



# UAV based measurements of CO<sub>2</sub> emissions from anthropogenic point sources

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CO<sub>2</sub> emissions are the primary cause of man-made climate change. In order to limit this, a reduction of emissions is necessary. For this reason, possibilities must be established to monitor emissions through independent measurements. A large part of the human CO<sub>2</sub> emissions falls on point sources such as coal or gas fired power plants. On a global level, it is planned to explore these remotely by means of satellites. At the regional level, both airborne and UAV-based measurements are suitable, which can also be used for smaller sources and for the validation of the satellite data.

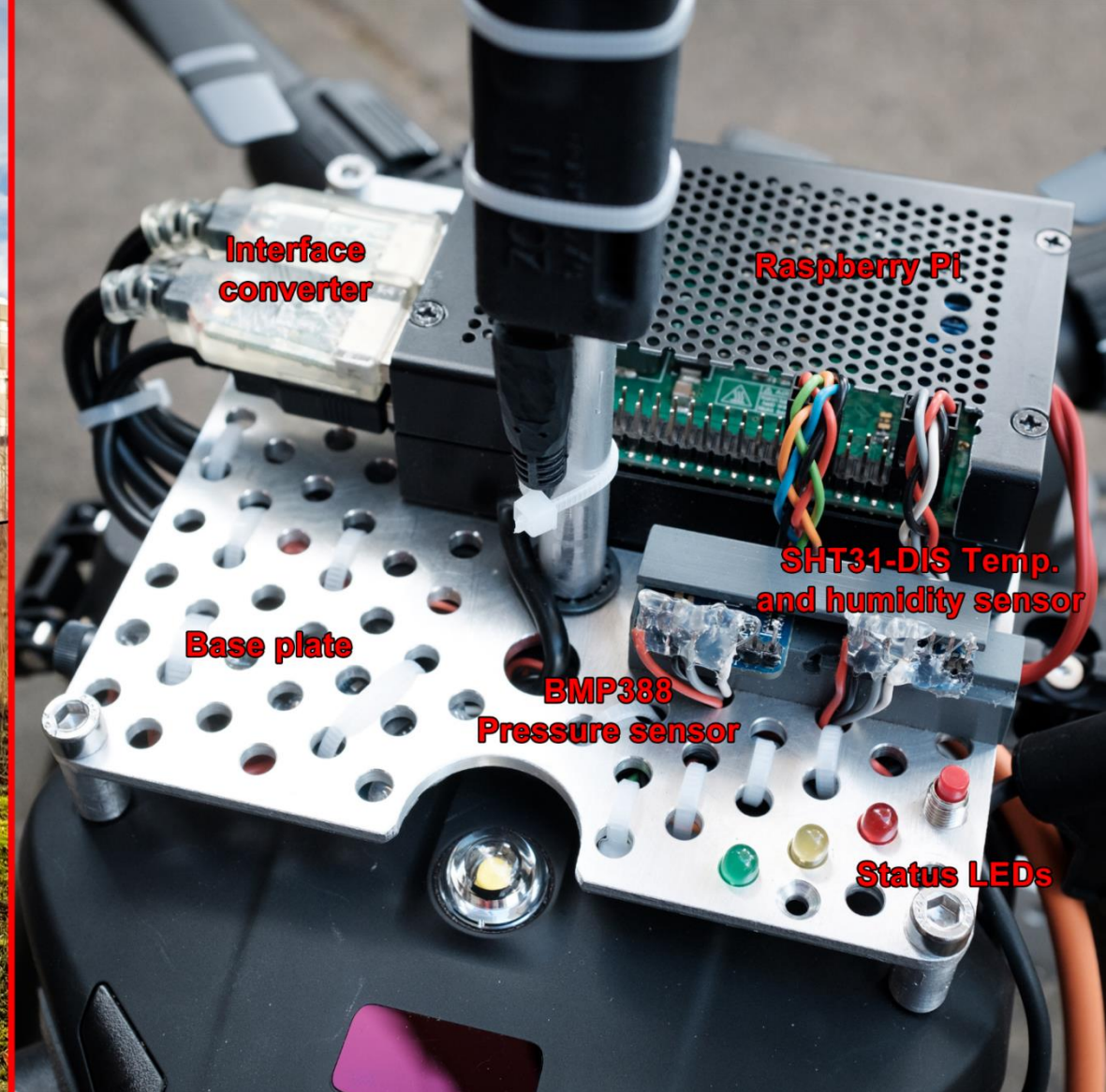
**Here we present the development of a UAV for the determination of CO<sub>2</sub> emissions from individual point sources by simultaneously measuring CO<sub>2</sub> concentration, wind speed and other meteorological parameters.**

A commercial UAV for industrial tasks is used as platform. CO<sub>2</sub> is measured by a non-dispersive infrared (NDIR) detector with an accuracy of about 2ppm and an ultrasonic anemometer is used for wind measurements. All relevant data is transmitted to the operator during the flight so that the flight pattern can be spontaneously adapted to the measurement data.

**This presentation introduces the UAV including the installed sensors as well as the measuring principle and presents results of the first flights.**



# UAV and instrumentation



- Usage of off the shelf components. UAV: DJI Matrice 210v2. CO<sub>2</sub>: Vaisala GMP343. Wind: FT Technologies FT205. Pressure: Bosch BMP388. Temperature and humidity: Sensirion SHT31-DIS.
- Total weight: 4.8kg UAV + 1.2kg Payload (including camera)
- Maximum flight time: 24.7min.





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I'm looking forward to discuss with you and show you results of:

- the **characterization of the CO<sub>2</sub> sensor**,
- the **calibration of the anemometer**,
- a CO<sub>2</sub> and Wind **in-flight validation** with ICOS, and
- **first flights near an industrial facility and flux estimation.**



**Zoom:** Tuesday 05.05.2020, 18:00 (pass: 3482020)

<https://uni-bremen.zoom.us/j/99544778884?pwd=U3VSQnpaTnE5VFZrZHpDa2E5QlI0Zz09>