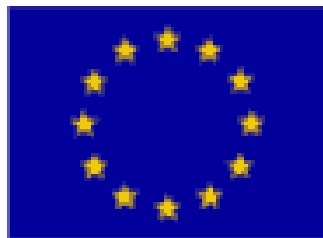


# The detection of autoconversion processes in clouds using ground-based passive and active microwave sensors

BRUSSELS 14 October 2015

Claudia Acquistapace



# WHAT IS MY PHD ABOUT?

New criterion to detect drizzle onset on statistical basis

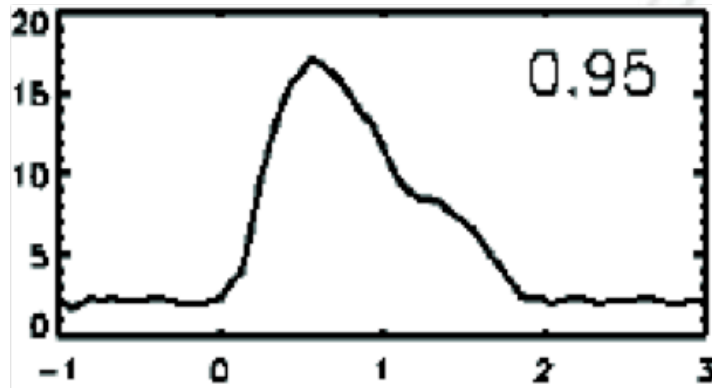
3 directions of work

Simulations of the observations: what are the microphysical processes observed?

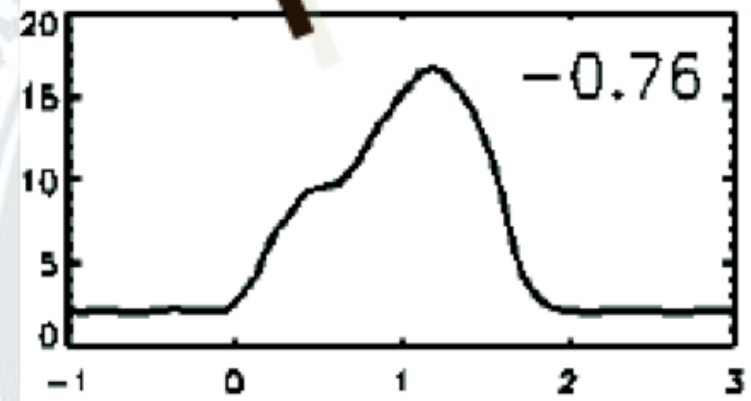
Sensitivity studies on radar measurements: how good are them for our purposes?

# HOW TO DETECT DRIZZLE? SKEWNESS OF A CLOUD RADAR DOPPLER SPECTRA

Examples of doppler spectra with positive and negative skewness

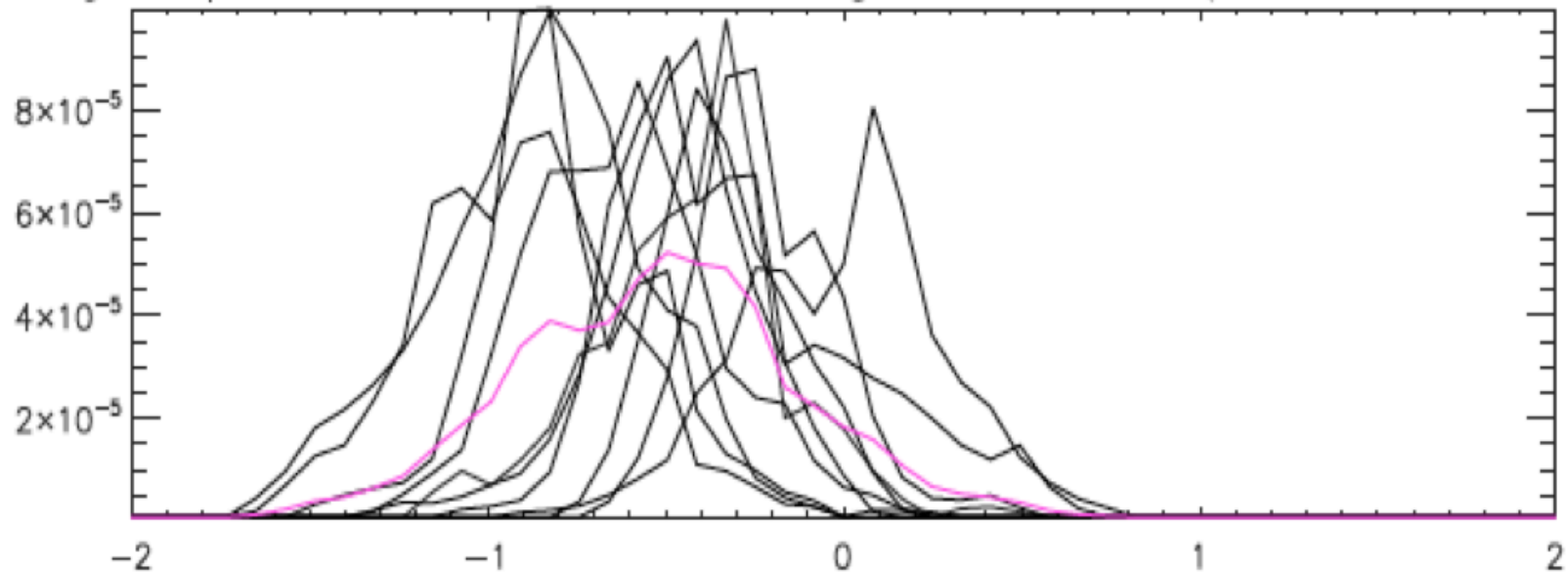


Skewness  $> 0$   
Drizzle appears

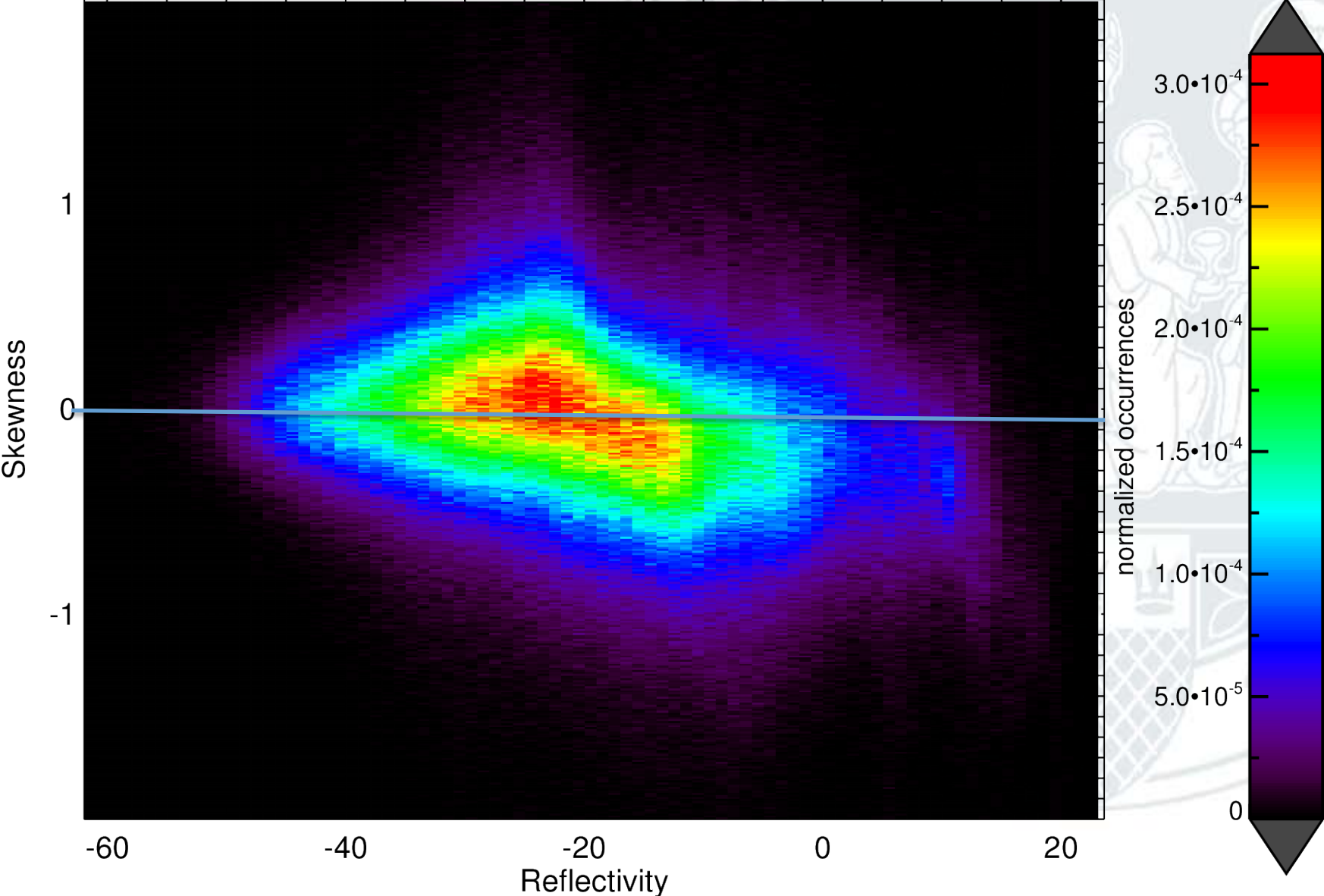


Skewness  $< 0$   
Drizzle dominates

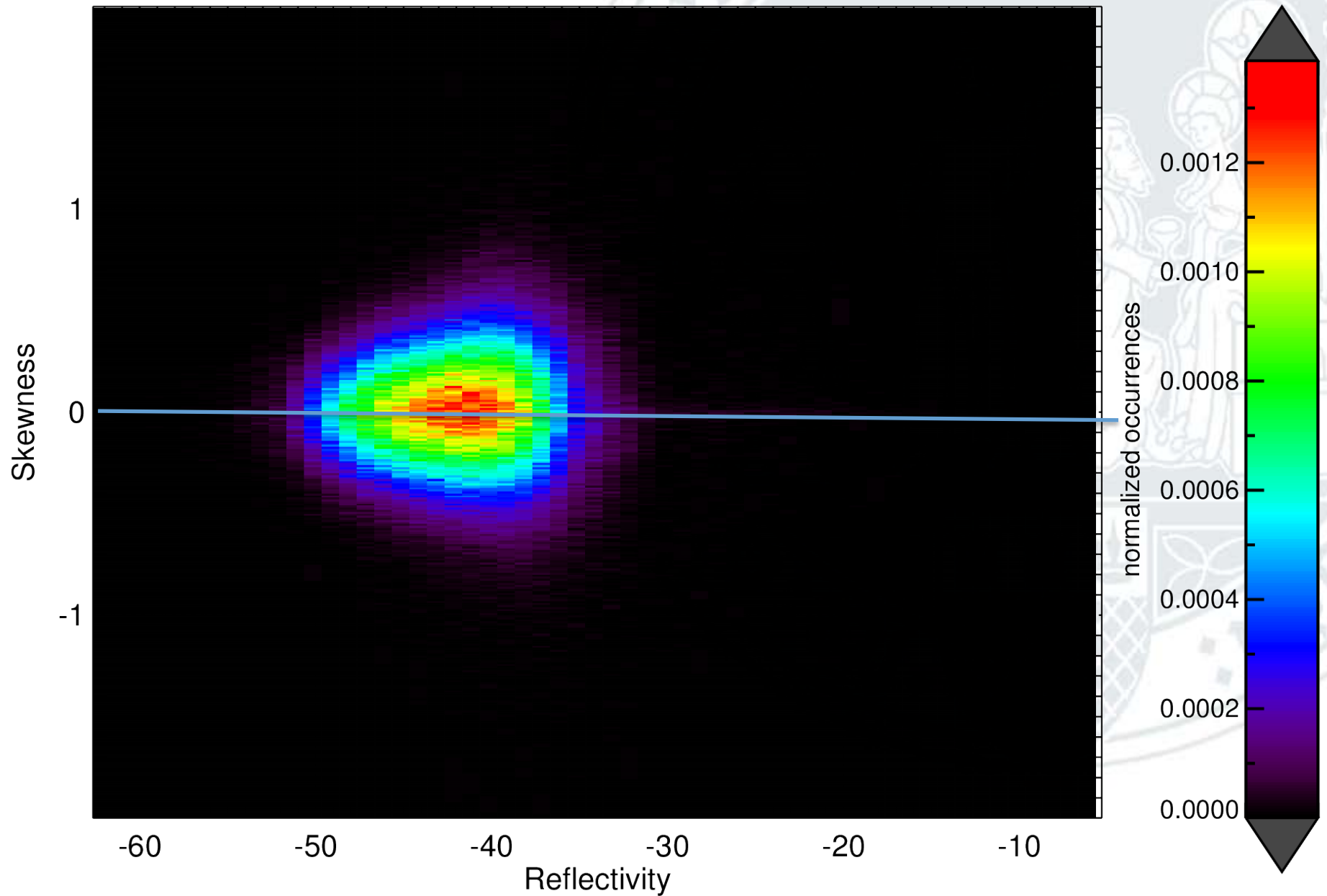
Original spectra at time 4.183529 and height 1180.012695 ( $v$  mean =  $-0.486581$ )



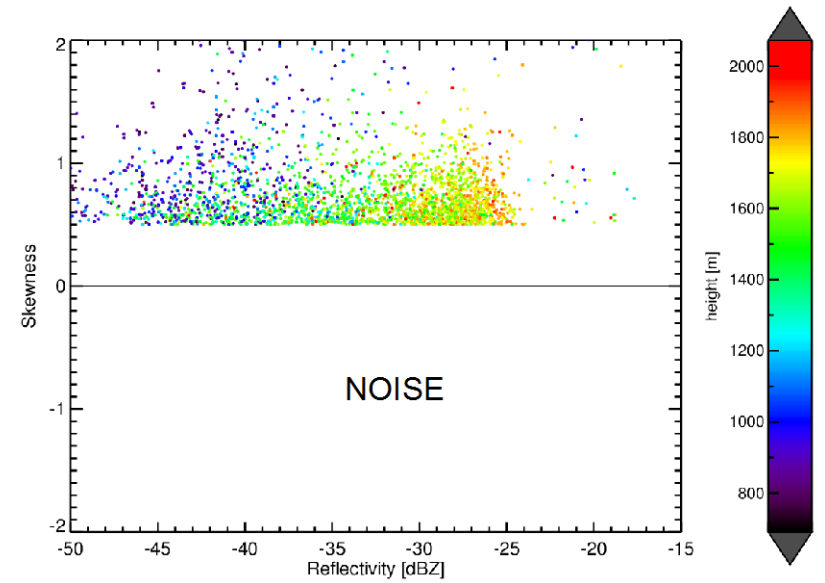
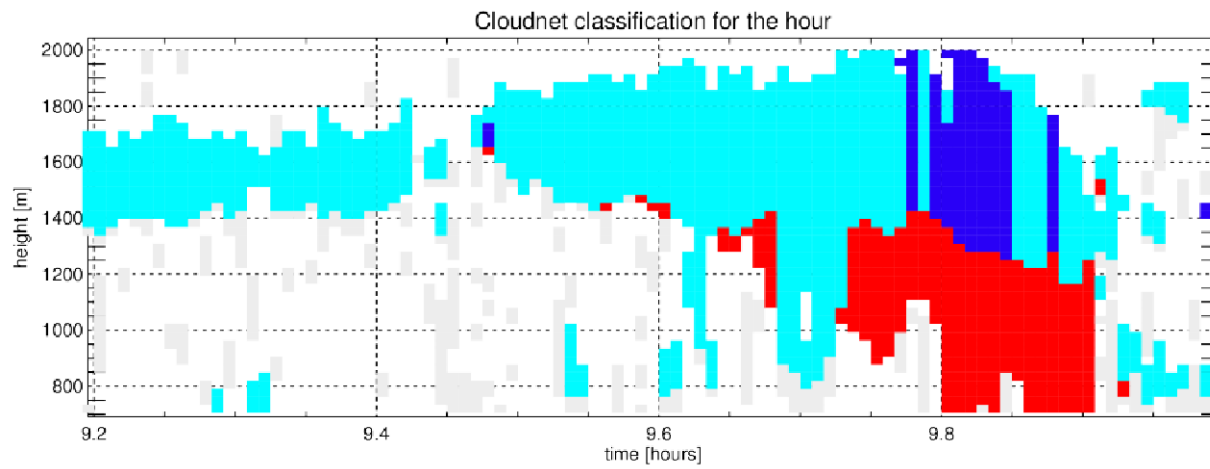
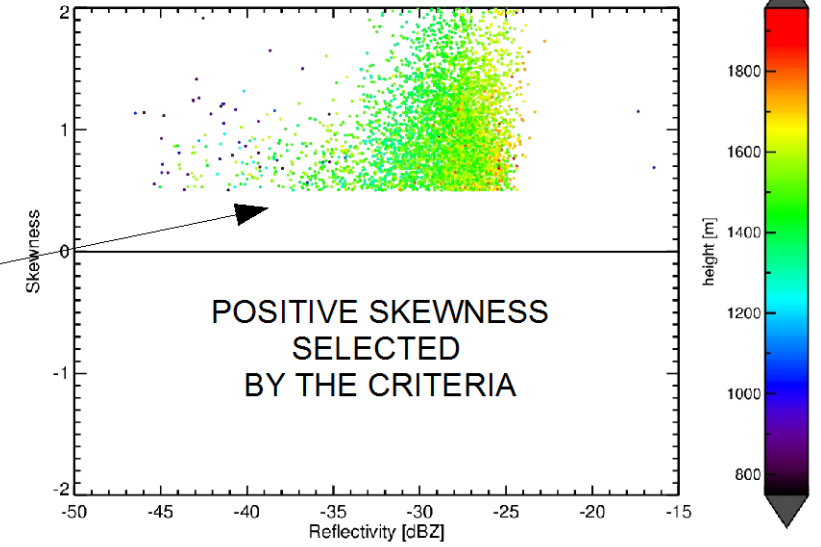
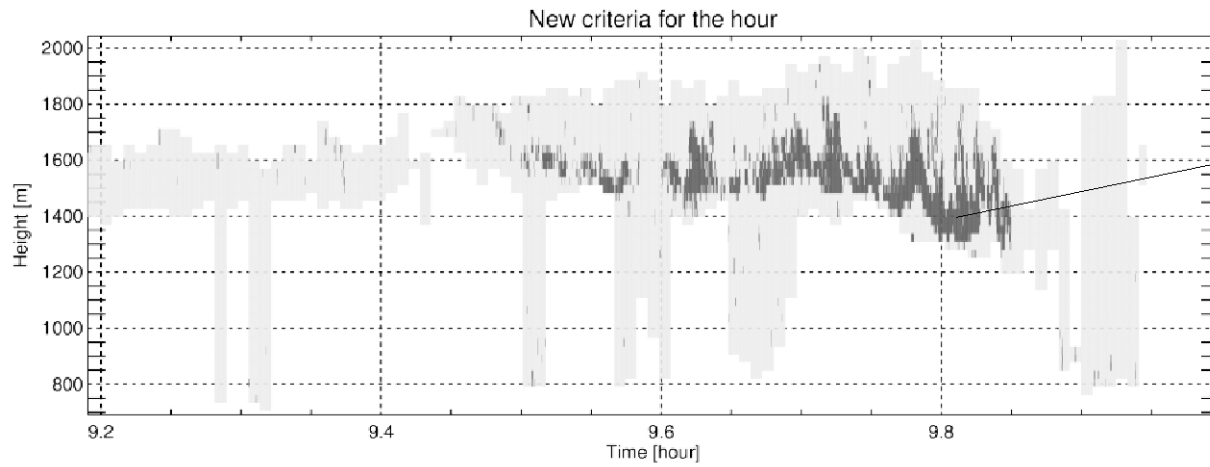
2D histogram for DrizzleContinuous dataset



2D histogram for nonDrizzleCont dataset

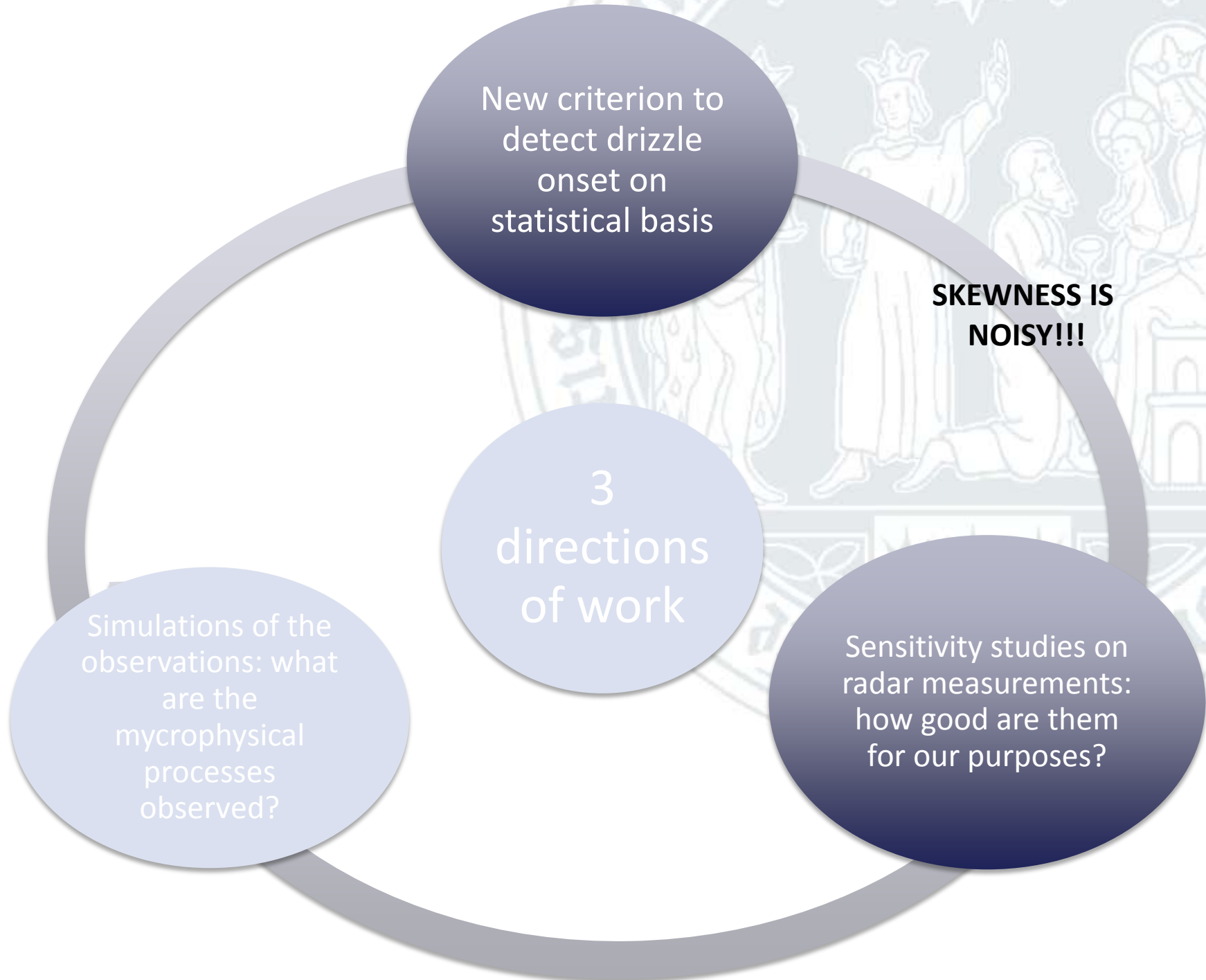


# NEW CRITERION PERFORMANCES COMPARED TO CLOUDNET





# Then, what happened?...



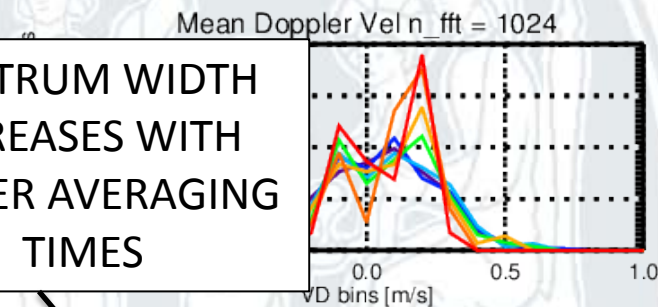
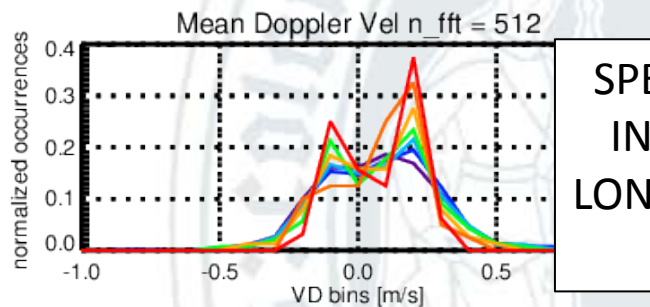
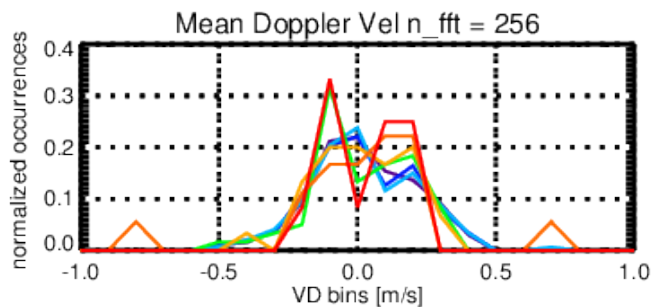
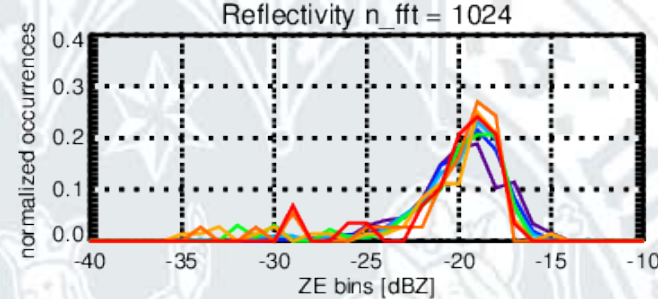
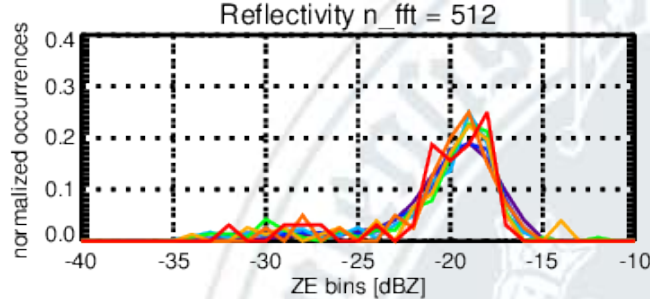
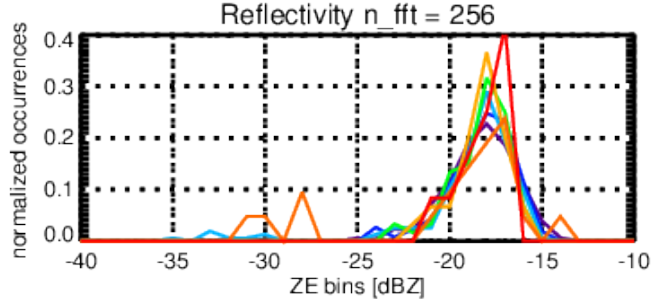
# Goal of the study:

- Sensitivity of moments of cloud radar doppler spectra to basic radar parameters (nfft, integration time)
- Evaluation of uncertainties over moments for given radar settings

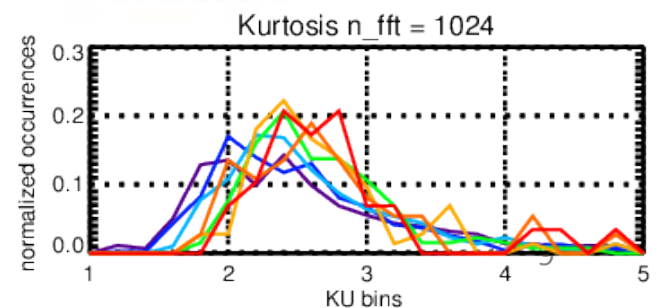
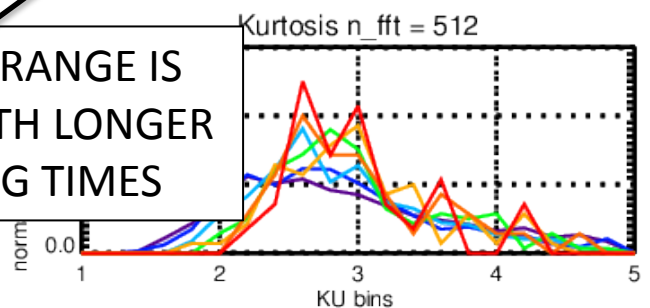
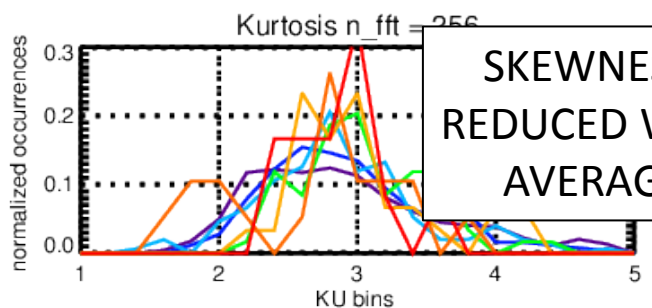
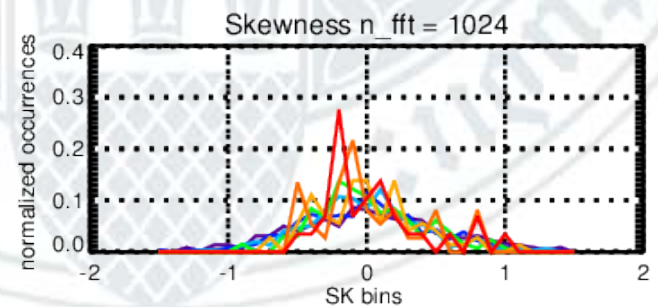
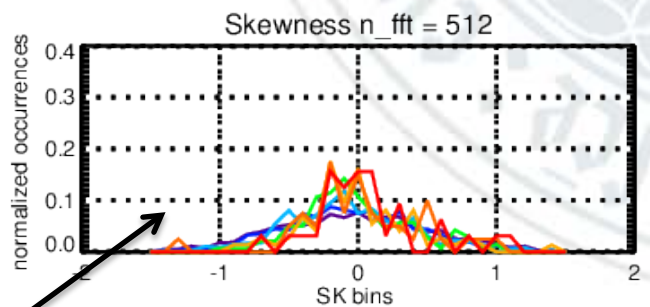
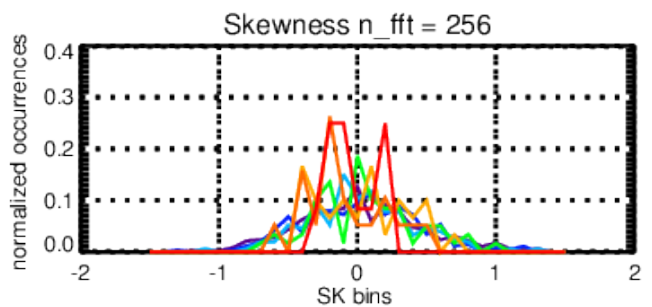
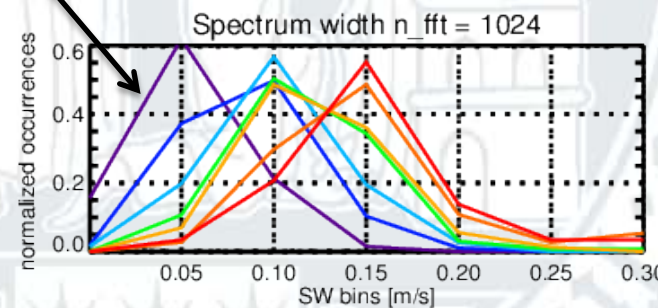
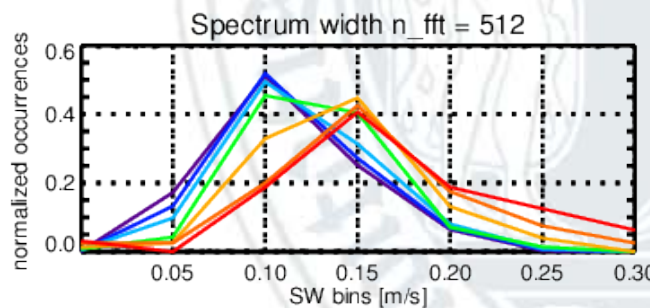
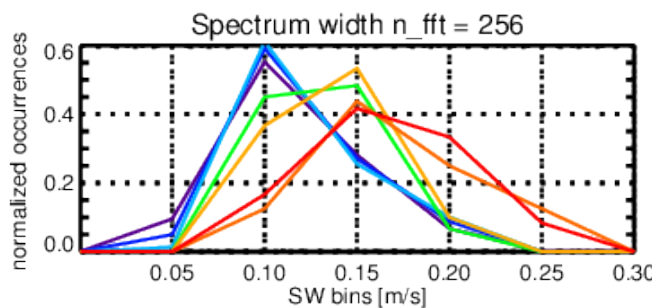
In the following different colors correspond to averaging times in the following way:

purple (0.2s), blue (0.4s), light blue (0.8s), green (2s), orange (4s), dark orange (8s), red (10s).





SPECTRUM WIDTH  
INCREASES WITH  
LONGER AVERAGING  
TIMES



SKEWNESS RANGE IS  
REDUCED WITH LONGER  
AVERAGING TIMES

**WHICH IS THE  
MICROPHYSICS  
BEHIND  
POSITIVE  
SKEWNESS?**

New criterion to  
detect drizzle  
onset on  
statistical basis

3  
directions  
of work

Simulations of the  
observations: what  
are the  
microphysical  
processes  
observed?

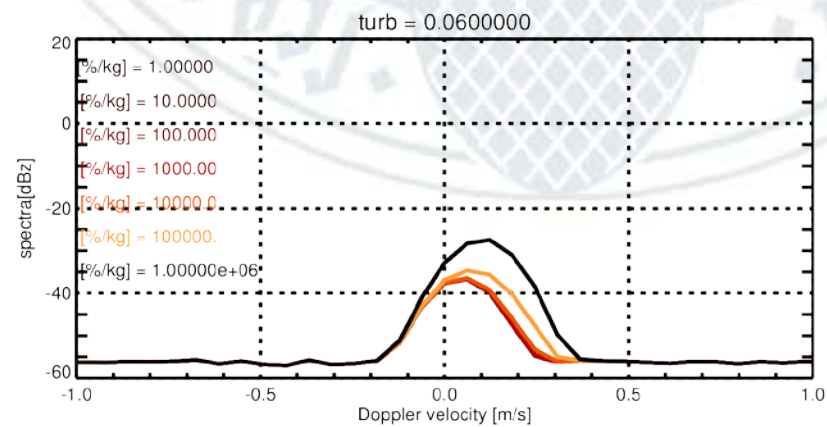
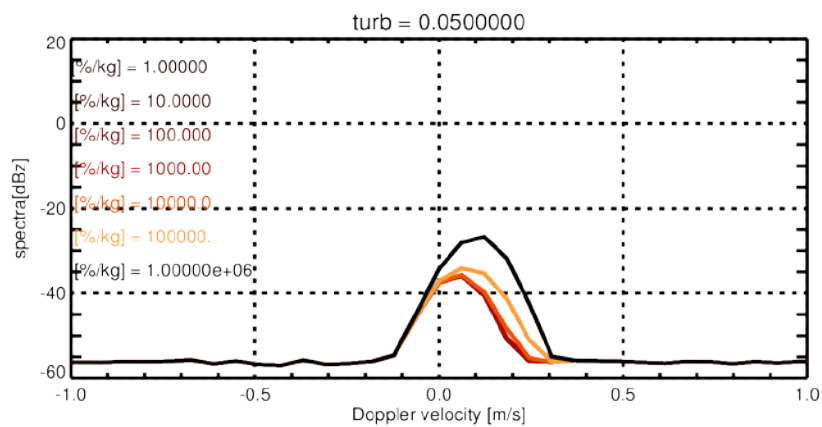
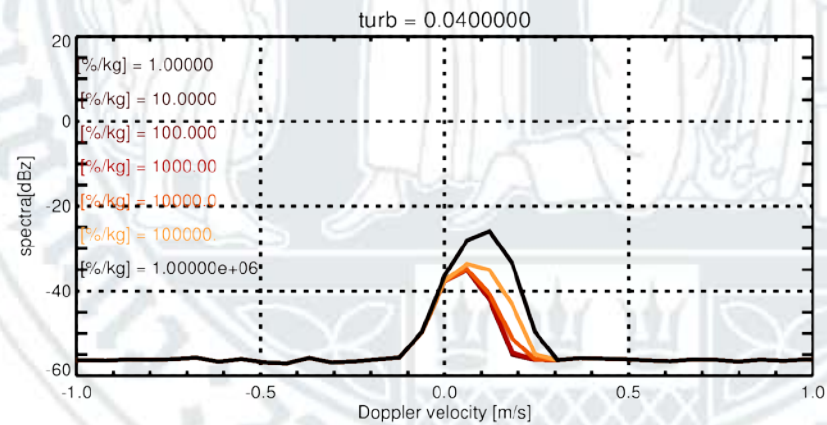
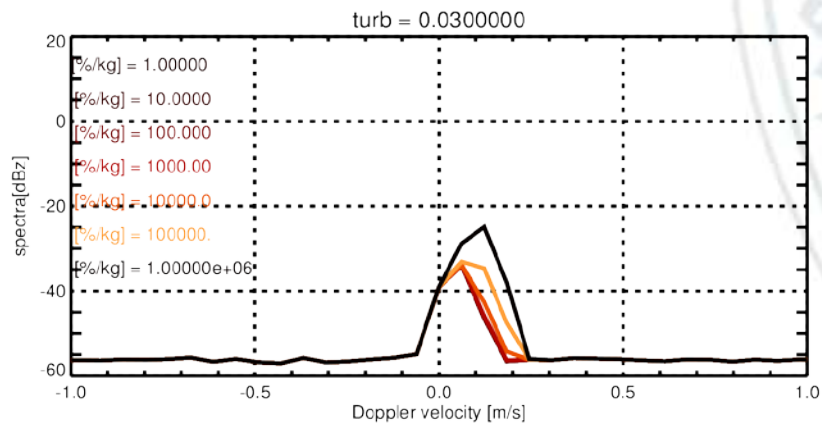
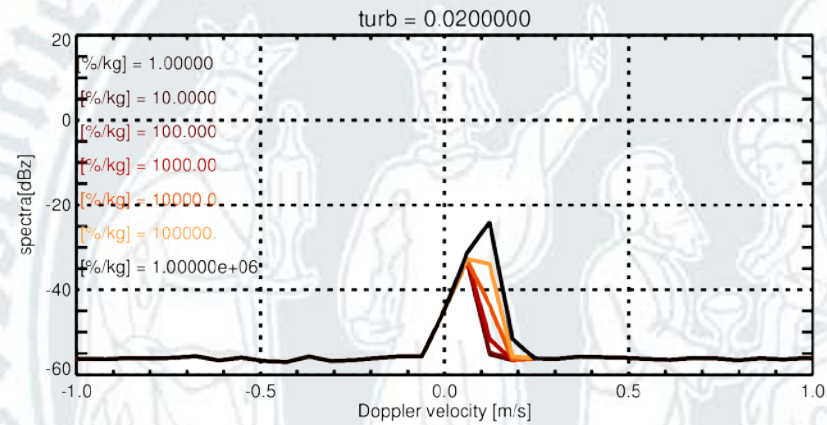
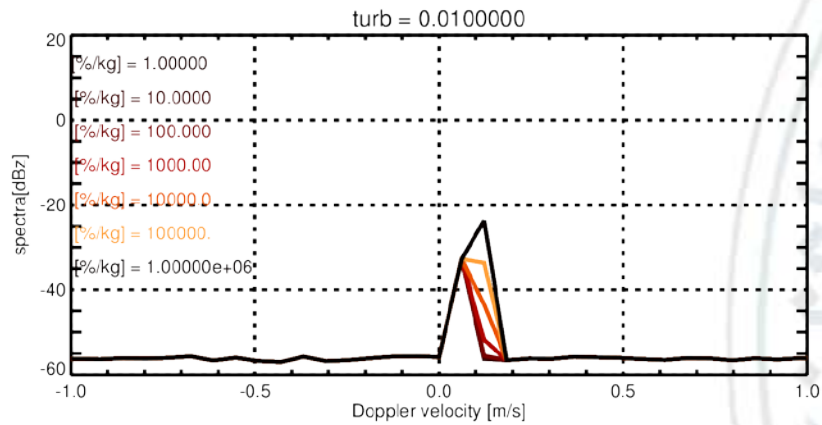
Sensitivity studies on  
radar measurements:  
how good are them  
for our purposes?

# Goal:

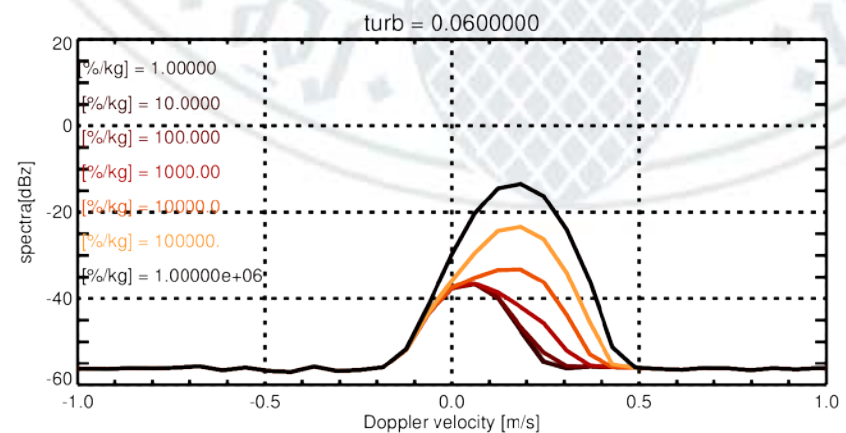
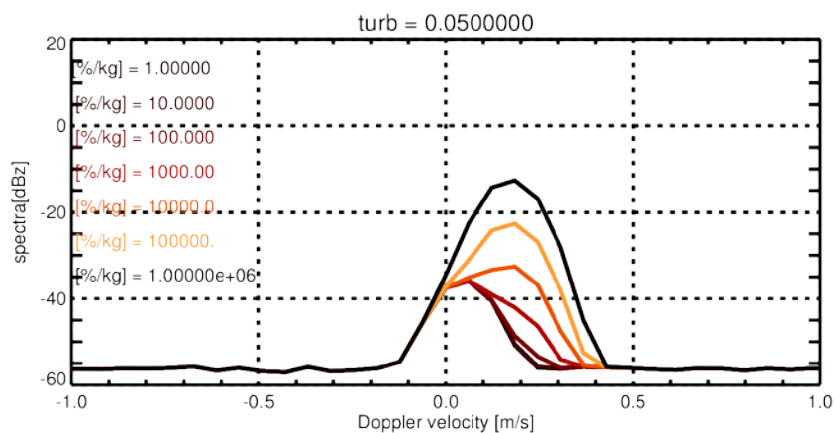
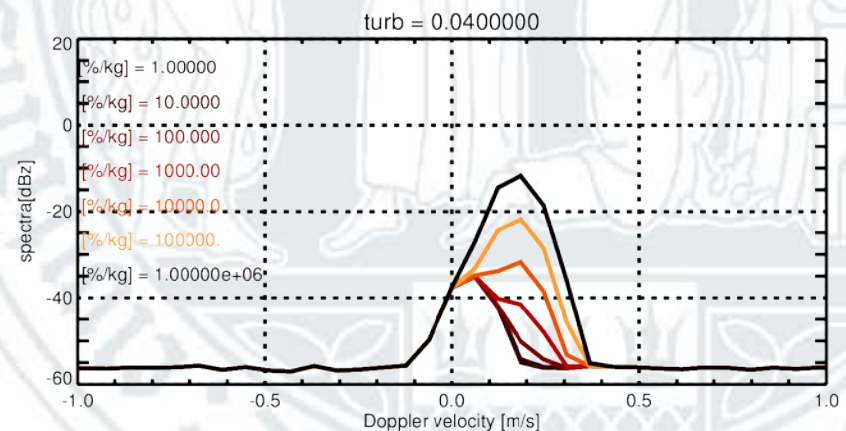
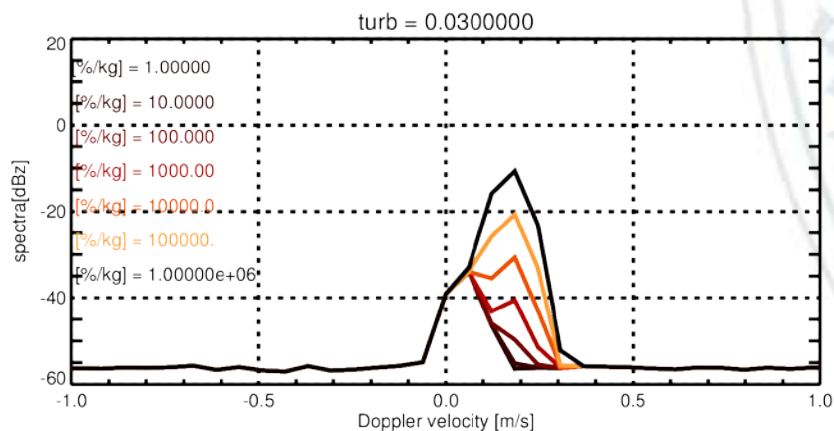
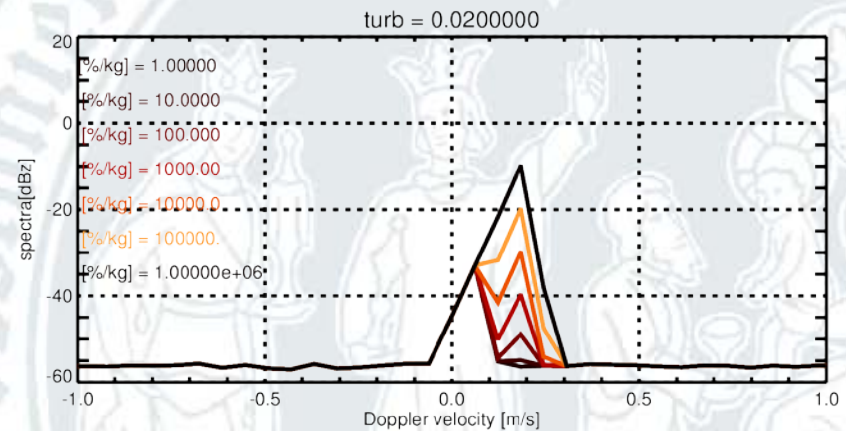
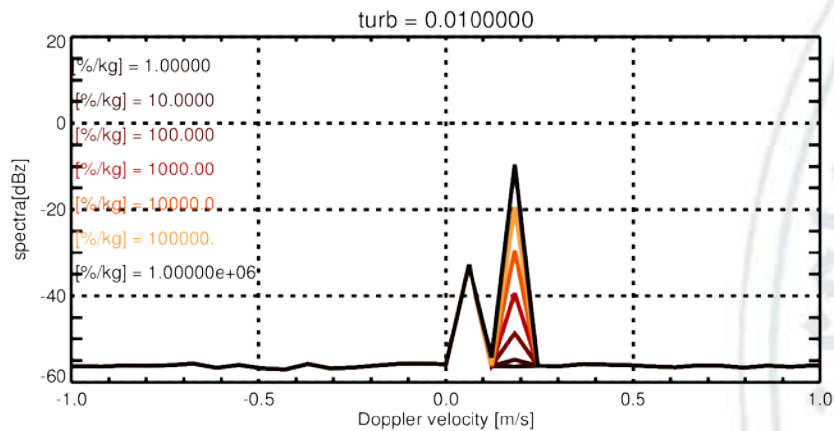
- Run situations in which drizzle is growing and simulate spectra observations from a 35Ghz cloud radar
- Derive all spectra moments
- Do sensitivity tests with respect to given input parameters for the simulation as:
  - Drizzle number concentration
  - Turbulence(parameters fixed: Cloud droplet concentration, Cloud droplet radius)



# Spectra simulation 1: 30 micron diameter



# Spectra simulation 1: 70 micron diameter





# Spectra simulation 1: 100 micron diameter

