HSD
Hochschule Düsseldorf
University of Applied Sciences

UMT
Labor für Umweltmesstechnik
Environmental Measurement Techniques

New development of a small customizable system for the measurement of volcanic gas concentrations with LTE data transfer

Konradin Weber, Christian Fischer, Detlef Amend

Düsseldorf University of Applied Sciences -
Hochschule Düsseldorf (HSD)

Laboratory for Environmental Measurement Techniques UMT

Wish List

- Measurement of various gaseous substances i.e. CO_2, SO_2, H_2S and many more
- Adaptable for different scenarios / sensors
- Rugged design that survives harsh environments
- Lightweight so the system can be delivered via UAV
- (rechargeable) battery powered
- Synchronized central data storage (no lost micro SD cards anymore)

DROPS – DROP Sensor current state

- Designed around a 32Bit ESPRESSIF ESP32 (not a power hungry RasPi)
- SimCom SIM7000G integrated GPS/GSM Module
- Firmware update via GSM
- Rechargeable LiIon Battery for autonomous operation
- LoFi housing from standard installation tube (UV resistant)

Sensors / Interfacing

- Support for BOSCH BMP280/BME280/BME680
- Support for SENSIRION SCD30 / SCD41 (CO_2)
- 4 ADC with options for 0…5V or 4…20mA interfacing – so a wide range of analog sensors can be attached

Data Storage (the website)

- Data is transmitted via GSM to our webserver
- storage solution on a standard webserver (PHP)
- Realtime visualization of data by type
- Location visualisation via google maps

In development (comming soon)

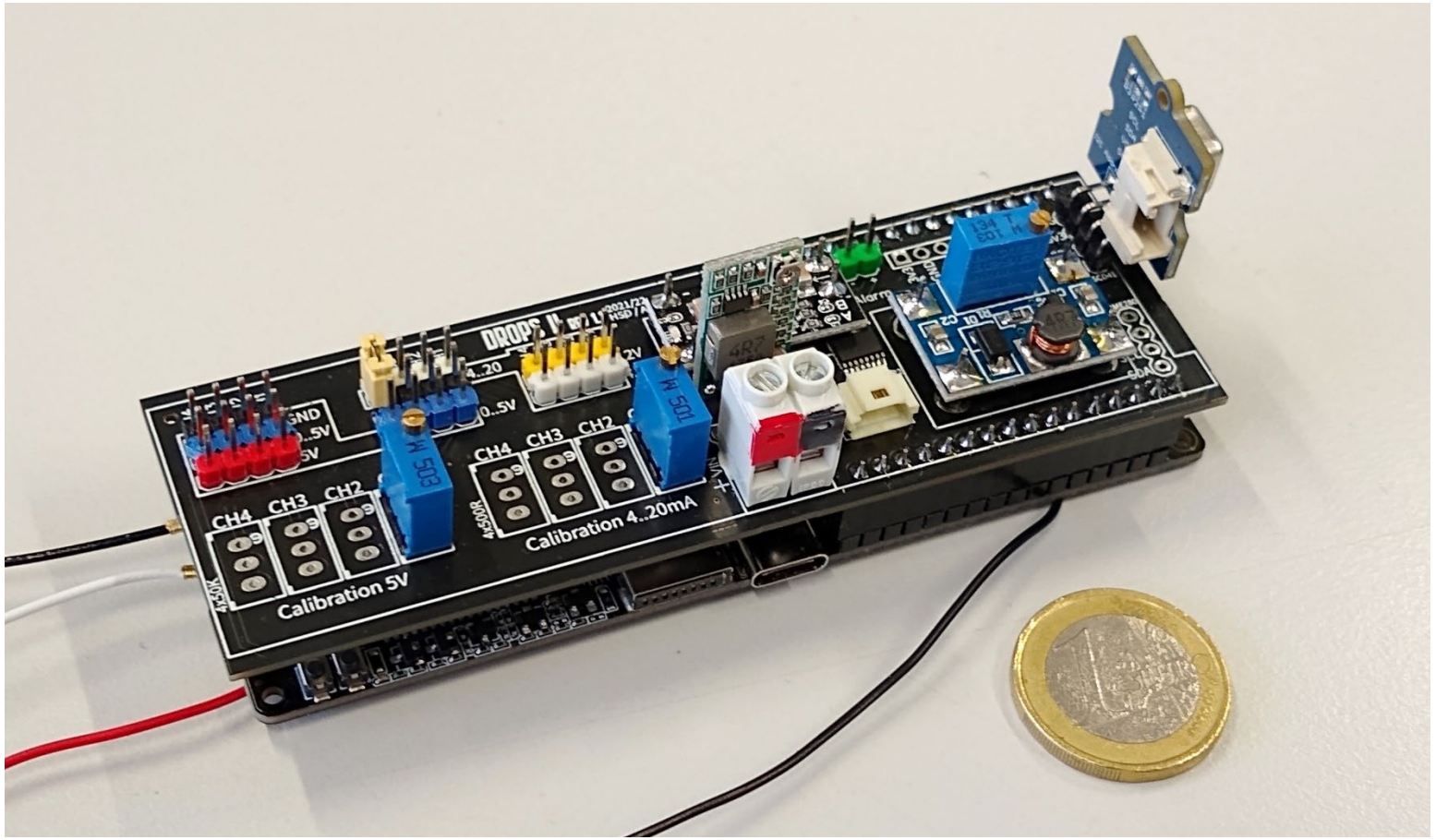
- solar powered units
- data transfer via satellite (IRIDIUM)
- lower power consumption (more sensor sleep)
- more sensors ☺

The naked system

Reference Board (developed by HSD) with an attached SENSIRION SCD41 (small blue PCB top right).

On the left side is the analog interfacing, on the right are (adjustable) voltage regulators.

The DROPS Board interfaces with the MCU Board via 32 pin interconnectors.



Under the hood

An open DROPS (Gen II housing).

Constructed from standard installation piping, we get about 25 years of UV stable housing for a really low price.

The custom cut mounting pieces hold the Board sandwich, the GPS and GSM antenna.

The housing can hold up to 6 18650 LiPo cells.

Two DROPS in the wild

Two Gen I DROPS (the old housing design) on the active crater rim on Vulcano Island, Italy.

Photo Credit: Luca Tarchini

Quad DROPs

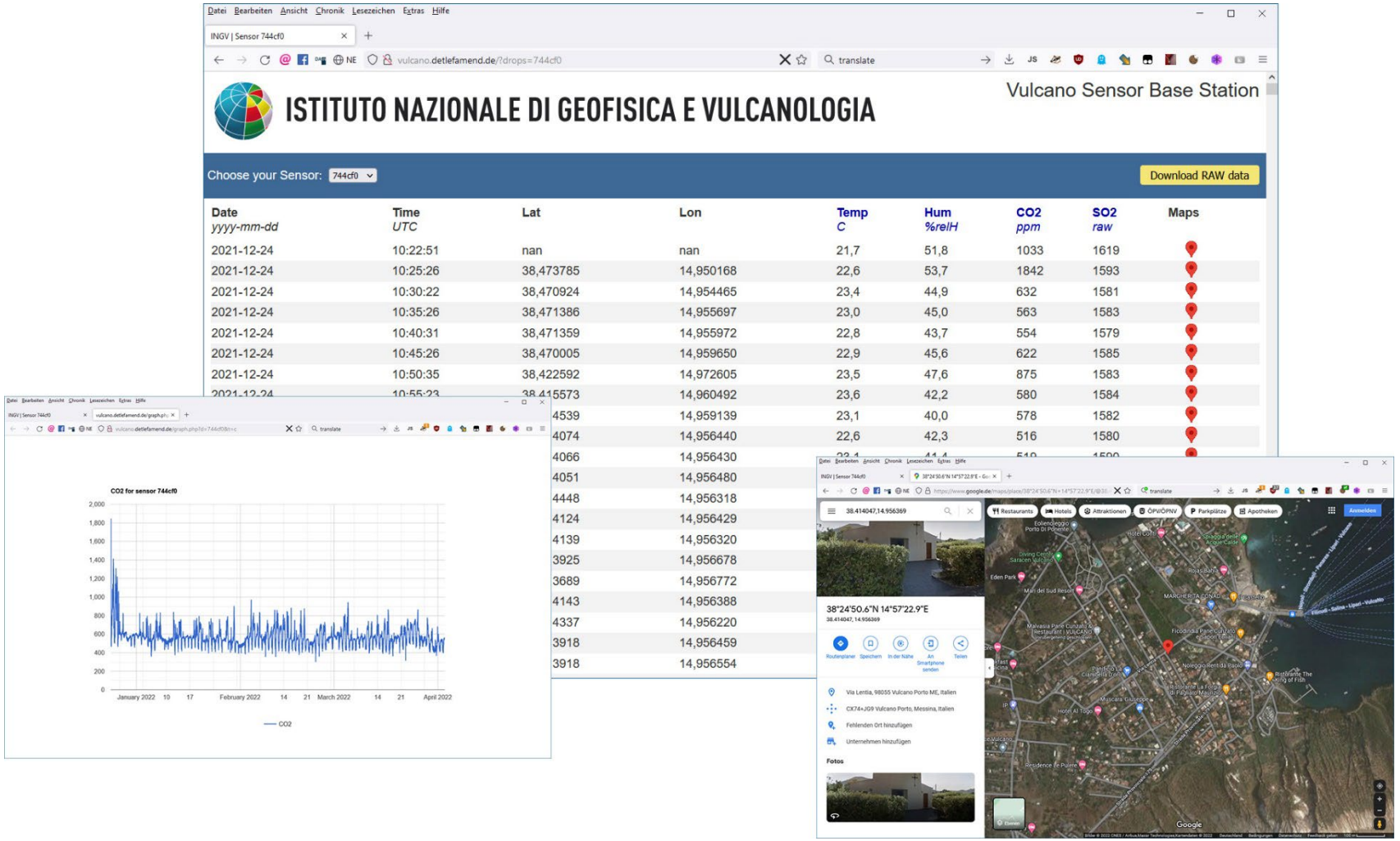
Four DROPs (Gen II housing) ready to ship to La Palma, Spain.

Web Interface

The Web Interface (customized for Sensor Units on Vulcano Island, Italy).

Bottom left is a real time graphical analysis, on the right a Google Maps view of the location of the sensor.

Since december 2021, every unit on vulcano has transmitted over 30.000 datapoints.



Thanks for listening!

More about the sensors in the presentation with Maria Luisa Carapezza, Session NH2.1, 22-05-26 | 17:28–17:35