Weather Stations in Kleve

Interactive Dashboards of Real-Time Weather Data

WeatherStation Obstbaum-Arboretum	WeatherStation Rathaus
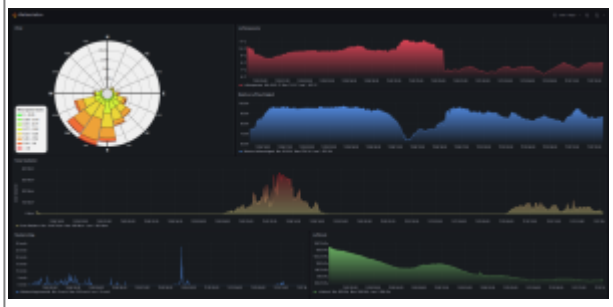	
Fig.: Interactive real-time data plots. **Click on the image** or **here** to open the Grafana dashboard.	Fig.: Interactive real-time data plots. **Click on the image** or **here** to open the Grafana dashboard.

Weather-Station Obstbaum-Arboretum

The weather station consists of a Vaisala WXT536 multisensor, which can measure wind speed, wind direction, barometric pressure, air temperature, relative humidity and rainfall. Global radiation is measured by a Kipp & Zonen CMP3 pyranometer. A raspberry pi zero is used to read the data from the weather station. From there the data is uploaded to a server running an influx database. The internet connection is provided by a **Teltonica router** using LTE. A LoRaWAN Gateway is installed next to the station to provide access to The Things Network in the park.

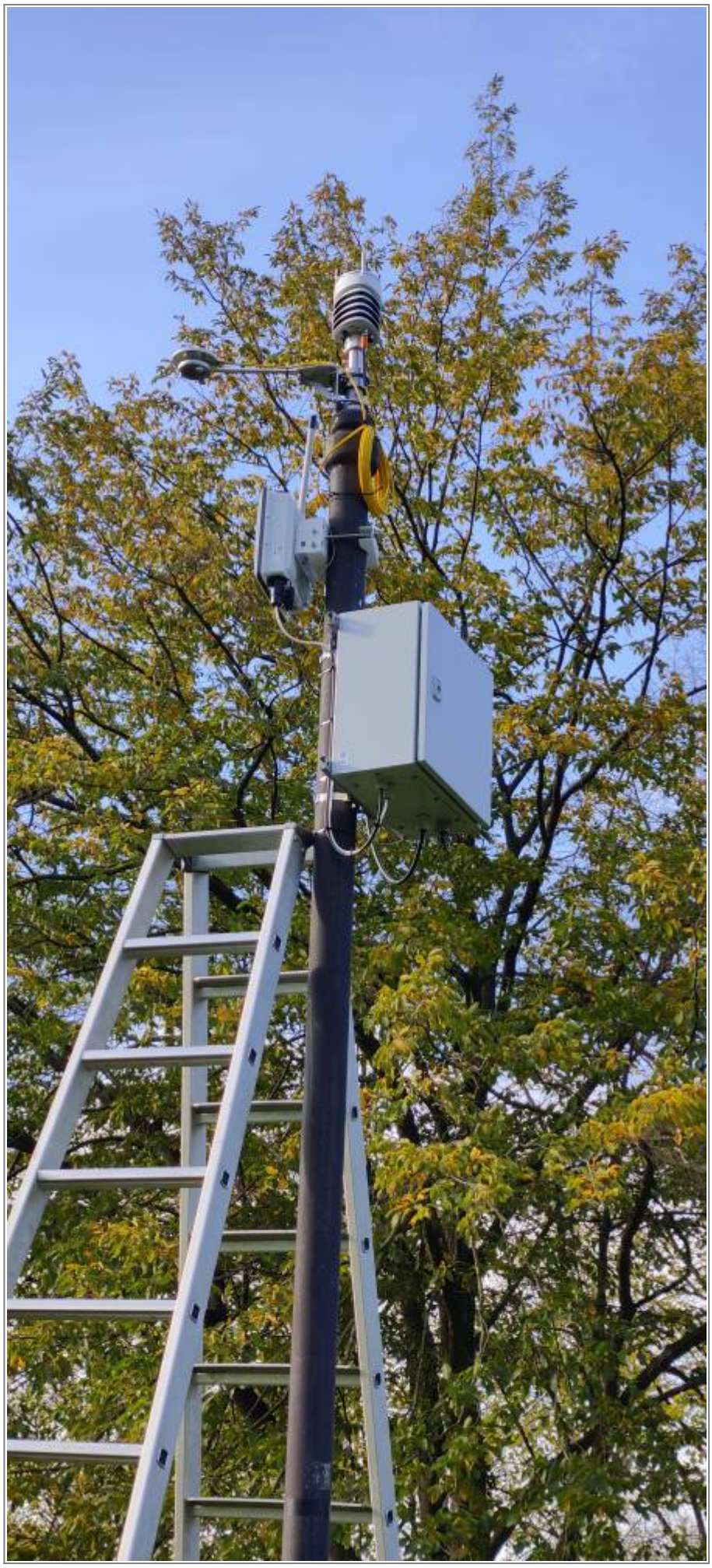

Fig.: Weather station mounted on a pole at Forstgarten in Kleve

Sensors of the Weather Station

Sensor / Component	Physical Quantity / Function
Vaisala WXT536	Temperature, Humidity, Barometric pressure, Wind speed / direction, Precipitation
Kipp & Zonen CMP3 pyranometer	Global radiation
Teltonika Router	
Raspberry Pi	
...	

Data Flow (under construction)

Physical:
Vaisala Sensors → (RS485) → Raspberry Pi → (Ethernet) → Teltonika Router → (4G) → MQTT Broker (kleve.cool)

Logical:
Vaisala Sensors → (API) → Raspberry Pi (MQTT Publisher) → MQTT Broker (kleve.cool) → Node-Red (MQTT Subscriber) → InfluxDB → Grafana

Remarks:

- Raspberry Pi does not provide permanent storage but buffers the sensor data in a local file in case the MQTT broker is unreachable.

Accessing the data

The data of our weather station is **freely available** through MQTT!

The accessible variables:

Key	Unit	Comment
wind_dir_min	°	
wind_dir_avg	°	
wind_dir_max	°	
wind_speed_min	m/s	
wind_speed_avg	m/s	
wind_speed_max	m/s	
temperature	°C	
humidity	%	
pressure	hPa	
rain_accumulation	mm	automatically reset after 100mm
rain_duration	s	
rain_intensity	mm/h	

Key	Unit	Comment
hail_accumulation	hits	
hail_duration	s	
hail_intensity	hits/h	
solar_radiation	W/m²	

More information about the measurements can be found in the datasheet: Vaisala WXT530 Series

MQTT Broker and Topic	
URL	kleve.cool
PORT	1883
TOPIC	weather/kleve/01
USERNAME	weather-kleve-public
PASSWORD	IoTRocks

Tests in the IoTLab

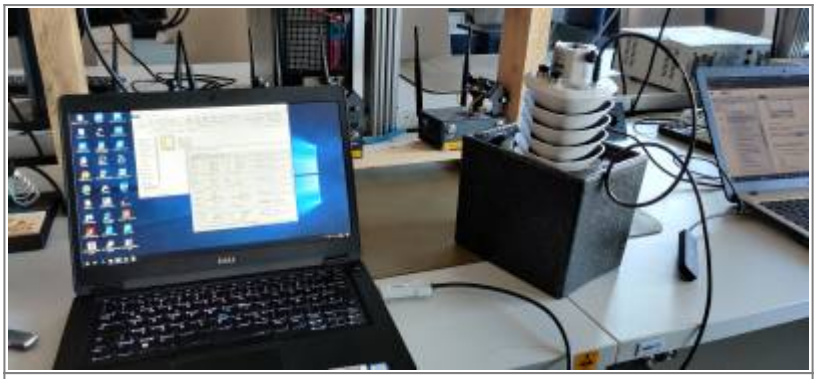

Fig.: First Test in the IOT-Lab with a USB-Connection

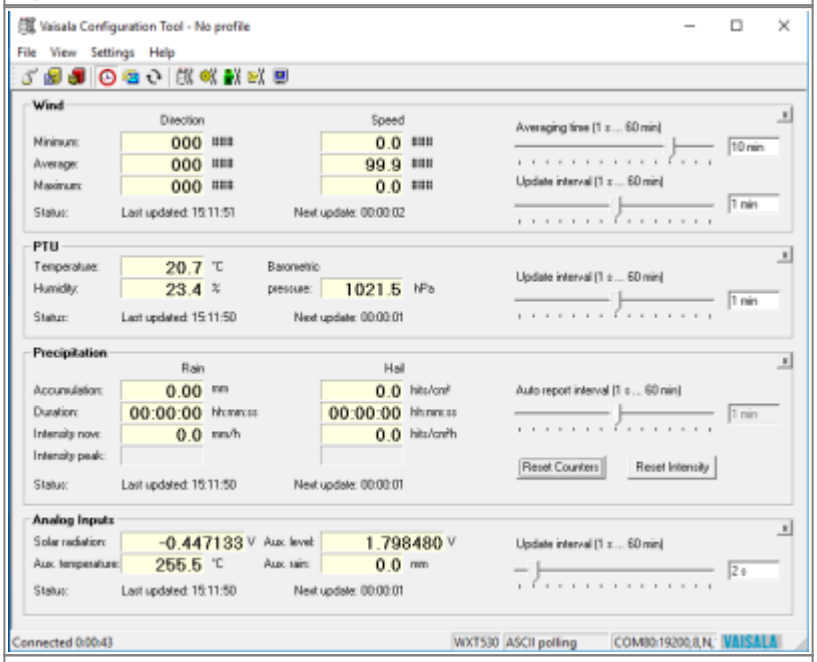

Fig.: Reading the Data with the Vaisala Configuration Tool

RS485

To read the Data from the WXT536 Module we connected an rs485 to USB converter. This protocol will

be used when the weather station is permanently installed in Kleve. The WXT536 accepts a voltage range from 6-24V, so we had to connect an external power supply.

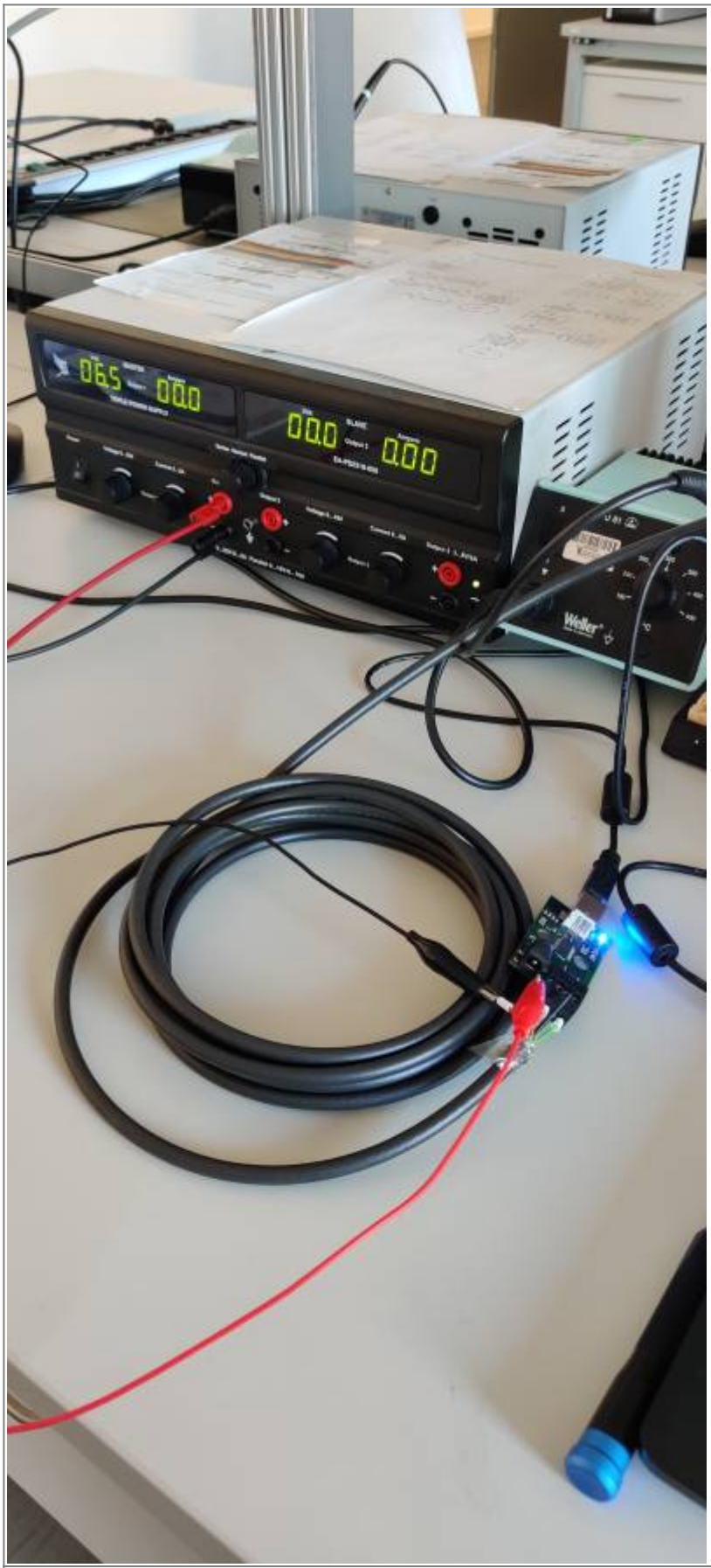

Fig.: Connecting to the WXT536 with an rs485 to USB converter

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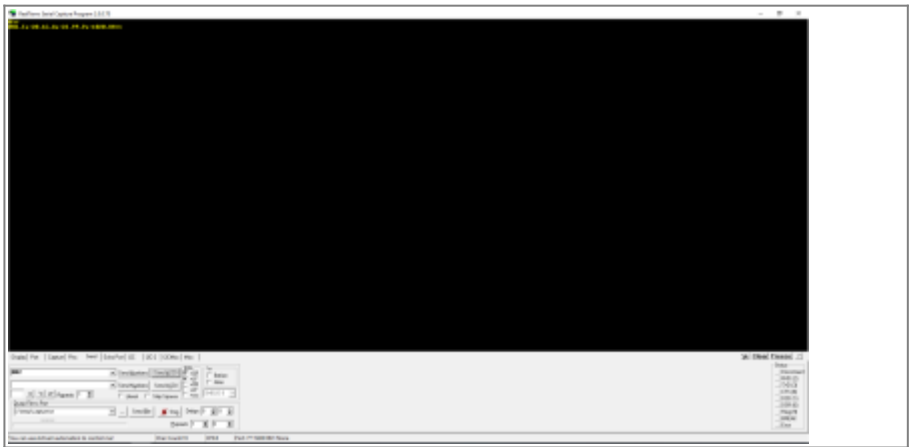

Fig.: Serial response from the WXT536 after sending a data request

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Last update: **2024/03/25 16:59**