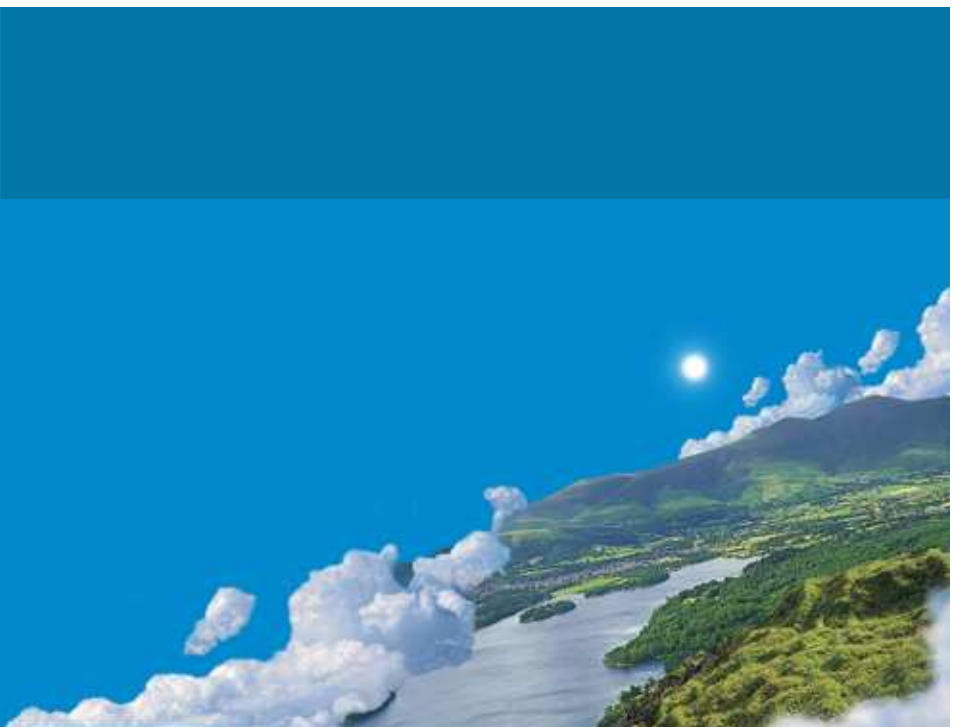


# Helsinki Testbed



*CO<sub>2</sub> Measurements in a  
Mesoscale Weather Network*

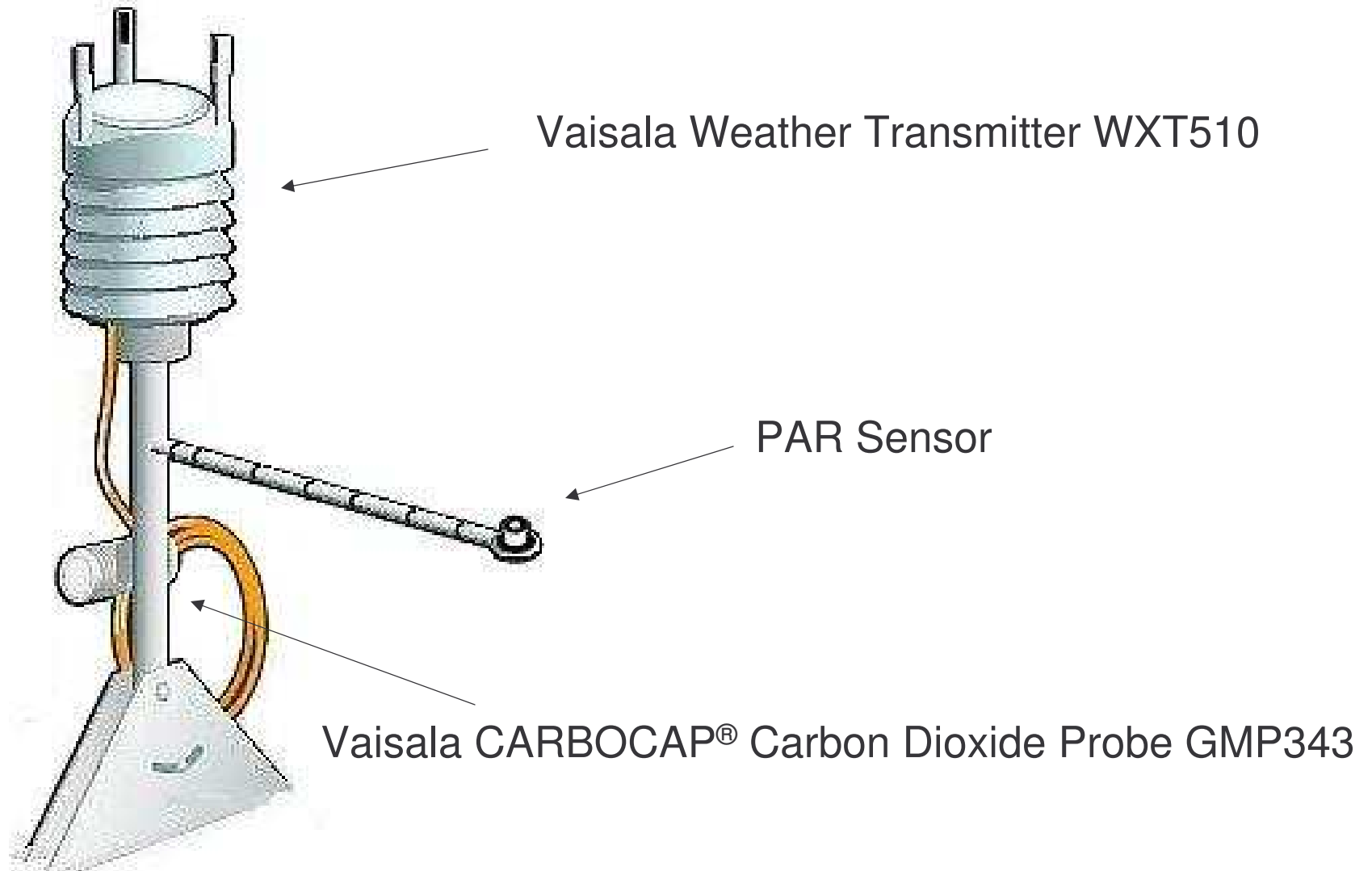
*Maria Uusimaa, Vaisala Corp.*



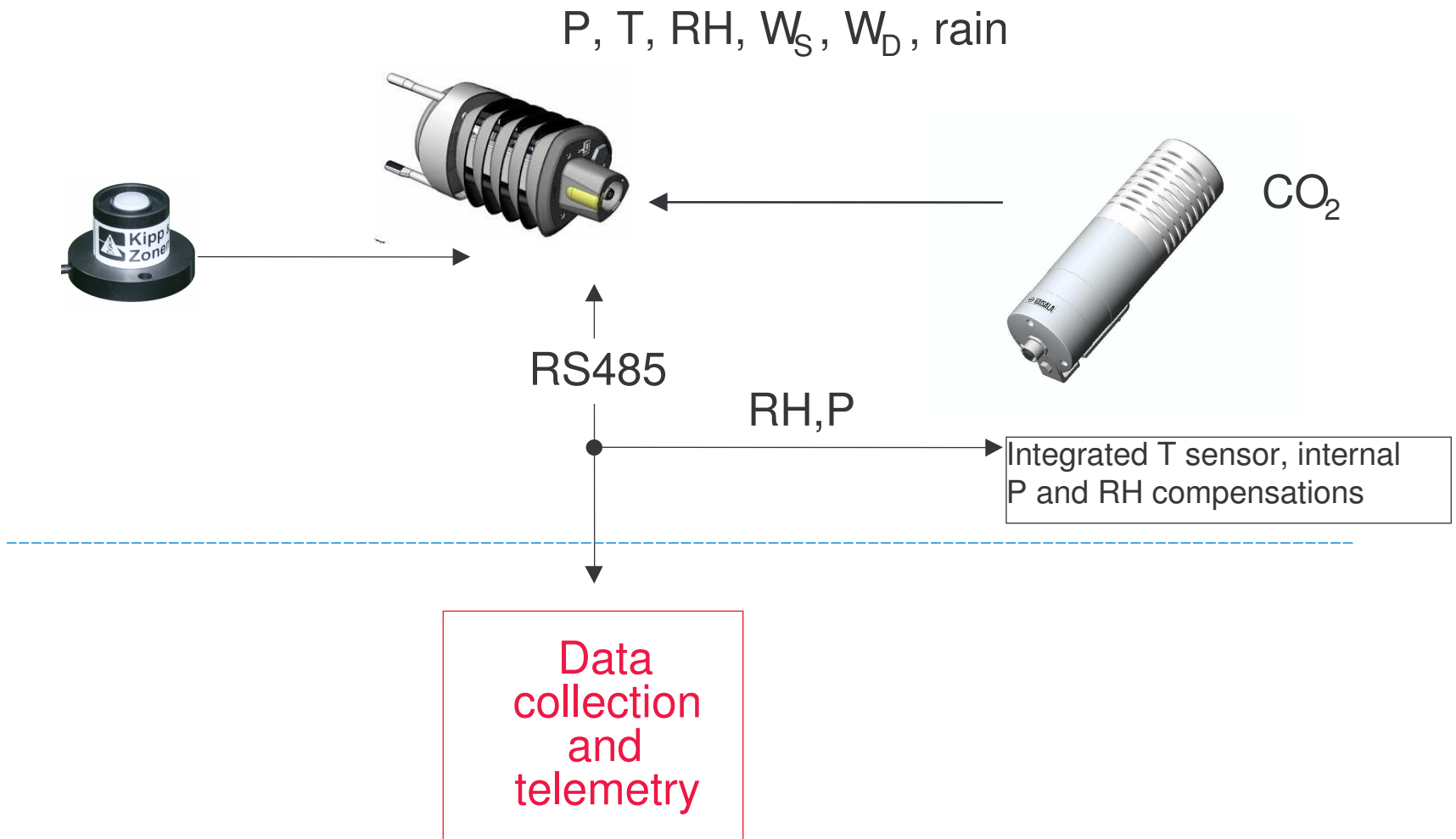
## CO<sub>2</sub> Measurements in Helsinki Testbed

- The study intended to demonstrate the use of a novel type of a CO<sub>2</sub> transmitter in a dense weather network
- In the testbed, the existing surface weather observation network is supplemented with WXT510 Weather Transmitters
- A few of the sites are additionally supplemented with Vaisala CARBOCAP<sup>®</sup> Carbon Dioxide Probe GMP343's and photosynthetically active radiation (PAR) sensors
- The sites for CO<sub>2</sub> measurements were chosen to represent different kinds of environments (marine, in-land, urban, etc.)
- A ***cost-effective ecological measurement station*** was demonstrated in the study

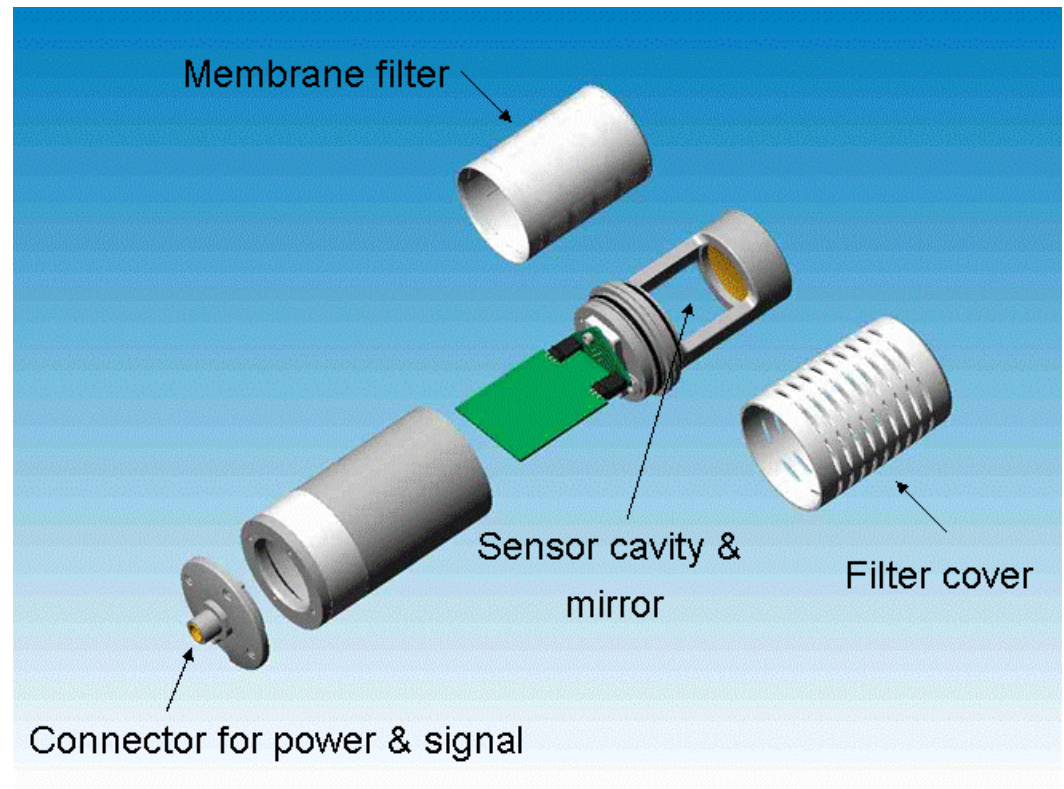
# Structure of the Cost-Effective Ecological Measurement Station



# Communications and Components in the Helsinki Testbed



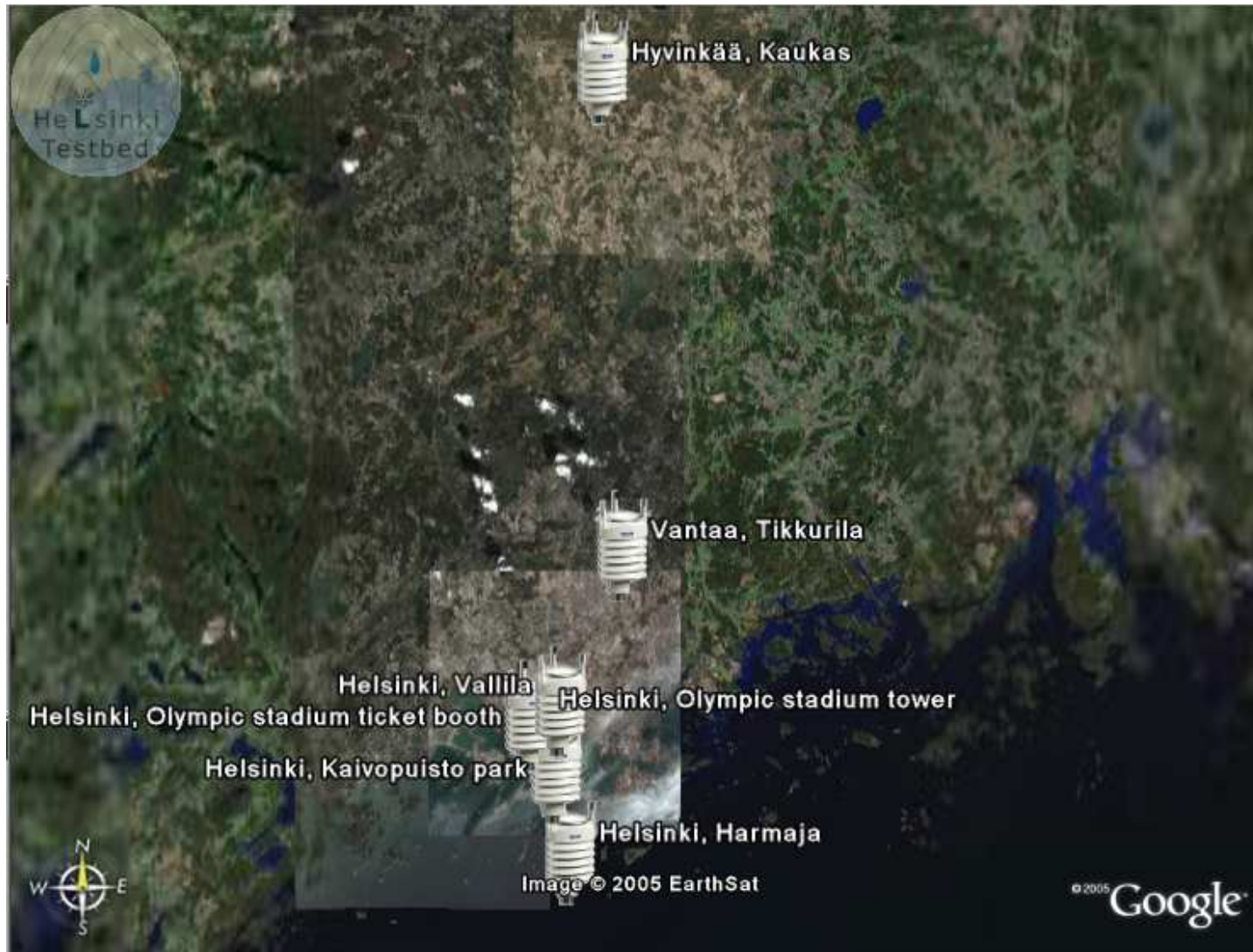
# Vaisala CARBOCAP® Carbon Dioxide Probe GMP343



## Examples of the Studied Phenomena

- Variations in the daily CO<sub>2</sub> concentration
- Variations in the seasonal atmospheric CO<sub>2</sub> concentration
- Land-sea variations in CO<sub>2</sub> concentration
- Soil CO<sub>2</sub> respiration
- Urban climate and strong inversion
- Correlation of aerosols, exhaust gases, and CO<sub>2</sub> concentration
- Horizontal advection of CO<sub>2</sub> concentration

# Network of Stations, Southern Coast of Finland



# Network of Stations: Downtown Helsinki





# Stations with CO<sub>2</sub> Measurement

## *Harmaja*

- A site off the coast of Helsinki on a small rocky island. The CO<sub>2</sub> was measured at 2 m and PAR at the top of a mast. The site was chosen for its marine location.

## *Kaivopuisto Park*

- A site on the tip of the Helsinki peninsula, both CO<sub>2</sub> and PAR were measured. The site was chosen for its coastal location, represents a mixture of marine and continental environment.

## *The Helsinki Olympic Stadium ticket booth and tower*

- CO<sub>2</sub> measured near the ground level as well as from the tower for vertical measurement in central Helsinki. Also PAR is measured from the tower. The area is fairly congested with buildings, though the southern edge of the central park is located north from the stadium.

## *Vallila*

- This site is one of Helsinki Metropolitan Area Council's (YTV's) air quality measurement sites. Also CO<sub>2</sub> is measured here. The site represents an inner city traffic site in central Helsinki from where air quality index and concentrations of pollutants can be retrieved.

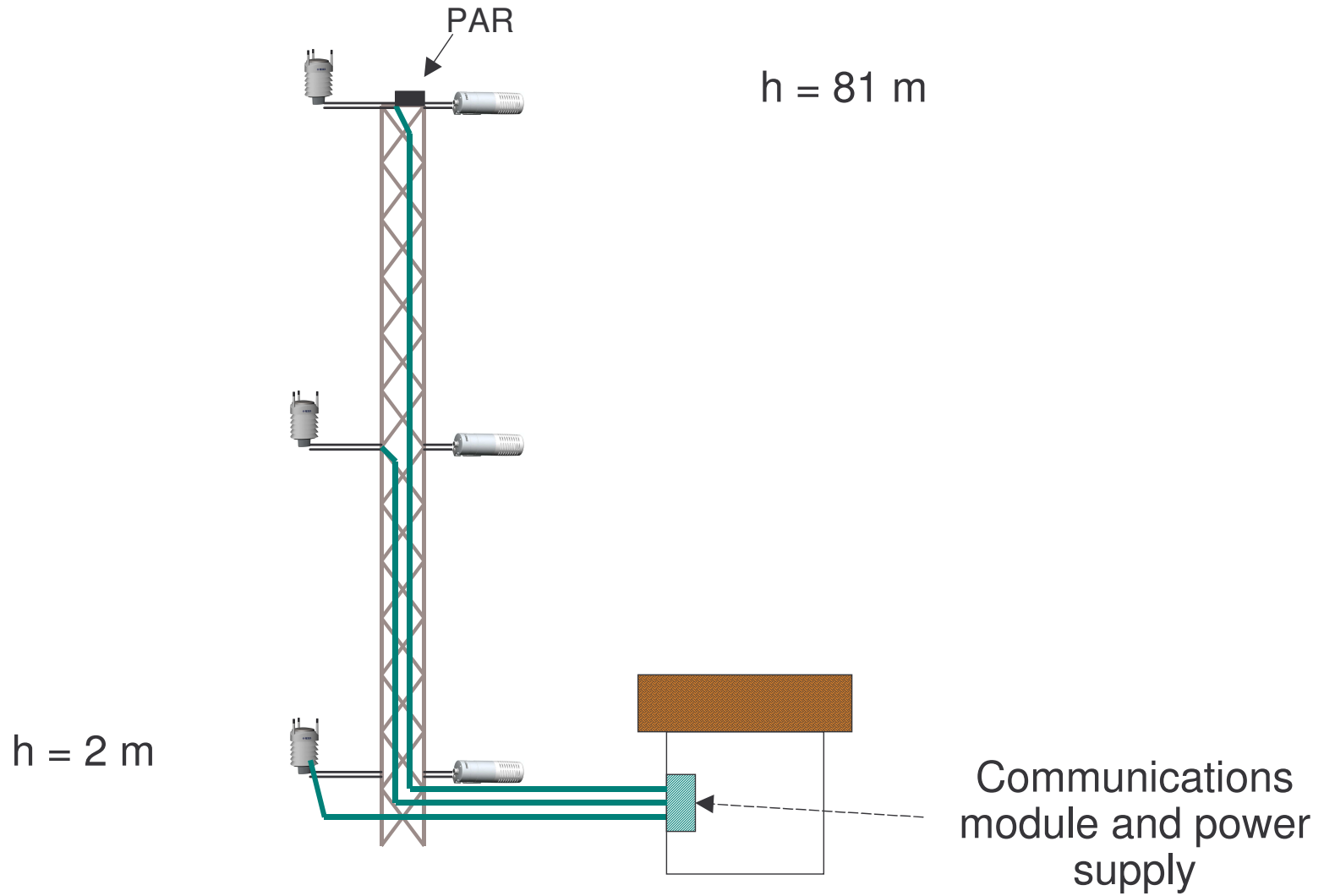
## *Tikkurila*

- Also one of YTV's air quality measurement sites. The site is a busy suburban center in Vantaa, which is part of metropolitan Helsinki.

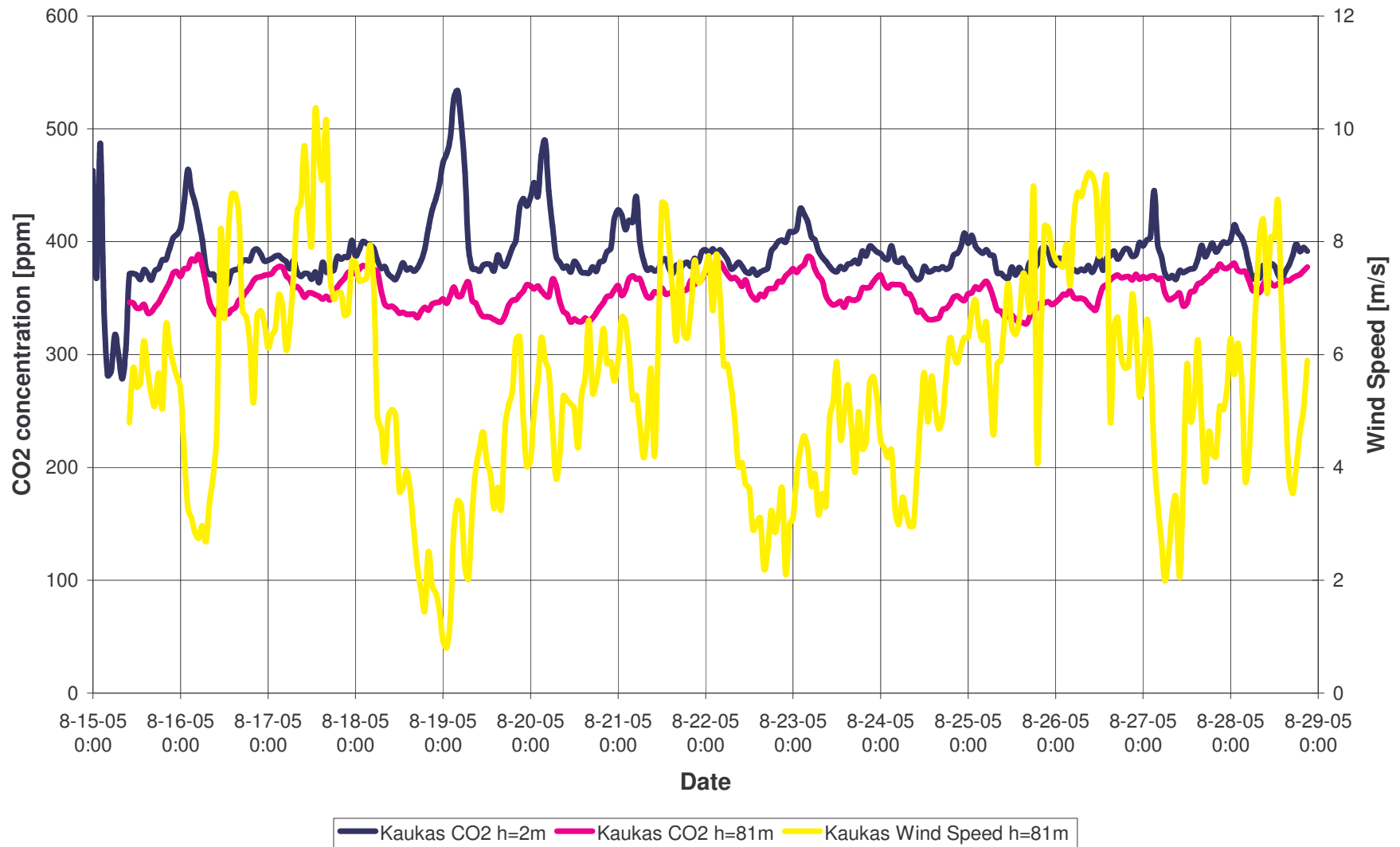
## *Kaukas, Hyvinkää*

- CO<sub>2</sub> is measured on the site in a GSM mast at three different heights. Also PAR is measured. This site was chosen for its location in the countryside and distance from the sea.

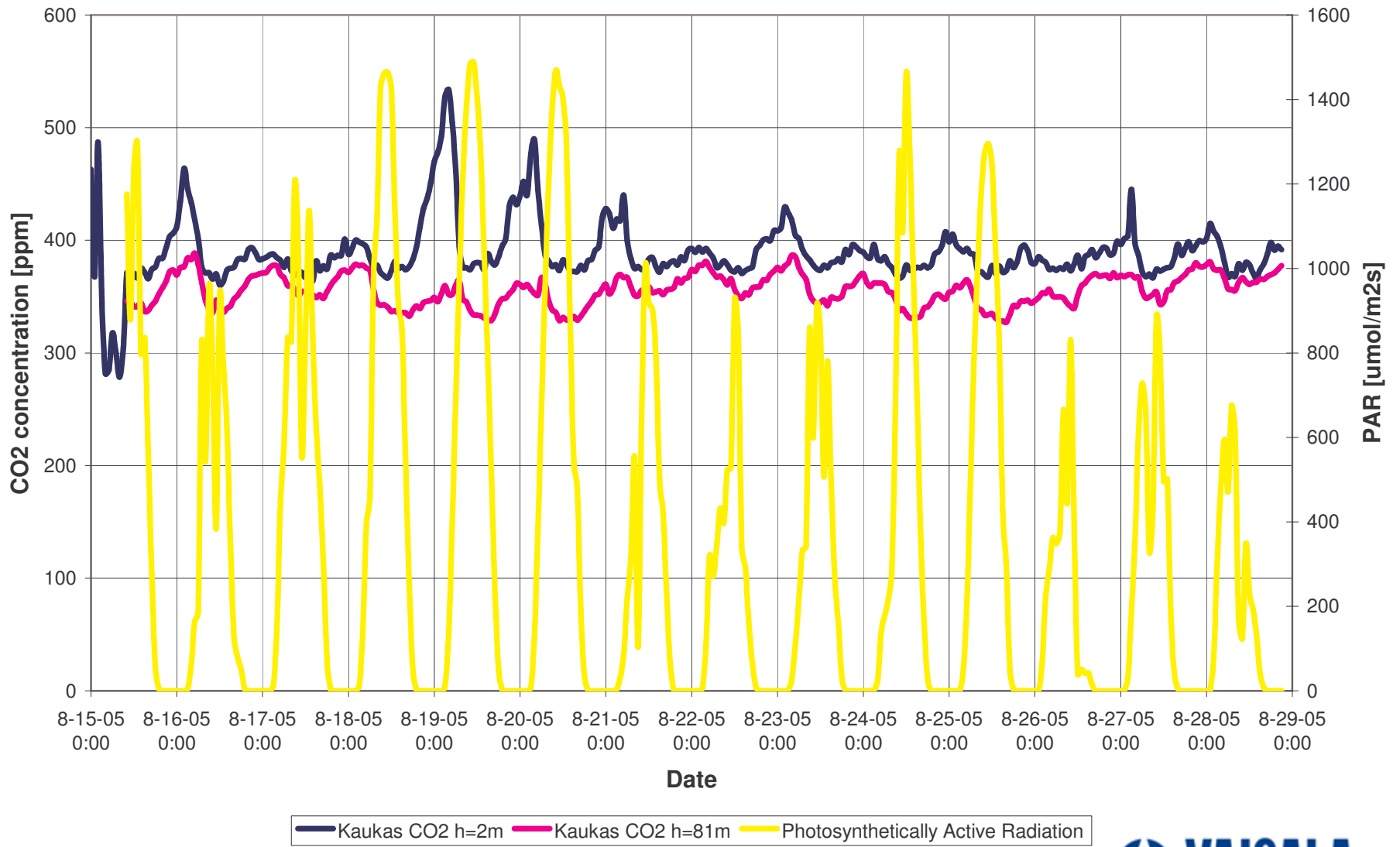
# Example of an Setup: Kaukas, Hyvinkää



# Variations in the Daily CO<sub>2</sub> Concentration (1)



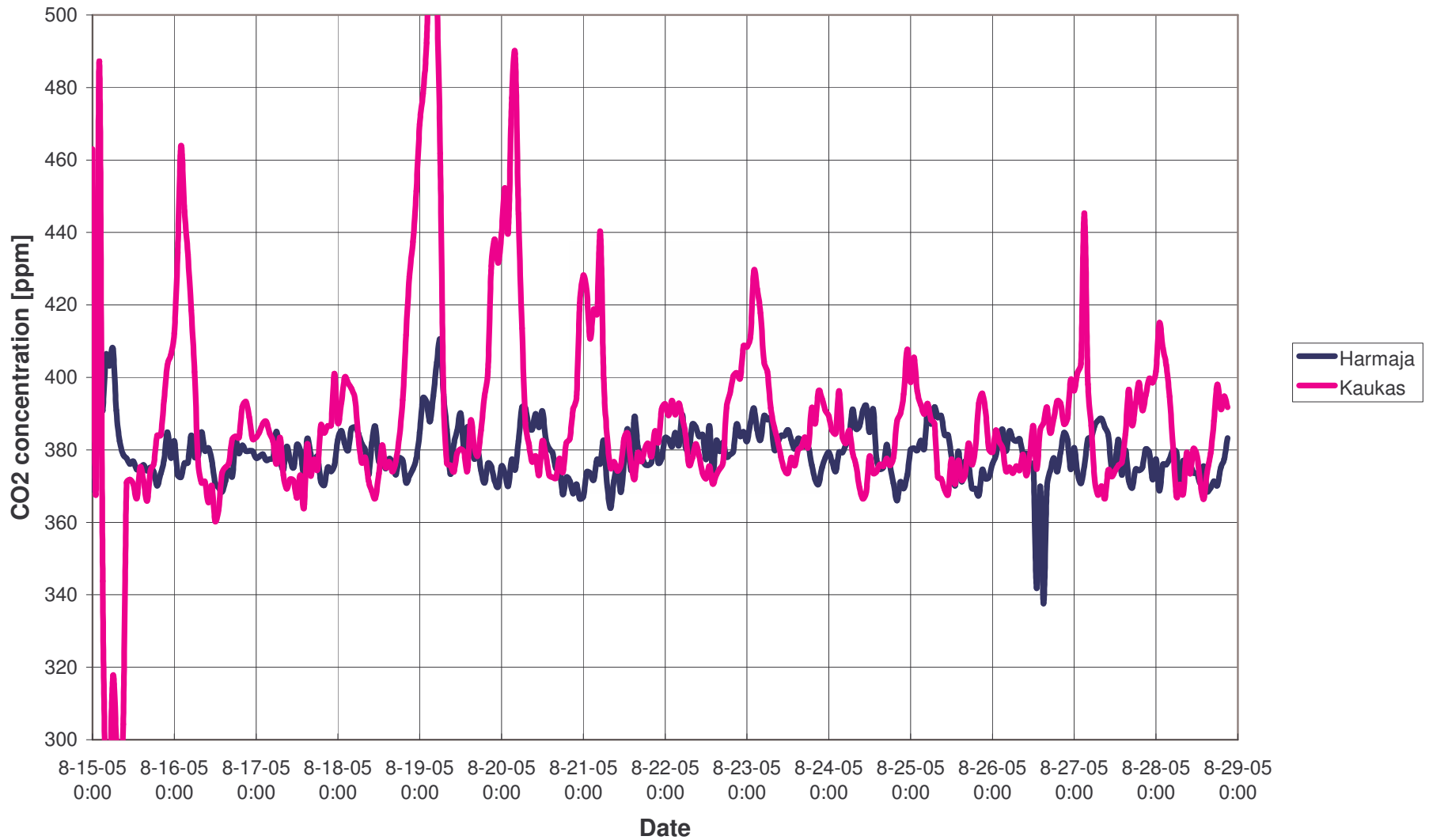
# Variations in the Daily CO<sub>2</sub> Concentration (2)



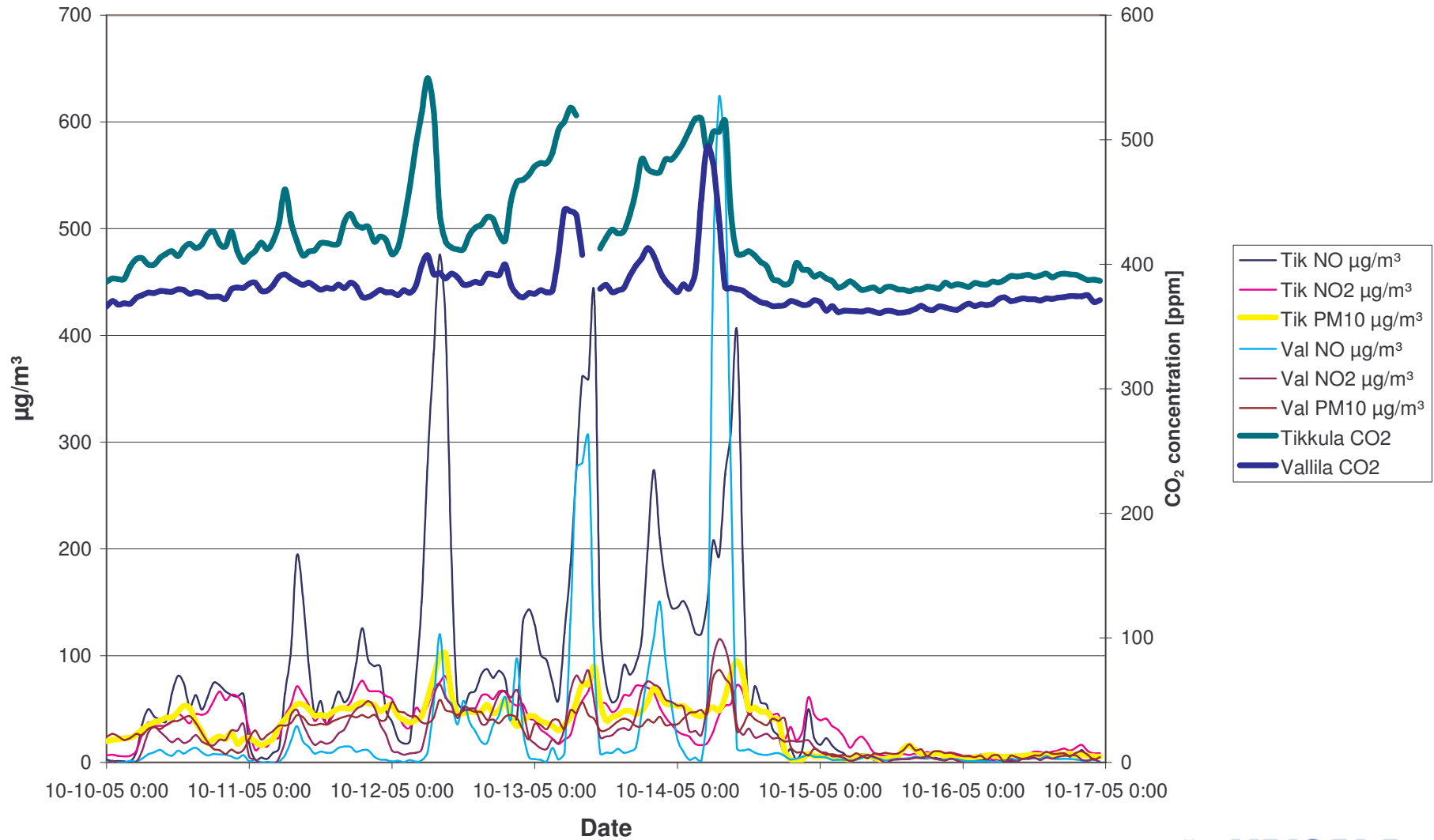
# Land-Sea Variations in CO<sub>2</sub> Concentration



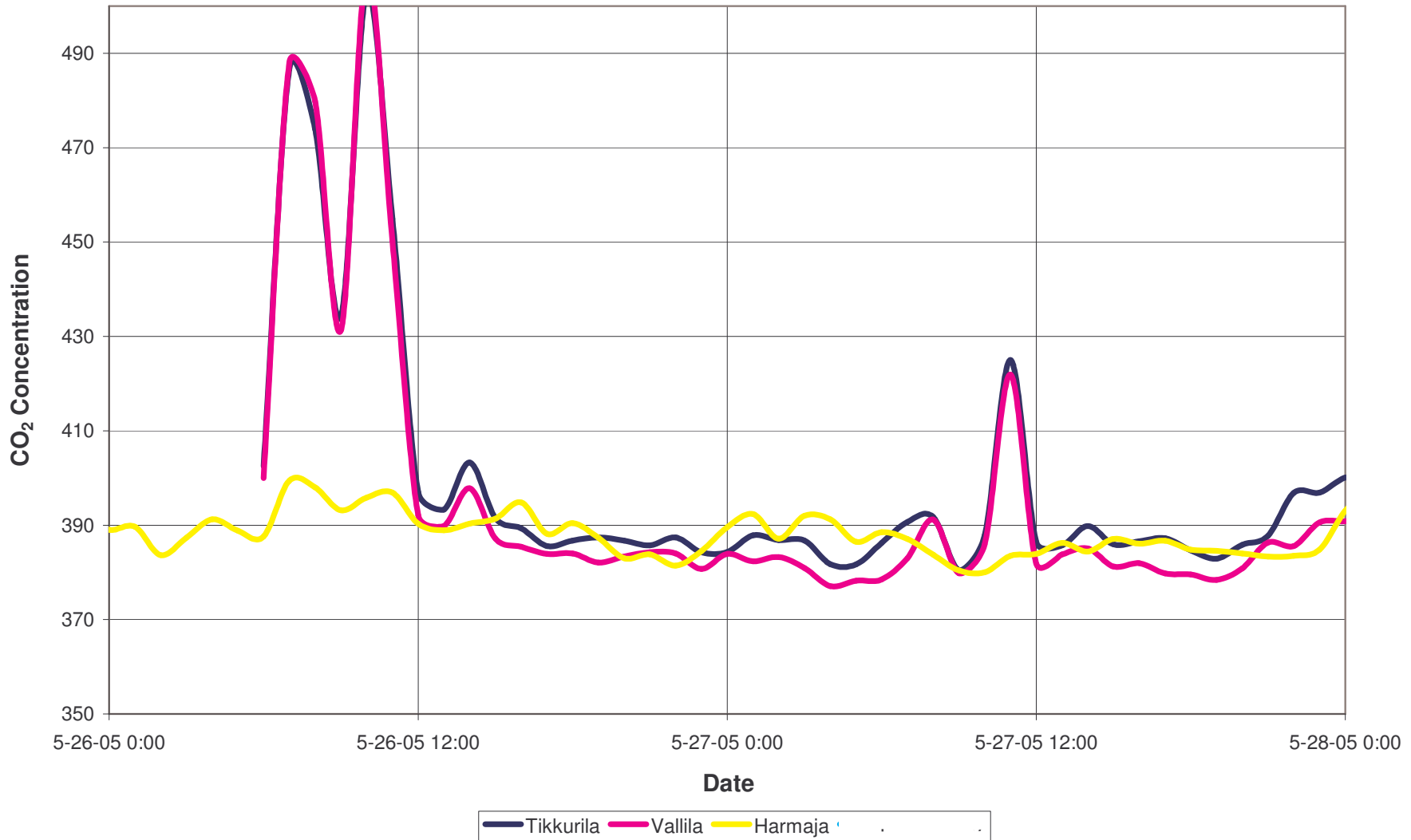
# Land-Sea Variations in CO<sub>2</sub> Concentration



# Urban Climate and Strong Inversion

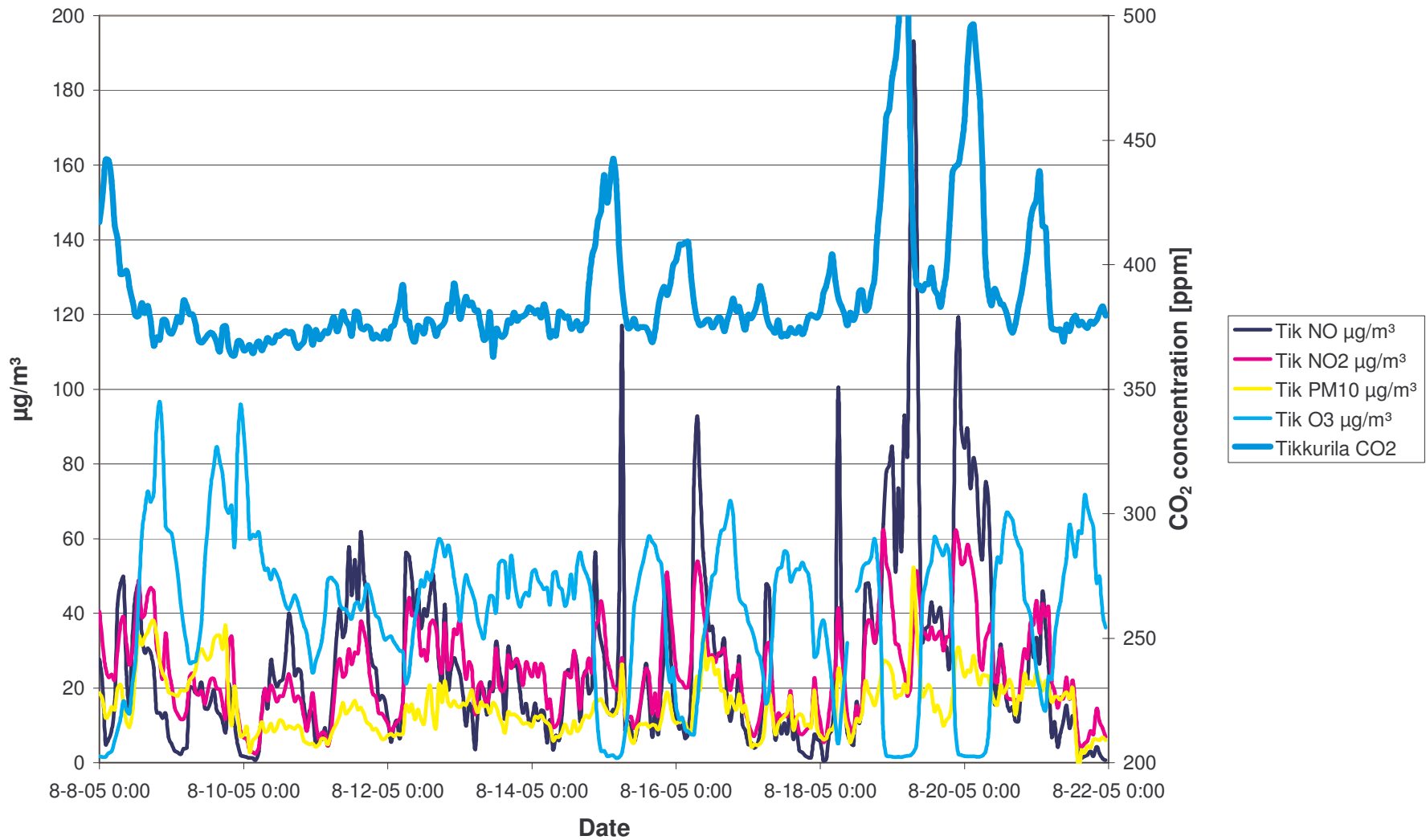


# Urban Environment and Variations in CO<sub>2</sub> Concentration





# Correlation of Aerosols, Exhaust Gases, and CO<sub>2</sub> Concentration



# Conclusions

- In the Helsinki Testbed, a dense weather network with CO<sub>2</sub> measurements was demonstrated
- The ecological measurement station consisted of a Vaisala Weather Transmitter WXT510, a Vaisala CARBOCAP® Carbon Dioxide Probe GMP343, and a PAR sensor
- The CO<sub>2</sub> measurement concept of Helsinki Testbed and the **preliminary** results are very interesting
- The concept is suitable especially for ecological measurements
- The correlation with the aerosols and exhaust figures in urban environment is another interesting measurement application

# Thank You!

More information on the CO<sub>2</sub> measurements in Helsinki Testbed from:

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