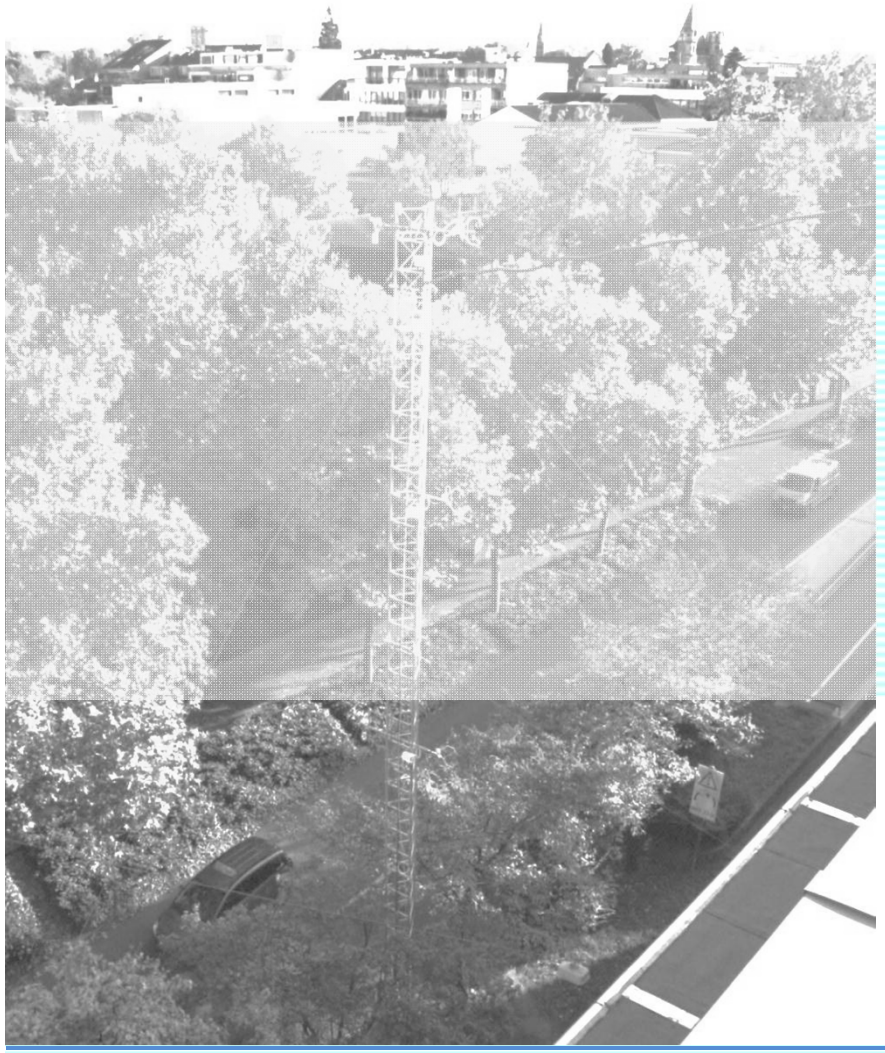

Variability of CO_2 in an urban environment:
from street canyon to neighborhood scale

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Outline

- **Background /Motivation**
  Why measuring CO_2 in urban environments
- **Experiment**
  Goal, Sites, Setup
- **Results**
  Mean diurnal patterns of CO_2 concentrations and fluxes
- **Summary, Conclusions & Outlook**

Background / Motivation

Why measuring CO_2 in urban environments

Modeling the global carbon cycle:
Quantifying the role of cities is a crucial part and not well known today.

Methodological uncertainties:
Limitations of single-point measurements in complex urban environment.

Reliability of micrometeorological standard-methods in urban environments?

Experiment

Goal

Investigation of micro to local scale variability of
CO_2 concentrations and fluxes in a dense urban environment.

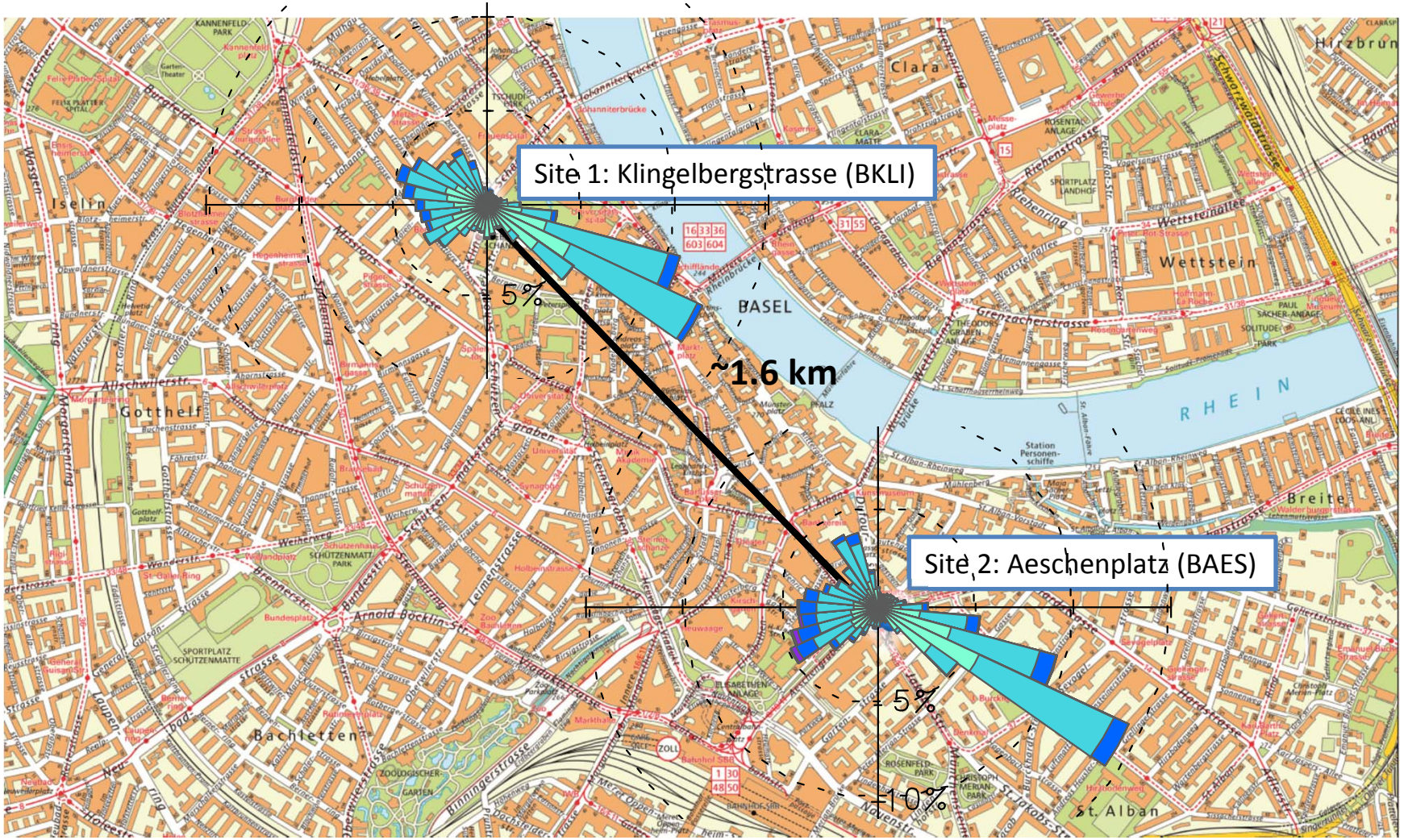
Focus

1. Comparison of two urban CO_2-flux sites over more than one year.
2. Micro to local-scale CO_2-exchange processes in and above a street canyon.

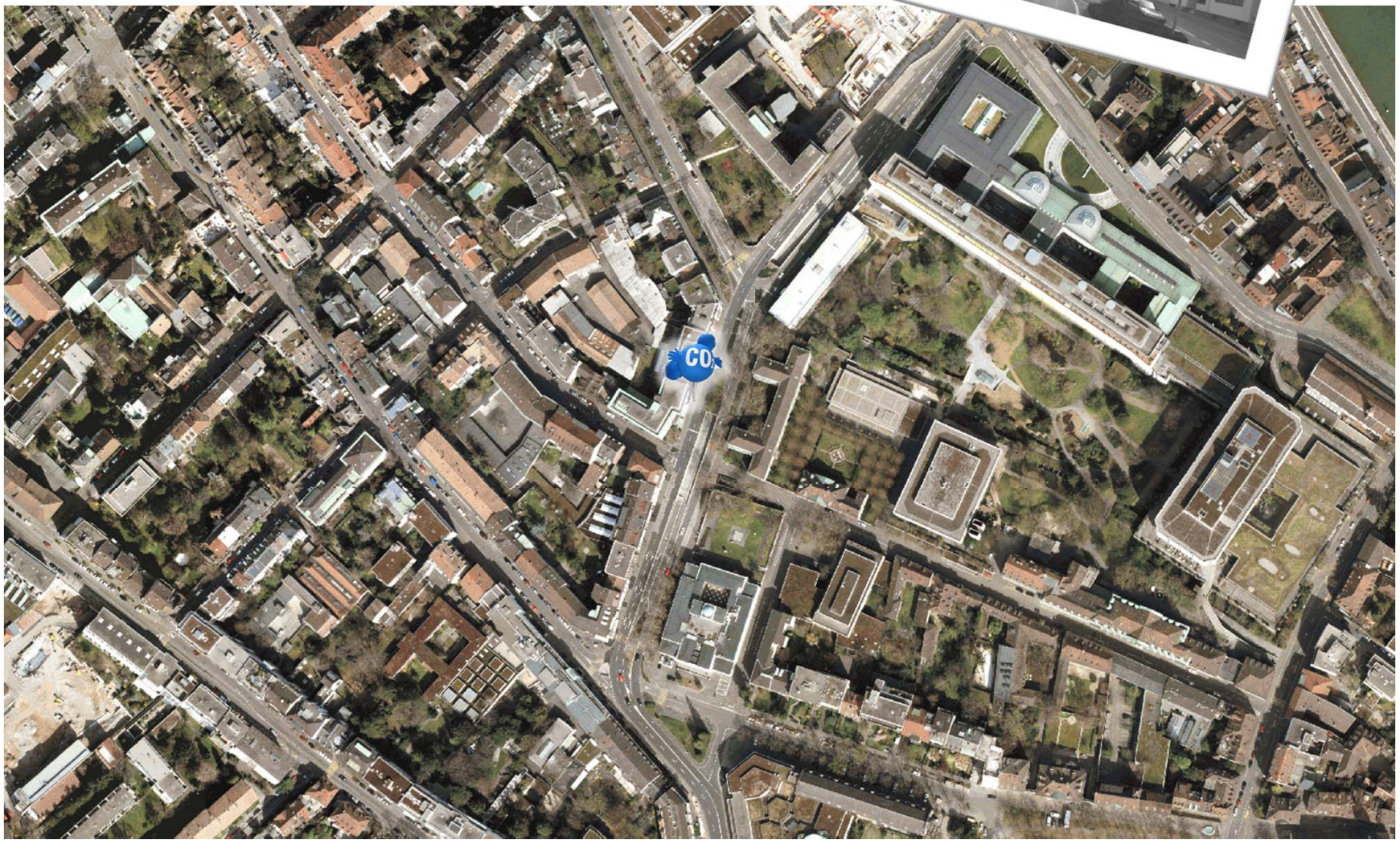
Measurements

Basel, Switzerland. June 2009 to March 2011
(Data period: 15.10.2009 - 17.01.2011, ~15 months)

Experiment: Sites



Site 1: Basel, Klingelbergstrasse (BKLI)



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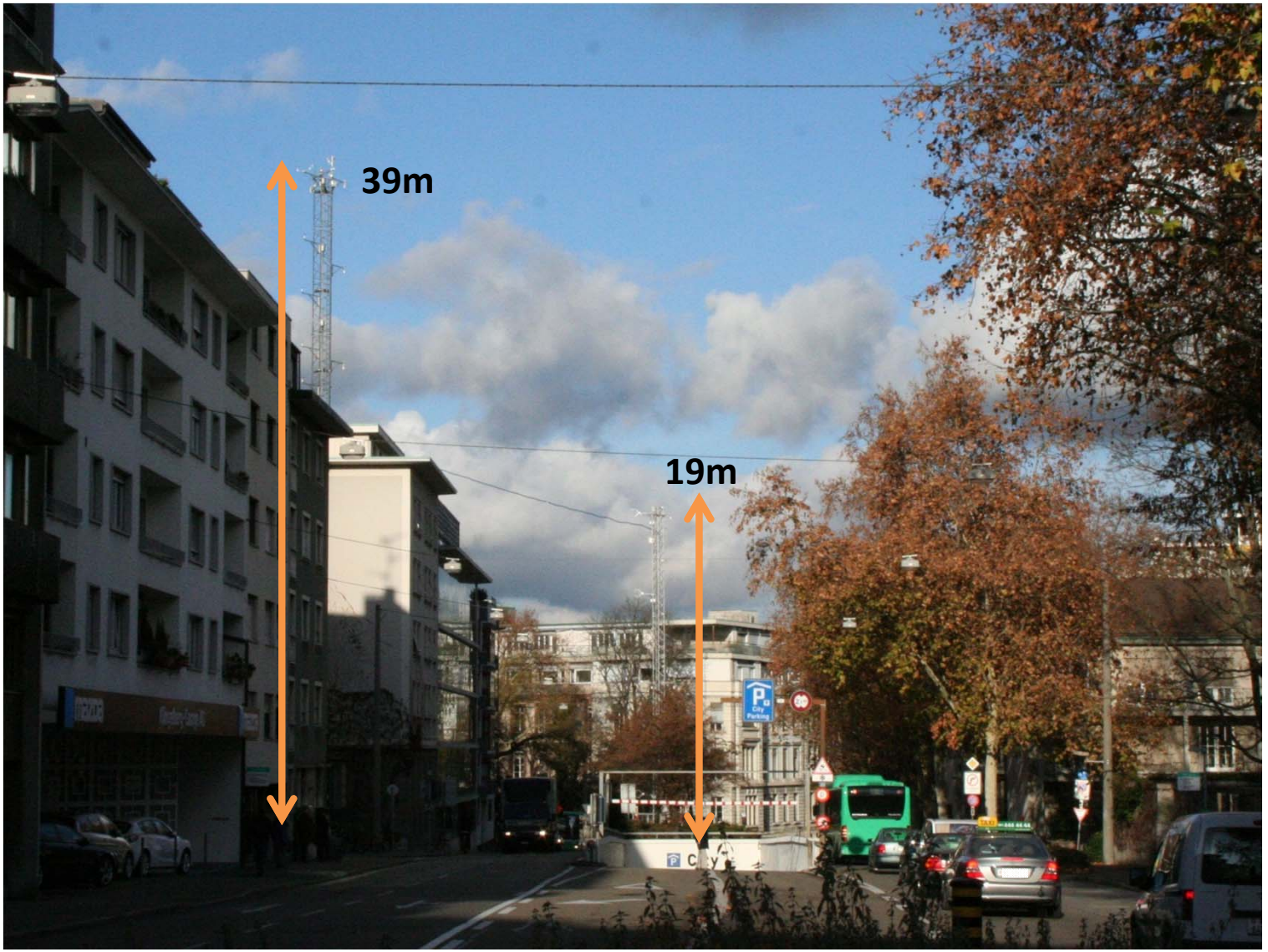
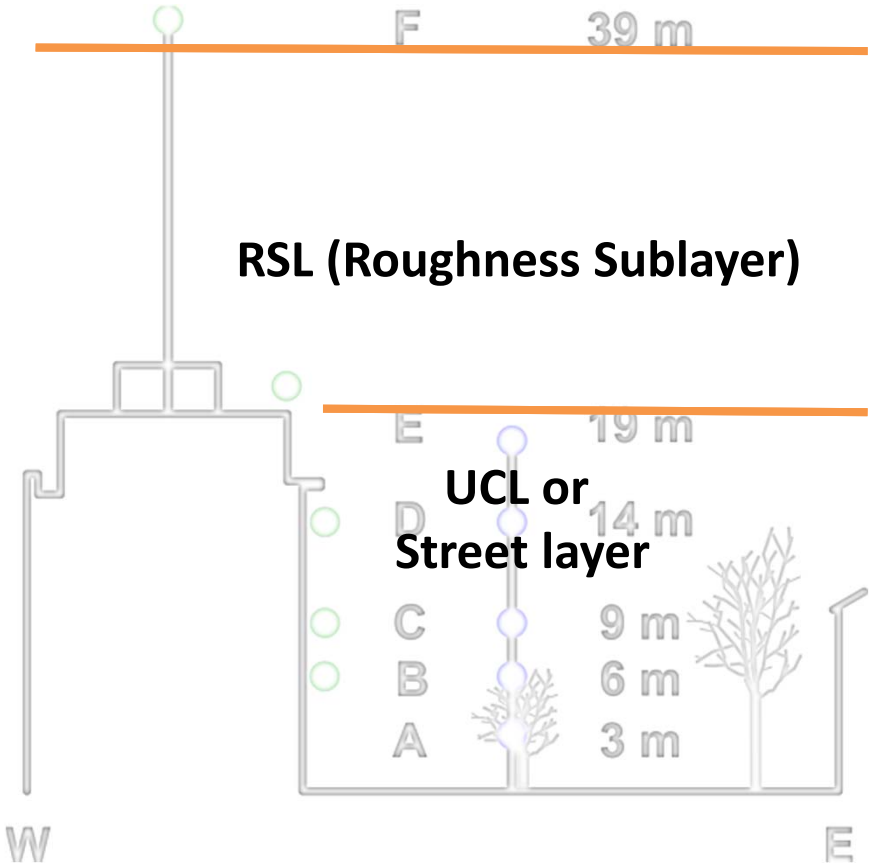
Site 1: Basel, Klingelbergstrasse, „Street Canyon“ (BKLC)



Site 1: Instrumentation & setup (BKLI/BKLC)

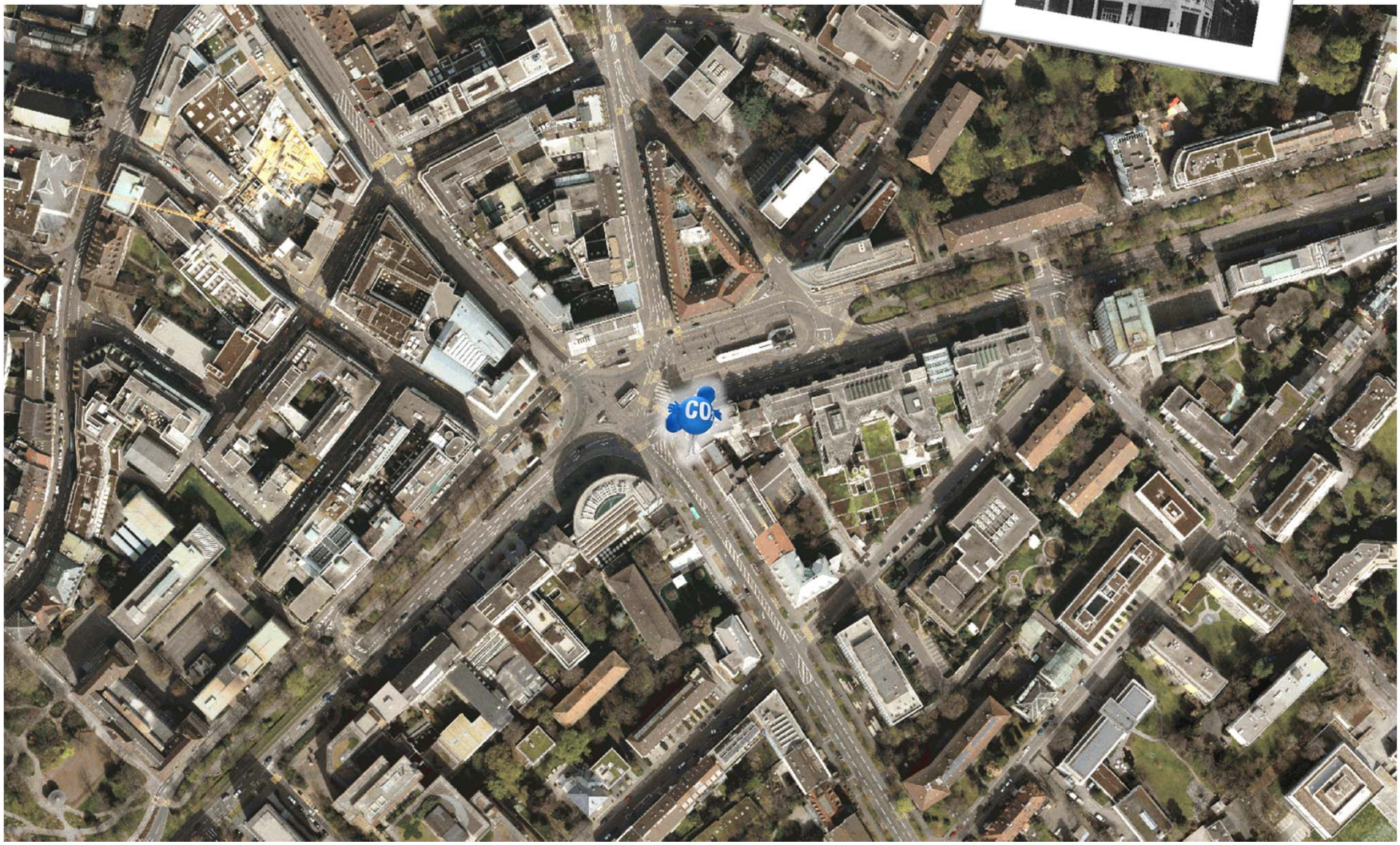
E, F

A-E, A-F

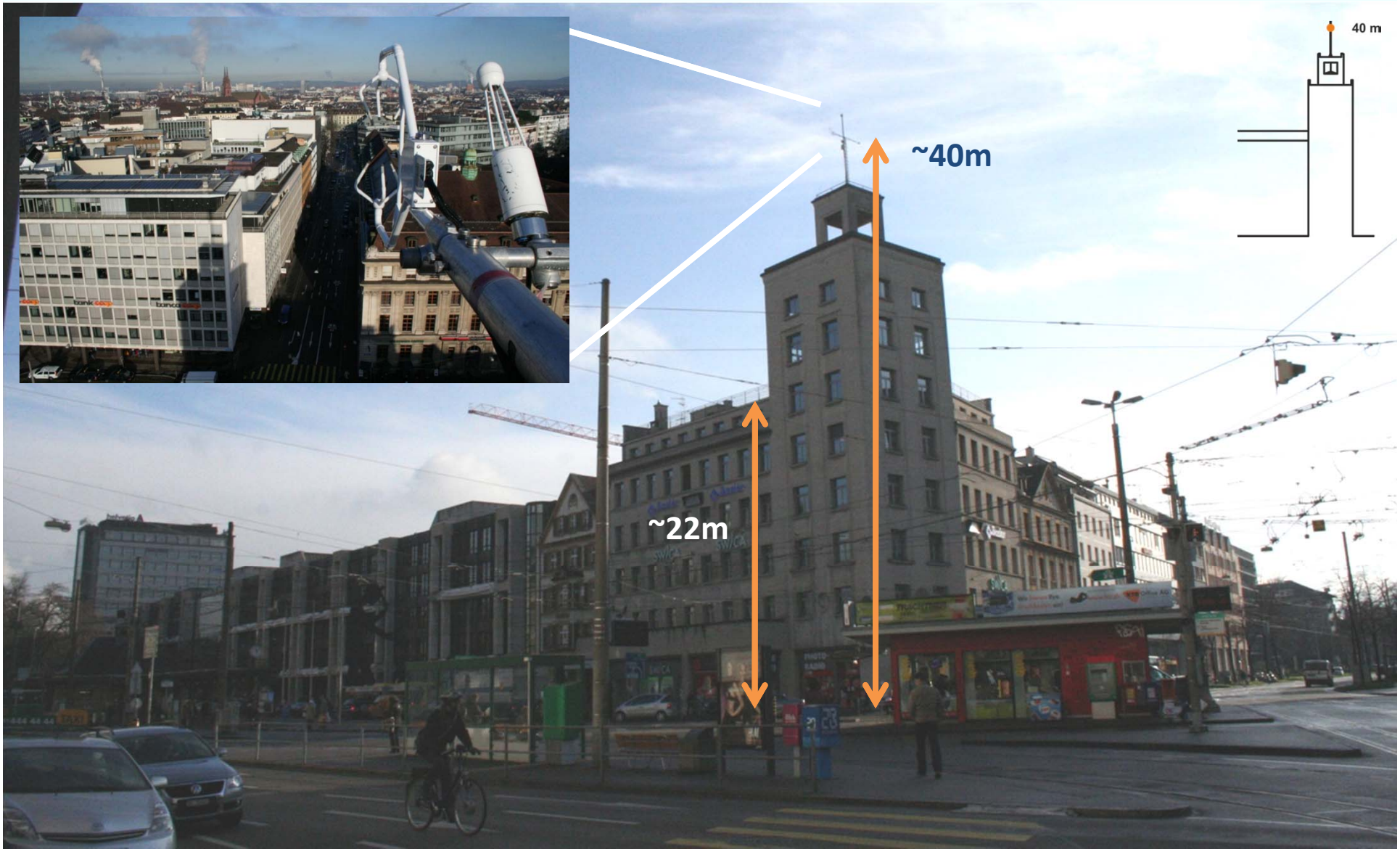


A, C-E, F

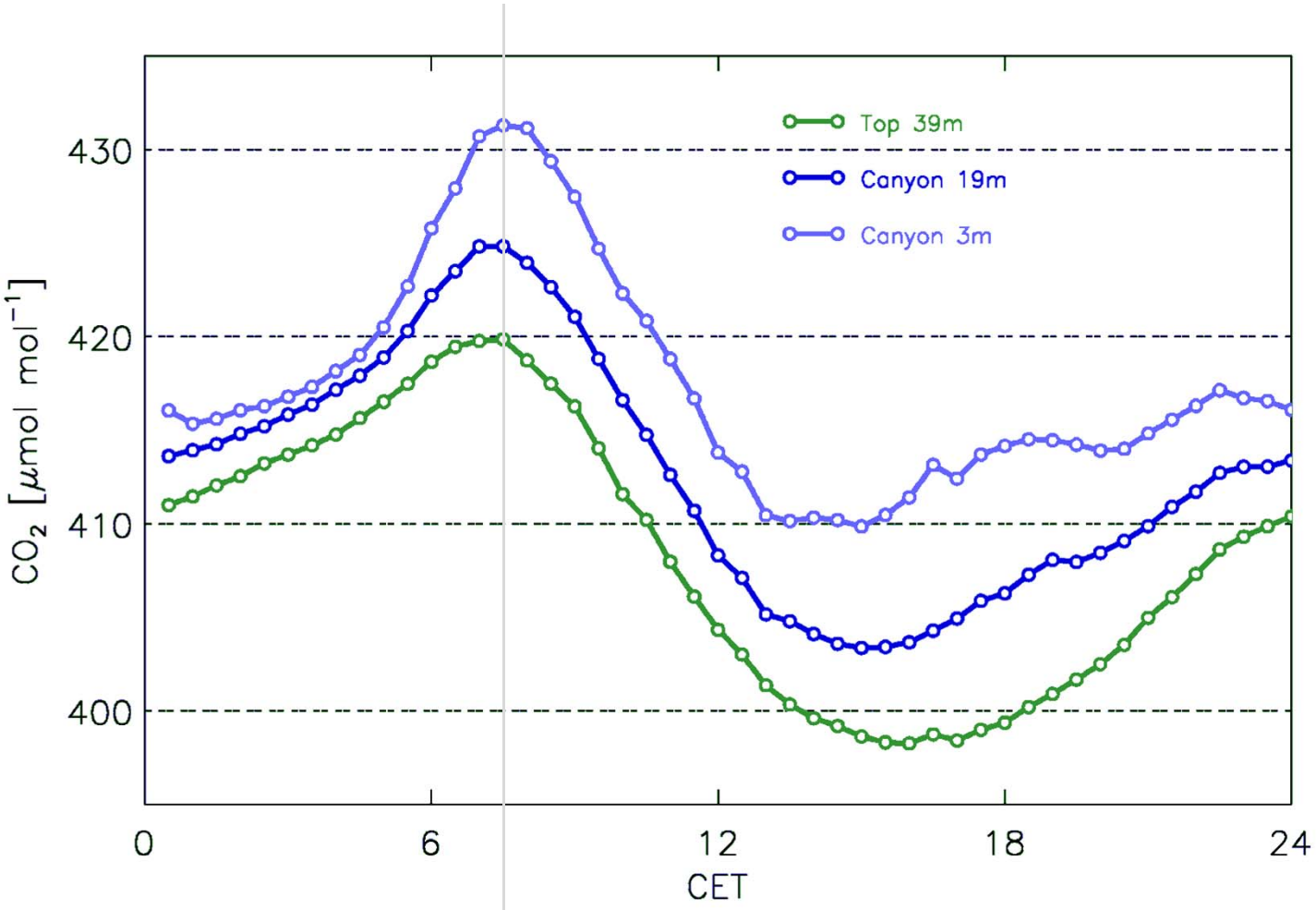
Site 2: Basel, Aeschenplatz (BAES)

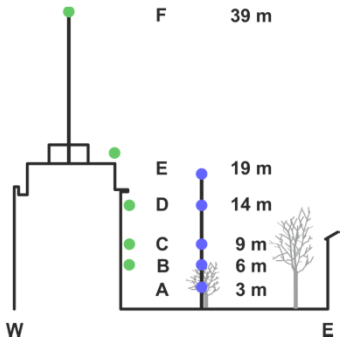


Site 2: Basel, Aeschenplatz (BAES), Turmhaus



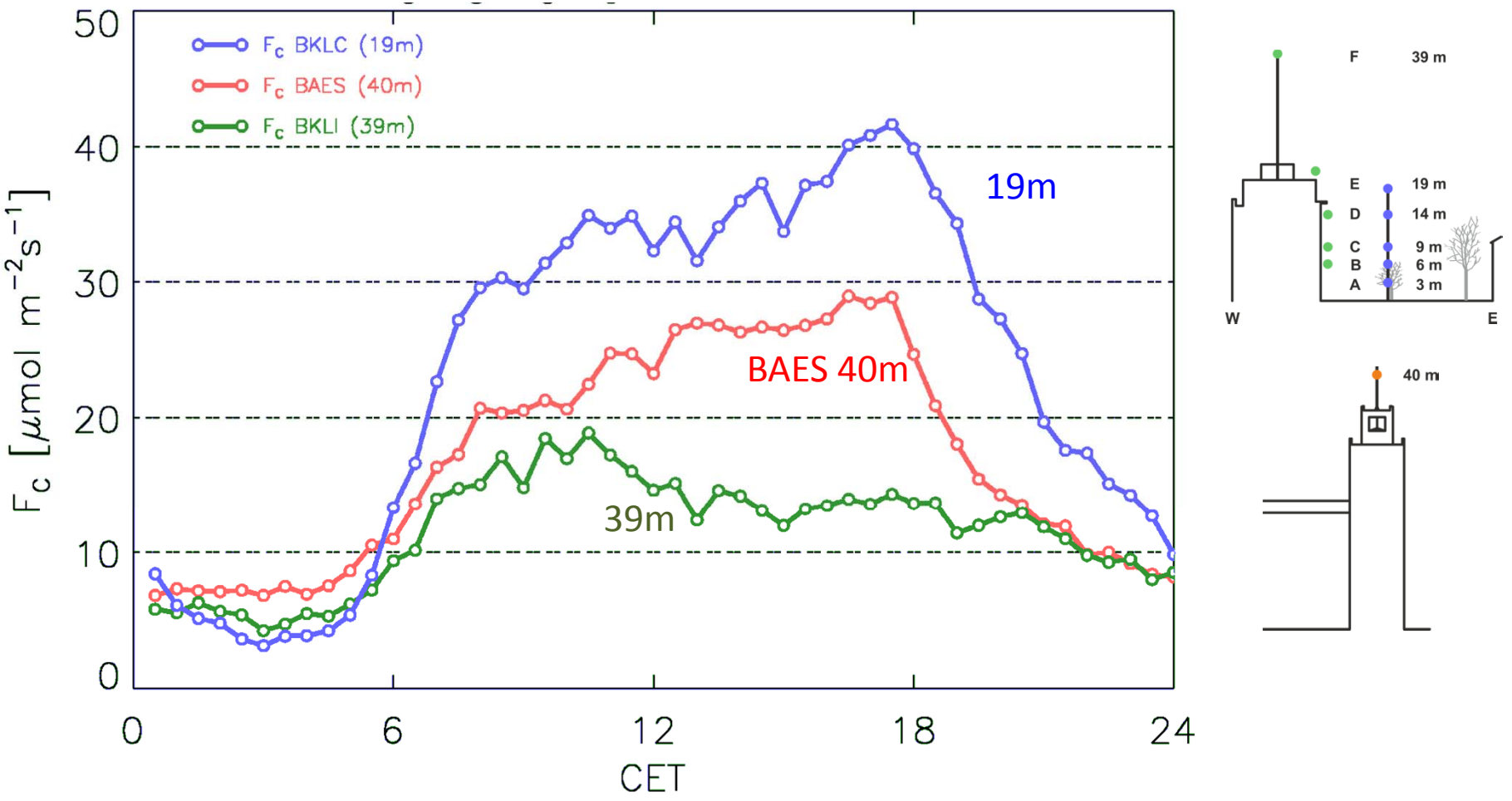
Mean diurnal CO_2 concentrations





Stable nocturnal layer | Growth of mixing layer

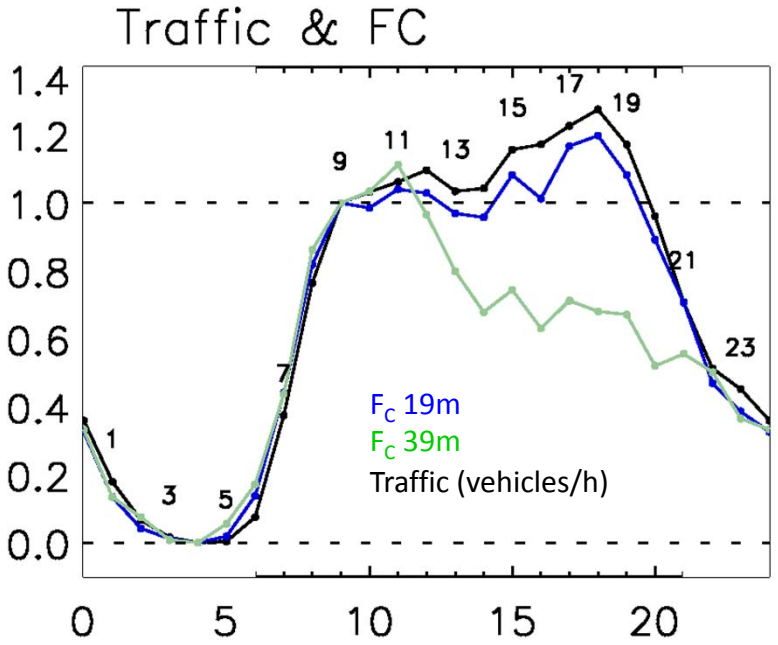
Mean diurnal CO_2 fluxes (F_C)



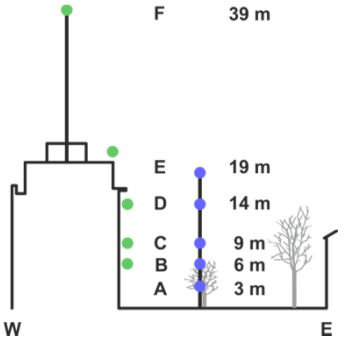
Comparing Fluxes (BKLC) and Sources (Traffic)

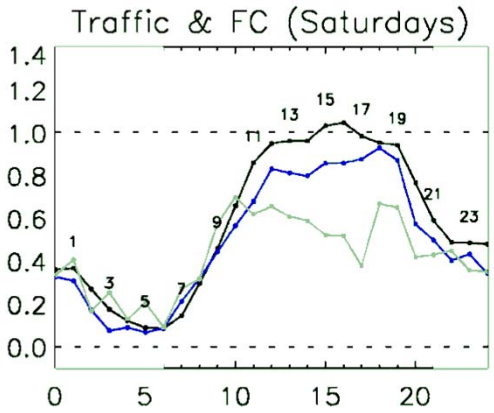
Scaled (4h & 9h-value) mean diurnal traffic density and F_C

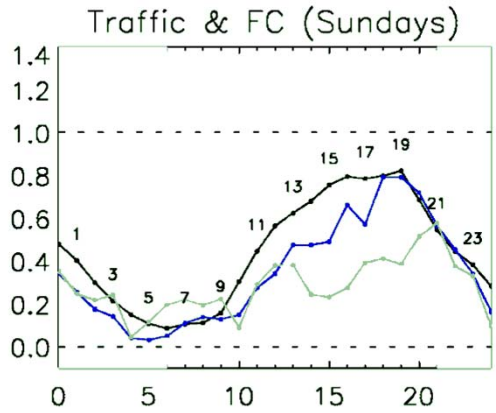
→ Qualitative comparison



All working days (Mo-Fr)



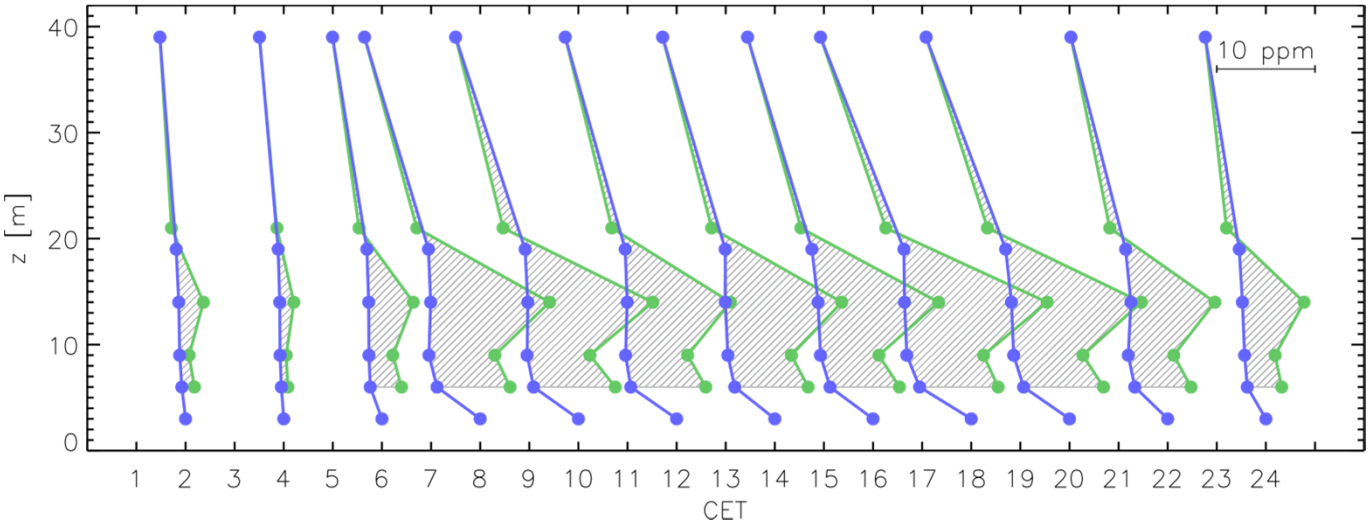


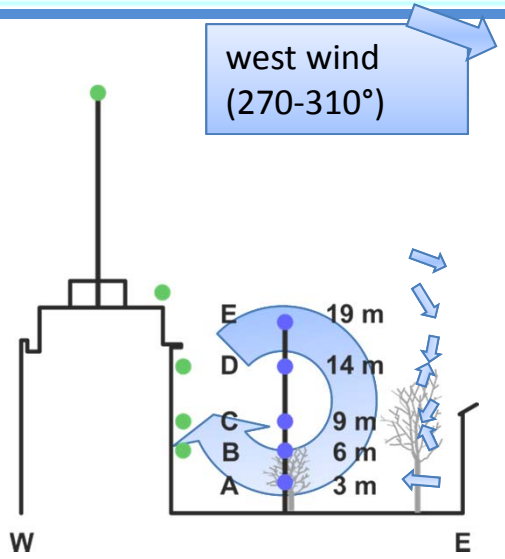


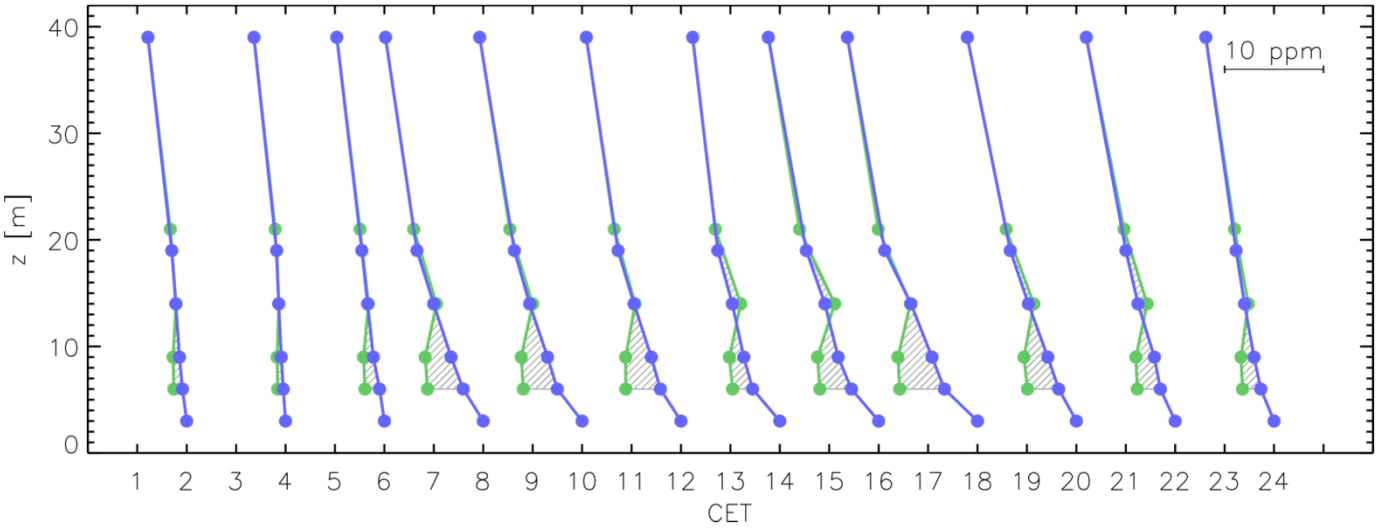
Saturdays / Sundays

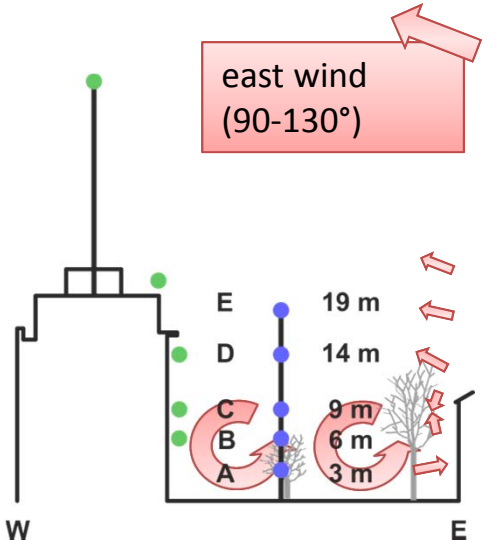
Wind rose BKLI

Vertical profiles of mean diurnal CO_2 concentrations









Summary, Conclusions & Outlook

Conclusions

- One city, two different sites and as expected: two totally different diurnal flux patterns (ISL).
- Traffic emissions are well represented by street layer (UCL) flux measurements.
- Sensor location of great importance (ISL).
- Street layer CO_2 distribution strongly depending on wind direction & building / city geometry .

Outlook

- Further examination of comprehensive dataset planned.
- Comparison with CFD simulations → better understanding of micro scale processes.

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