

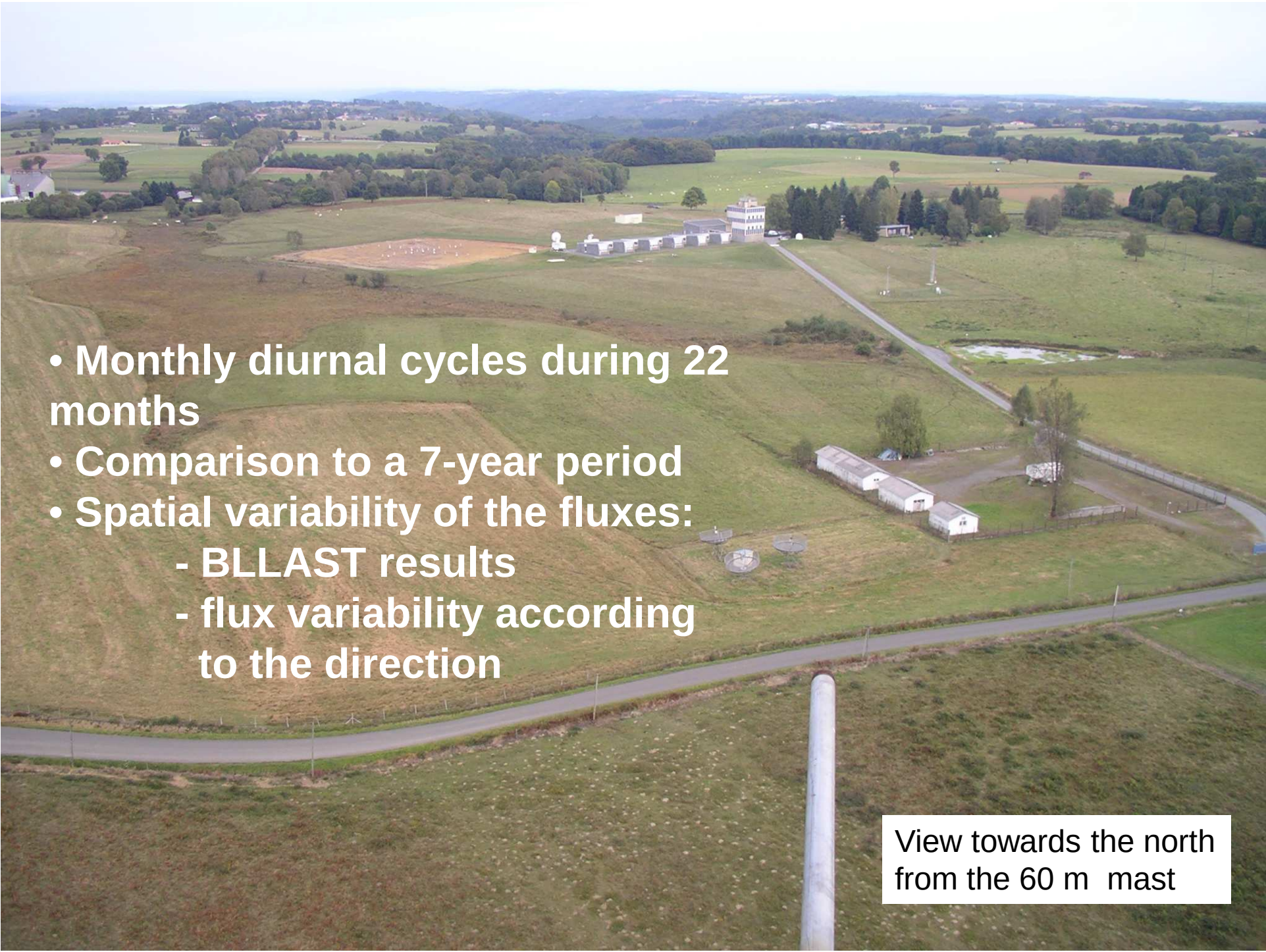
60 m mast used
for FluxPyr

2010-2012: 22 months of flux
measurements on a patchwork of
vegetation, at the Pyrénées
foothills (600m)

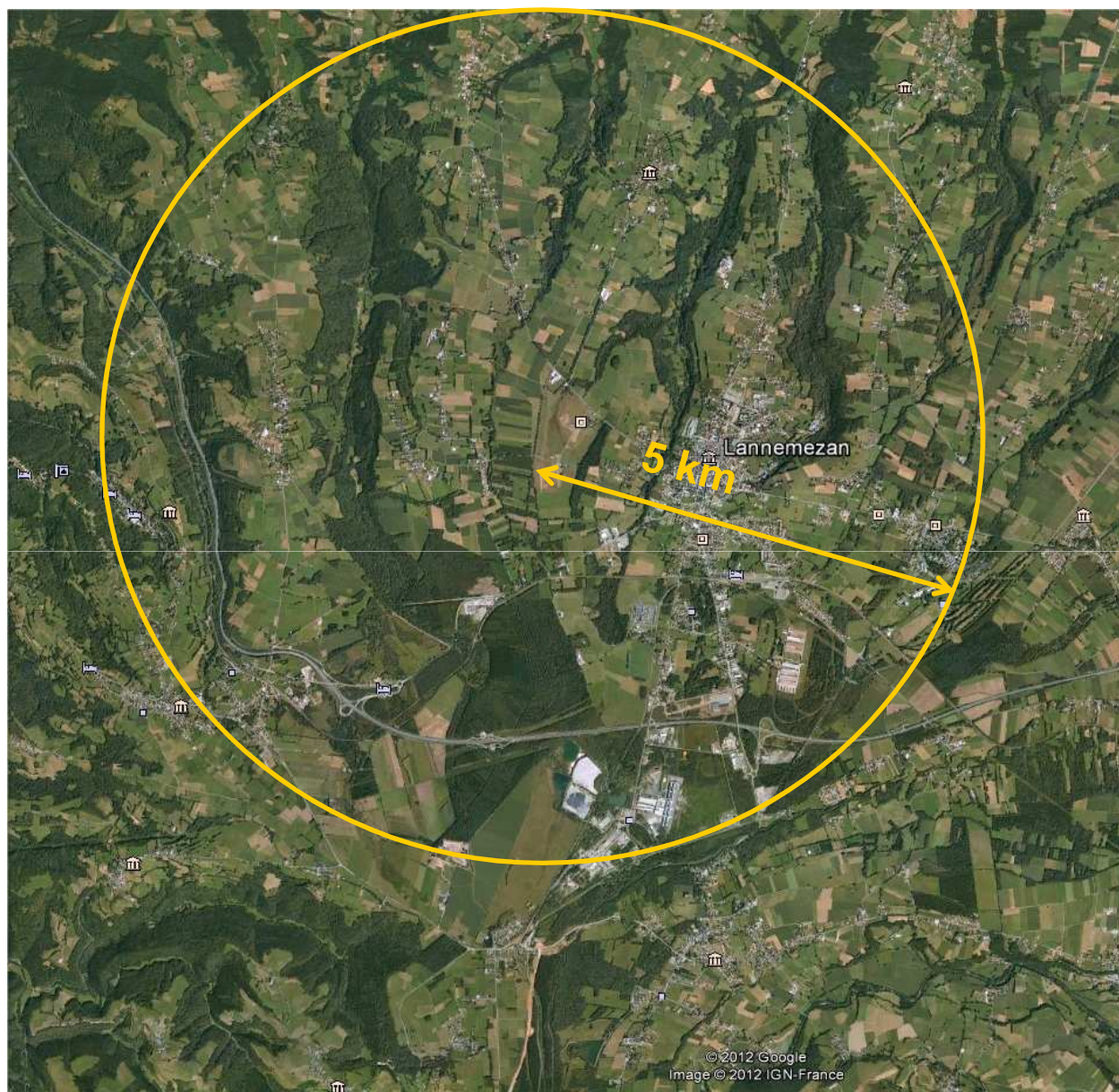
F. Saïd, S. Derrien, M. Lothon, F.
Lohou, M. Abadie, E. Pique, Y.
Bezombes, R. Rechal, J.P. Cazes,
Y. Meyerfeld, E. Bargain, S. Prieur,
C. Jarnot and J.M. Martin



UPS-LA Laboratoire d'Aérodologie : Centre de Recherches Atmosphériques
<http://www.aero.obs-mip.fr/spip.php?article739>

- 
- Monthly diurnal cycles during 22 months
 - Comparison to a 7-year period
 - Spatial variability of the fluxes:
 - BLLAST results
 - flux variability according to the direction

View towards the north
from the 60 m mast



Google view of the area. The circle radius corresponds to the air mass travel due to a 2.8 m/s wind during 30 min (samples size).

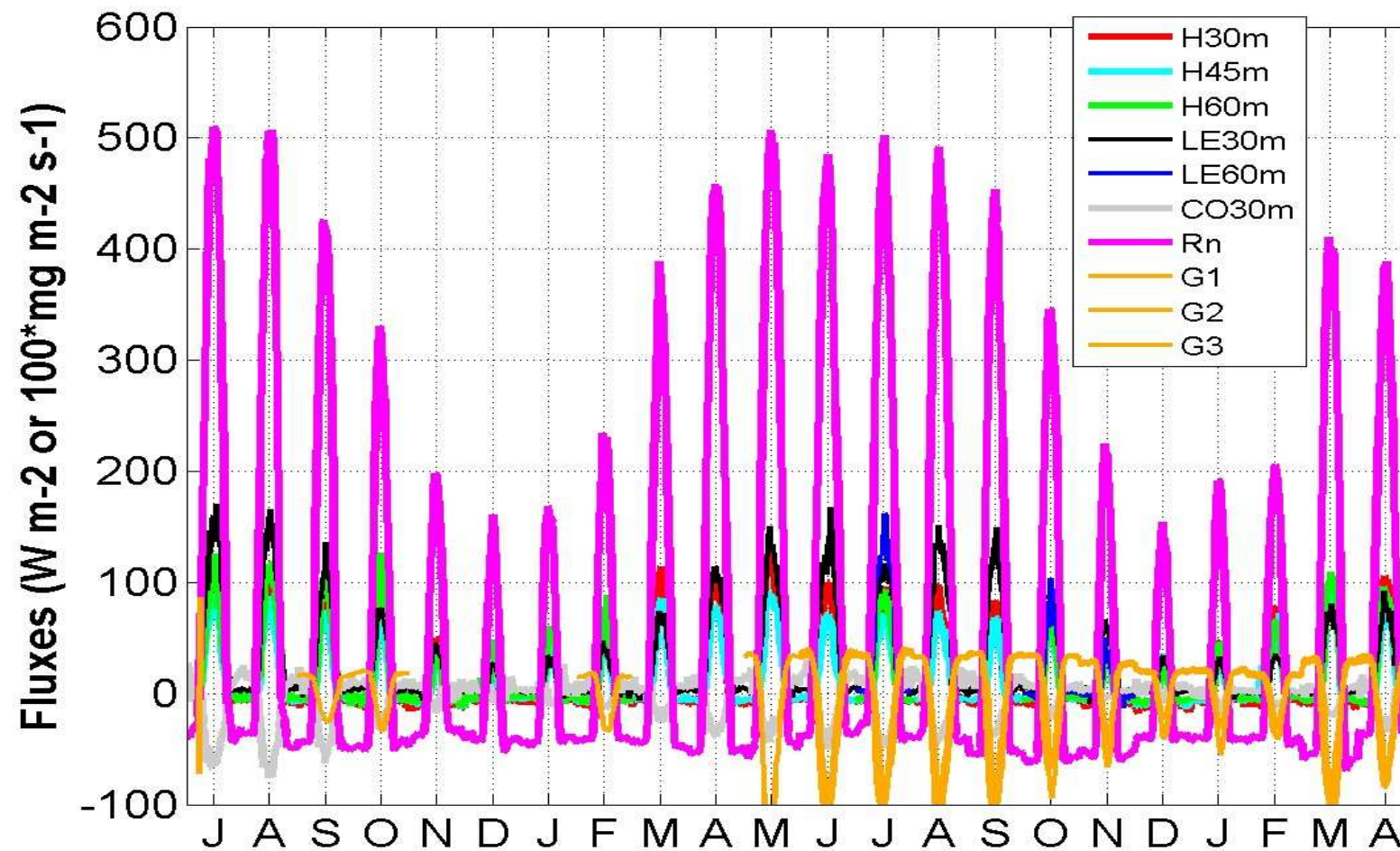
DATA RECOVERY RATE : number of data / number of potentially available data

	Data recovery %	Sensor
Wind 30 m	90-100	Csat
45 m	90-100	Gill
60 m	75-100	Csat
Sensible heat flux 30 m	72-85	Csat
45 m	80-95	Gill
60 m	73-90	Csat
Latent heat 30 m	60-80	Licor (open path)
60 m	25-65	KH20 (open path)
CO2 flux 30 m	60-80	Licor (open path)

Energy budget at the surface

$$R_n = H + LE + G$$

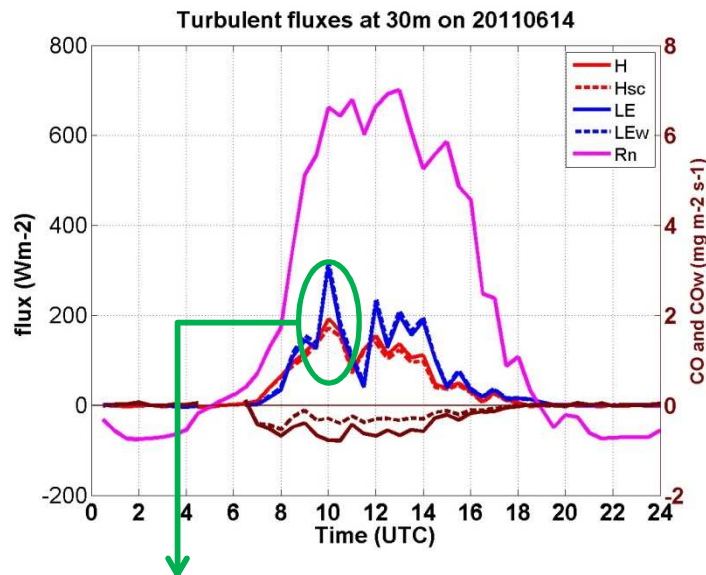
2010-2012



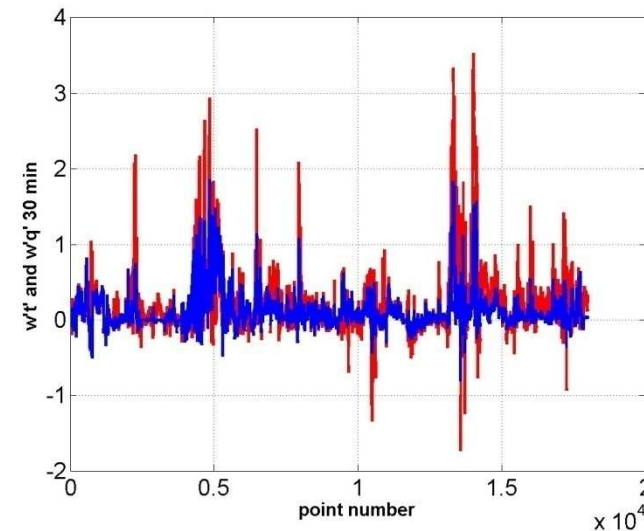
Rather level independant heat fluxes

LARGE FLUCTUATIONS BETWEEN 30 MN SAMPLES FOUND ON THE HEAT FLUXES

We gave up previous hypothesis (shelter effect on the mast, footprint , mesoscale vertical velocity) and only retained the following: mean windspeeds are weak on average and the 30 min sample length is not sufficient for the eddy correlation method to be applied.

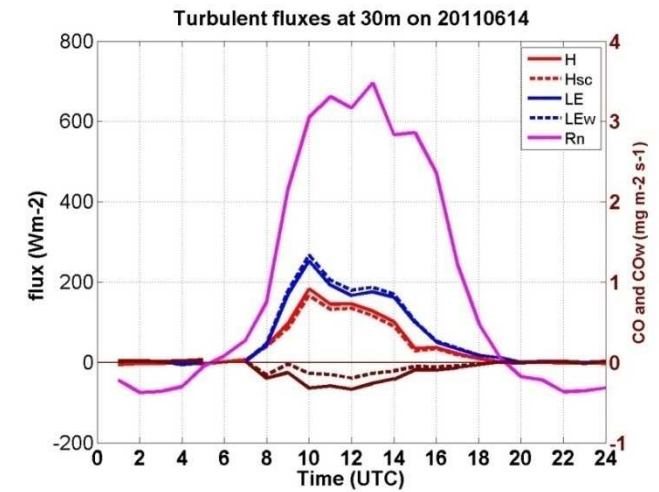
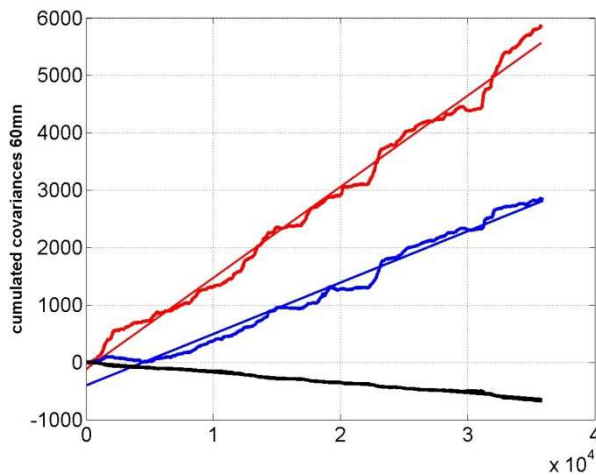
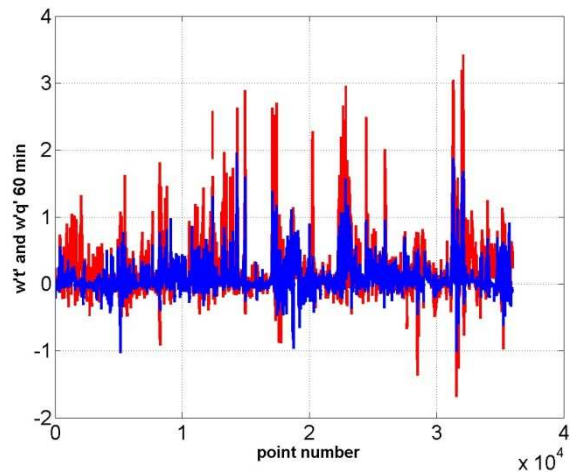
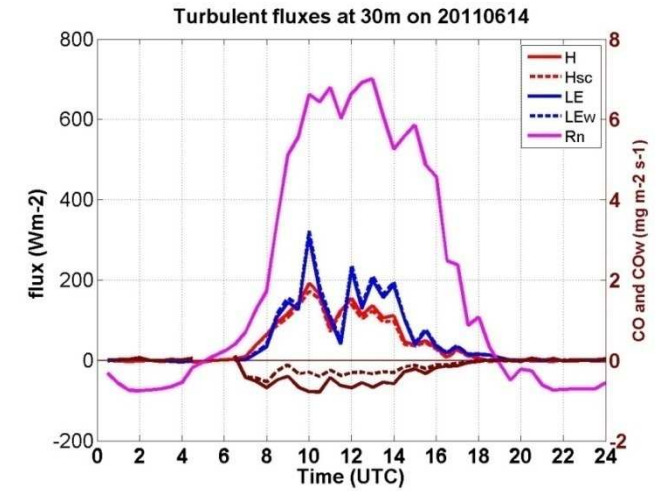
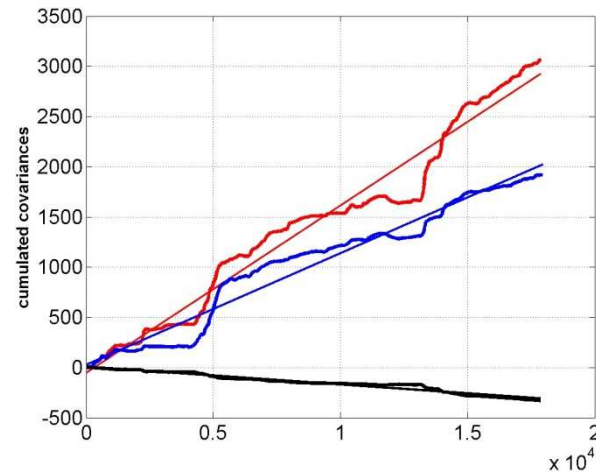
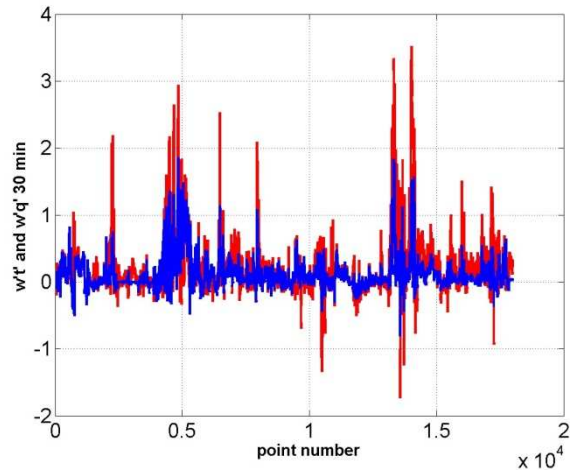


300 to 100 W/m^2 variation in 30 mn !
Wind drops from 2.5 to 2 m/s

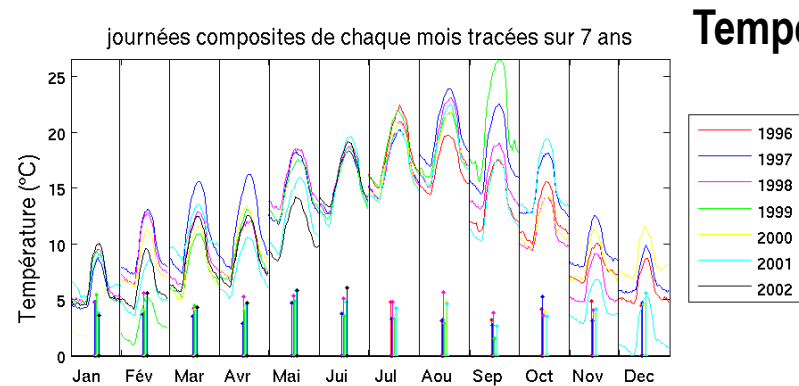


large scale events are not enough to be well represented

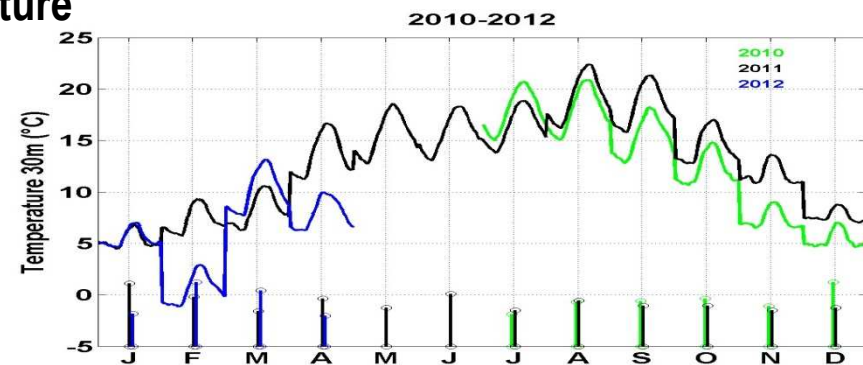
Increasing the integration duration from 30 mn (top) to 1 hour (bottom) improves the results



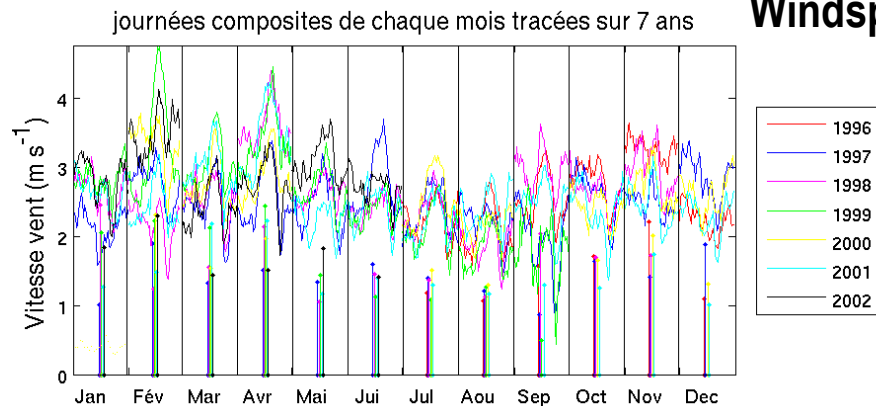
COMPARISON TO A 6-YEAR PERIOD: first steps towards a study of climatic change ...



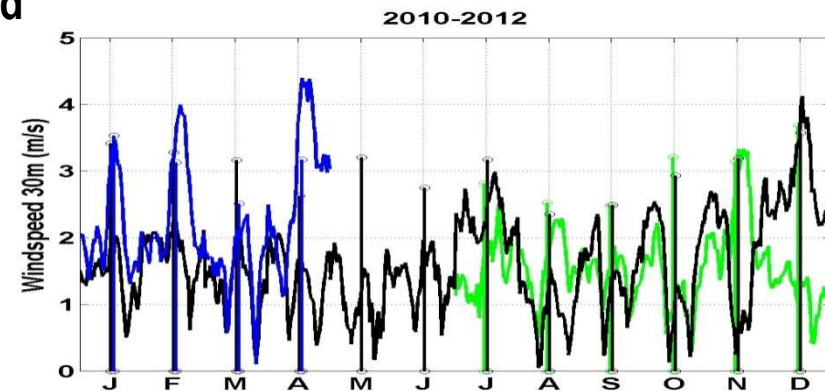
Temperature



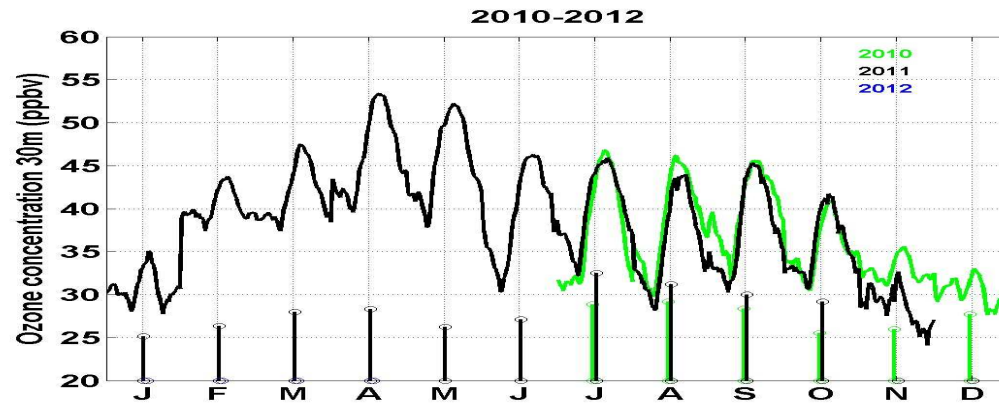
The beginning of 2012 is clearly fresher than the other years. The other month diurnal cycles and std are in the range of the first period. Same dissymetry in the annual cycle.



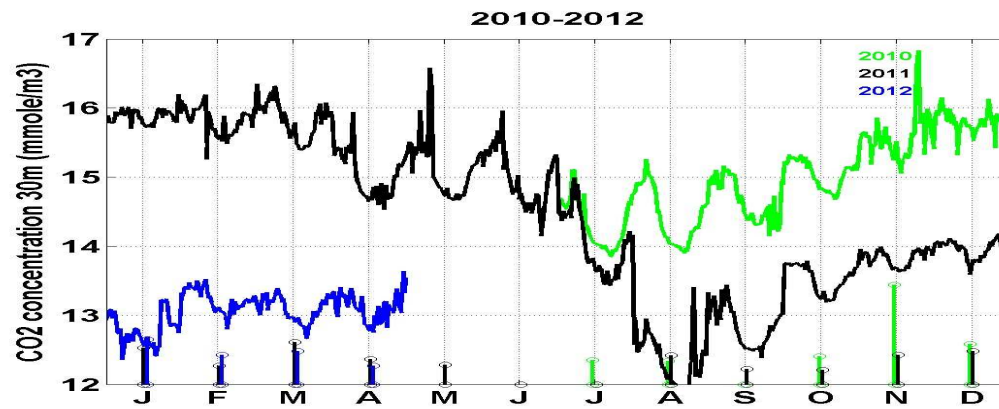
Windspeed



Lower windspeed in the past 2 years and higher variability



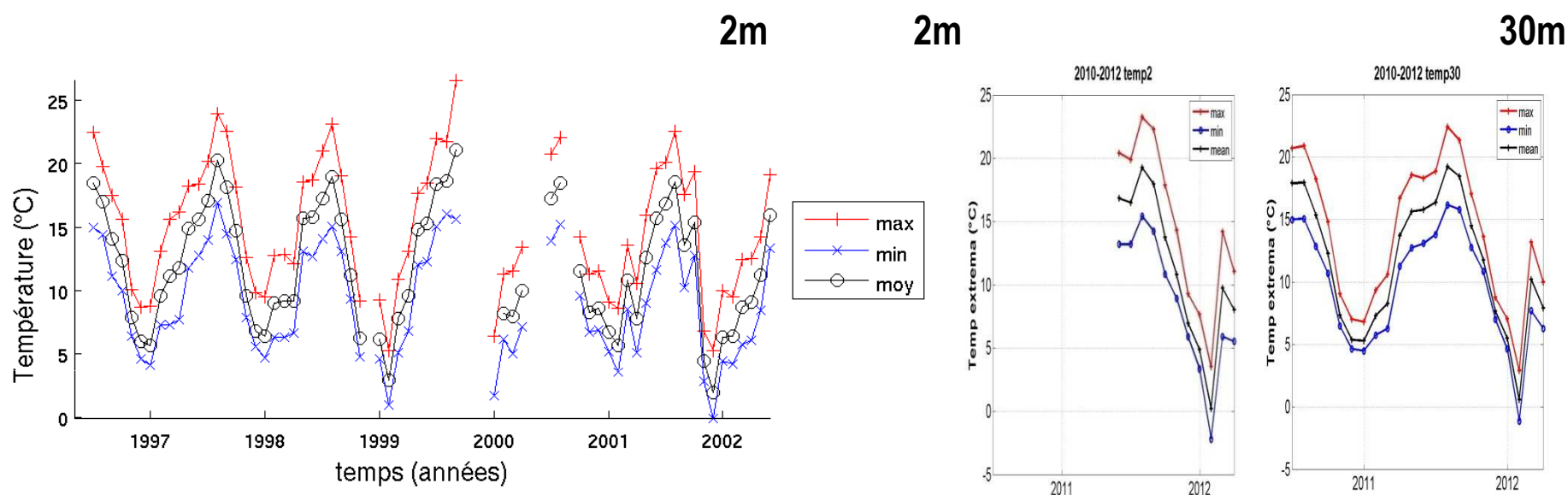
Ozone



CO2

High variability in CO2 between the years : decrease from 2010 to 2012

Evolution of the temperature extrema (min and max from monthly composite days) and of the mean temperature for the 1996-2002 period (left) and 2010-2012 period (right)



The slight decreasing tendency that appeared during the five years is not confirmed after 10 years (2010-2011) even if 2012 is clearly colder.

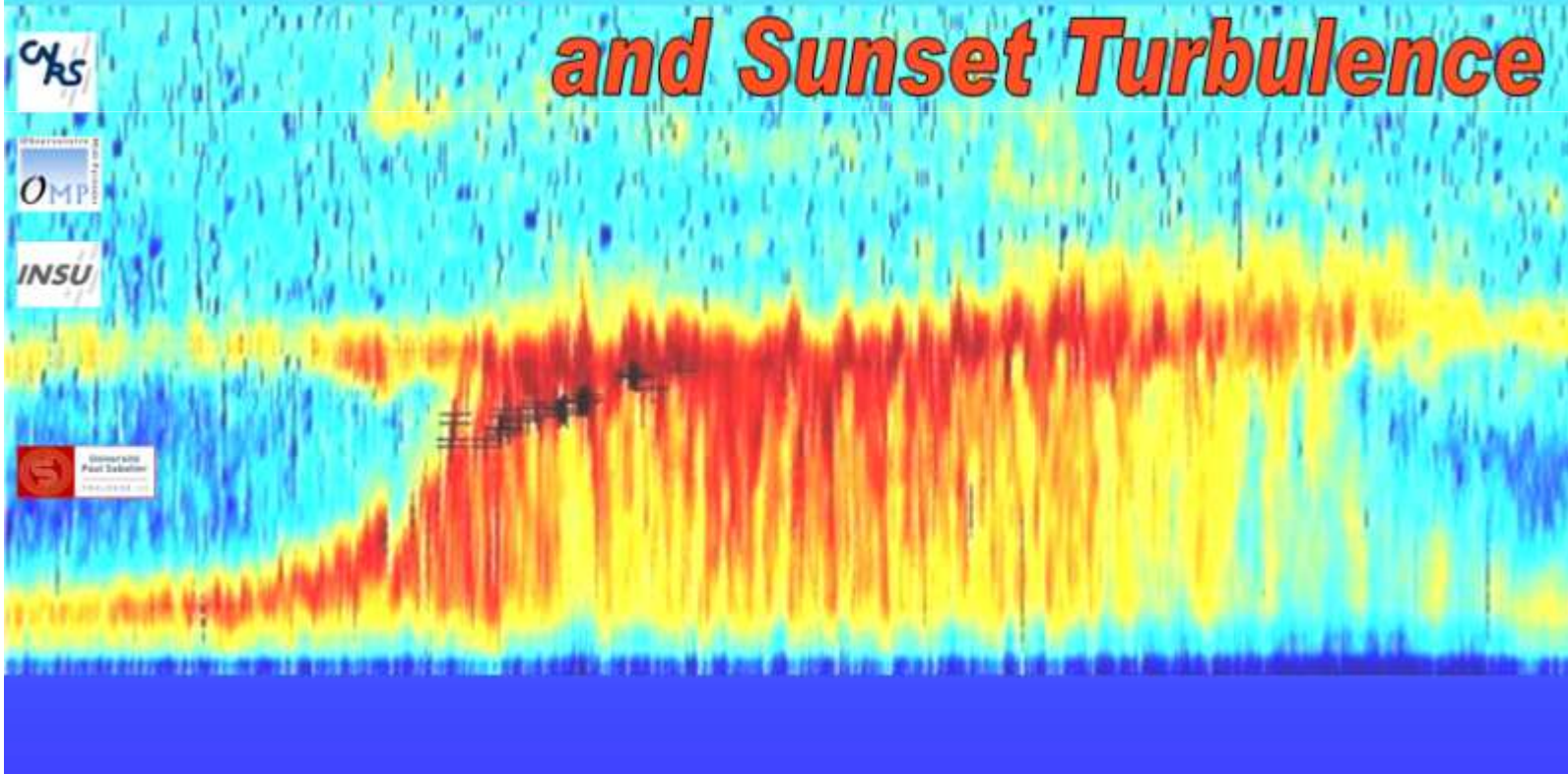
SPATIAL VARIABILITY OF THE FLUXES

BLLAST experiment

BLLAST

15 June- 10 July 2011

*Boundary Layer Late Afternoon
and Sunset Turbulence*



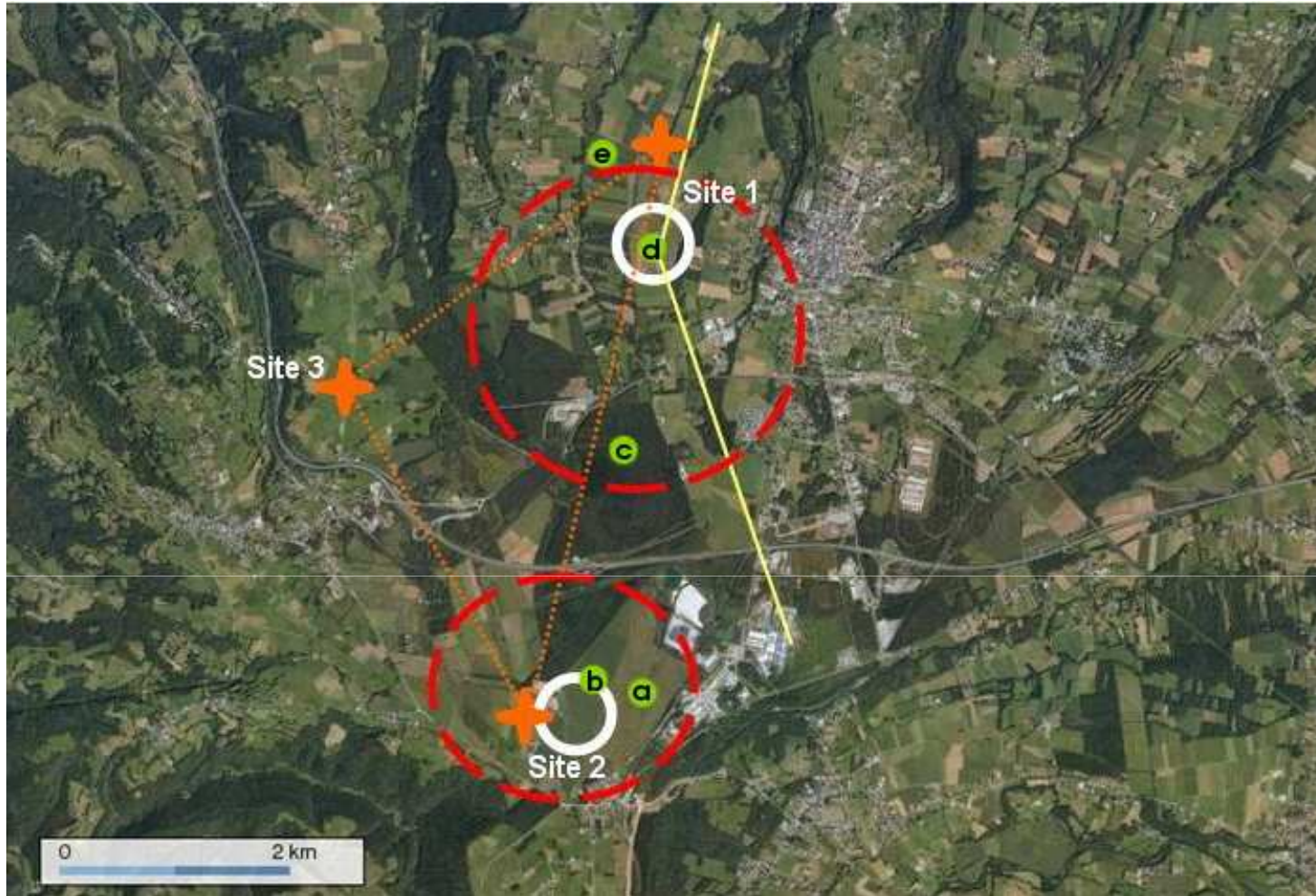
Coordinated by Marie Lothon from Laboratoire d'Aérodologie, this project is an international experiment that brings together research scientists who work on this transitory part of the day, where :

- all competitive forcings are weak,**
- turbulence is decaying**
- the boundary layer is beginning to stratify, at the end of a convective day.**

This transition remains poorly understood, though it may have significant impacts on trace gas transport and scale interaction.

It took place at the Centre de Recherches Atmosphériques de Campistrous.

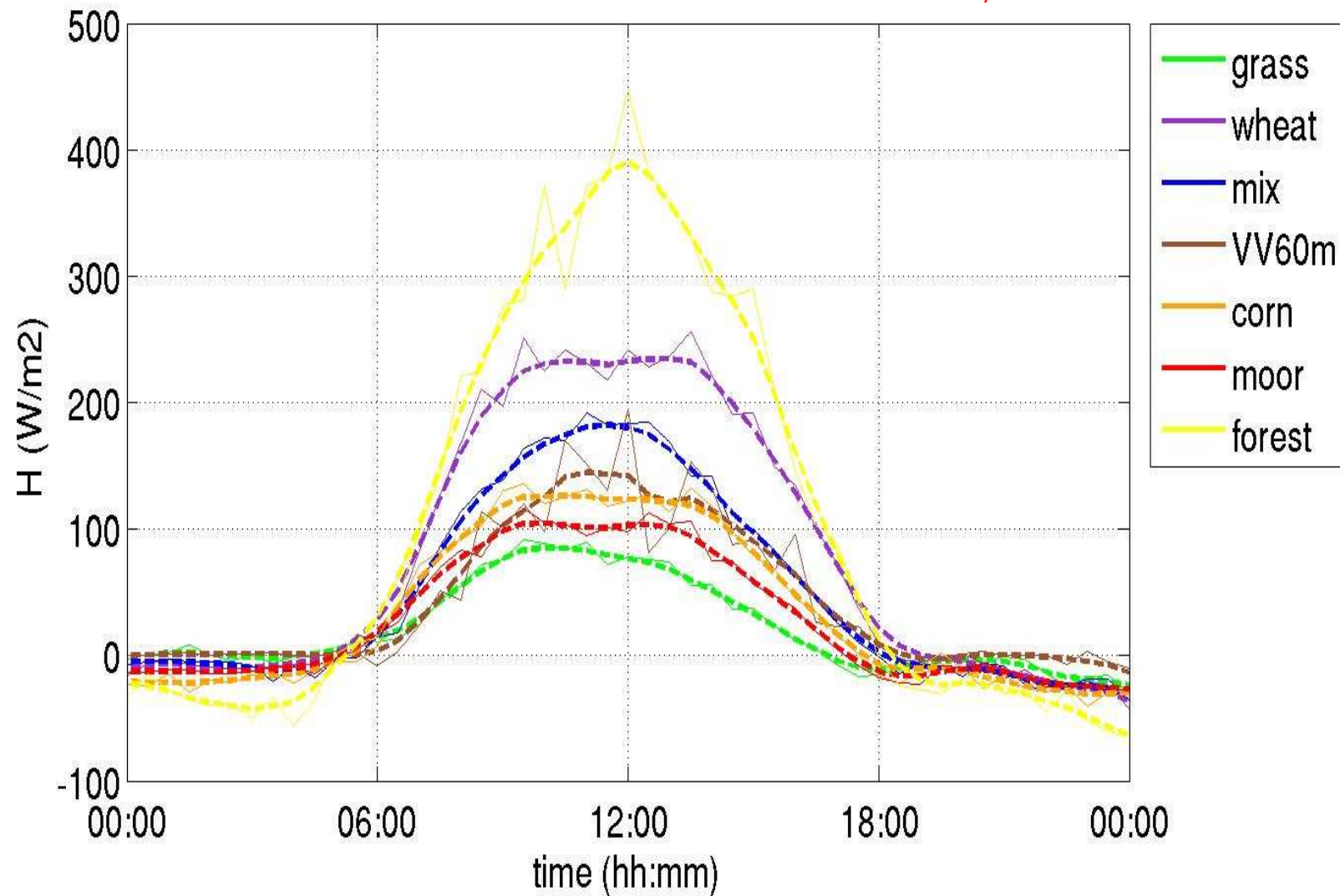
<http://bllast.sedoo.fr/>



Surface stations over various surfaces: (a) moor, (b) corn, (c) forest, (d) prairies, 60 m tower, (e) wheat, grass and edge. The orange dotted triangle indicates the profiler network, and the yellow lines represent the paths of the two larger aperture + balloons (rawisonds and tethered), aircraft and remotely piloted aircraft systems, scintillometers (Lothon et al., to be submitted to BAMS) .

POI 5

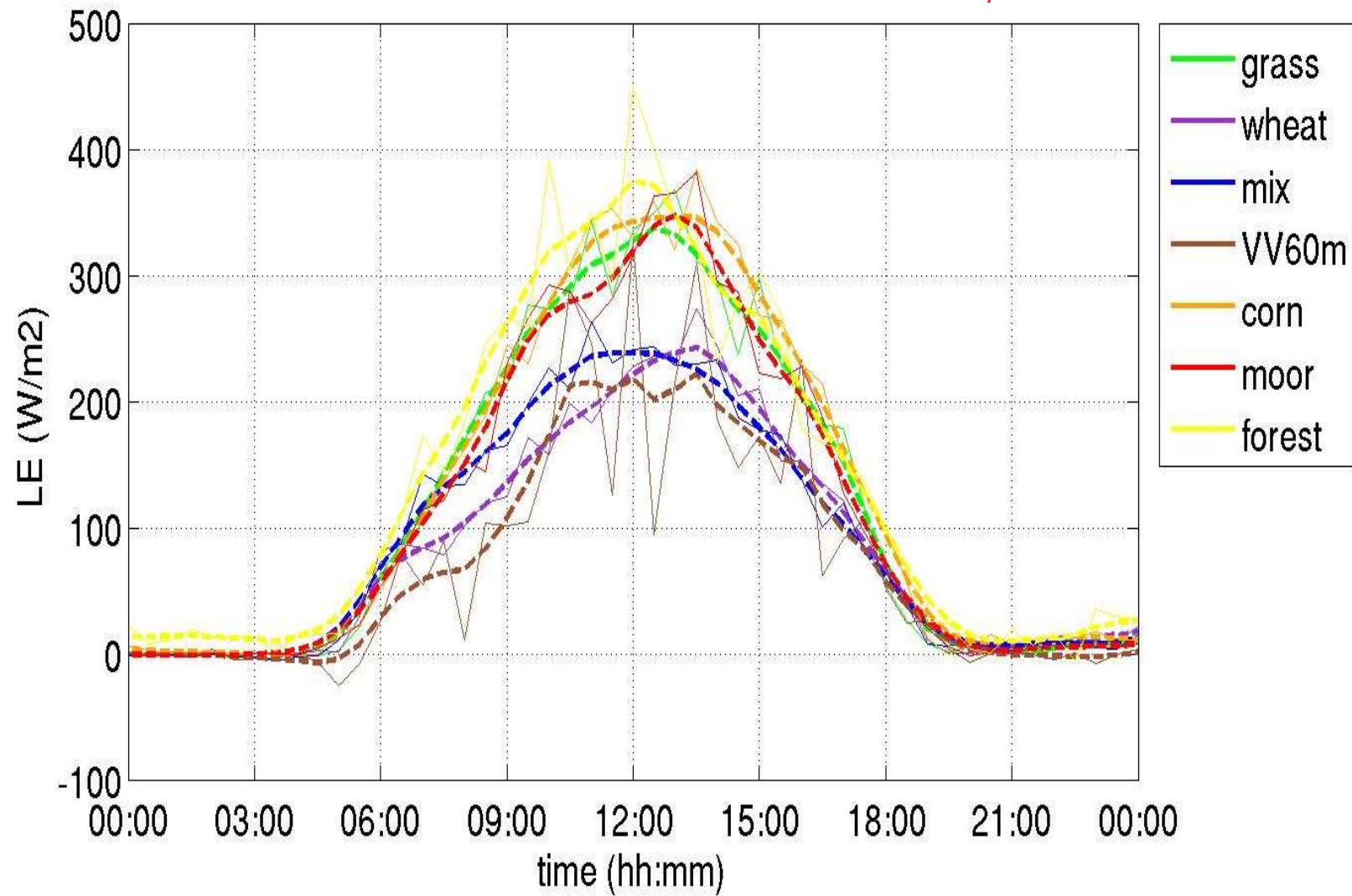
Lohou et al., Laboratoire d'Aérodynamique)



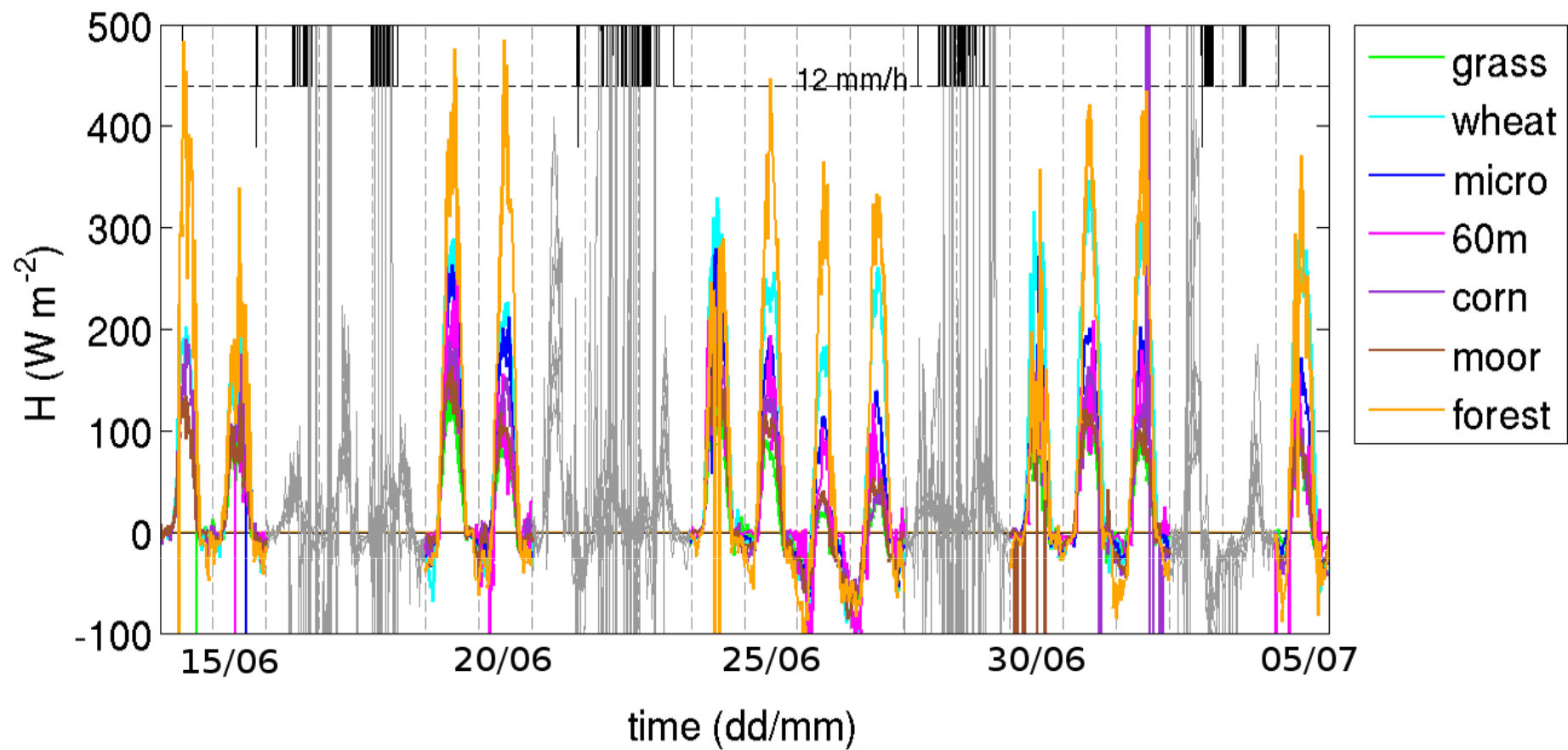
The 60 m mast sensible heat flux on June 25 represents an average of the other surface fluxes.

POI 5

Lohou et al., Laboratoire d'Aérodynamique)



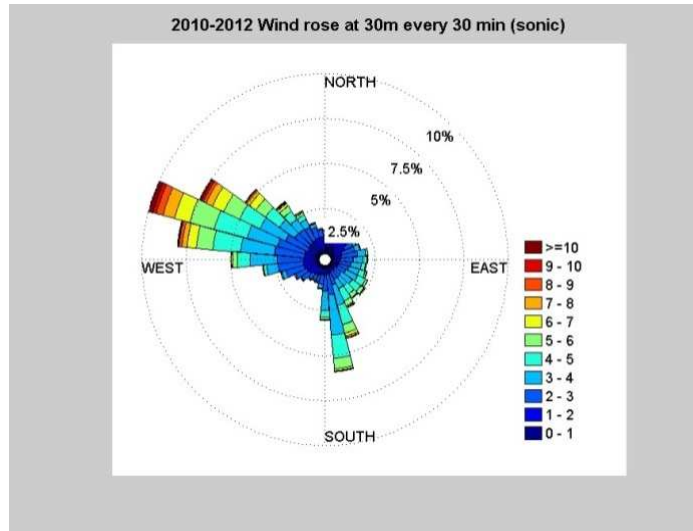
The latent heat flux is closer to the wheat and mixed surfaces



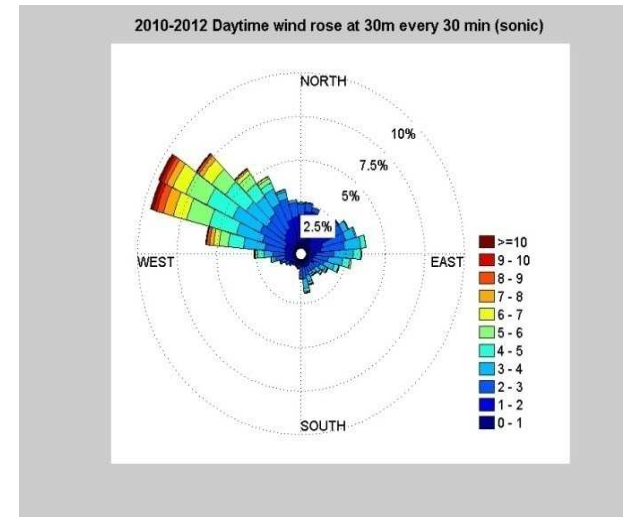
IOP's during BLLAST (Lothon et al. to be submitted to BAMS). Same comment as previous one for June 25

SPATIAL VARIABILITY OF THE FLUXES

Distribution relative to the wind direction



Wind distribution at 30 m
during 22 months (days
and nights)

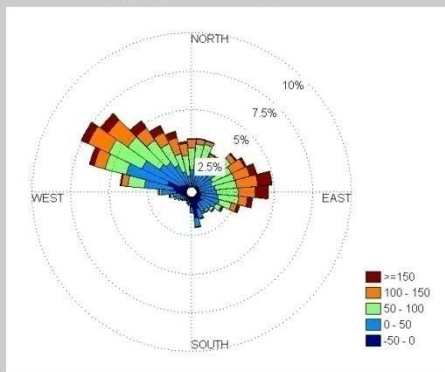


Wind distribution at 30 m
during 22 months (only
daytime)

Distribution of the fluxes (30m) according to the wind direction (nice weather and daytime conditions)

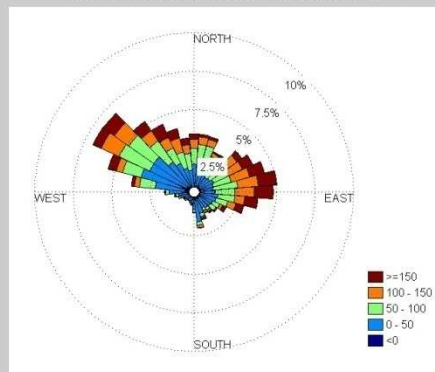
Sensible heat flux

2010-2012 Sensible heat flux at 30m (every 30 min)



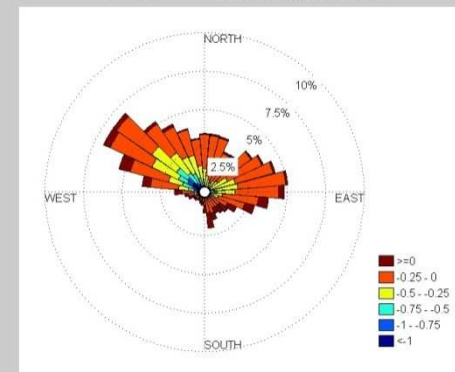
Latent heat flux

2010-2012 Latent heat flux at 30m (every 30 min)



CO2 flux

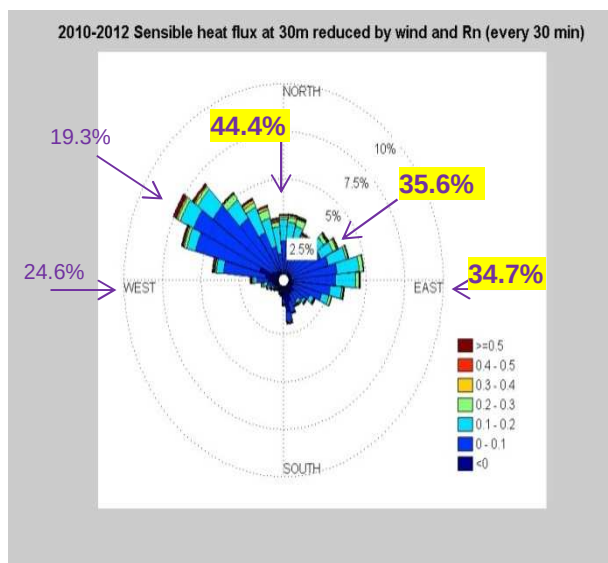
2010-2012 CO2 flux at 30m (every 30 min)



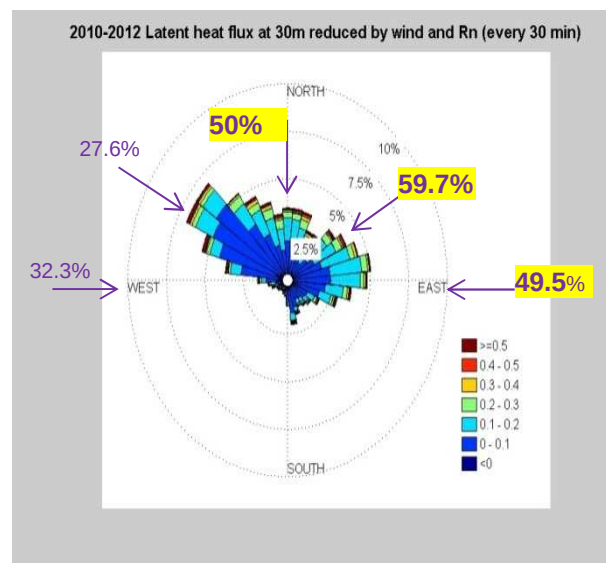
No clear tendency. Perhaps higher fluxes in the 90° sector (nicer days) → fluxes were reduced relative to the wind speed and net radiation flux

Distribution of reduced fluxes (by windspeed and Rn) according to the wind direction (nice weather and daytime conditions)

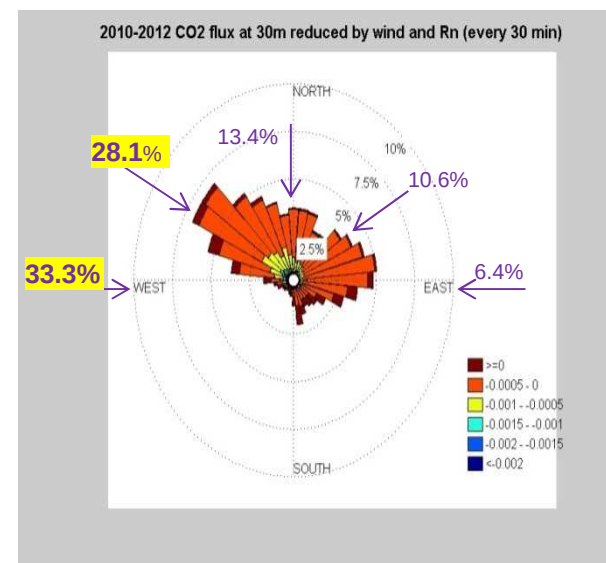
Sensible heat flux



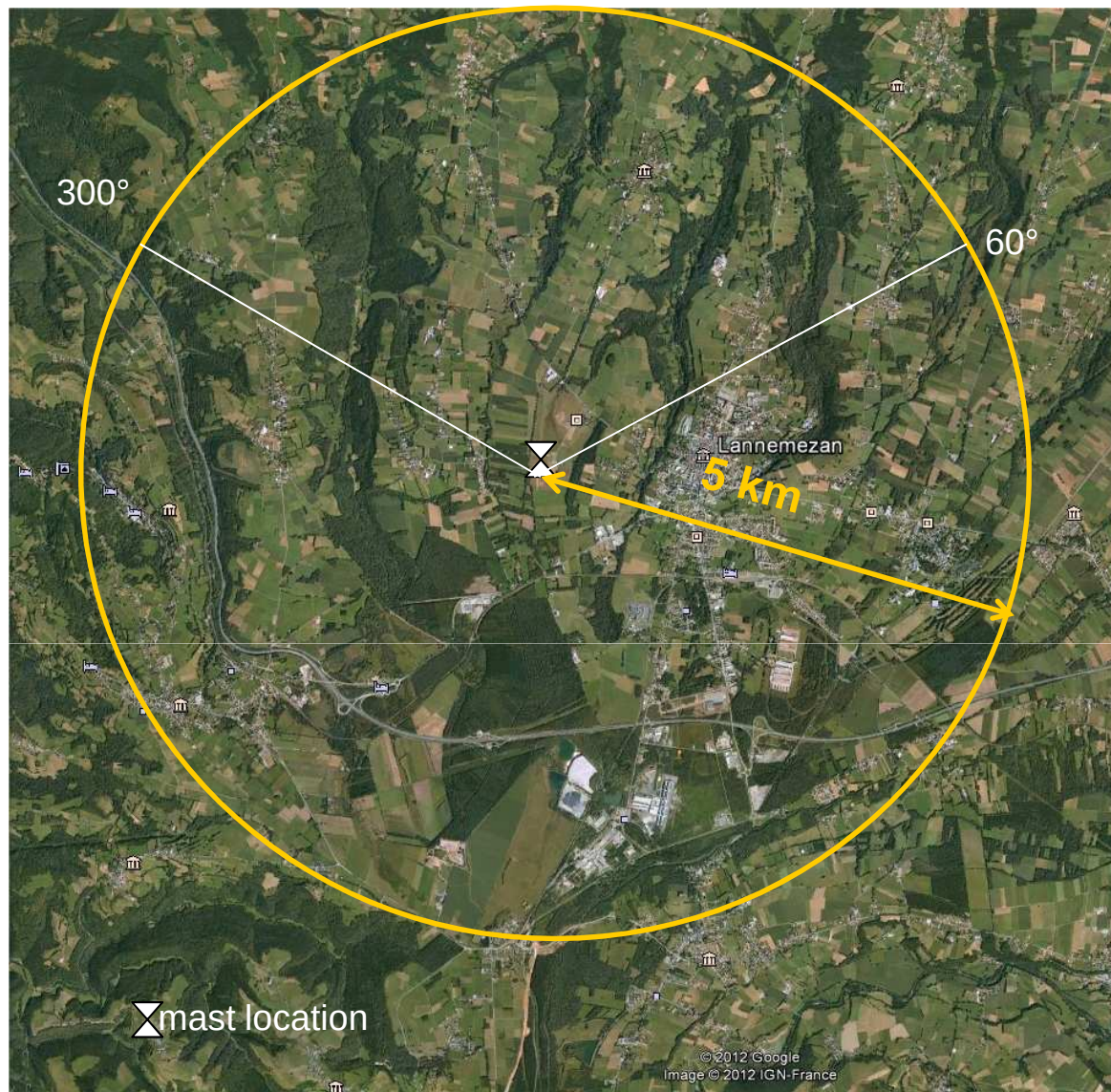
Latent heat flux



CO2 flux



Higher heat fluxes in the north-eastern sector but higher CO2 fluxes in the western sector.



To be done

- **No climatic tendency yet so necessity to GO AHEAD to collect a larger period!**
- **study the footprint. Compare to model outputs.**
- **compare with the 2 m mast in grassland when available**
- **to be mentioned: a study of characteristic patterns of meteorological situations has been started with the Vasco University using surface data (Pic du Midi and Lannemezan) and also boundary layer data from wind profilers + reanalysis.**