Back on the high frequency measurements produced by tethered balloon during 12 IOPs of BLLAST

Guylaine Canut

Thanks to :

Dominique Legain

Bruno Piguet

Fabien Gibert

METEO FRANCE
Toujours un temps d'avance

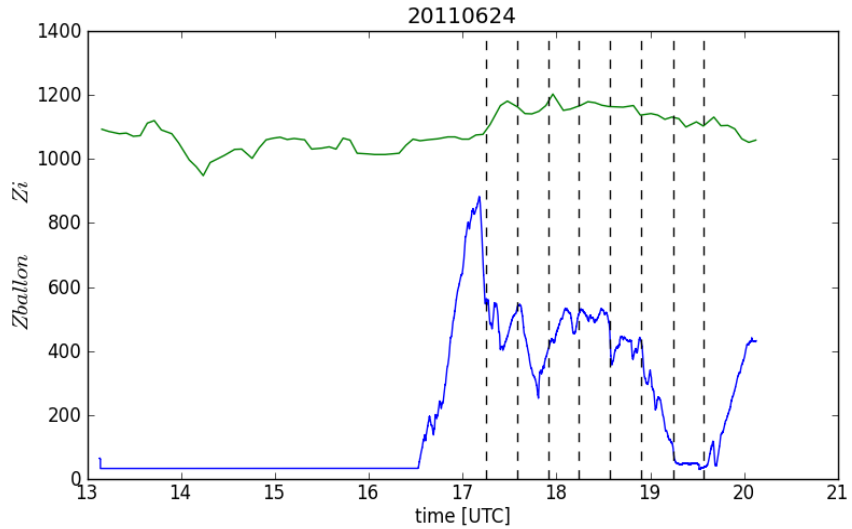
1. Approach and data
2. The turbulent parameters :
   - ➔ Estimates the :
     - Variance
     - Heat flux
     - TKE
     - Dissipation rate
3. Balloon and windcube Lidar
4. Conclusion

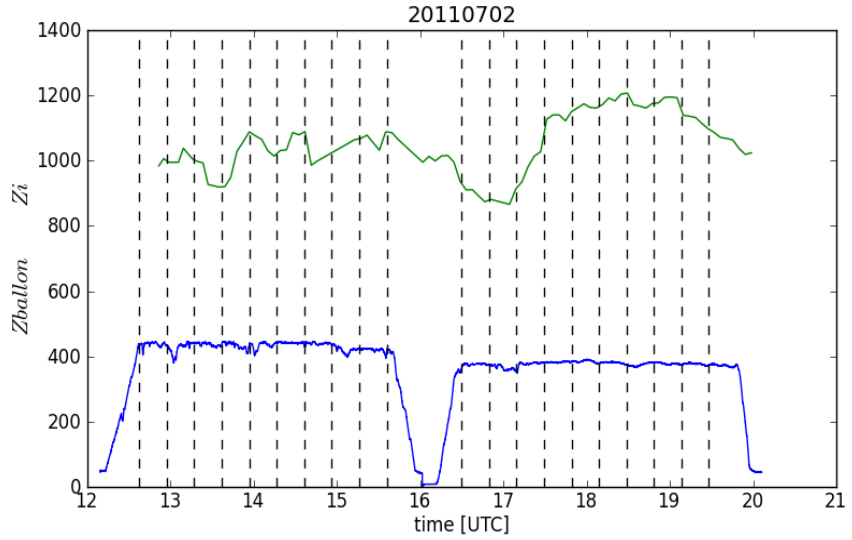
1. Approach and data

Sonic anemometer
&
Xsens (inertial motion+GPS)

- 15 flights

- several plans,
- about 8 hours per day,
- u v w t measurements at 10 Hz
- estimation of the sensible heat flux every 20 minutes
- variance every 5 minutes

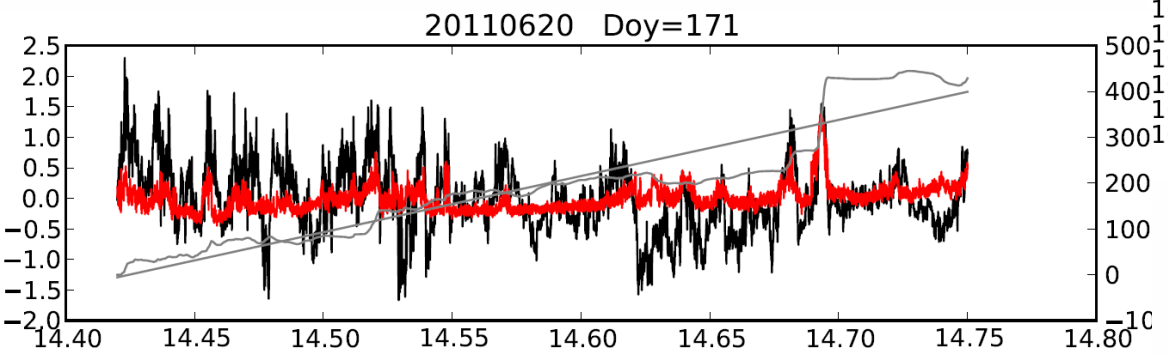


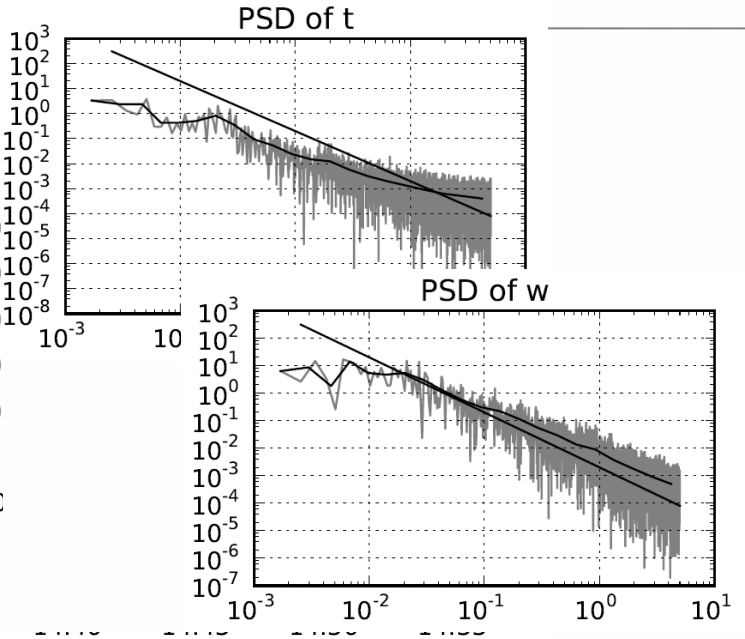


METEO FRANCE
Toujours un temps d'avance

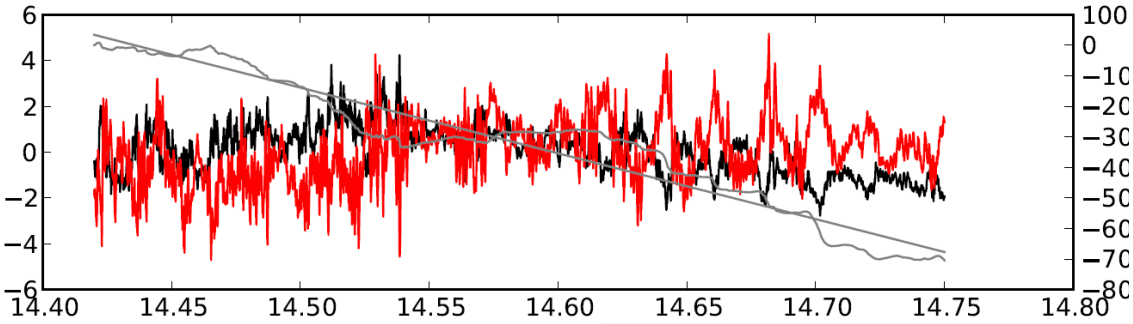
1. Approach and data

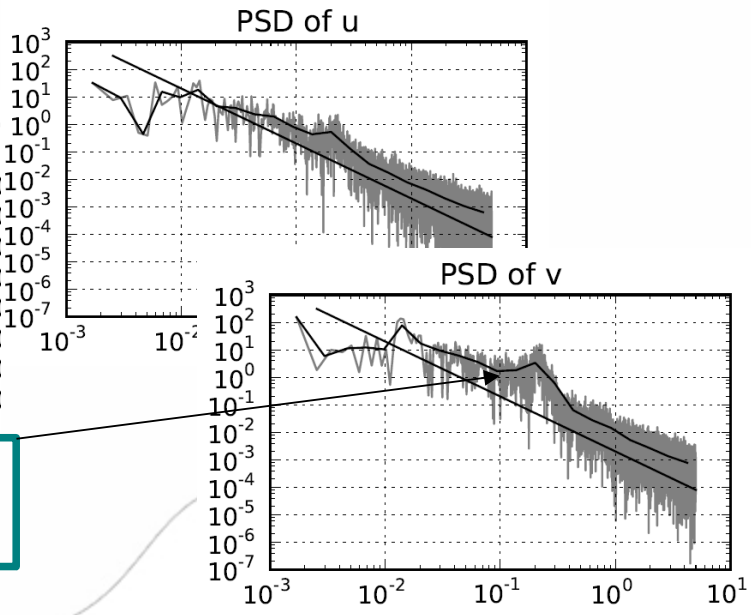
- Fluctuations of w & t





- Fluctuations of u & v

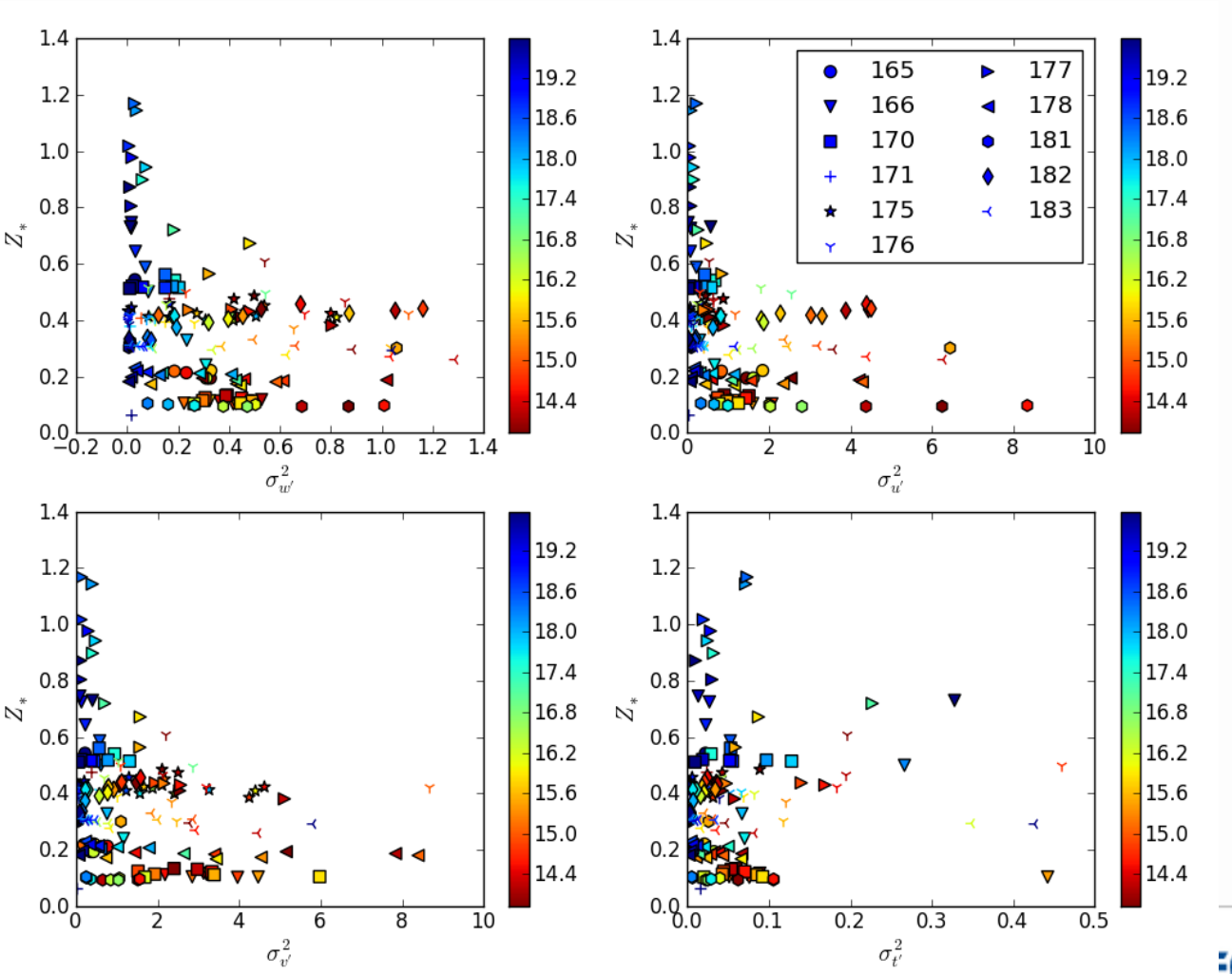




Ongoing research to understand these peaks

2. The turbulent parameters

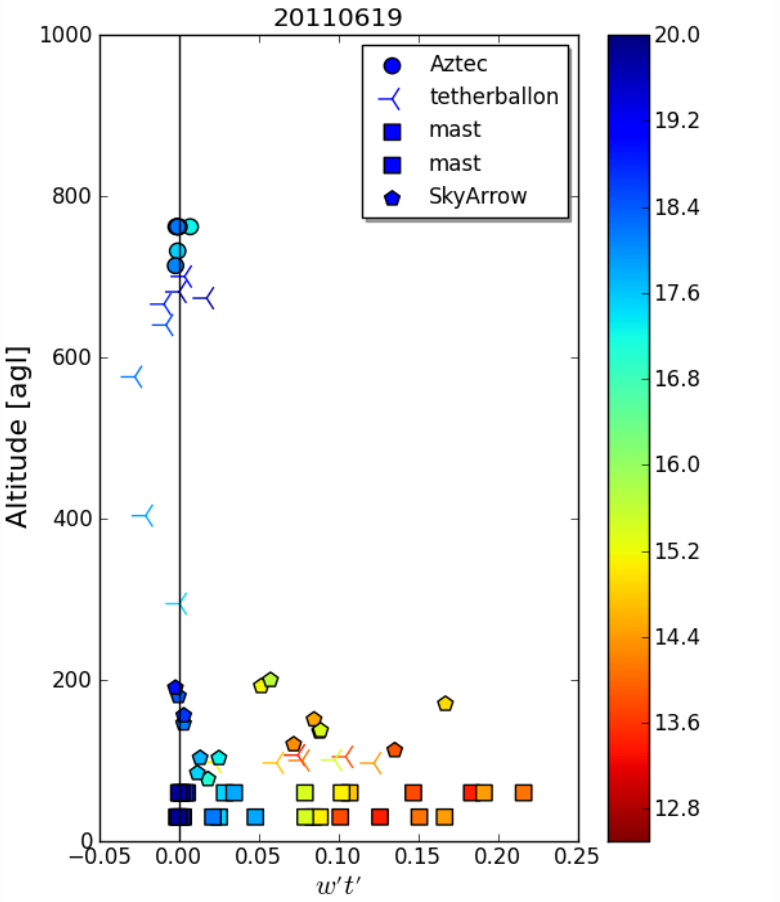
→ Estimation of the variance of t, u , v, w (every 20 minutes)

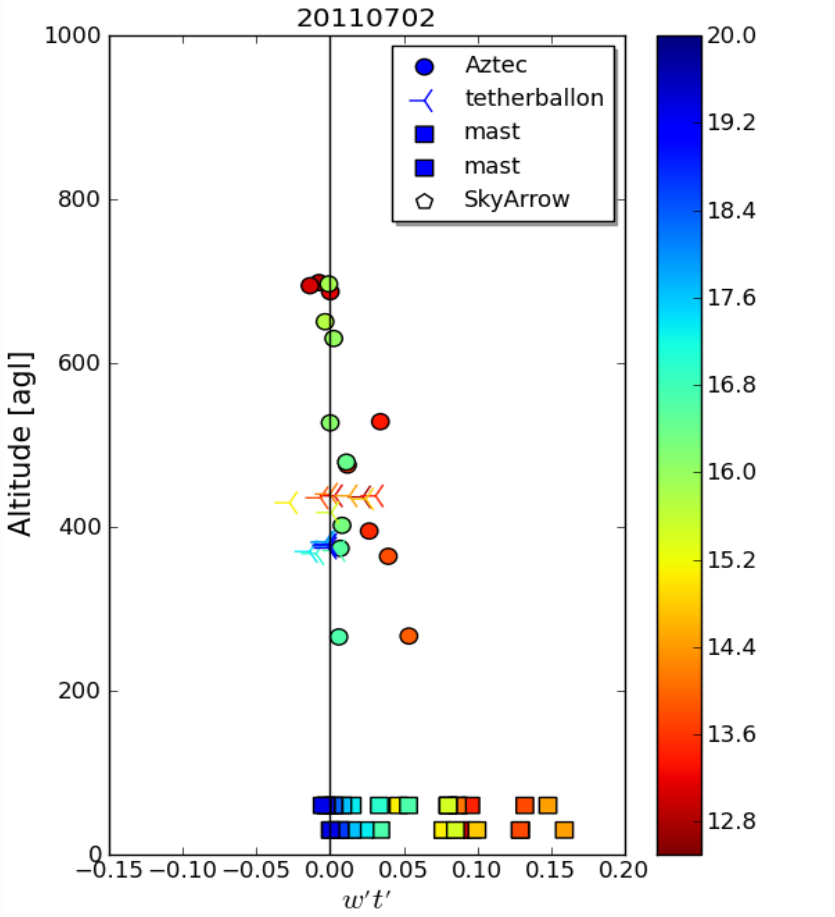


2. The turbulent parameters

→ Estimation of the heat flux (every 20 minutes)

Example of 2 different days

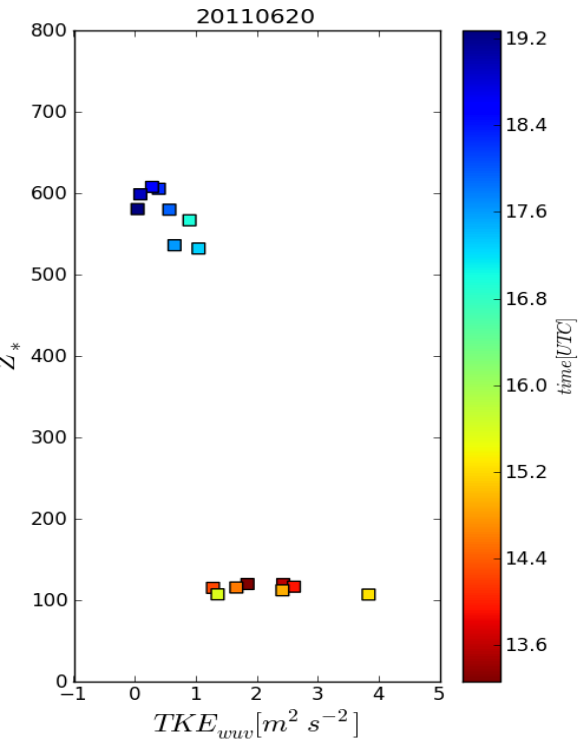


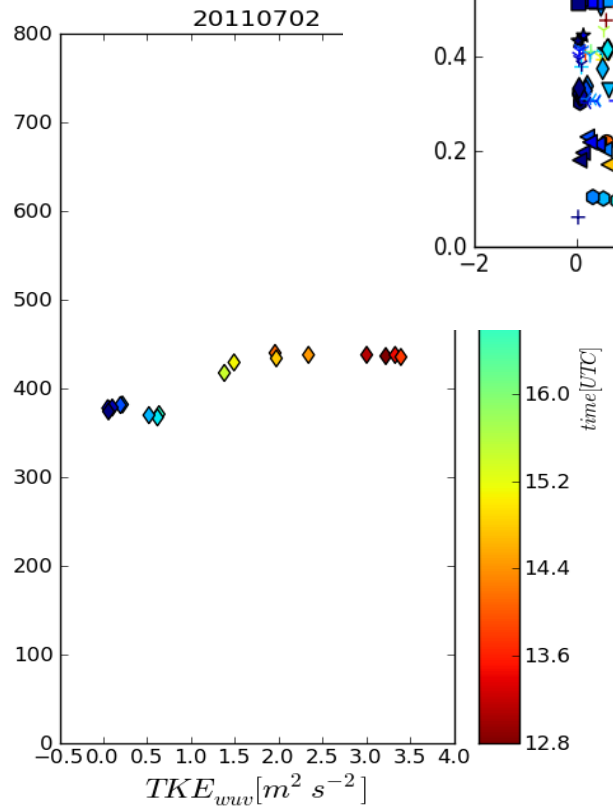


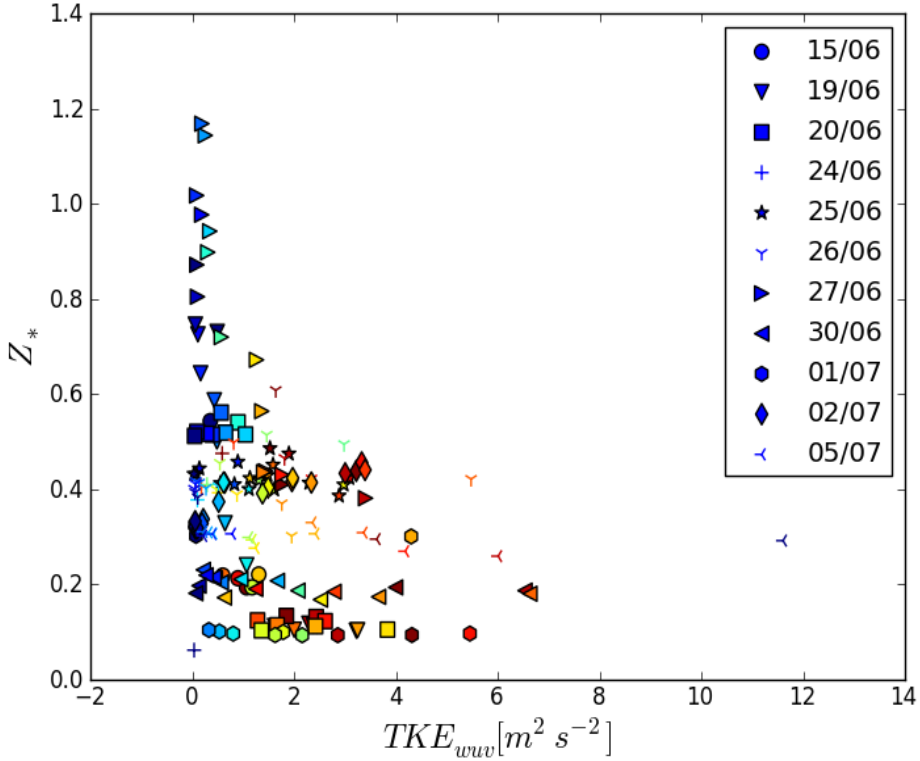
2. The turbulent parameters

→ Estimation of the TKE

- 15 days
- every 20 minutes



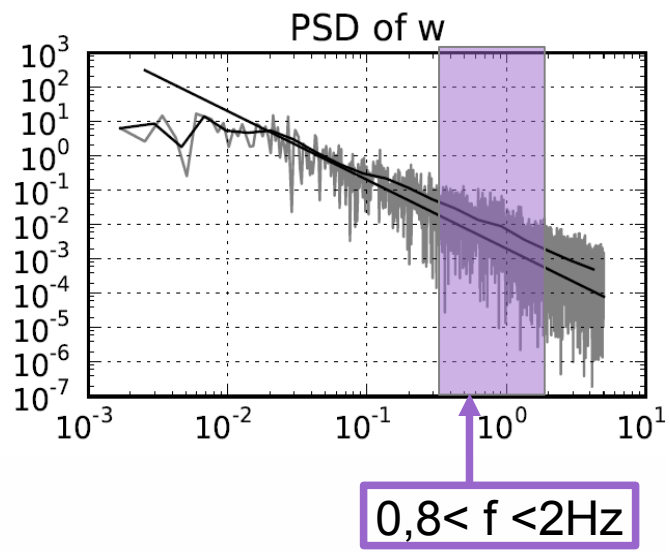


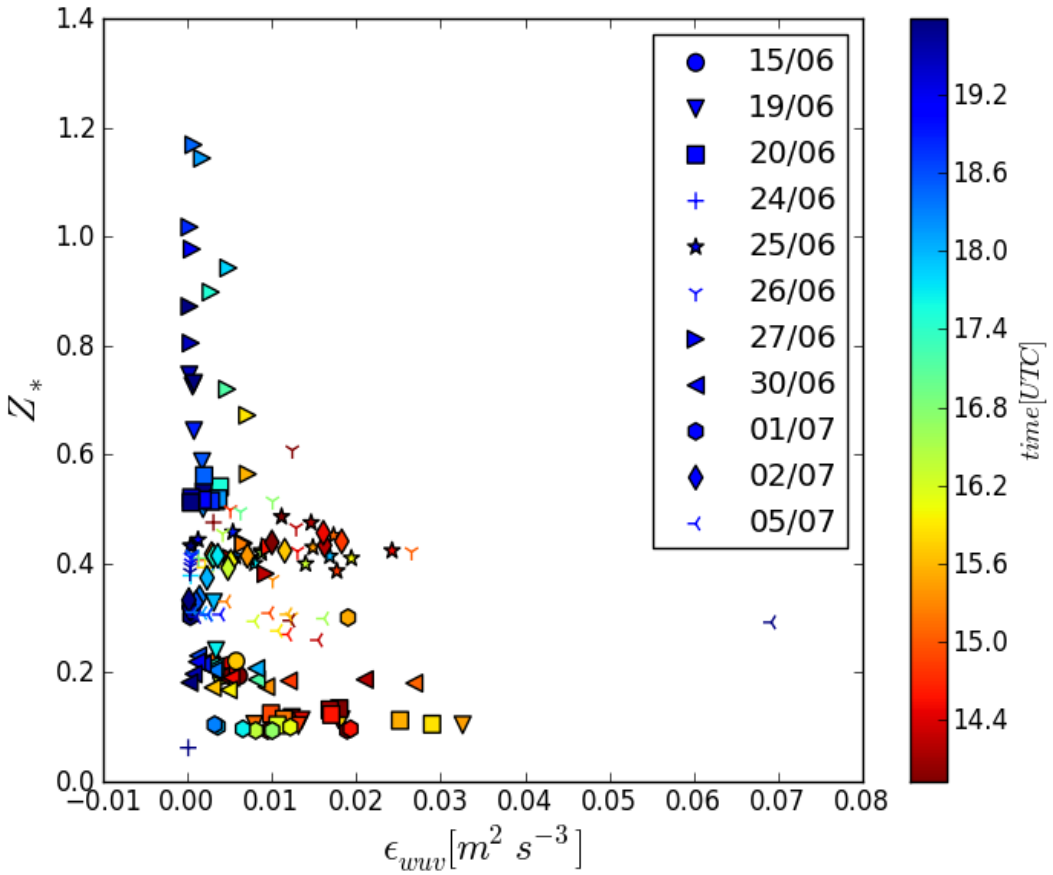


METEO FRANCE
Toujours un temps d'avance

2. The turbulent parameters

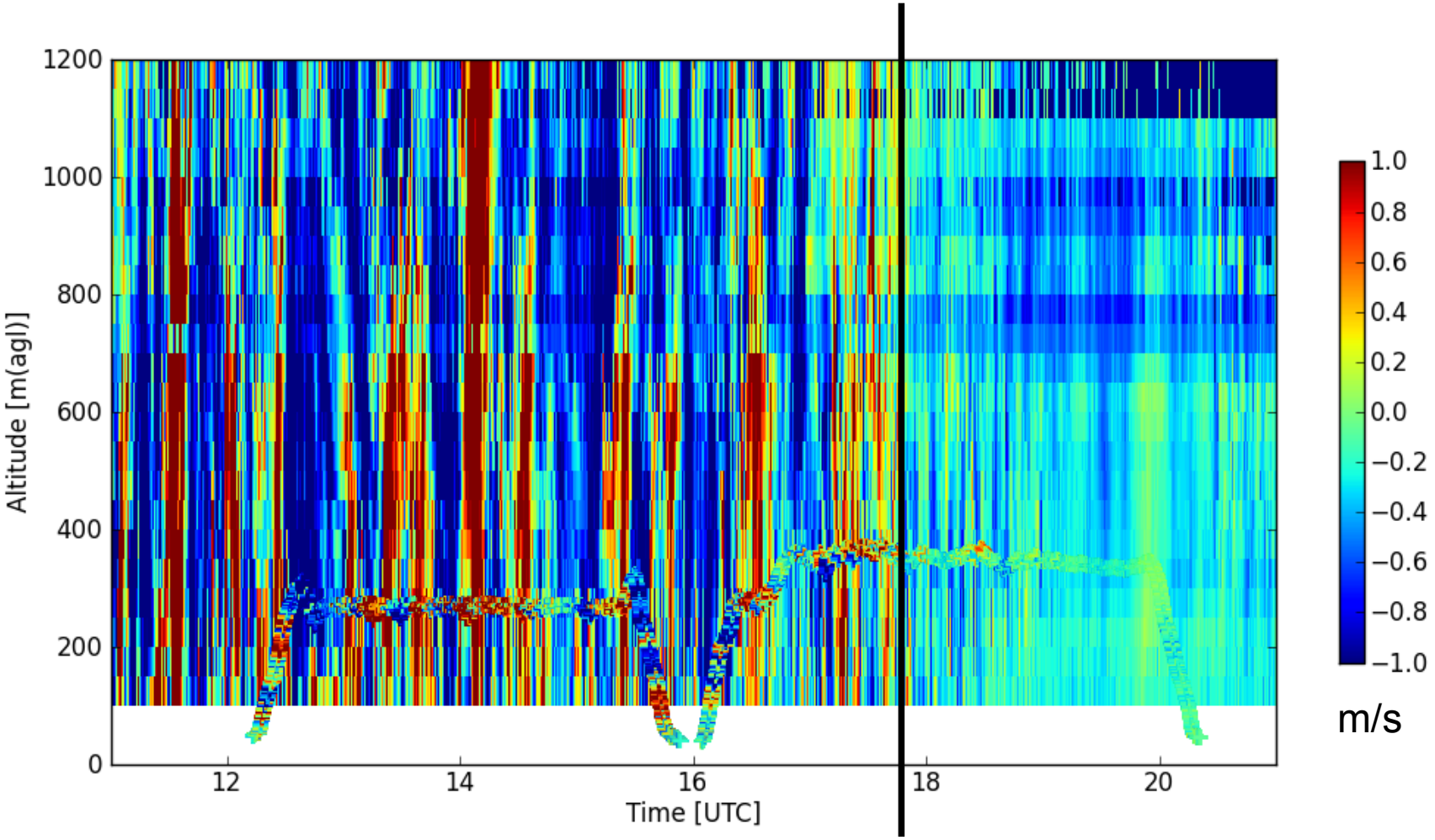
→ Estimation of the dissipation rate





METEO FRANCE
Toujours un temps d'avance

3. Balloon and windcube Lidar

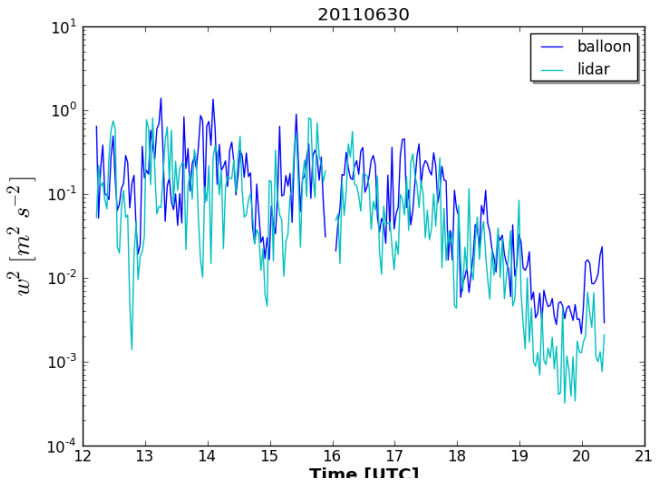


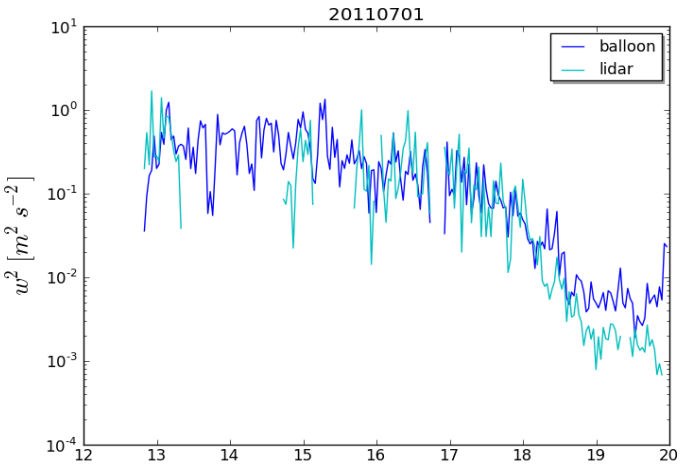
- vertical velocity measurements with Lidar & sonic anemometer
- windcube (0,25Hz)
- unfortunately, only 4 days with both data

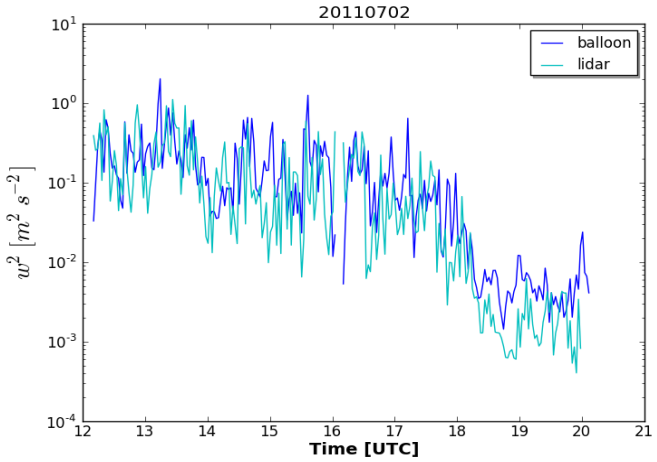
METEO FRANCE
Toujours un temps d'avance

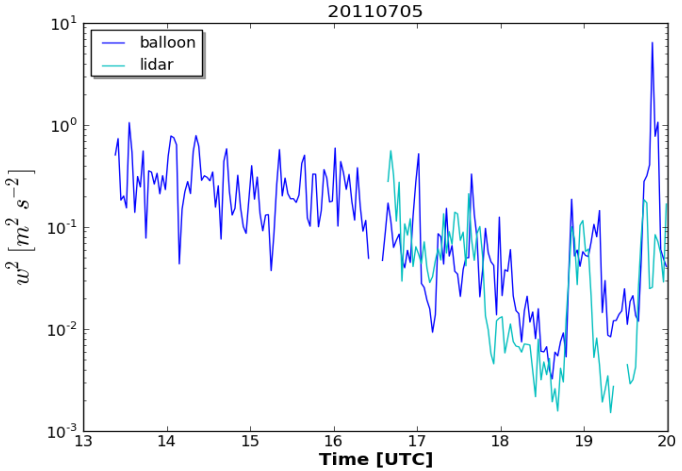
3. Balloon and windcube Lidar

- variance of vertical velocity (every 5 minutes at the similar altitude)





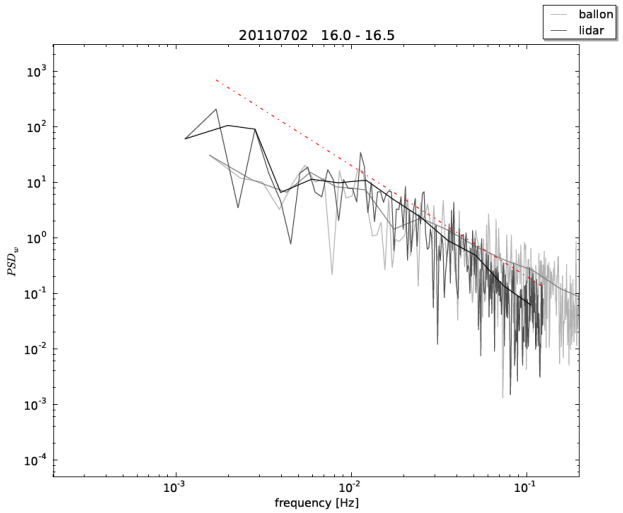


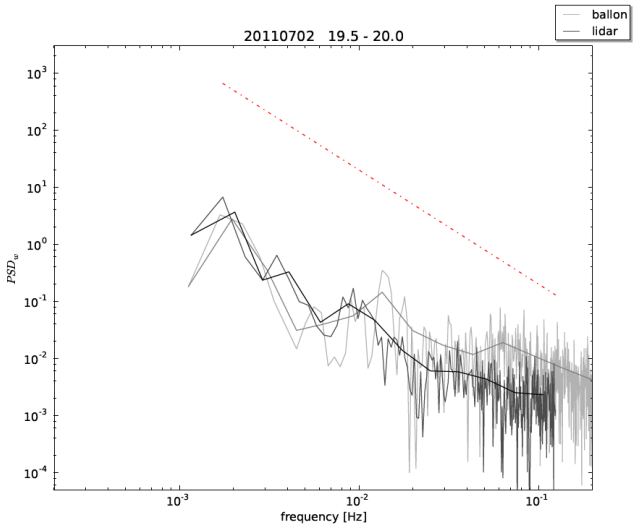


For this 4 days, the variance
from the Lidar is available at all the levels

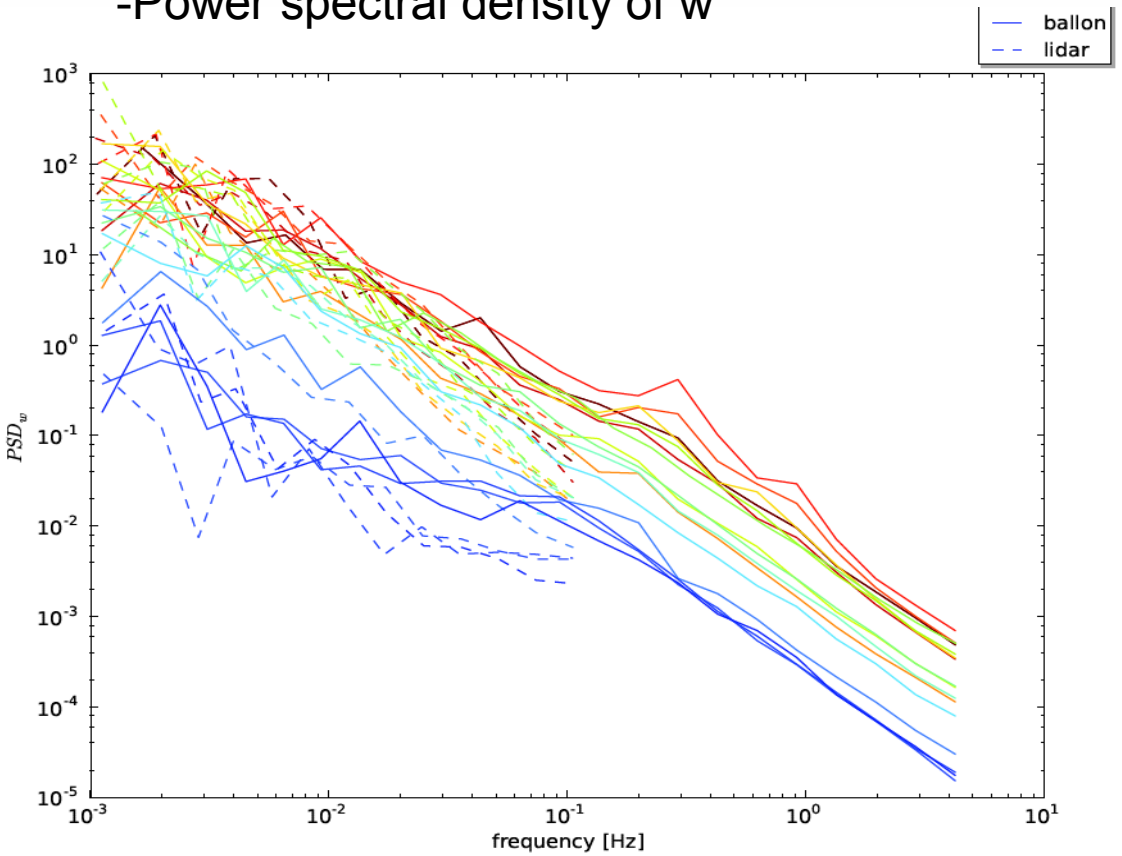
METEO FRANCE
Toujours un temps d'avance

3. Balloon and windcube Lidar





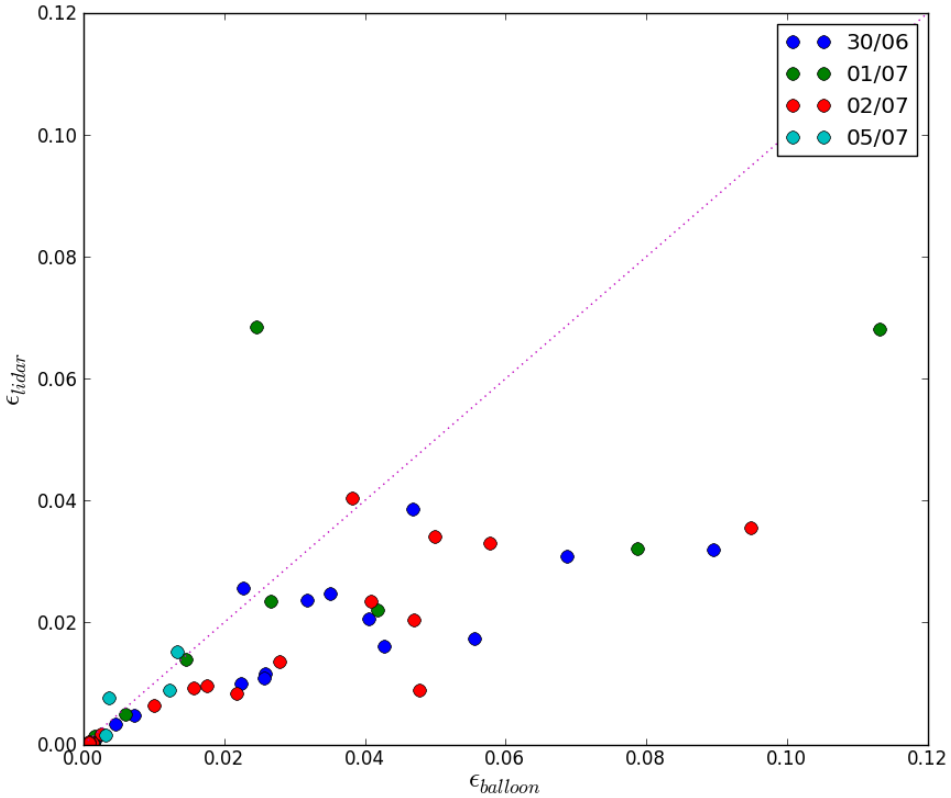
-Power spectral density of w

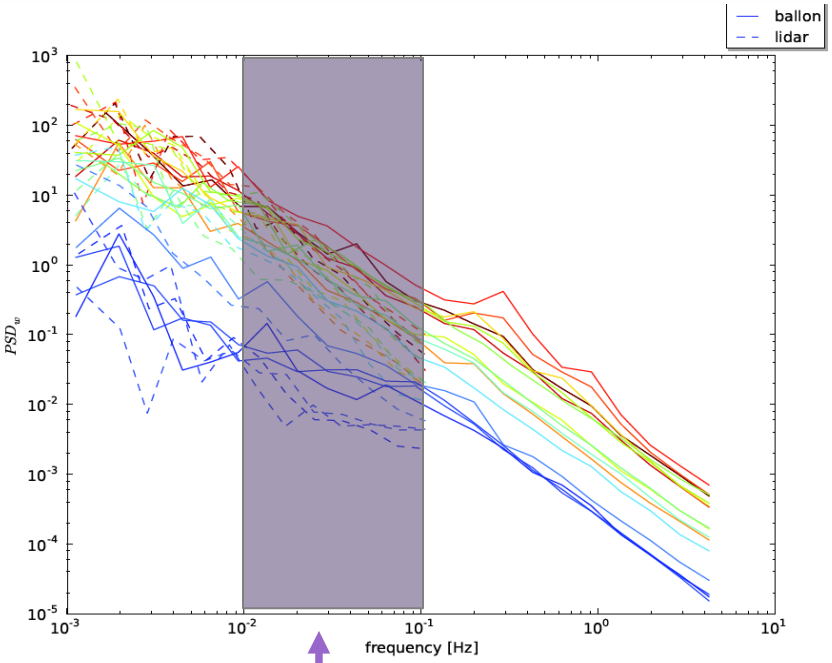


METEO FRANCE
Toujours un temps d'avance

3. Balloon and windcube Lidar

Comparison between the estimation of the Dissipation rate obtained by Lidar and sonic anemometer.





0,01< f <0,1Hz

METEO FRANCE
Toujours un temps d'avance

Conclusion & perspectives

- Data available, however it is necessary to be careful when using u and v... but we are confident that the problem is resolved quickly...

- The w from the windcube lidar at 0.25 Hz gives a good description on the vertical structure, but not below 200m.

- We plan to continue the investigation with variance measurements with Lidar (new small field campaign with a smaller temporal resolution and with the 3 wind components)

- We will start a work with the scintillometer dataset (master student)