Universität Basel

Research Project

diFUME

Third-party funded project

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Monitoring CO2 emissions of urban areas has become a necessity for sustainable urban planning and climate change mitigation. The current urban inventories are based on top-down approaches that use fuel and electricity consumption statistics for determining CO2 emissions. Such approaches present consistency issues, neglect the biogenic components of the urban carbon cycle (i.e. vegetation, soil) and have restricted spatial and temporal resolution. The main goal of diFUME is to provide a robust methodology for mapping and monitoring the actual urban CO2 flux at optimum spatial and temporal scales, meaningful for urban design decisions. diFUME will develop, apply and evaluate independent models, capable to estimate all the different components of the urban carbon cycle (i.e. building emissions, traffic emissions, human metabolism, photosynthetic uptake, plant respiration, soil respiration). An innovative interdisciplinary methodology will be introduced, combining two cutting-edge technology tools, the Eddy Covariance (EC) and the latest advances in Earth Observation (EO). EC provides continuous in-situ measurements of CO2 flux at the local scale. Previous EC applications in urban areas have provided valuable insights on the holistic understanding of the urban CO2 flux according to the source/sink distribution in the highly heterogeneous urban environment. EO offers synoptic and continuous monitoring of large areas, capable of enhanced representation of the urban cover, morphology and function. Combined use of EO and EC can provide enhanced interpretation and modelling capabilities to achieve fine scale mapping and monitoring of urban CO2 flux. diFUME methodology will be developed and applied in the case study of Basel, exploiting the unique infrastructure and long-term urban EC measurements. diFUME methodology can be transferable to any city, providing an independent toolbox for consistent urban CO2 emission monitoring, supporting sustainable urban planning strategies.

Keywords Urban climate; Micrometeorology; Boundary layer meteorology; Turbulent fluxes; Eddy Covariance; Carbon dioxide emissions; Urban carbon dioxide flux
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Add publication

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