

Wednesday, 27 March

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InterAir 2: Air Quality in the Urban Environment: Monitoring & Measurement

## **Modern cost effective environmental sensor network for smart cities**

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# Air Quality monitoring reinvented

Modern cost effective environmental  
sensor network for smart cities

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**VAISALA**



**LEOSPHERE**  
A VAISALA COMPANY

# Vaisala is the Global leader in Weather and Environment Observation Systems

METEOROLOGY

TRANSPORTATION

RENEWABLE ENERGY

AMBIENT AIR QUALITY



Employs over  
**1800**  
professionals  
worldwide



EMEA	Americas	APAC
<b>73%</b>	<b>19%</b>	<b>8%</b>

Has over  
**30** in  
offices in **18**  
countries



**39%**  
of Vaisala  
people work  
outside of Finland



Serves customers  
in over  
**150**  
countries  
annually

2018 net sales  
**348.8** million  
euros

EMEA	Americas	APAC
<b>29%</b>	<b>39%</b>	<b>31%</b>

2018 R&D  
investments  
were

**13%**  
of net  
sales

**22%**  
of employees  
work in R&D  
activities

# Air Pollution: Single Biggest Environmental Health Risk

- Inhaling air pollution takes away at least 1-2 years of a typical human life

- More than 80% of people living in urban areas that monitor air pollution are exposed to air quality levels that exceed the World Health Organization (WHO) limits

- More than 5 million people die prematurely each year from outdoor pollution.

- Without action deaths will double by 2050

- Toxic air pollution poses a greater threat to children, due to their smaller physical size and lung capacity.

- We do not yet even fully understand, what impact nanoparticles will ultimately have...

# Actions for cleaner air and healthier people

## Urban and regional planning

- Public transport made attractive and clean
- Green corridors and areas in city
- Location of industries and waste disposal sites

## Legislation affecting pollution sources

- Clean fuels regulations
- Legislation for control measures in industry

## Targeted efforts during air quality episodes

- Traffic restrictions
- Advisories for industries and construction sites
- Street dust management

## Limiting exposure of people

- Up to date information on conditions
- Accurate advisories and warnings
- Modern tools for avoiding exposure (mobile apps etc)

**All of these require an accurate understanding and awareness of air quality situation:**

- **Main pollutants**
- **Areal distribution**
- **Temporal variation**

# Understanding air quality

## Composition, key urban pollutants

- $\text{NO}_2$  – indicating traffic emissions
- $\text{PM}_{2.5}$  and  $\text{PM}_{10}$  – indicating traffic, street dust and dust from natural sources
- $\text{O}_3$  – crucial to understand photochemical reactions and smog
- $\text{CO}$  – to understand combustion sources like furnaces, stoves
- $\text{SO}_2$  – to understand emissions from the industry and heavy machinery, ships etc

## Areal distribution

- **Air quality is a local phenomenon affected by weather and local emission sources**
- A few high accuracy analysers will not provide an accurate picture of people exposure or pollutant dispersion

## Temporal variation

- Sampling techniques give a picture of integrated exposure, but will not help in tactical decision making
- Real time monitoring will make also air quality forecasting possible



Conventional network

## Supplementary dense network (AQT + WXT series)



# Vaisala air quality instruments

Easy to deploy in quantities

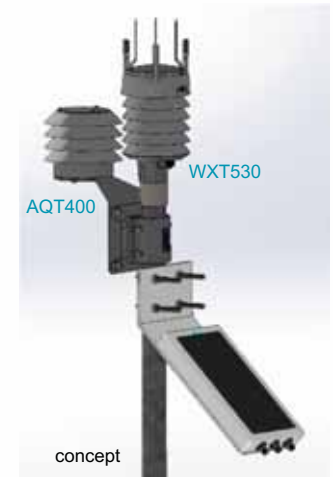
- Compact
- Fully wireless, solar powered

Low maintenance

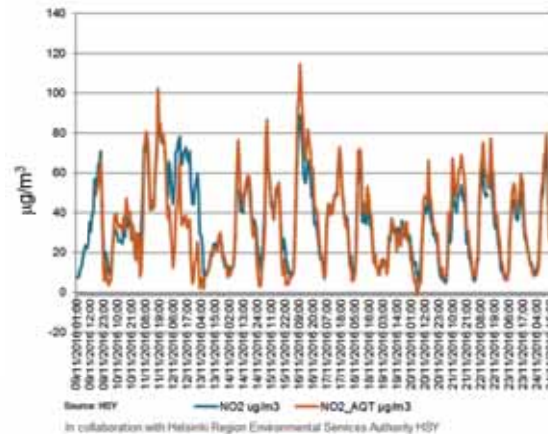
- Annual to biannual interval
- Easy to do locally

Near reference performance

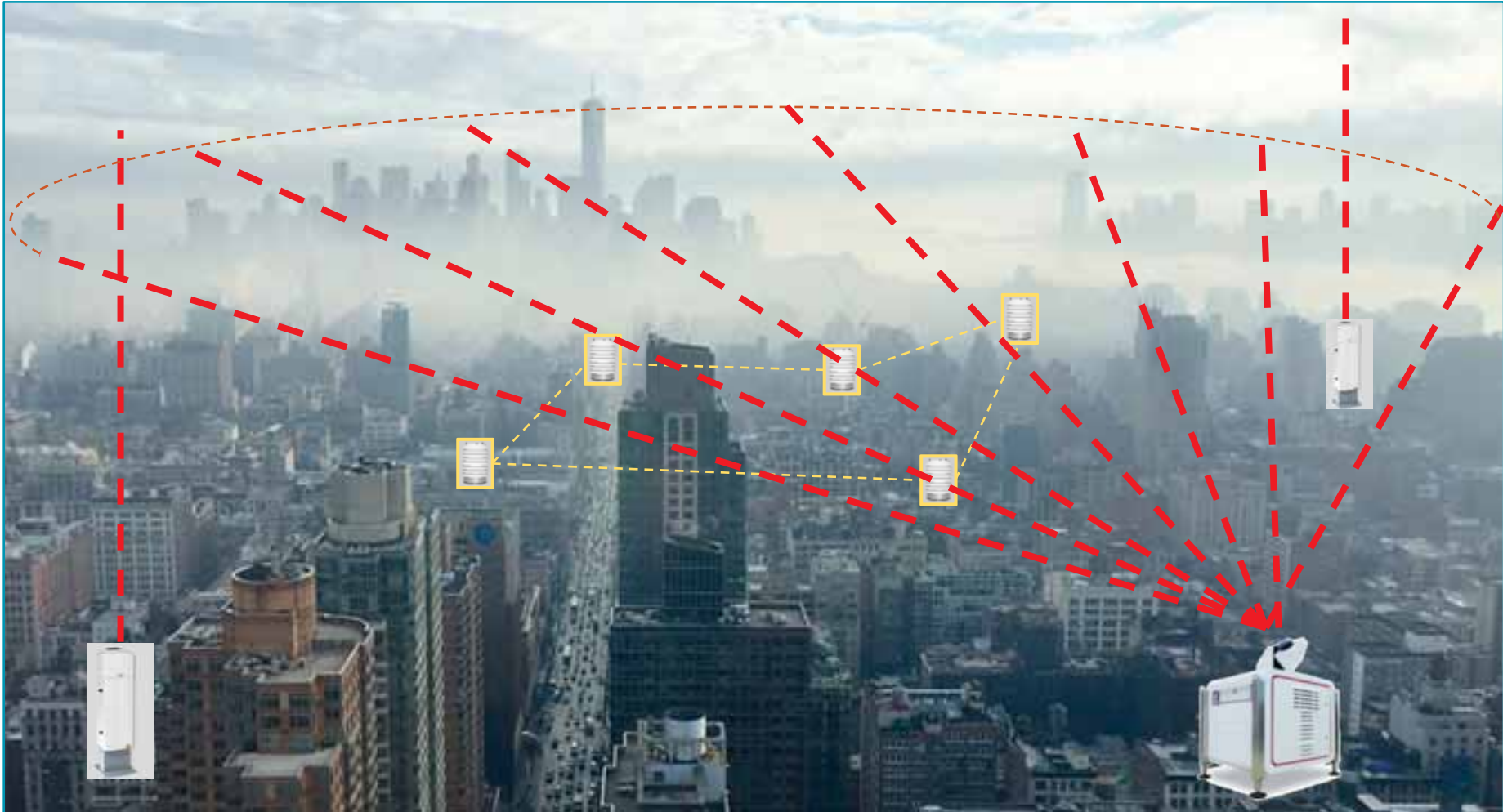
- Measures all key urban pollutants
- Verified performance



Air quality + weather



# Another step forward: 3D pollutant and urban weather measurement network



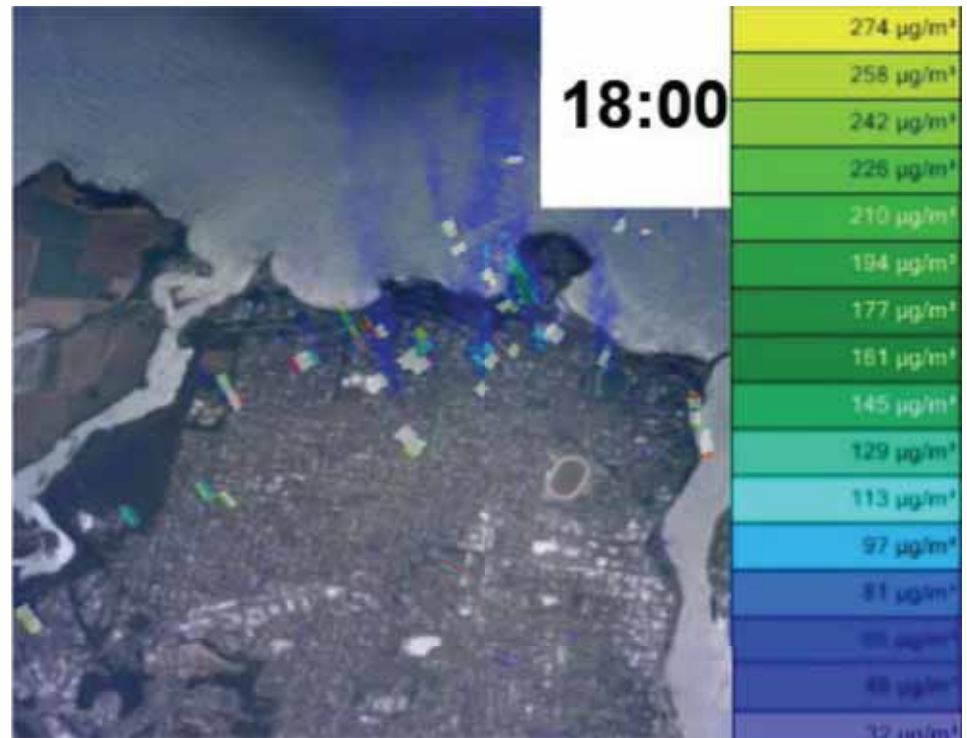


# Real-time monitoring of PM sources

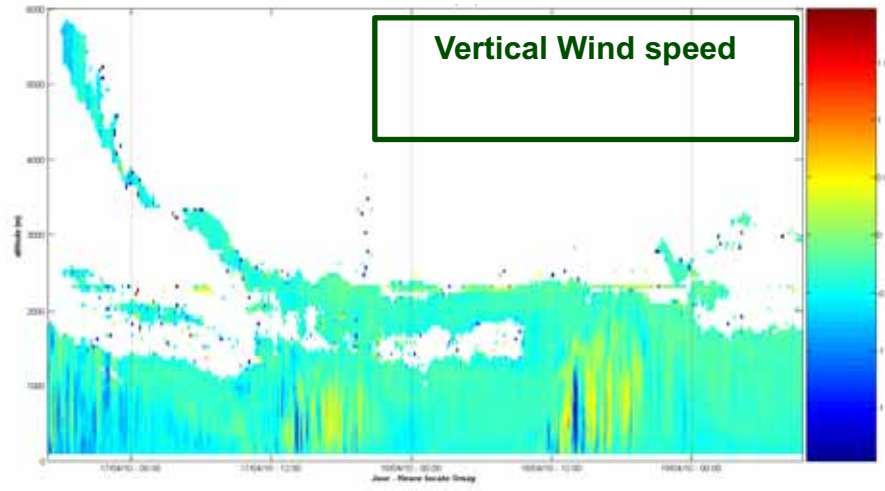
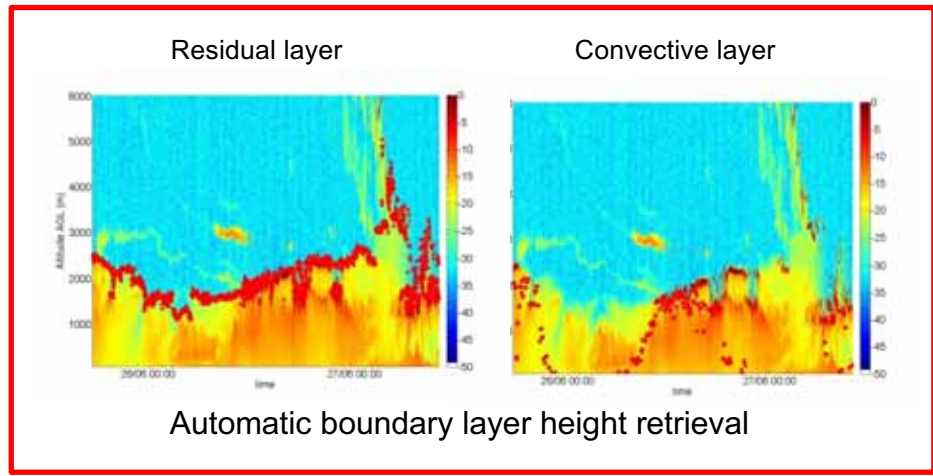
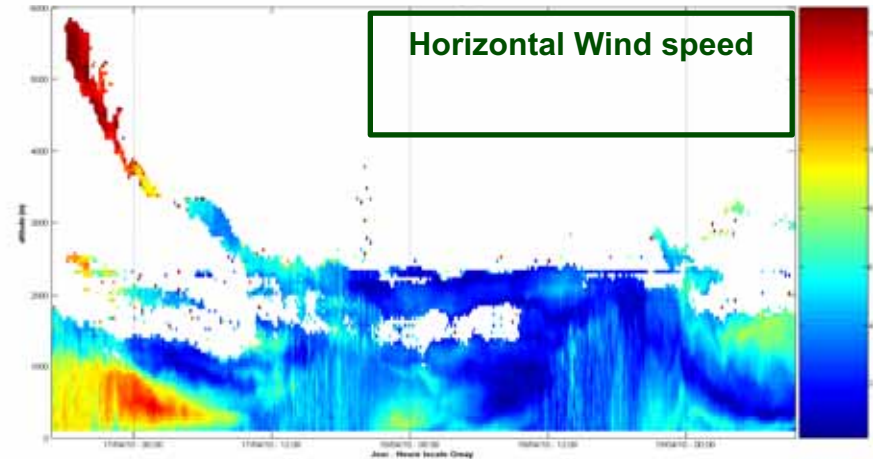
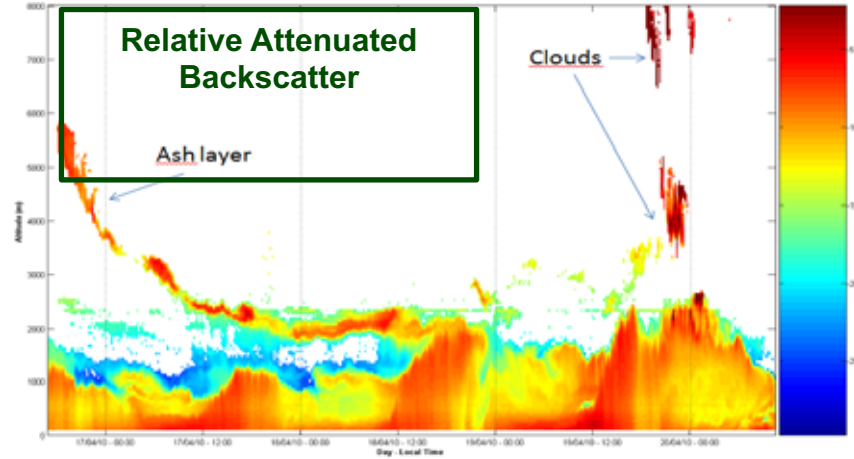
Combination of in-situ measurement  
and Windcube scanning Lidar



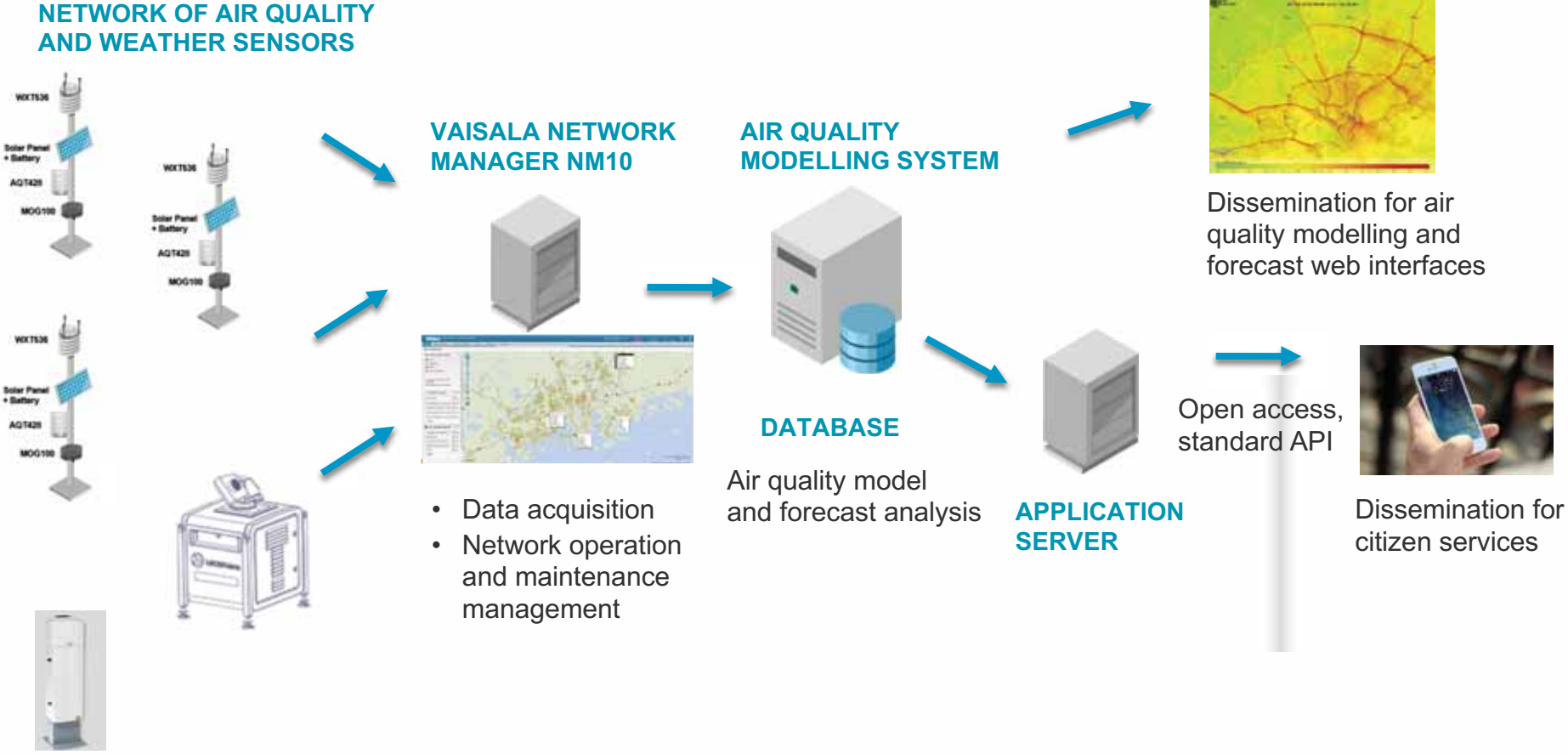
Windcube 100S/200S/400



# Simultaneous local lower troposphere profiling



# Air Quality total solution



# Summary

- Efficient decision making requires **good awareness of pollutants and their spatial / temporal distribution**
- Forecasting the air quality requires **continuous local urban atmospheric environmental observations**
- **New measurement devices complement reference air quality stations** to provide a comprehensive and accurate picture of environmental parameters
- Scalable integrated and connected sensors network is paving the road for smarter cities





Thank you...  
Kiitos !  
Merci !