**CarboSense: a low-cost low-power $CO_2$ network for the city of Zurich and Switzerland**

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The project CarboSense establishes a dense network of 300 sensors distributed over Switzerland, with a denser cluster of 40 sensors in the urban area of Zurich. It uses the unique opportunity of combining newly available wireless low-power communication through LoRaWAN (long-range wide-area network) with low-cost sensor devices. The 300 $CO_2$ nodes are deployed at strategic locations in Switzerland and Zurich, including operational air quality monitoring stations, weather measurement sites, telecommunication towers and ad hoc sites such as lamp poles for the dense deployment in Zurich. Such a dense network will help documenting the spatial and temporal gradients of $CO_2$ atmospheric concentrations at the regional and smaller scales. The final objective is to constrain $CO_2$ surface fluxes from both anthropogenic and biogenic sources, including fossil fuel emissions and vegetation uptake. For the city of Zurich, the specific objective is to monitor the temporal evolution of the anthropogenic $CO_2$ emissions, to attribute these emissions to different sectors, and to evaluate the success of the measures taken by the political authorities in the context of various initiatives to reduce the energy demand and carbon footprint of the city. For this purpose, the sensor measurements are combined with building-resolving simulations of the $CO_2$ dispersion within the entire city.

Here we will present first measurements from the city network as well as first $CO_2$ simulations and emphasize the challenges in properly accounting for all $CO_2$ sources and sinks within the city including human respiration and vegetation uptake.