# Paramétrisation de la distribution du vent sous-maille liée aux thermiques

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# “ARMCU” case : shallow cumulus over land

**“case"** = Initial conditions + sfc boundary cond. + large-scale forcing and radiation

**ARMCU** case : based on an idealization of observations made at the Southern Great Plains **(SGP) site** of the Atmospheric Radiation Measurement (**ARM**) Program on **21 June 1997.**

The **SGP site** : in situ and remote-sensing instrumented clusters arrayed across

~ 140 000 $km^2$ in Oklahoma and Kansas.

On **21 June 1997**, cumulus clouds developed at the top of an initially clear convective boundary layer.

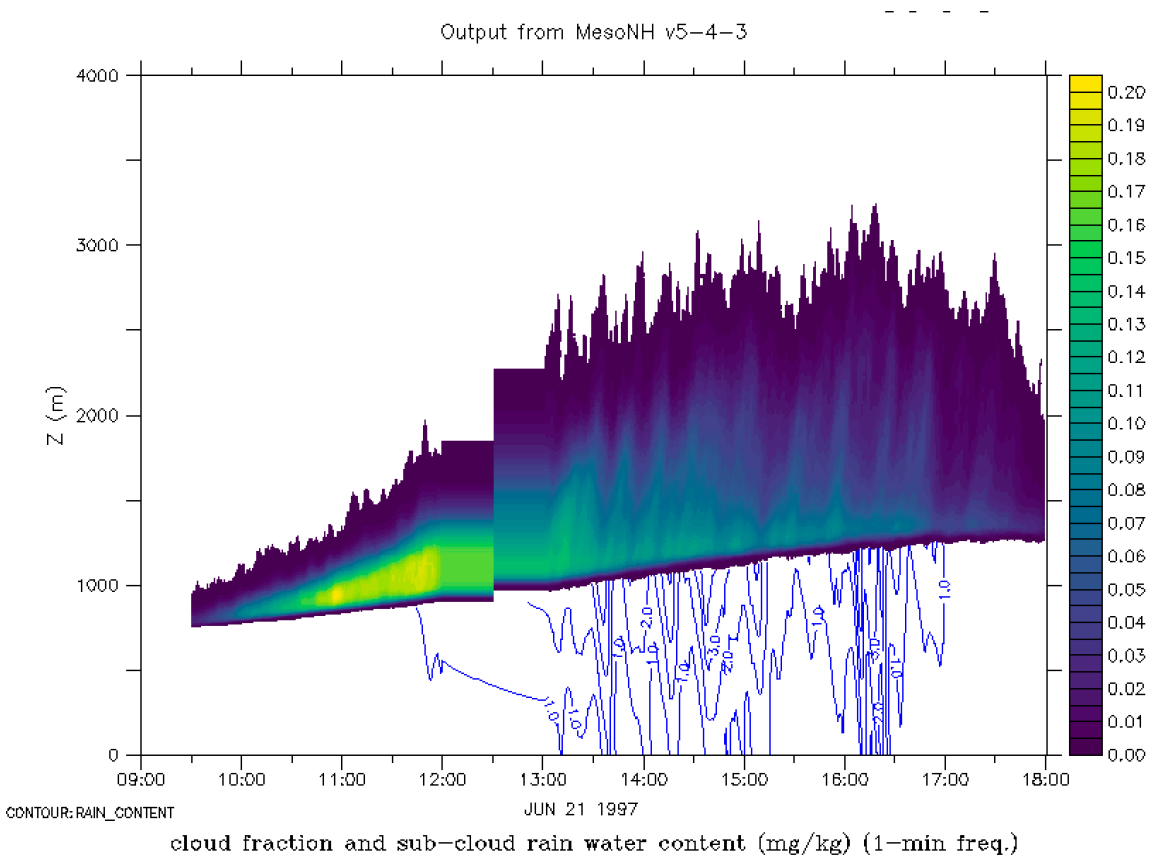
(Brown et al., *Q. J. R. Meteorol. Soc.*, 2002)

# ARMCU LES at res. 8m: cloud fraction & rain content

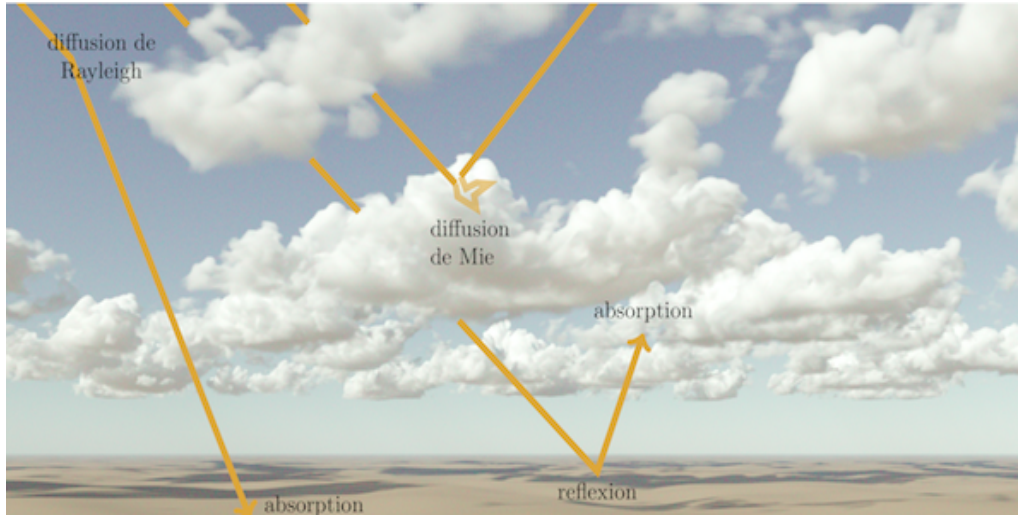
**LES** at **8m** resol (xyz)
on **12 x 12 x 4km** domain,
with MesoNH v5.4.3,
run by F. Hourdin
on Jean-Zay super-comp.
(Idris)

3D-output for (Local Time) :
- 07h30-11h30 : every 1h
- 12h00-18h00 : every 30'
- 12h00-13h00 : every 10" !!

*NB : fig using Ferret's « shade », not « fill » !*

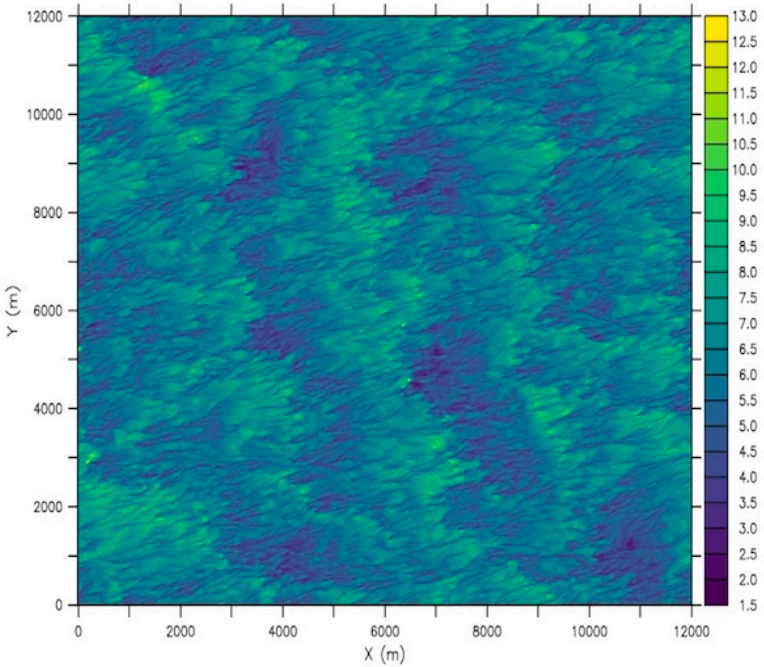


# ARMCU LES at resol. 8m : cloud field & 12m-wind



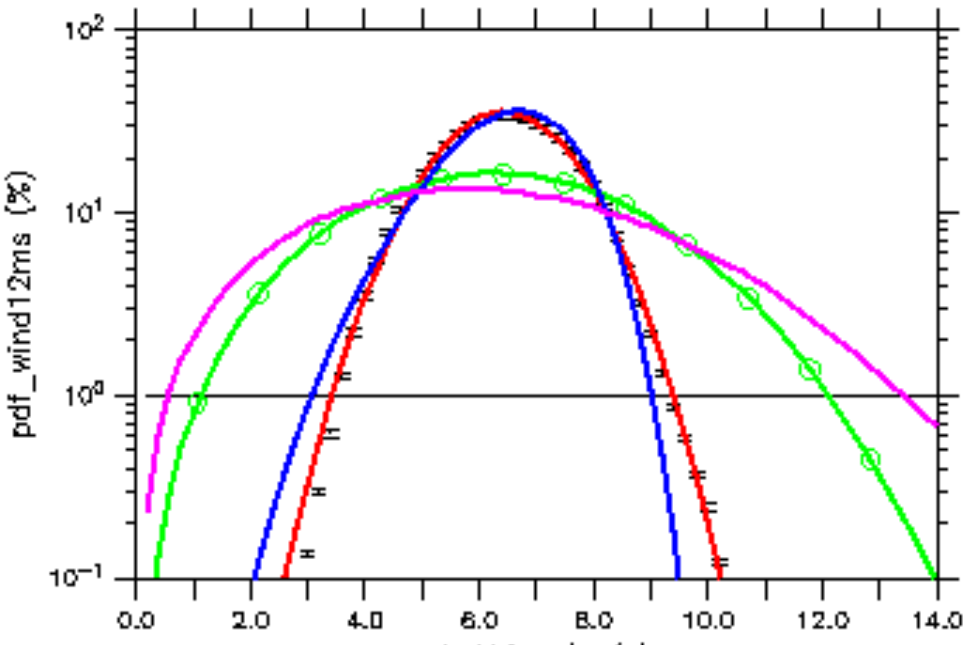

3D cloud field
for calculating cloud-radiation interaction

*(PhD thesis Najda Villefranque)*




12m-wind at 12h30 (LT) from LES

# ARMCU LES 8m : 12m-wind distribution




12m-wind speed (LT 13h30)

Wind pdf-s commonly used : Weibull with 1 param « k » :

$$p(u,k,A) = \frac{k}{A}\left(\frac{u}{A}\right)^{k-1}\exp\left[-\left(\frac{u}{A}\right)^{k}\right]$$

------ SPLA : k=const ( =3)
------ Grini & Zender (2004) : k=fct(wind)
------ Justus (1978) : k = fct(wind,σ)
… pas mal, mais pas idéal !

------ Our choice : normal distribution :

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

… so we need to parametrize σ of the 12m-wind

# THE Parameterization

Idée de base, simple :

$\sigma^2 = (\sigma\_shear)^2 + (\sigma\_conv)^2$

with

$\sigma\_shear = coef1 * ustar$

and

$\sigma\_conv = coef2 * conv\_intensity\ (mass\_flx_{th}, w_{th}, wstar)$

… le … reste … est dans les details :)

(travail sur u, v, non pas sur le module, etc...
Perspective : combinaison avec la param pour les poches froides de Lamine )