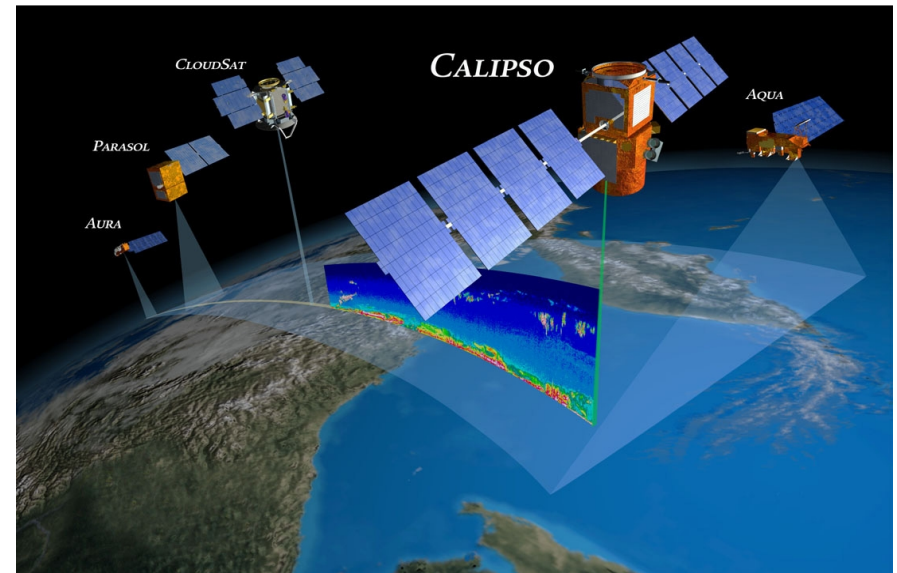


# Évaluation de la fraction et de l'épaisseur optique des nuages simulés par LMDZ 5A et 5B.

D. Konsta, J-L Dufresne, H. Chepger, A. Idelkadi, G. Cesana



**CALIPSO:** Lidar, profil vertical de la fraction nuageuse

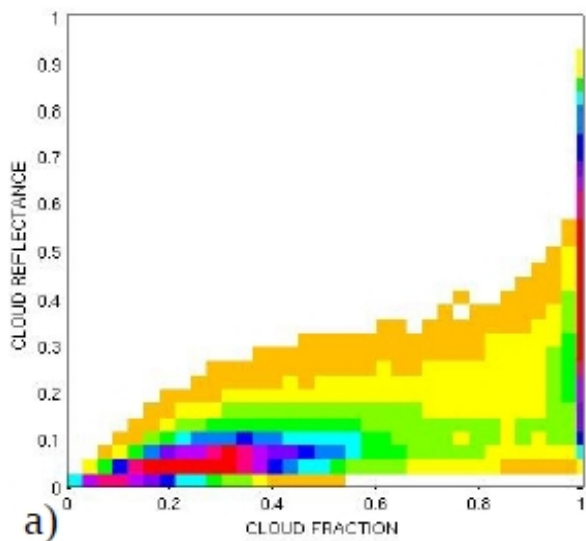
**PARASOL:** reflectances directionnelle du rayonnement solaire, pour un angle de visé particulier: => bonne approximation de l'épaisseur optique

**CERES:** flux SW au sommet de l'atmosphère

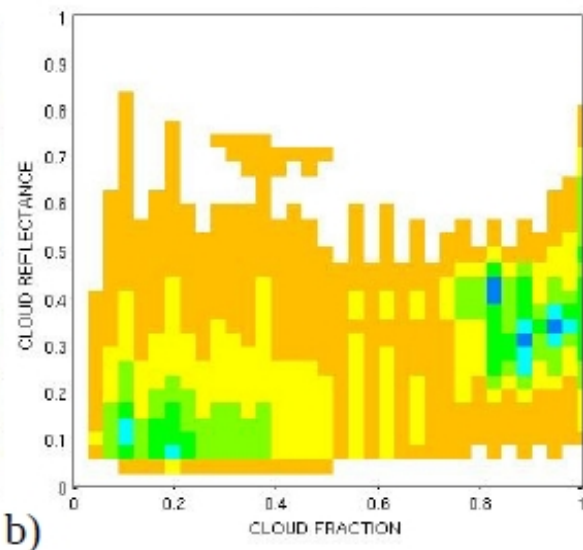
# Cloud reflectance versus cloud fraction, over the tropical oceans

instantaneous

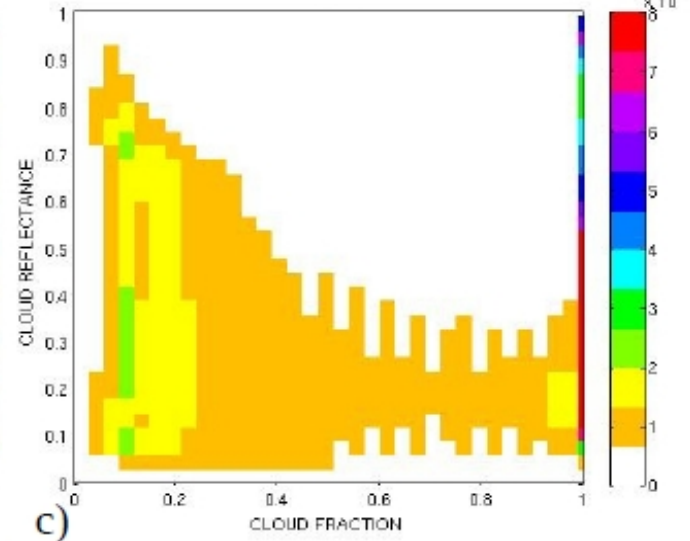
CALIPSO & PARASOL (obs)



LMDZ-5A

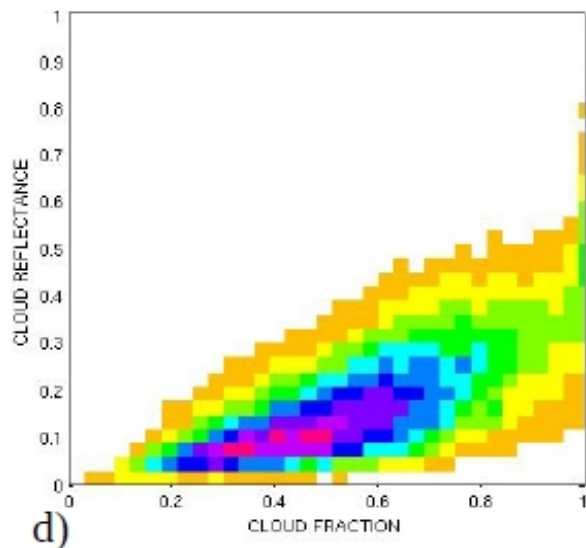


LMDZ-5B

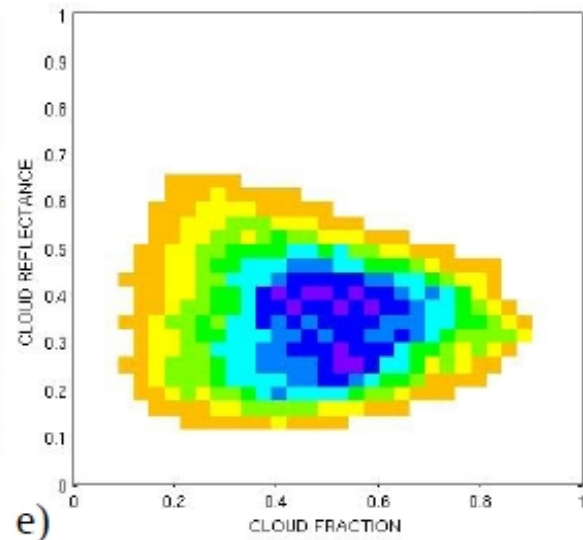


CALIPSO & PARASOL (obs)

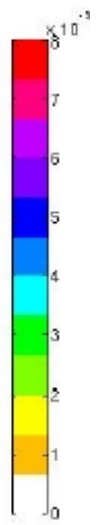
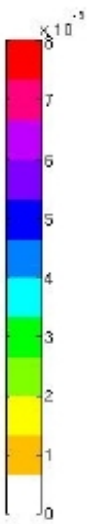
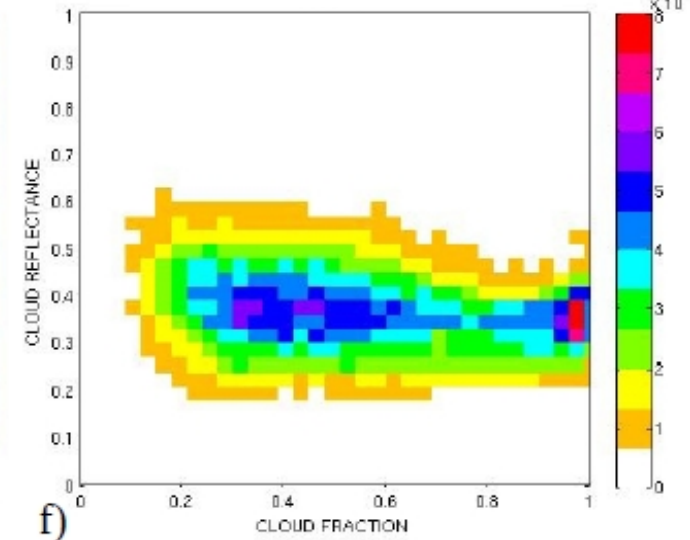
monthly mean



LMDZ-5A



LMDZ-5B



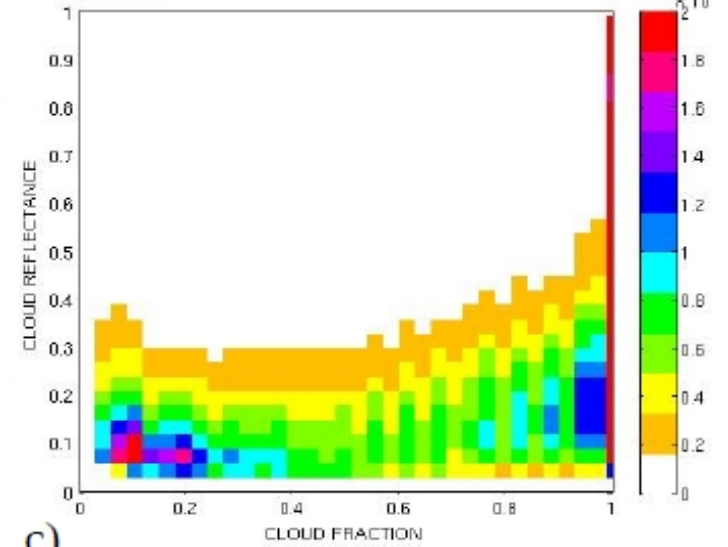
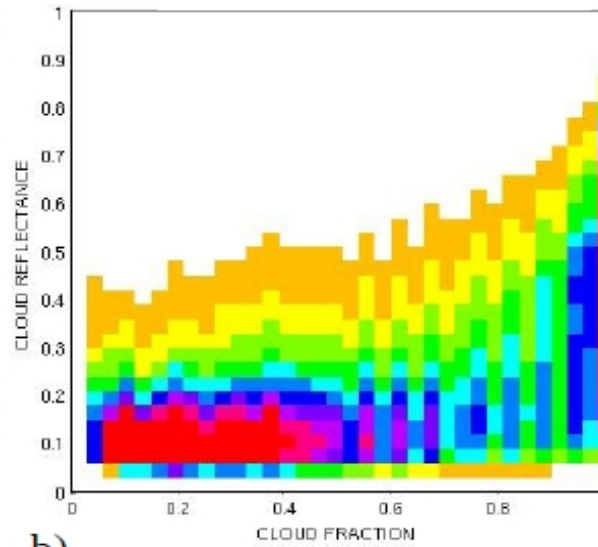
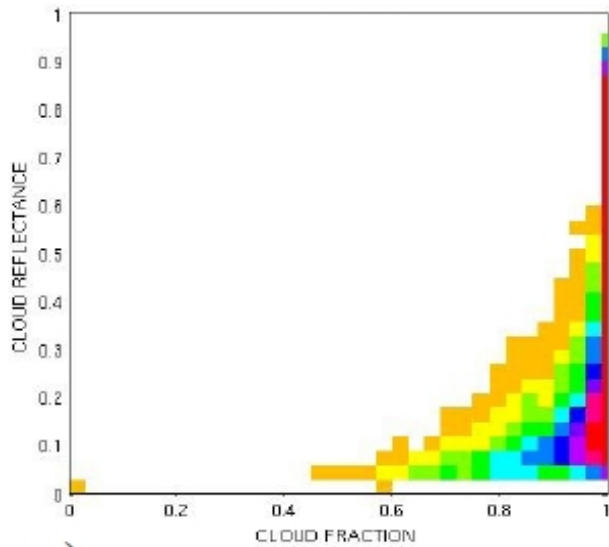
# Cloud reflectance versus cloud fraction, for *low and high level clouds*, over the tropical oceans

High level

CALIPSO & PARASOL (obs)

LMDZ-5A

LMDZ-5B



a)

b)

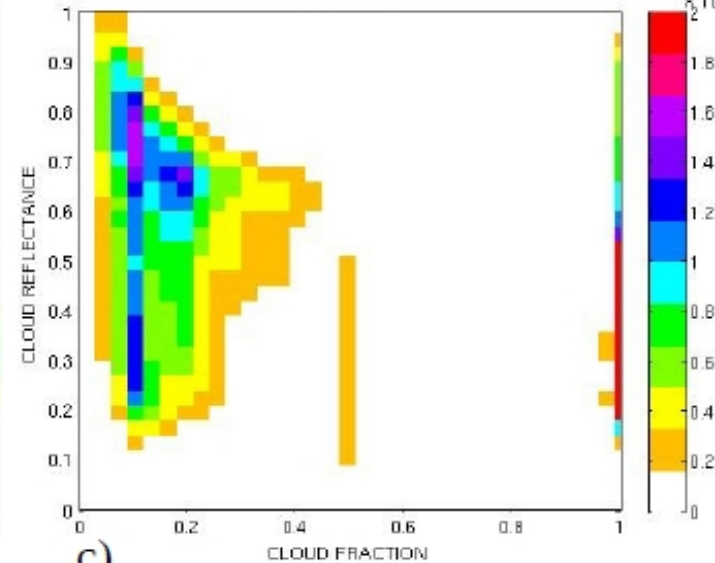
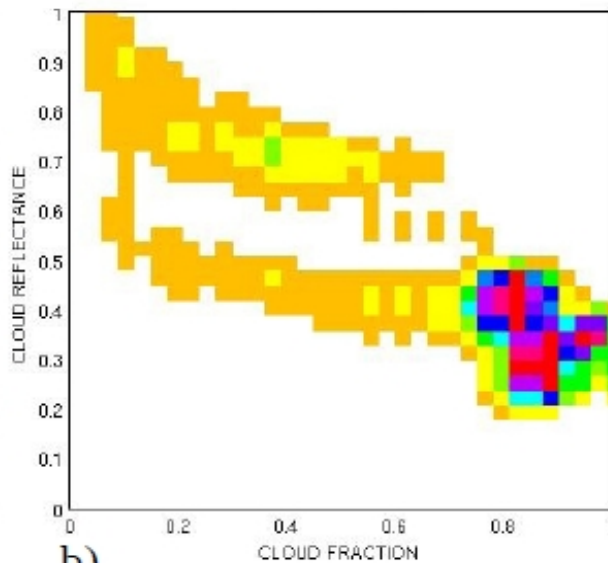
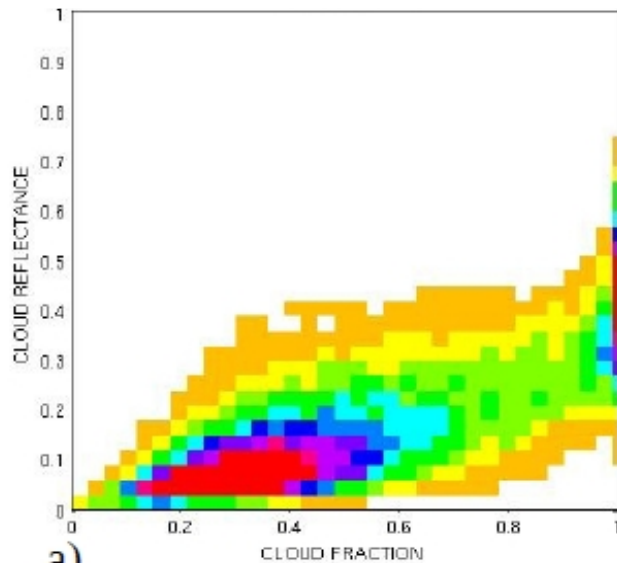
c)

Low level

CALIPSO & PARASOL (obs)

LMDZ-5A

LMDZ-5B



a)

b)

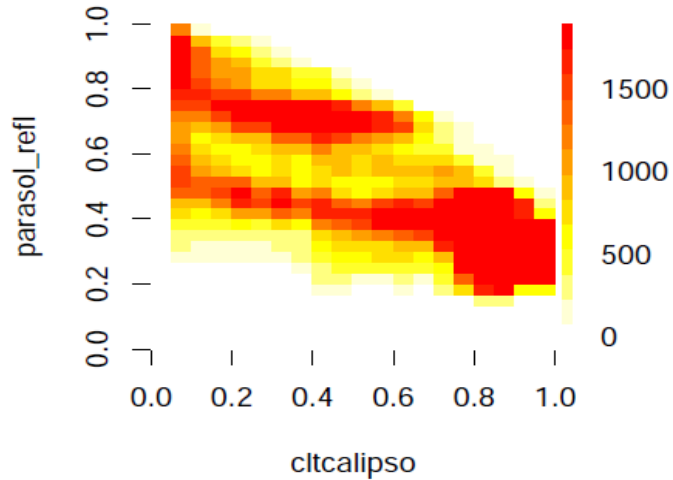
c)

# LMDZ5A

Augmentation linéaire avec la pression de ratqs\_bas à ratqs\_haut, du 1er niveau à 300 hPa

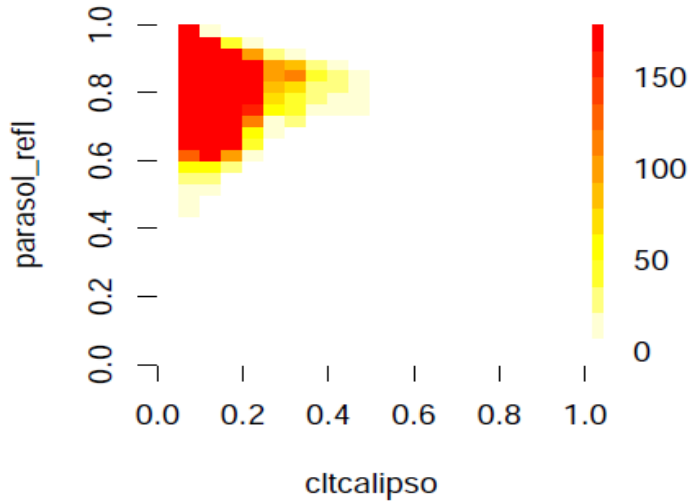
**Original:**  
**ratqs Bas=0.005, Haut=0.33**

*Tropics, low clouds*



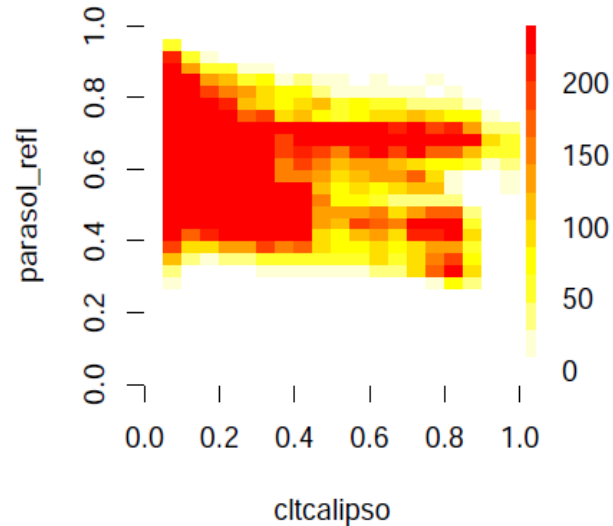
**Ratqs Bas=Haut=0.15**

*Tropics, low clouds*



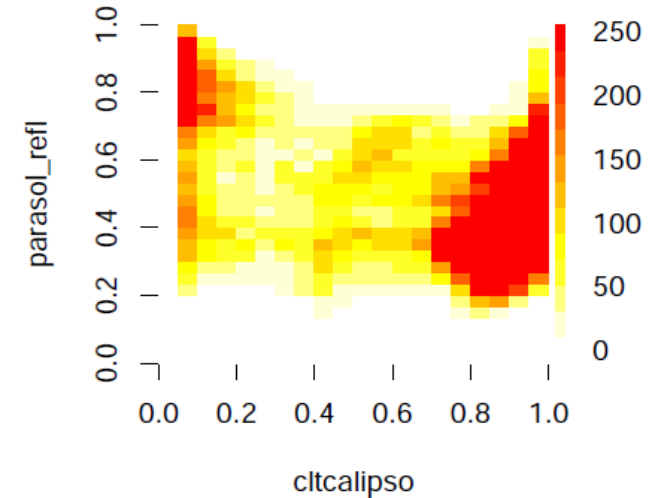
**Ratqs Bas=Haut=0.05**

*Tropics, low clouds*



**Ratqs Bas=Haut=0.02**

*Tropics, low clouds*

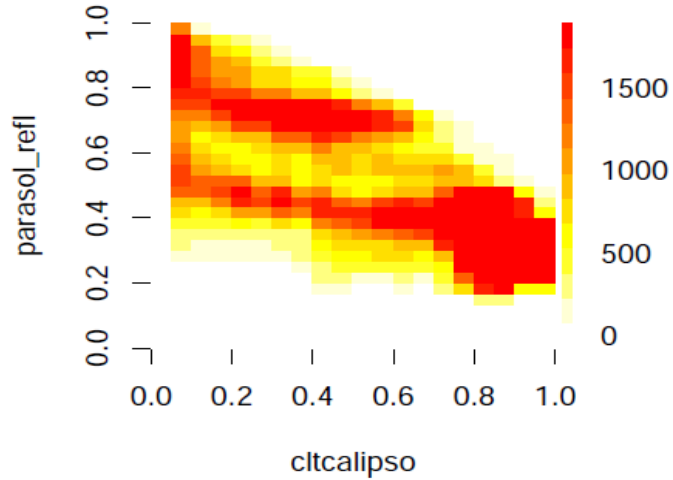


# LMDZ5A

Augmentation linéaire avec la pression de ratqs\_bas à ratqs\_haut, du 1er niveau à 300 hPa

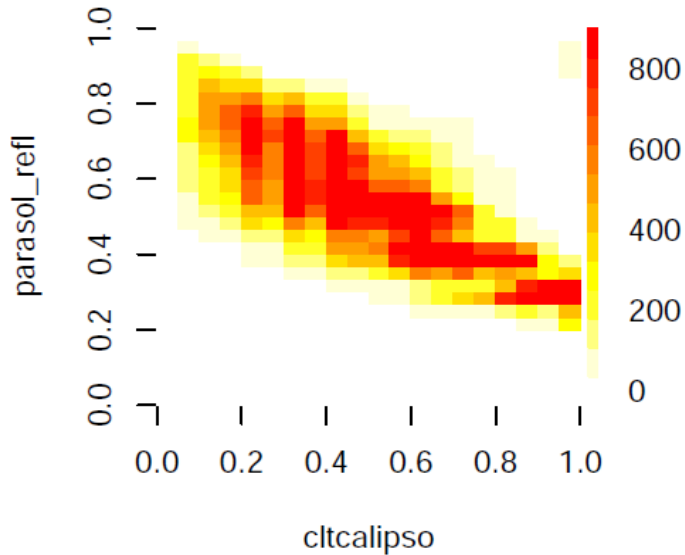
**Original:**  
**ratqs Bas=0.005, Haut=0.33**

*Tropics, low clouds*



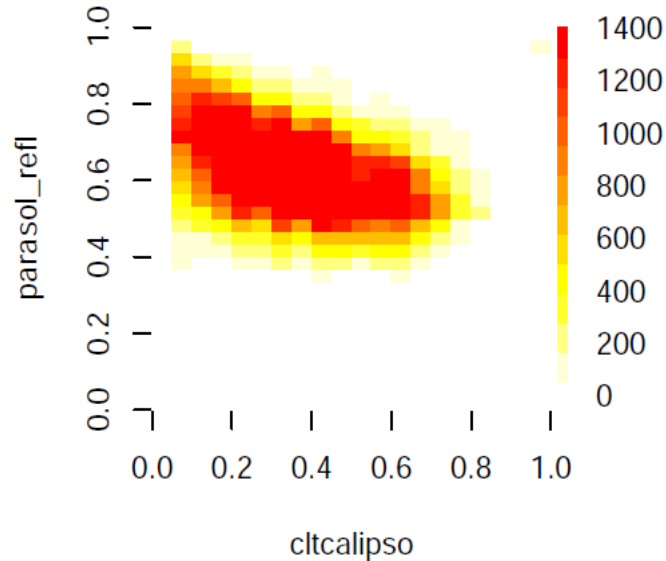
**Convection Off**

*Tropics, low clouds*



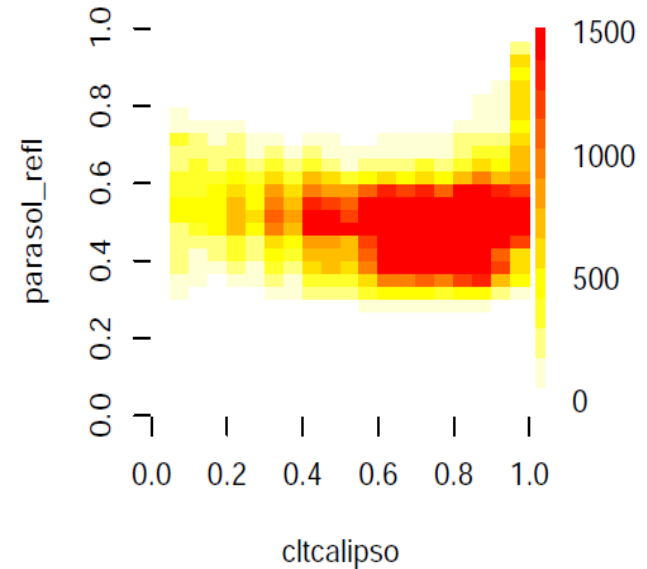
**Convection Off**  
**Ratqs Bas=Haut=0.05**

*Tropics, low clouds*



**Convection Off**  
**Ratqs Bas=Haut=0.03**

*Tropics, low clouds*

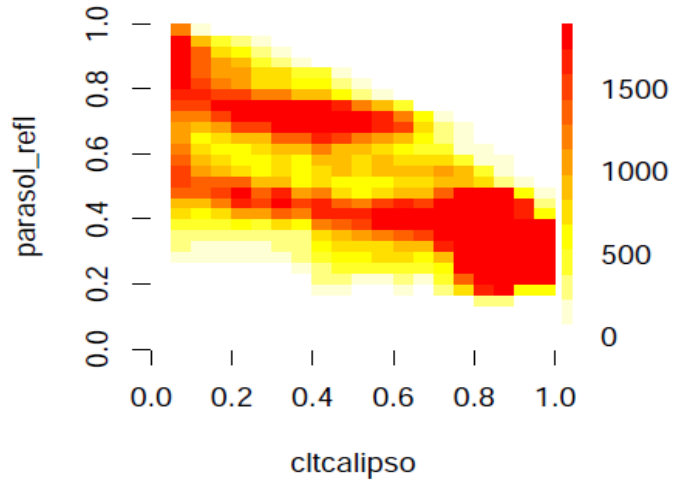


## LMDZ5A

Augmentation linéaire avec la pression de ratqs\_bas à ratqs\_haut, du 1er niveau à 300 hPa

**Original:**  
**ratqs Bas=0.005, Haut=0.33**

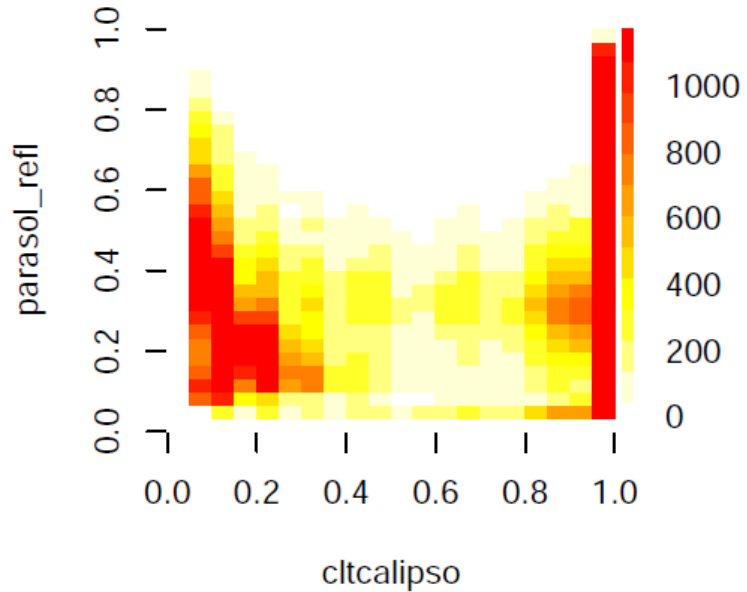
*Tropics, low clouds*



## LMDZ6

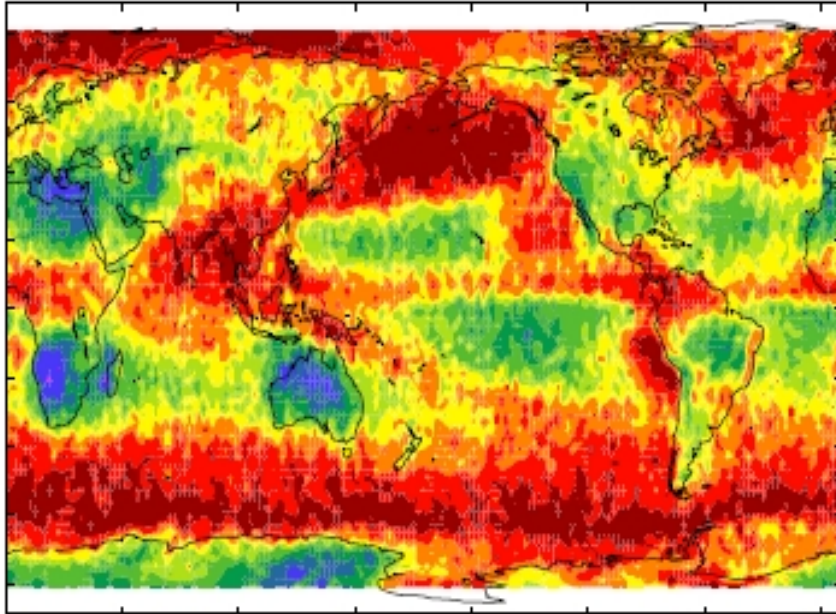
**NPV4.12**

*Tropics, low clouds*

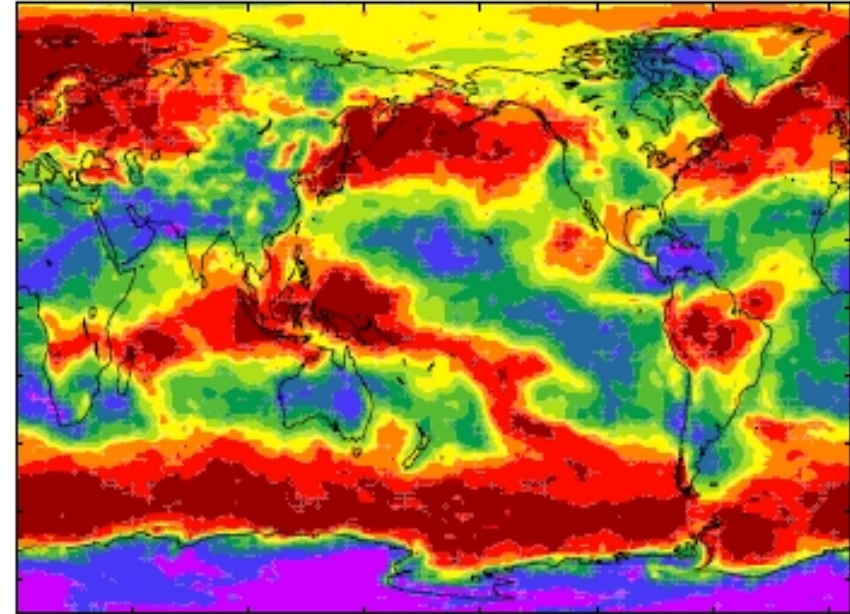


## Total cloud fraction (Jan.)

Calipso-GOCCP, Total Cloud, Jan

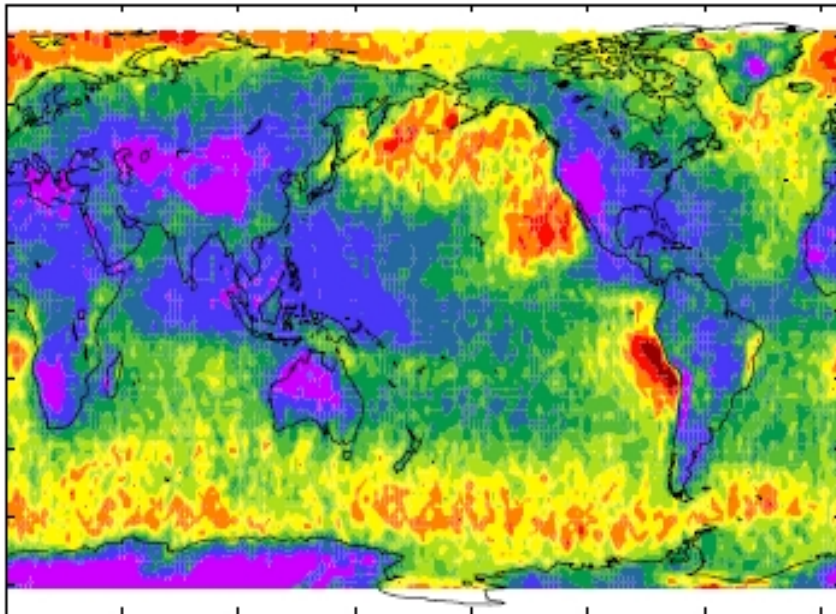


LMDZ NVv4.12, Total Cloud, Jan

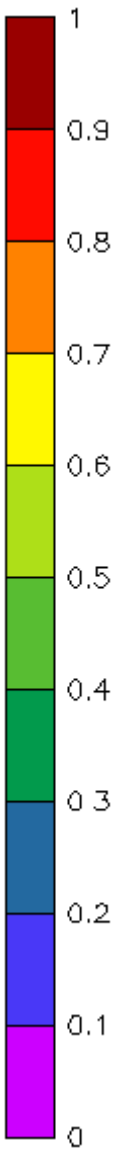
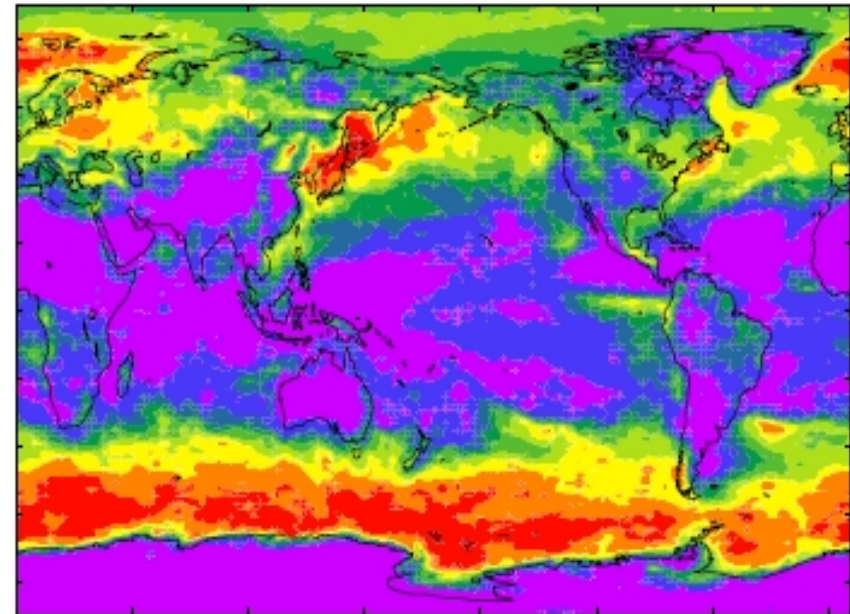


## Low cloud fraction (Jan.)

Calipso-GOCCP, Low Cloud, Jan

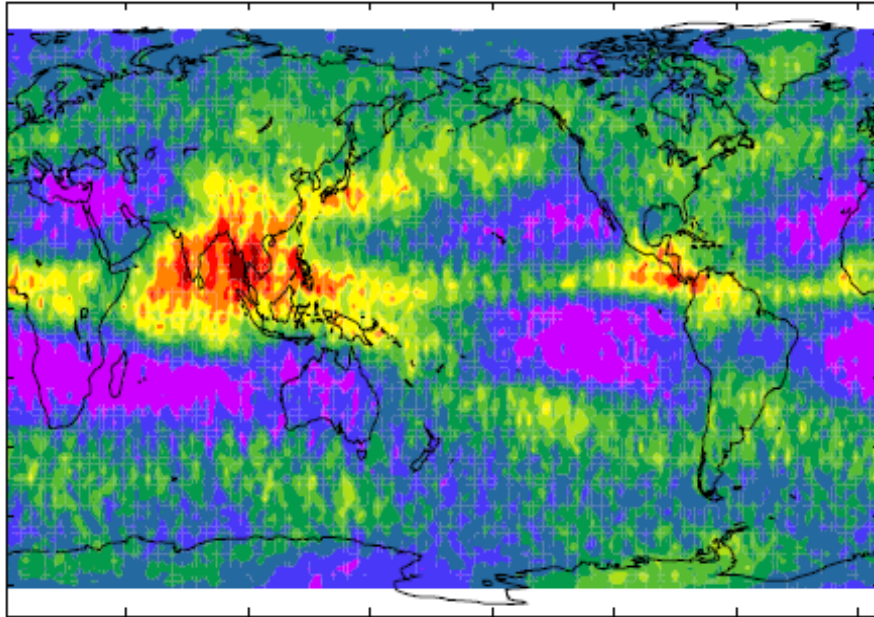


LMDZ NVv4.12, Low Cloud, Jan

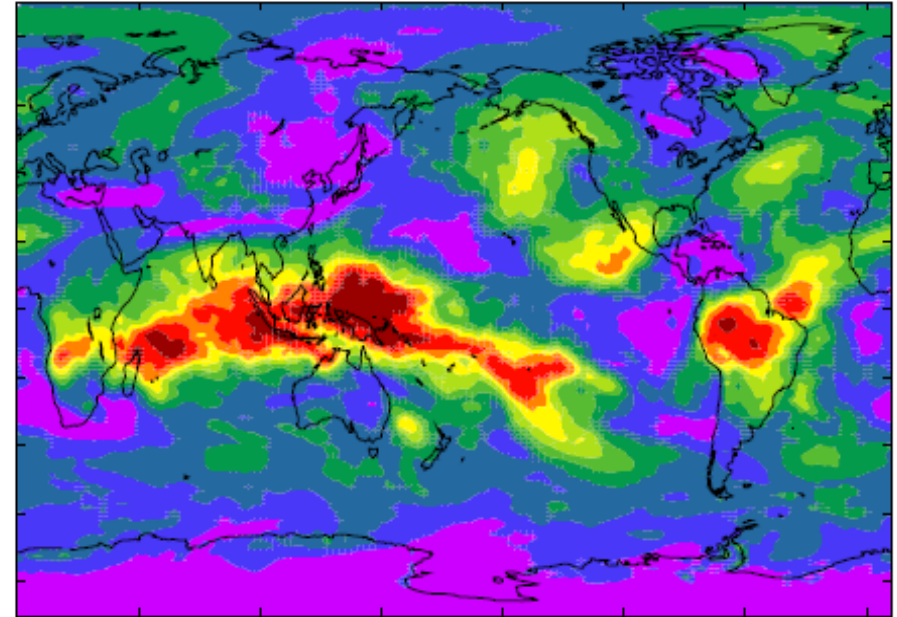


## High cloud fraction (Jan.)

Calipso-GOCCP, High Cloud, Jan

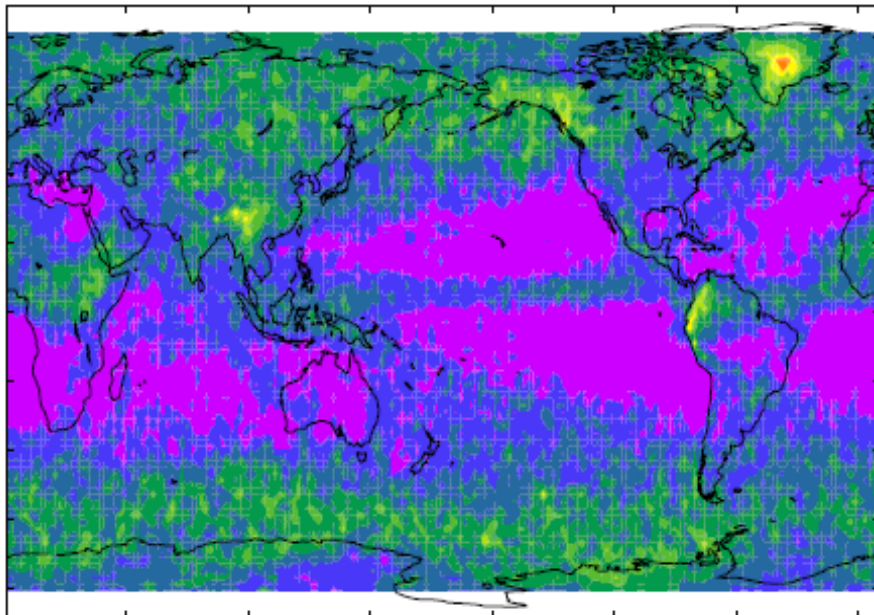


LMDZ NVv4.12, High Cloud, Jan

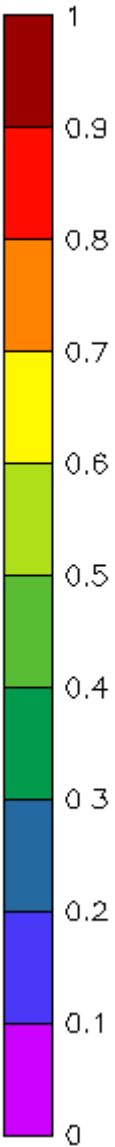
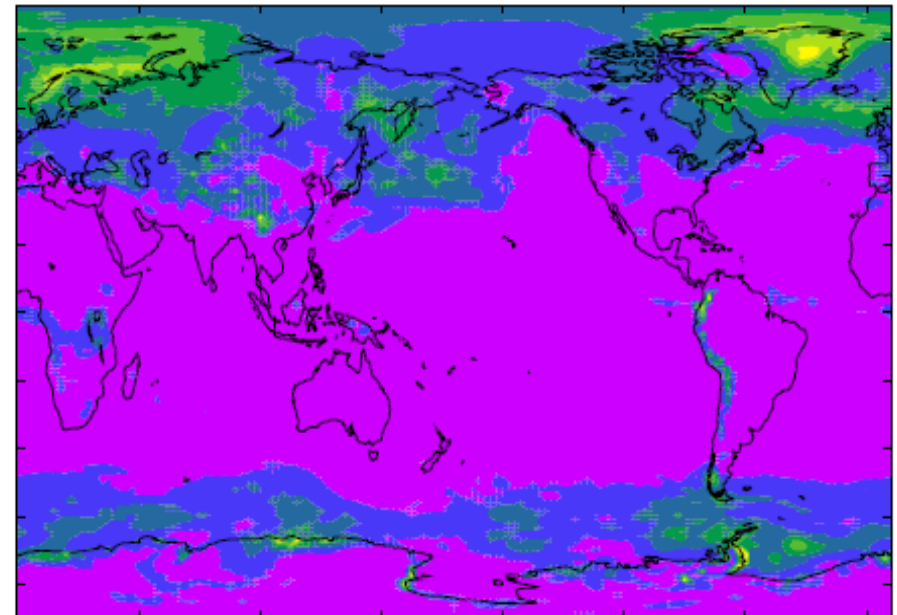


## Mid cloud fraction (Jan.)

Calipso-GOCCP, Med Cloud, Jan



LMDZ NVv4.12, Med Cloud, Jan

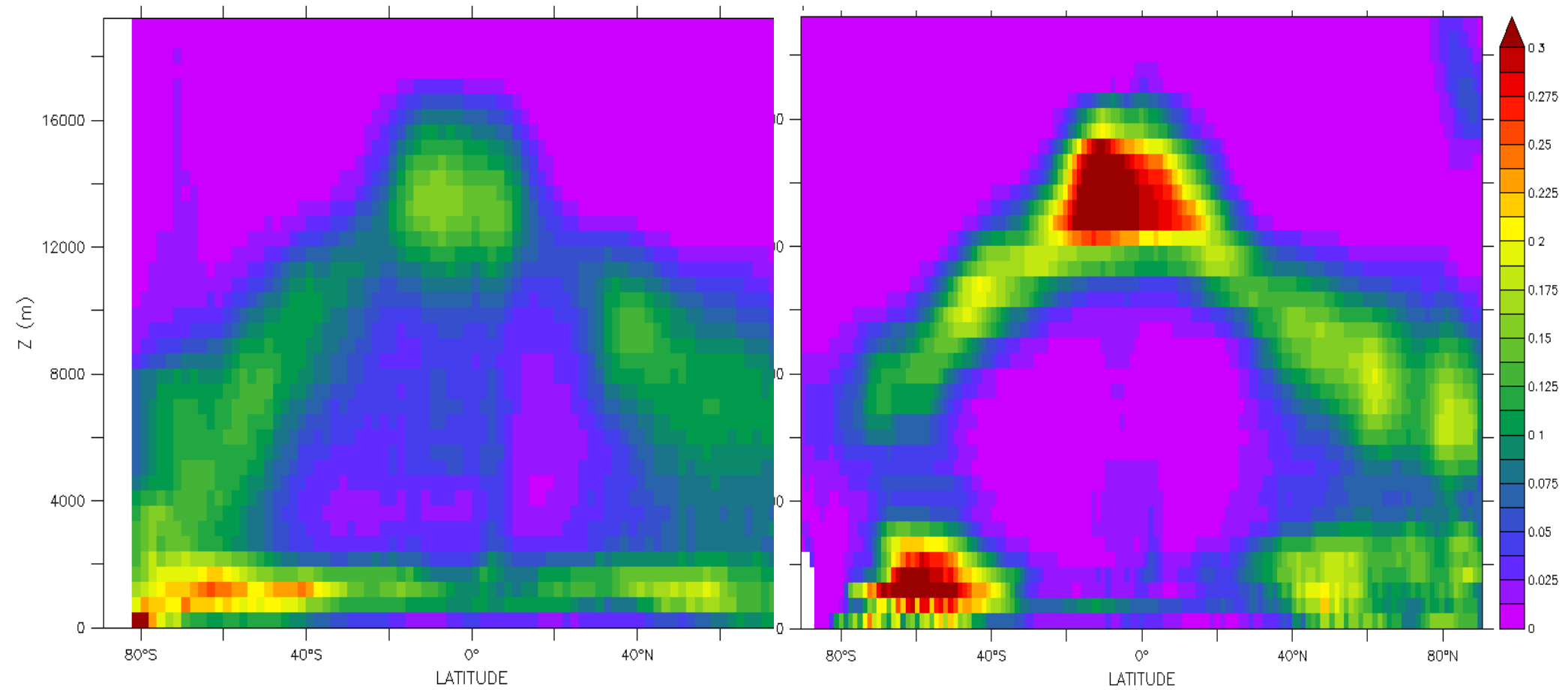




# Cloud fraction (Jan.)

## Calipso-GOCCP

## LMDZ NPv4.12



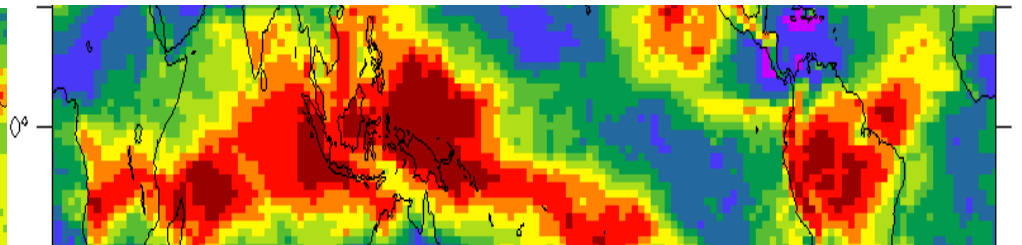
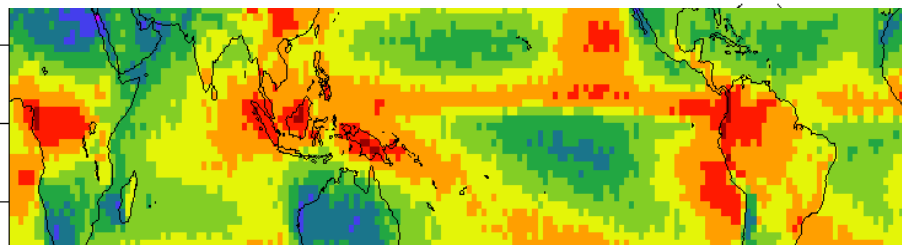
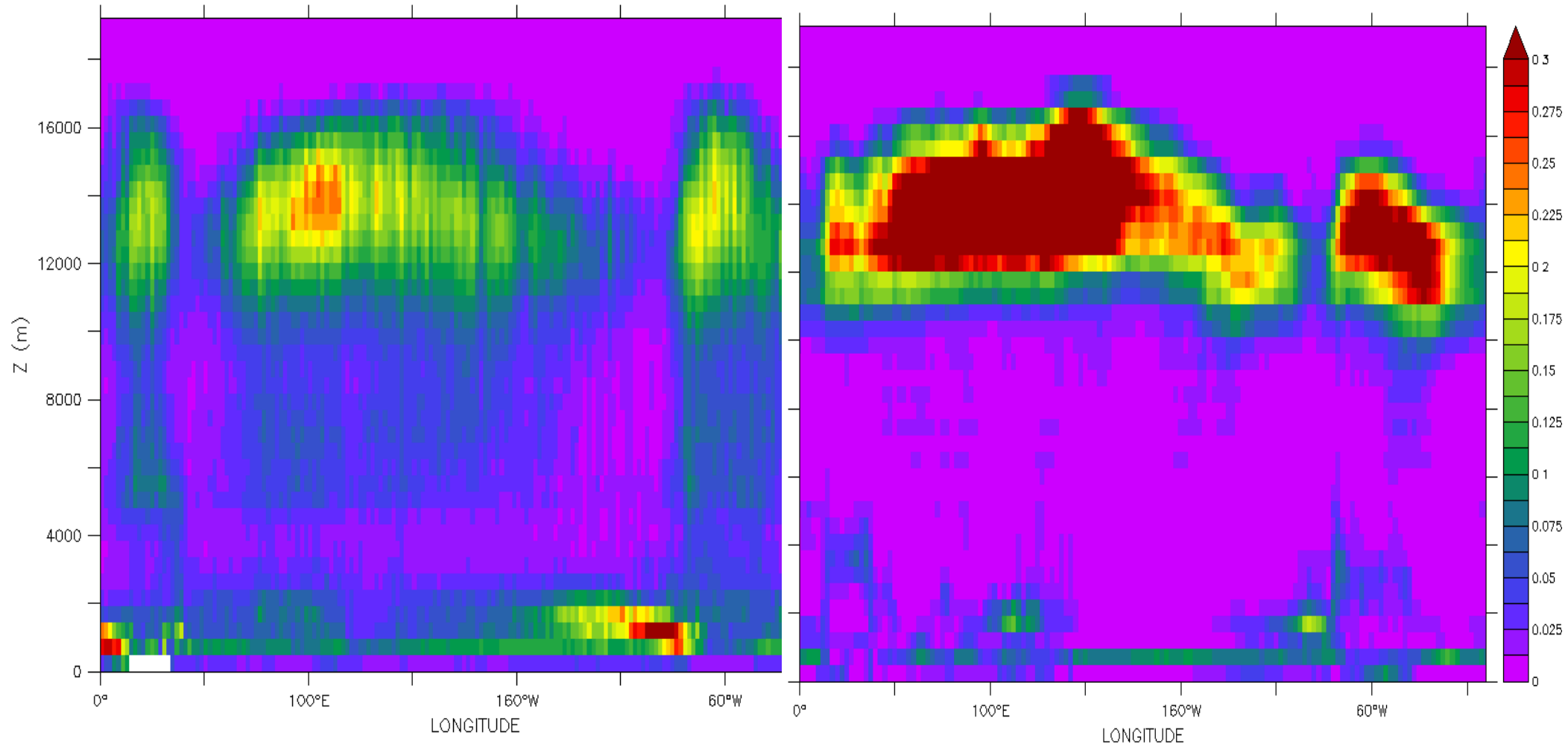
CALIPSO Cloud Fraction (%)

Lidar Cloud Fraction (532 nm) (1)

# Cloud fraction (Jan.)

## Calipso-GOCCP

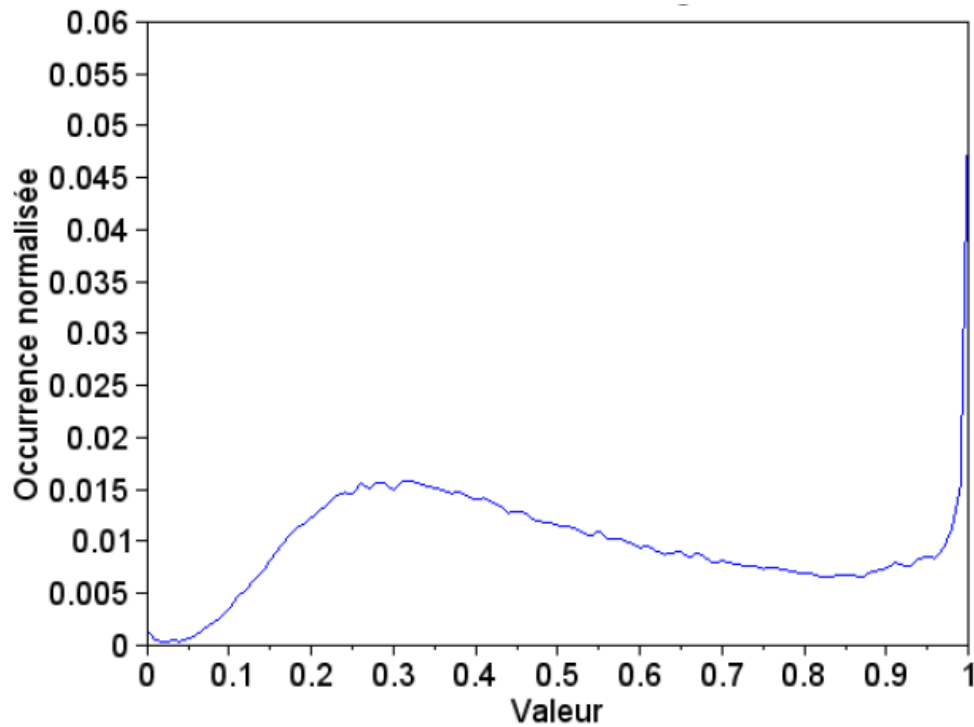
## LMDZ NPv4.12



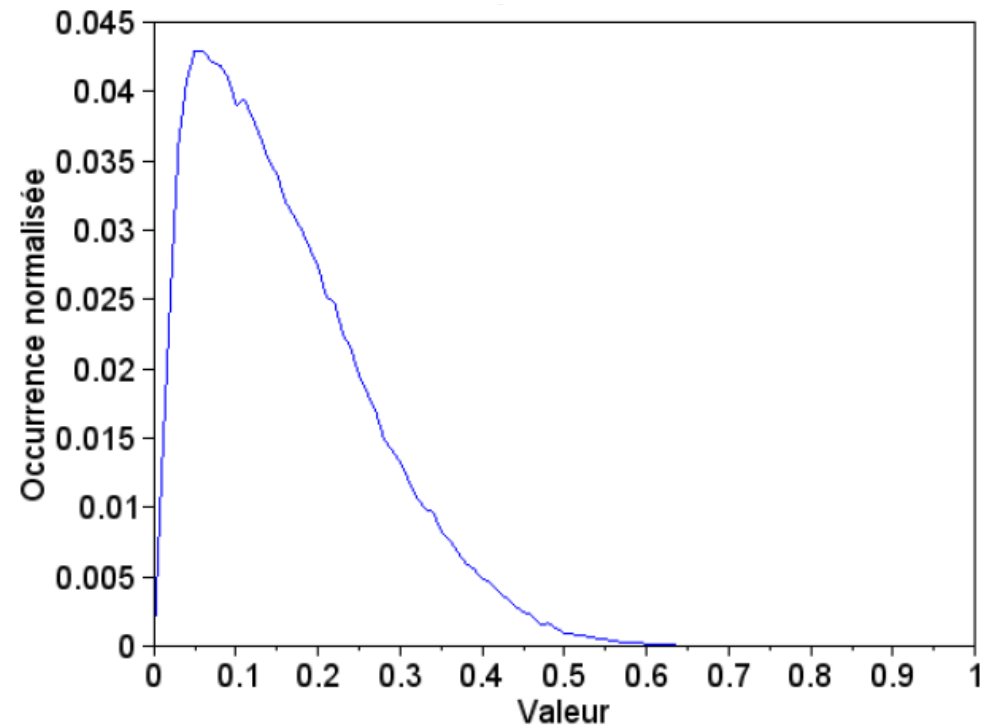
# Hétérogénéité sous-maille

En moyenne sur une grille  $2^\circ \times 2^\circ$

PDF de la **fraction** nuageuse  
**moyenne**



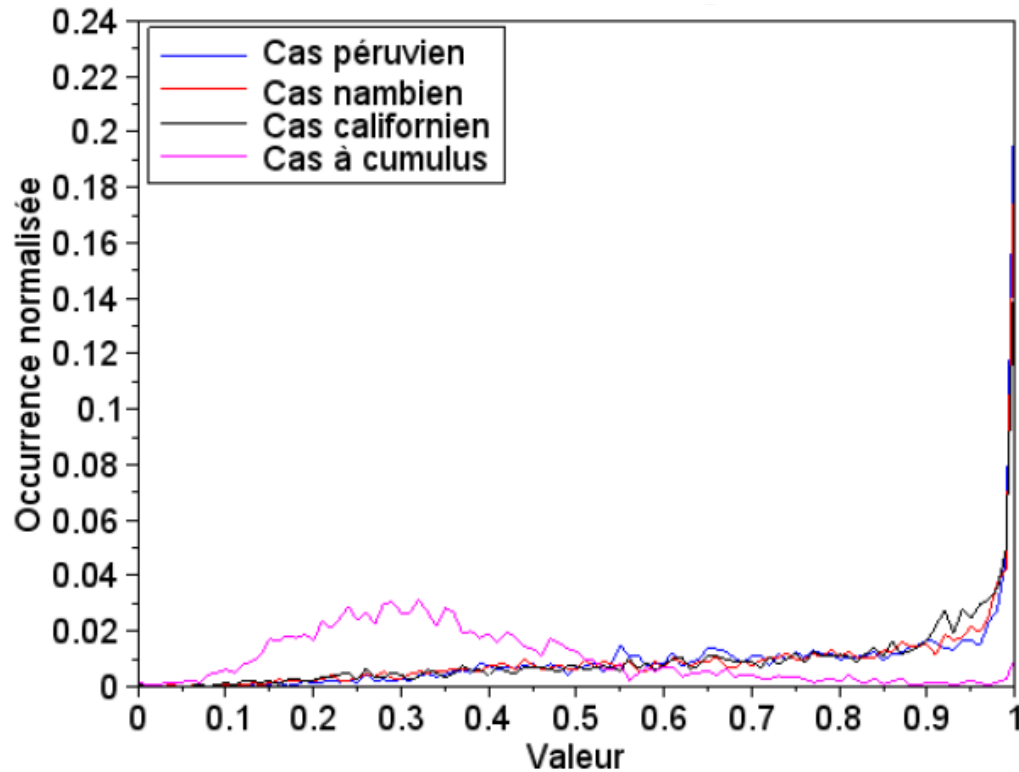
PDF de la **réflectance** nuageuse  
**moyenne**



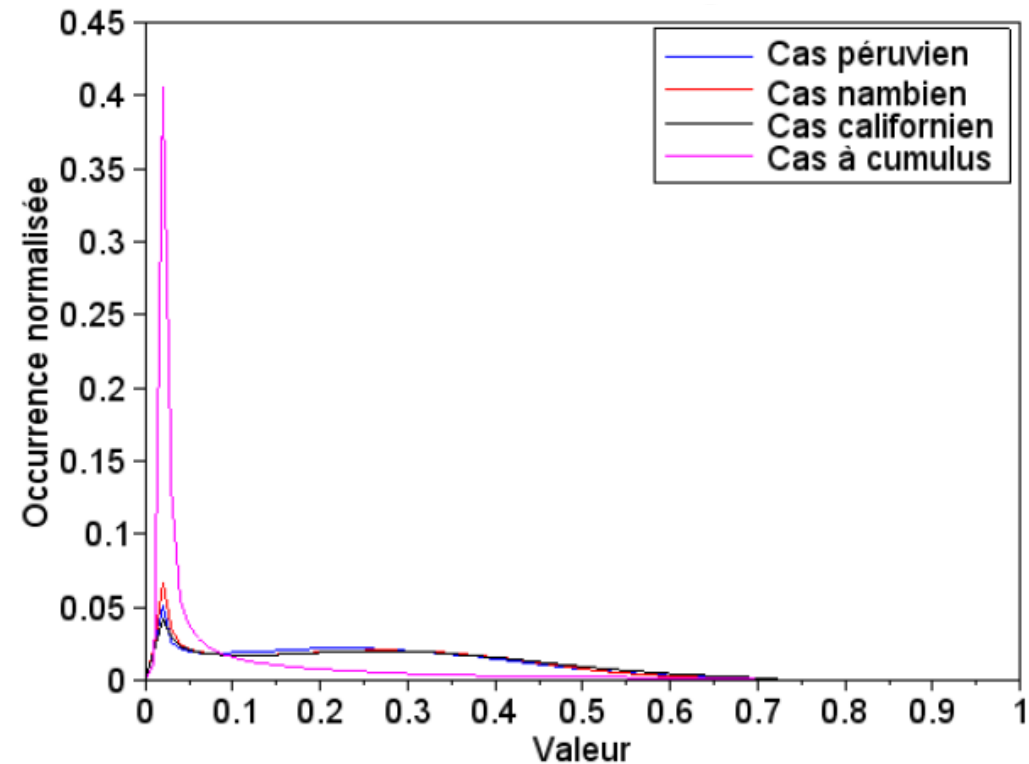
# Hétérogénéité sous-maille

En valeurs locales, pleine résolution (300 m)

PDF de la **fraction** nuageuse locale



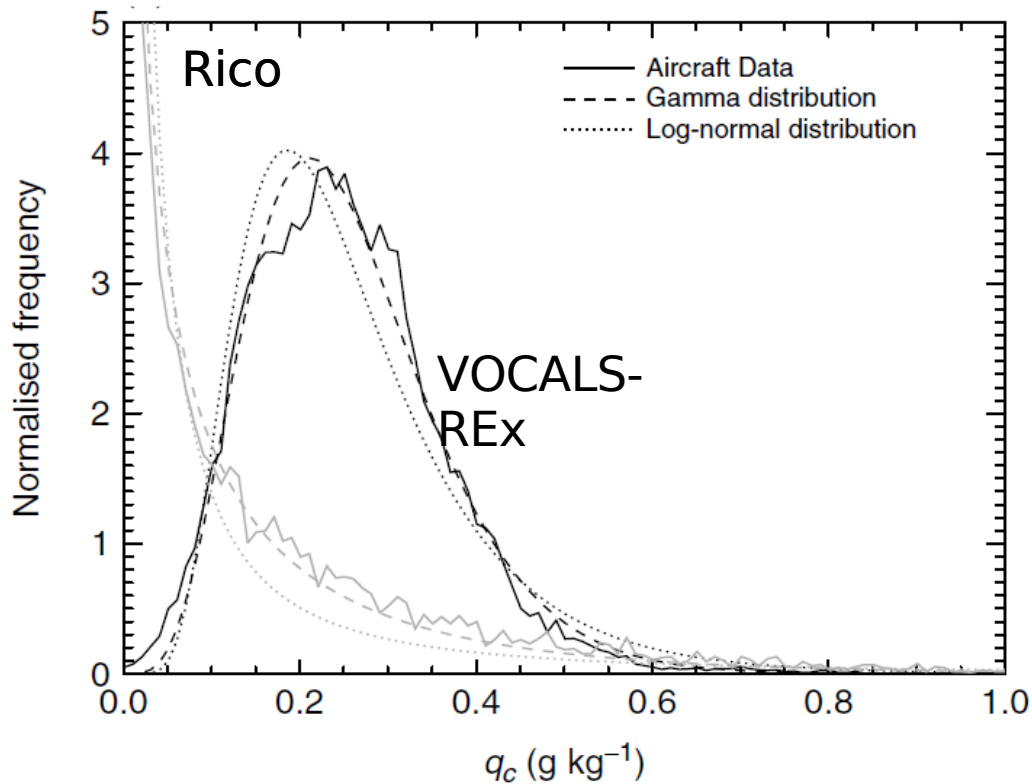
PDF de la **réflectance** nuageuse locale



# Hétérogénéité sous-maille

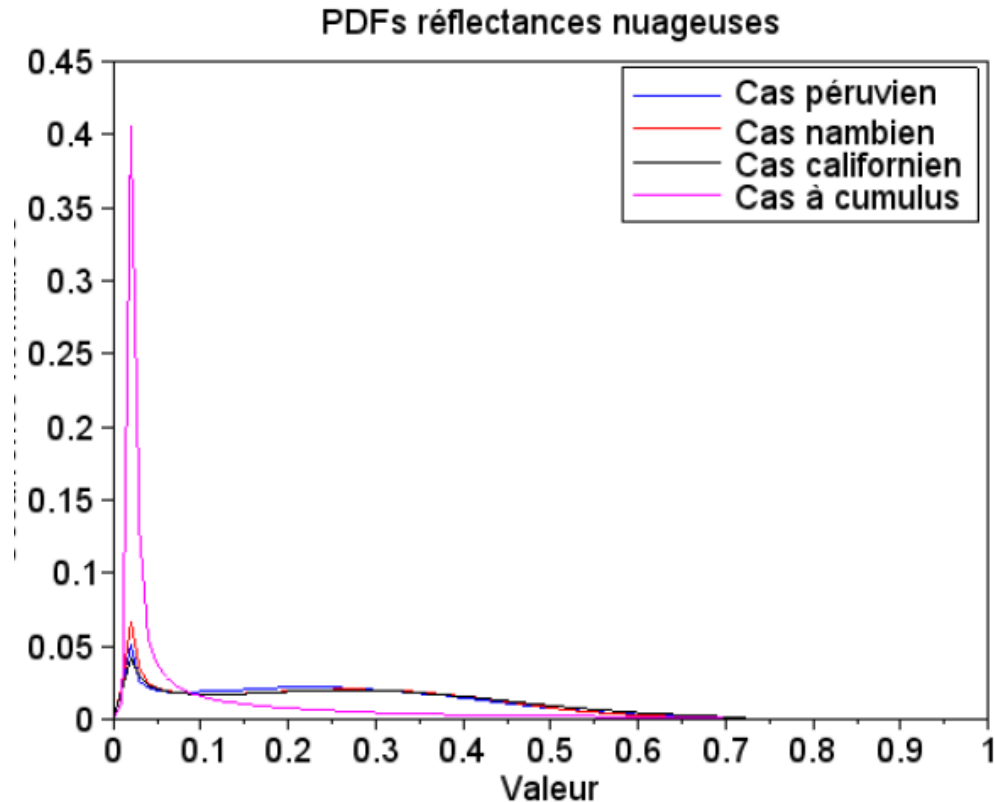
En valeurs locale, pleine résolution (300 m)

Observations locales du contenu en eau liquide des nuages



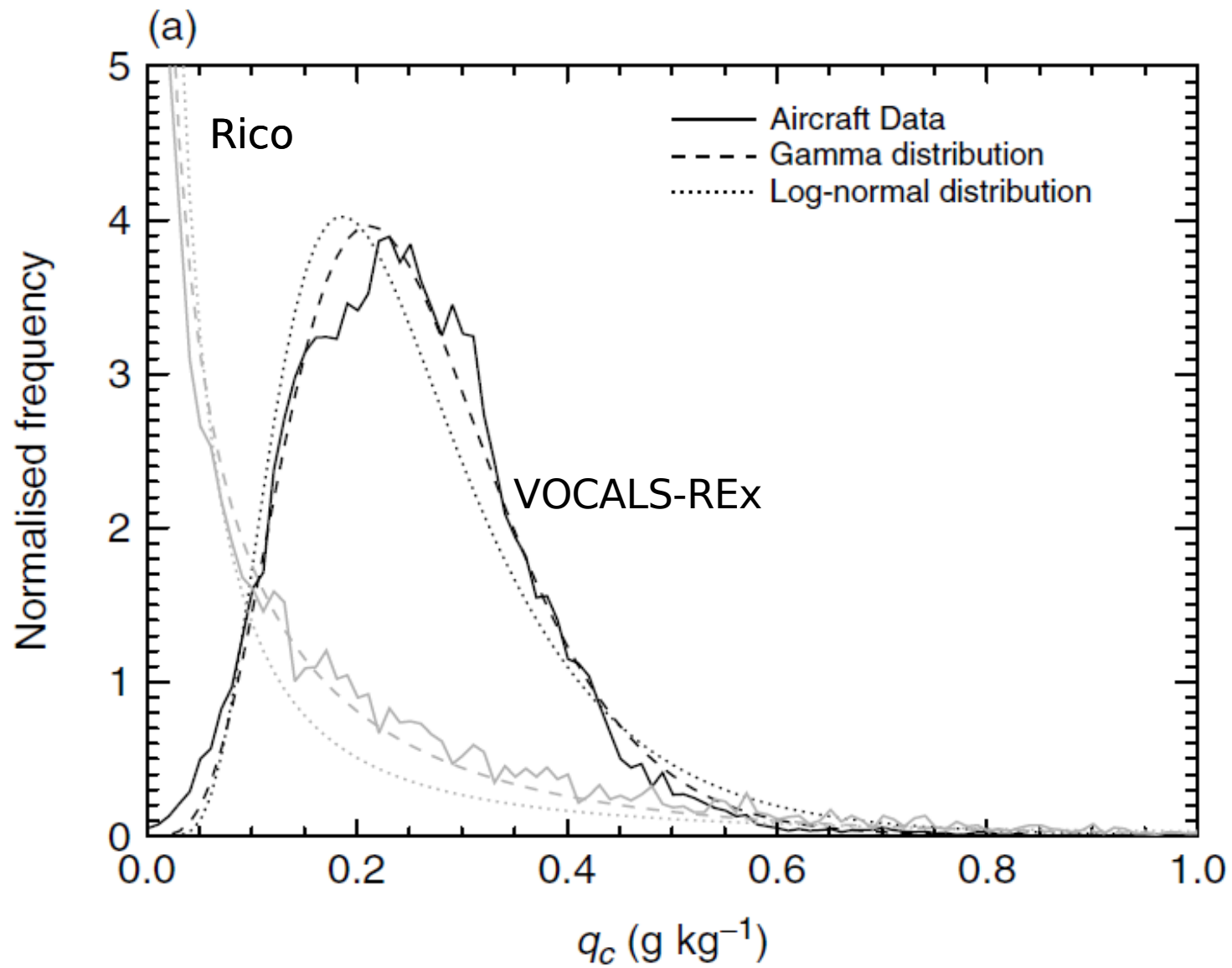
*Boutle et al., 2014*

PDF de la réflectance nuageuse locale

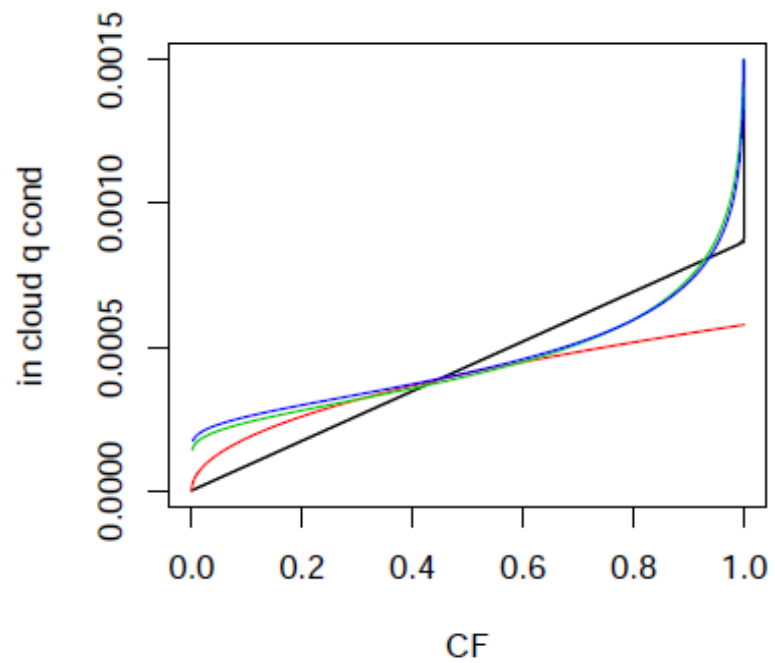


*Stage A. Supply, 2014*

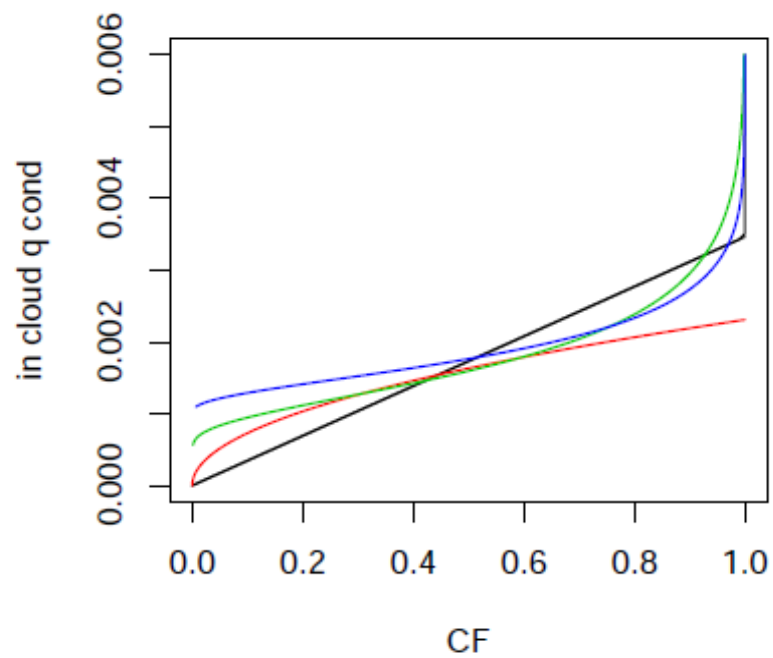




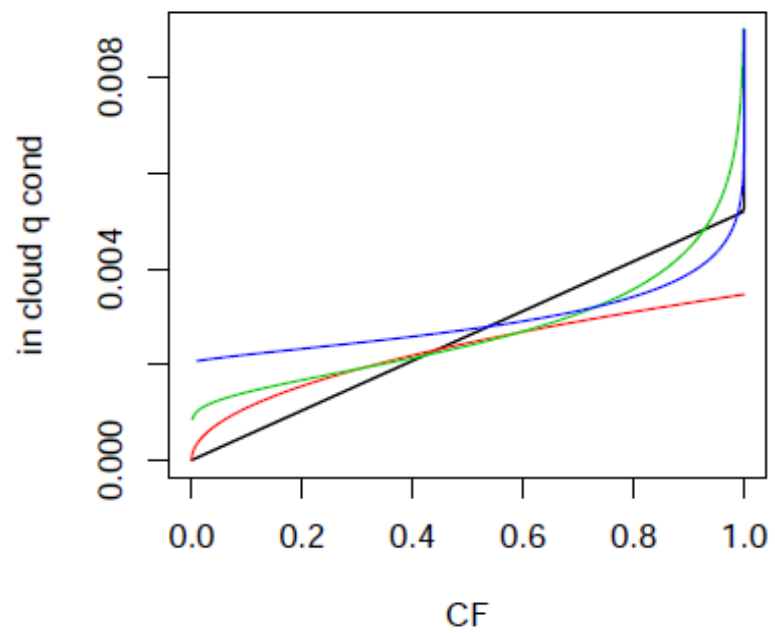
**qs=0.01, qsig=5e-04**



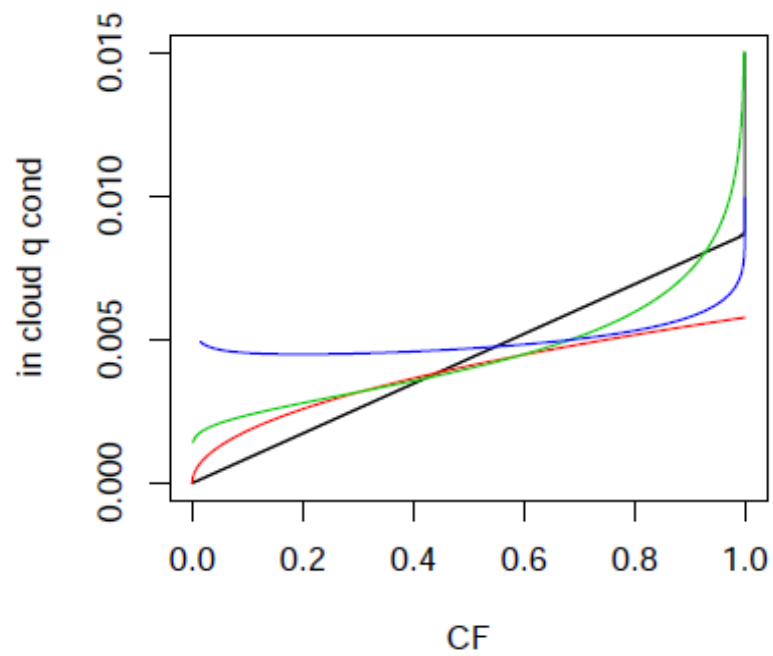
**qs=0.01, qsig=0.002**



**qs=0.01, qsig=0.003**



**qs=0.01, qsig=0.005**

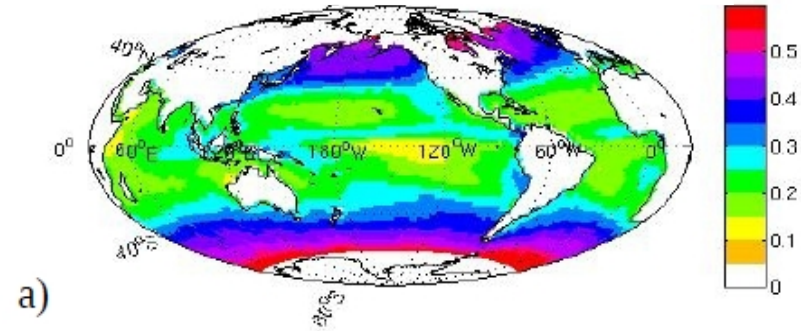




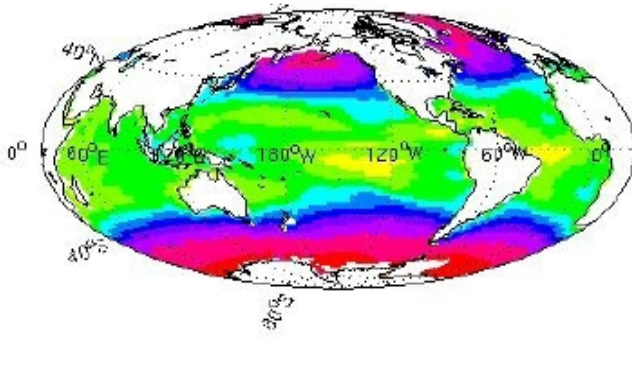


# SW albedo TOA

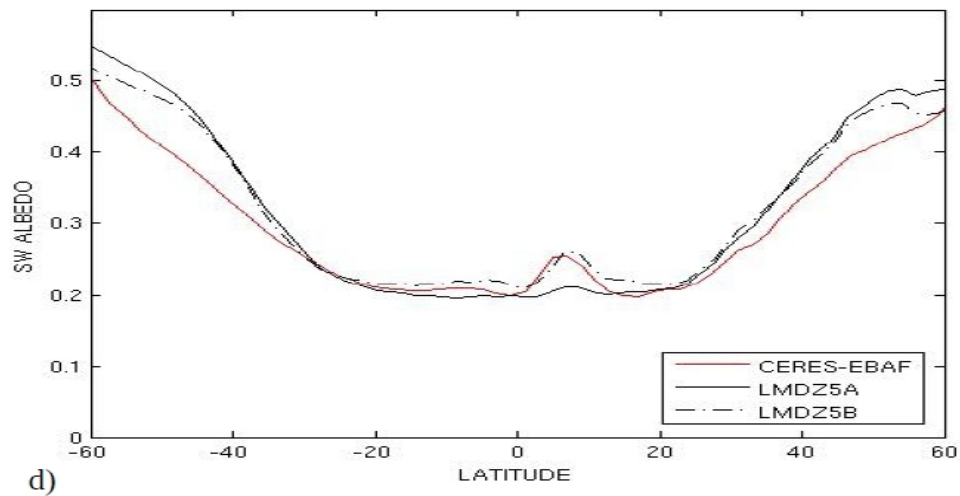
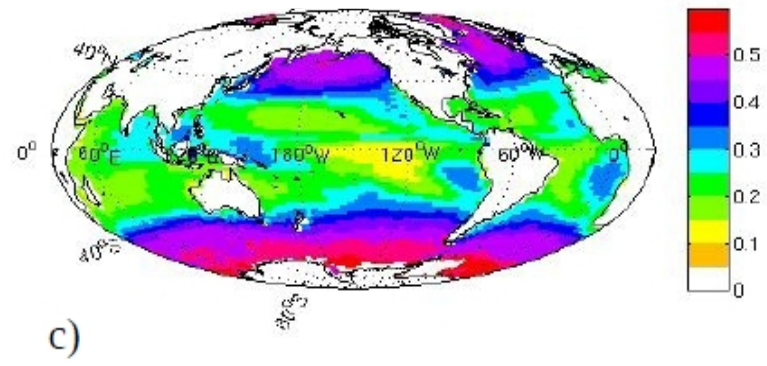
CERES (obs)



LMDZ-5A

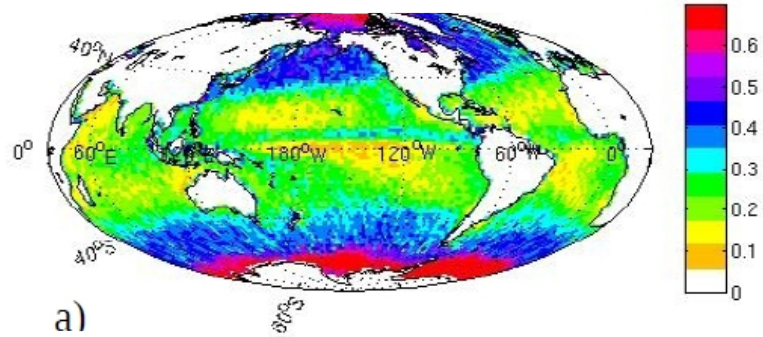


LMDZ-5B

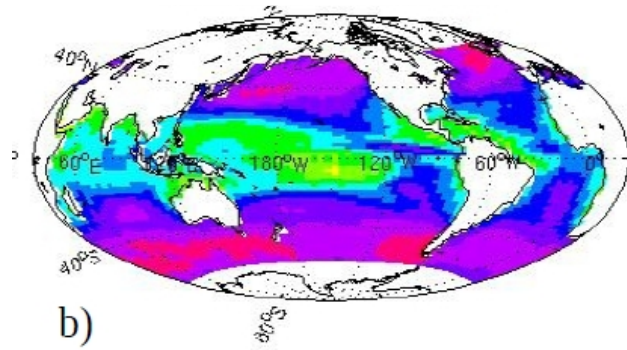


# Cloud reflectance (500 nm)

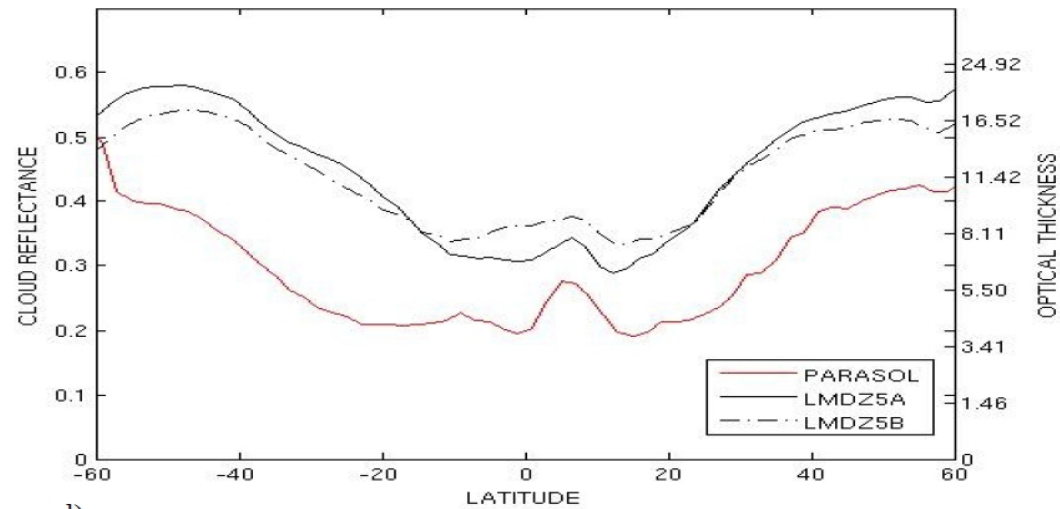
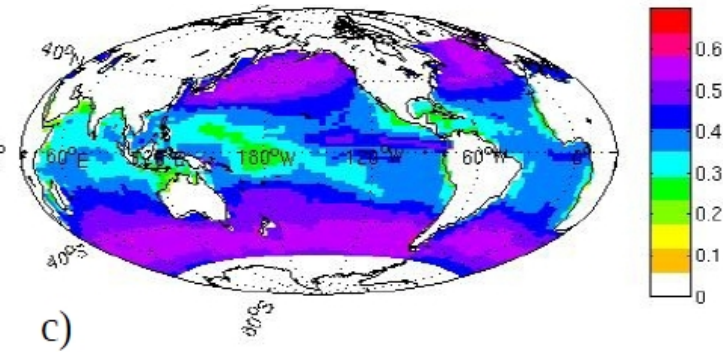
PARASOL (obs)



LMDZ-5A



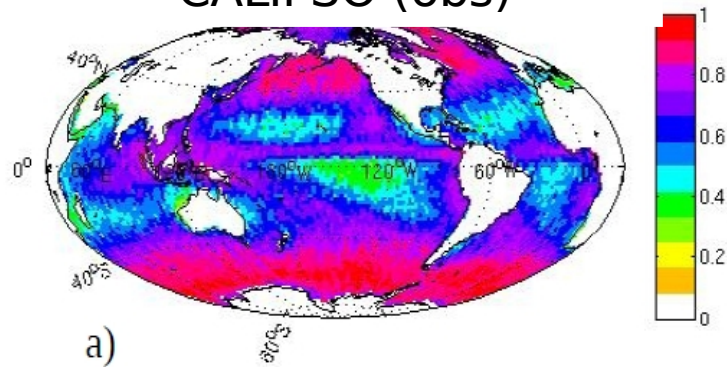
LMDZ-5B



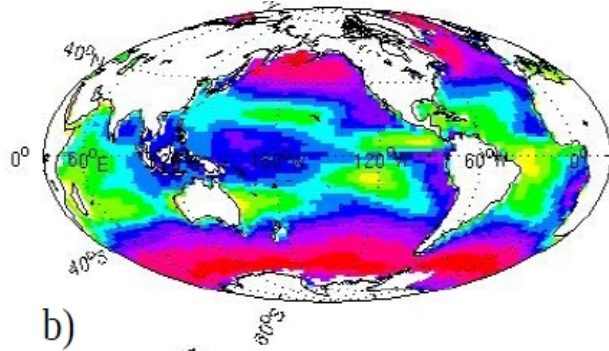
d)

# Total cloud fraction

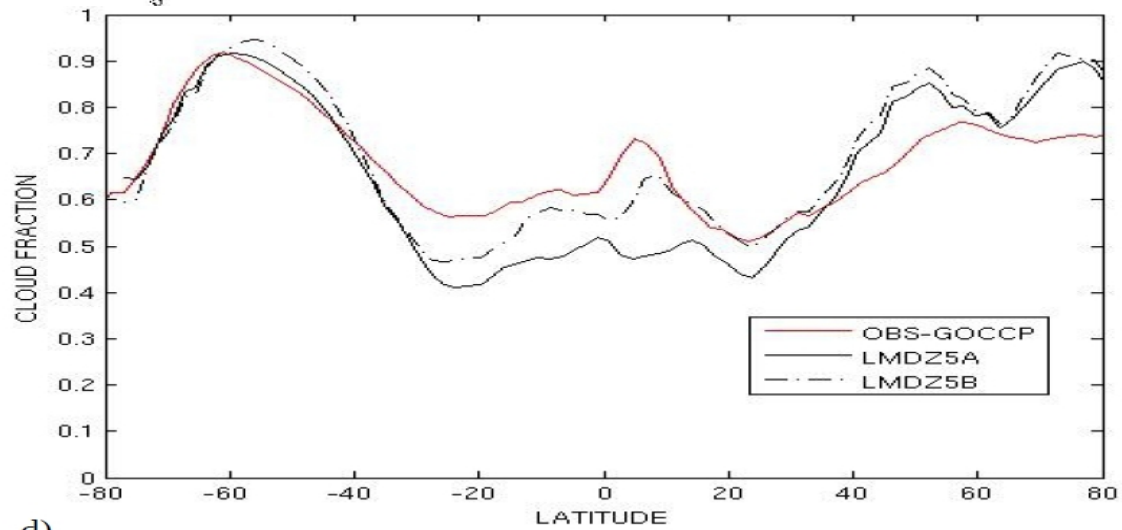
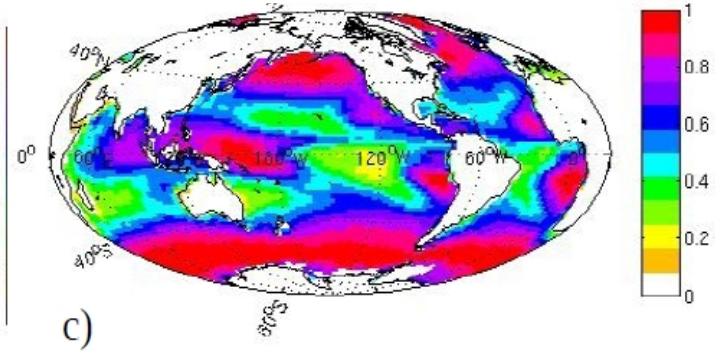
## CALIPSO (obs)



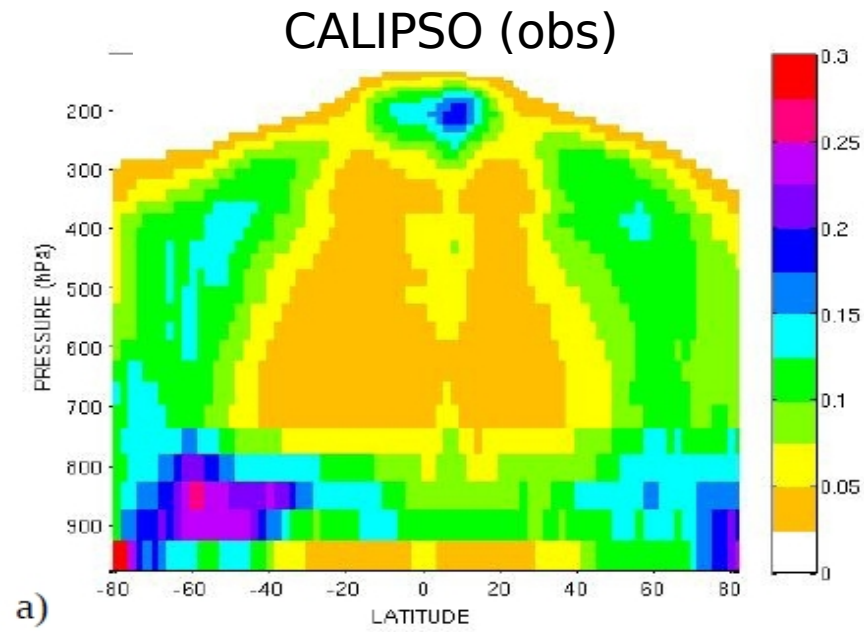
## LMDZ-5A



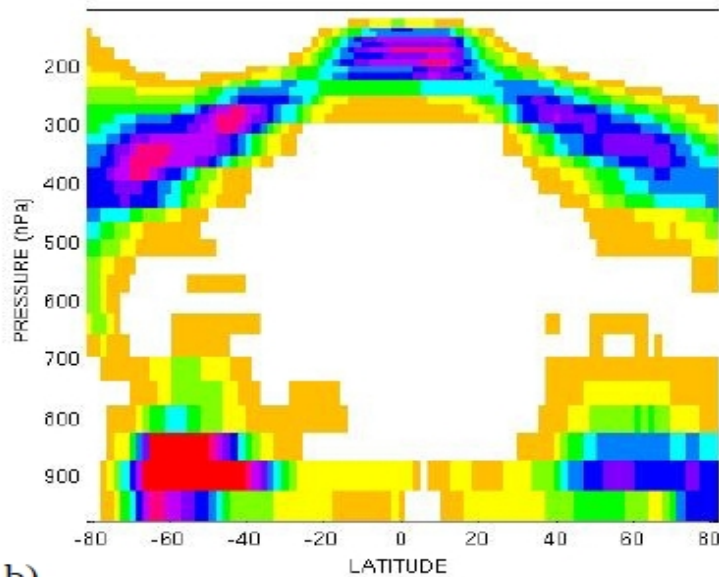
## LMDZ-5B



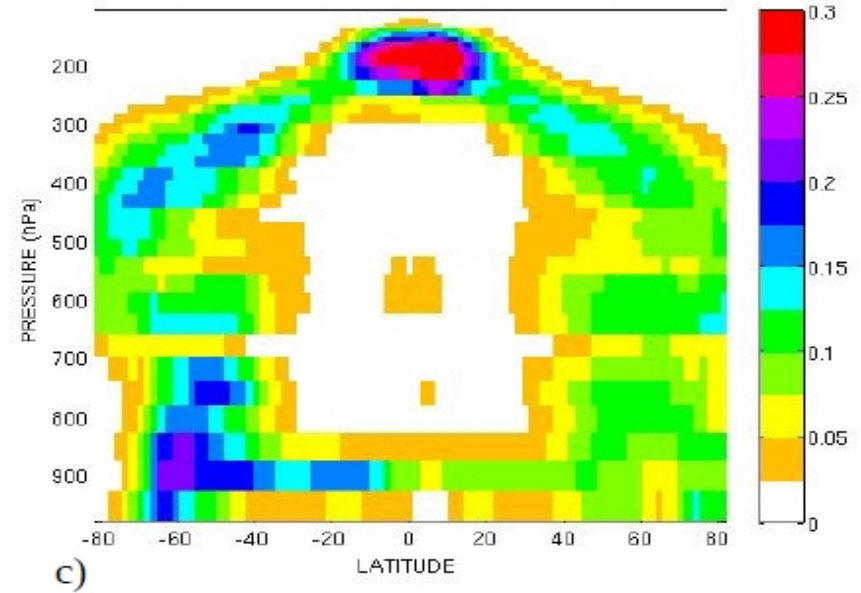
# Cloud fraction: vertical distribution



LMDZ-5A

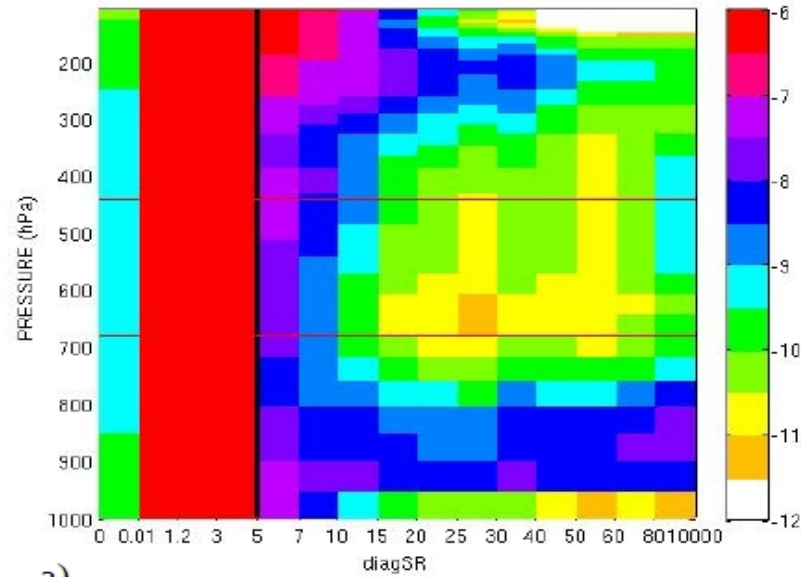


LMDZ-5B



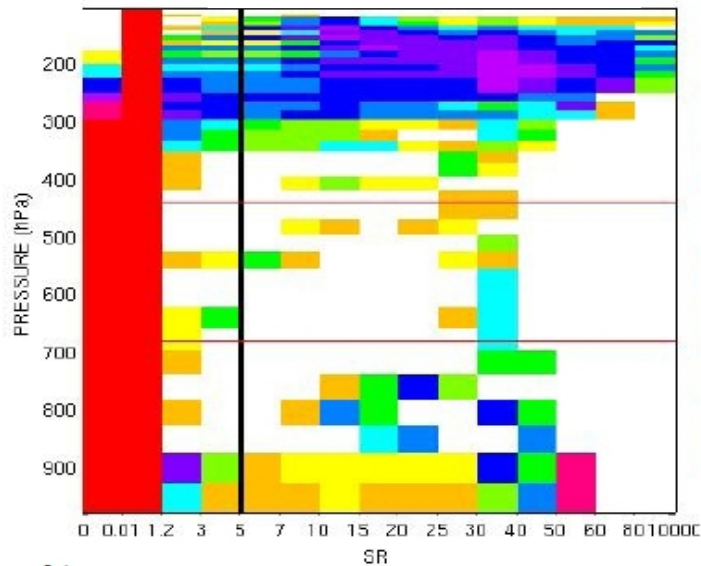
# Vertical distribution of the scattering ratio, over the tropical oceans

CALIPSO (obs)



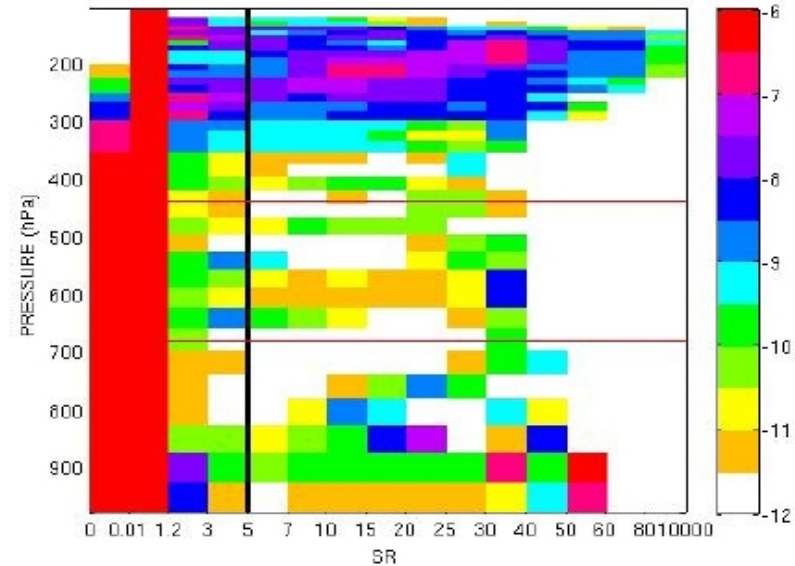
a)

LMDZ-5A



b)

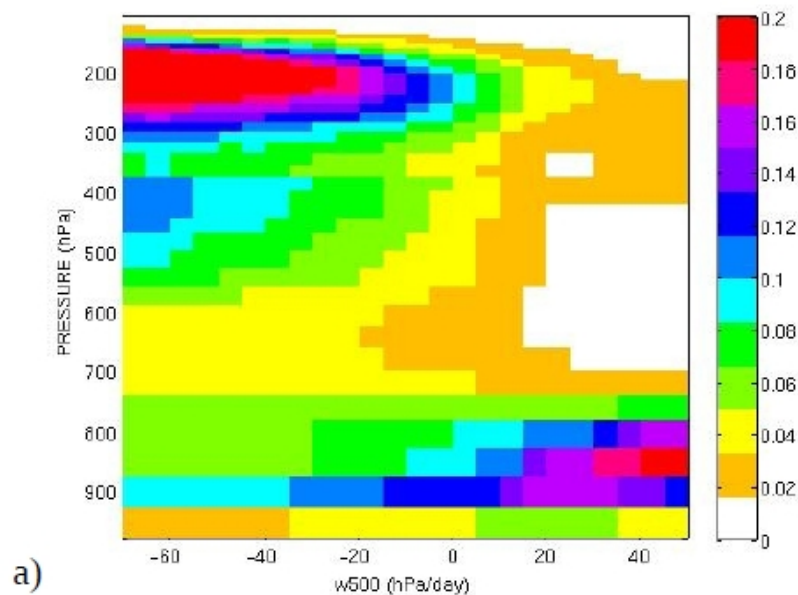
LMDZ-5B



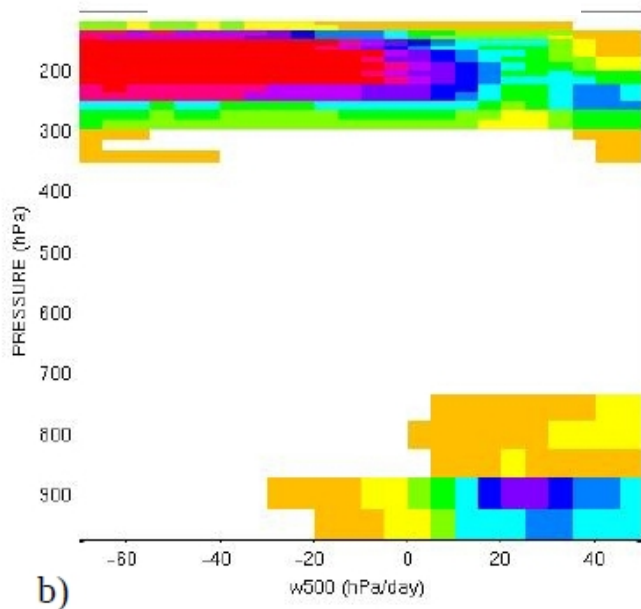
c)

# Vertical distribution of cloud as a function of the *dynamical regime* ( $w_{500}$ ) over the tropical oceans

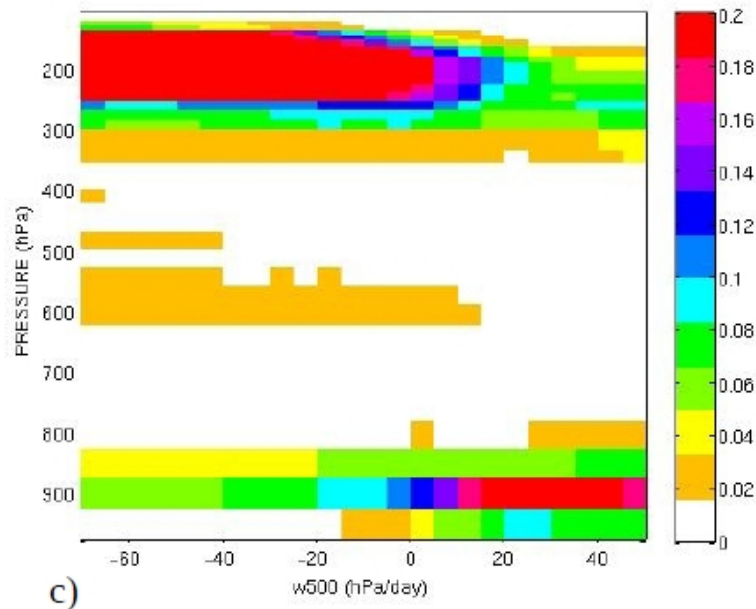
CALIPSO (obs)



LMDZ-5A

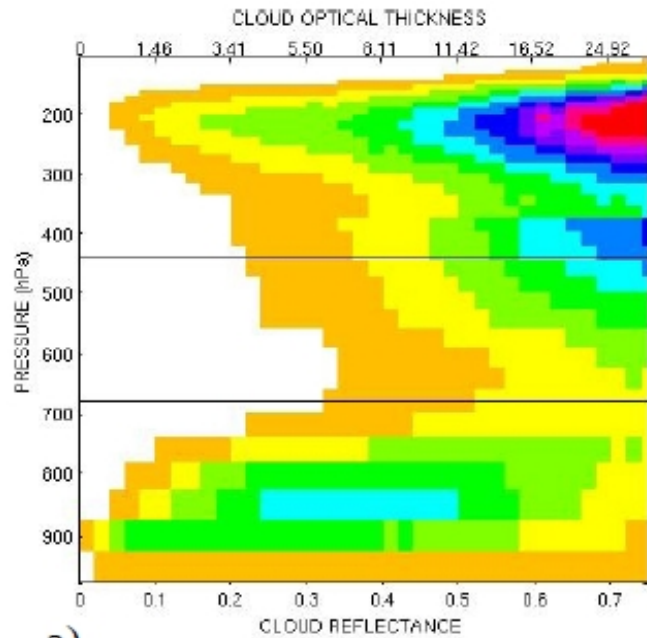


LMDZ-5B



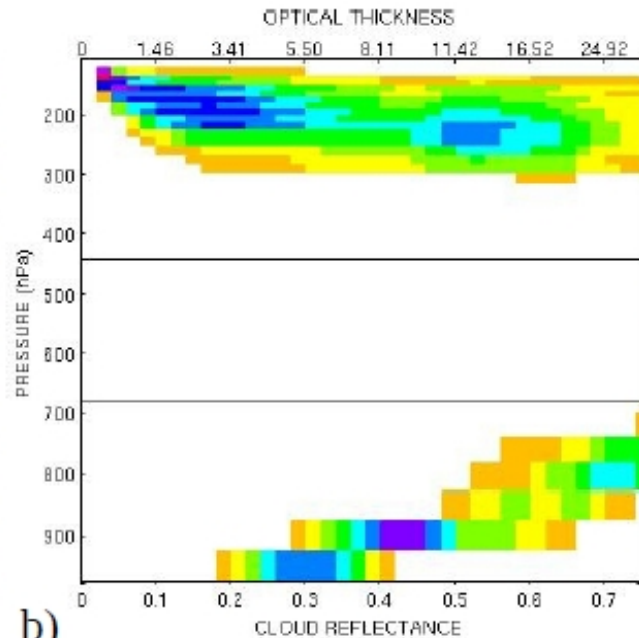
# Cloud fraction as a function of **total** cloud reflectance and cloud height, over the tropical oceans

CALIPSO & PARASOL (obs)



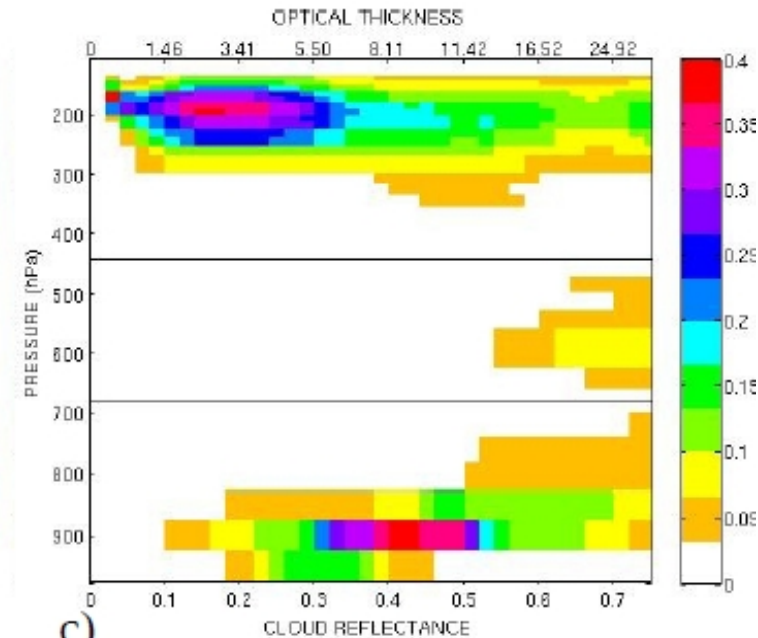
a)

LMDZ-5A

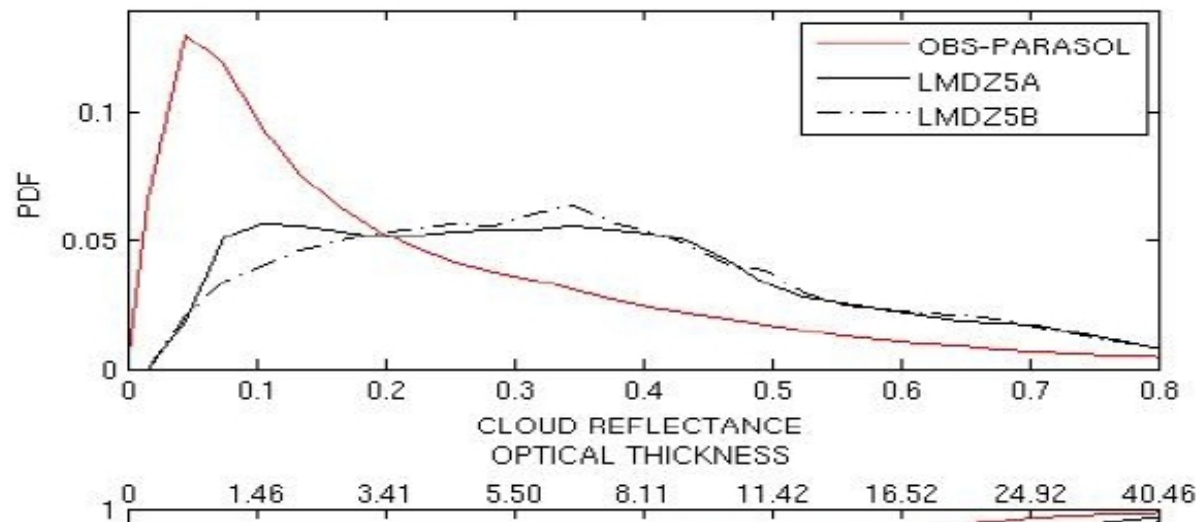


b)

LMDZ-5B



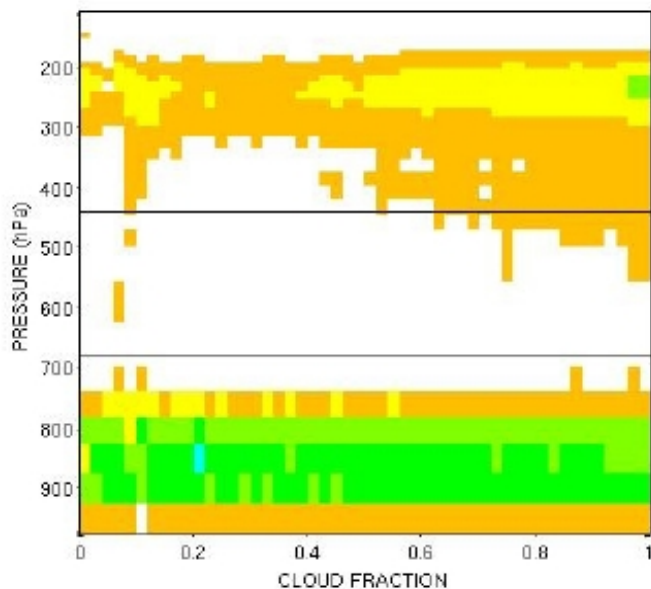
c)



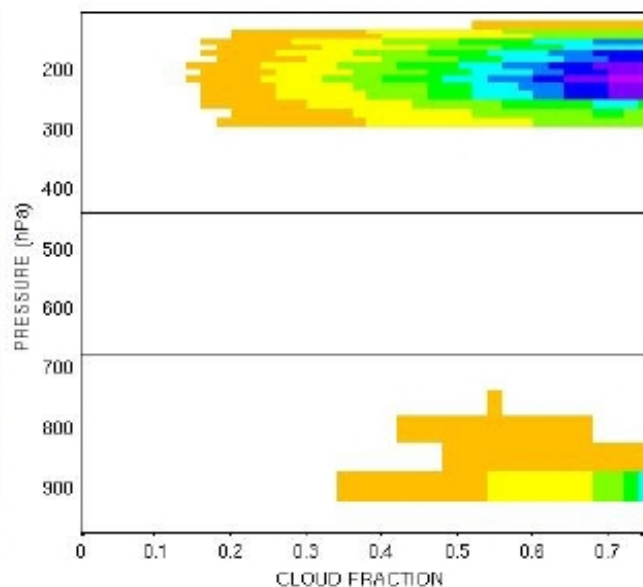


# Cloud fraction as a function of **total** cloud fraction and cloud height, over the tropical oceans

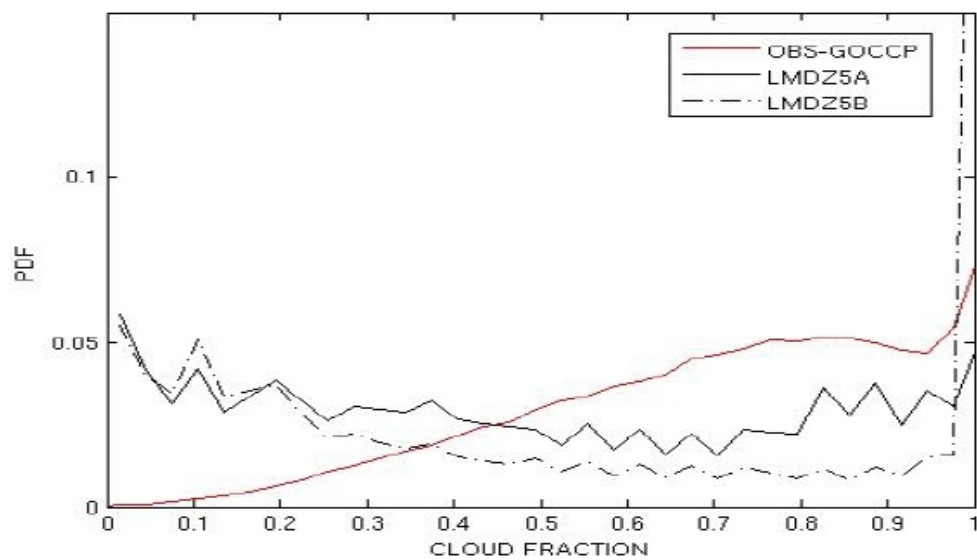
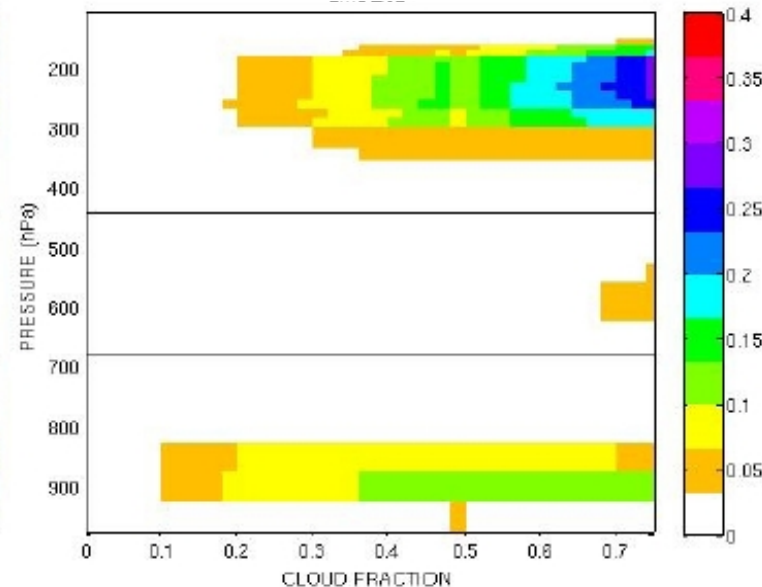
CALIPSO & PARASOL (obs)



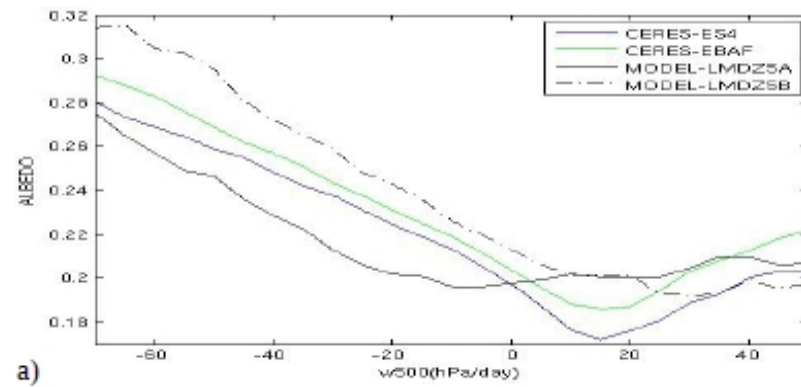
LMDZ-5A



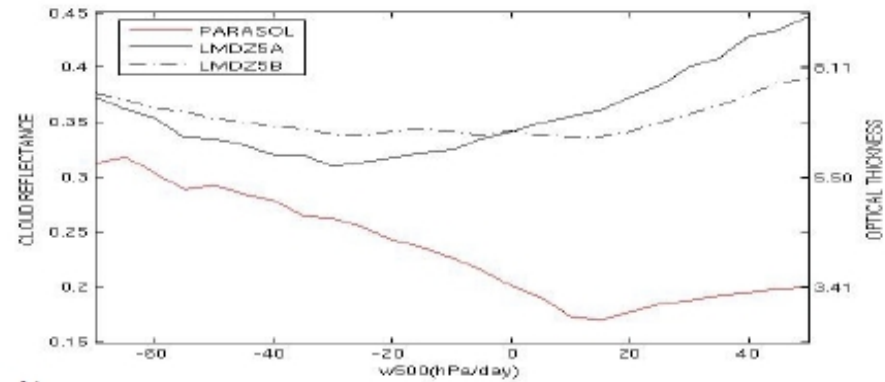
LMDZ-5B







a)



b)

