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UAV based measurements of CO₂ emissions from anthropogenic point sources

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Abstract

CO₂ 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 CO₂ 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 CO₂ emissions from individual point sources by simultaneously measuring CO₂ concentration, wind speed and other meteorological parameters. A commercial UAV for industrial tasks is used as platform. CO₂ is measured by a non-dispersive NIR detector with an accuracy of 1–2 ppm 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. We will introduce the UAV including the installed sensors as well as the measuring principle and present results of the first flights.