

Evaluation of Methane anthropogenic emission in Lyon-France area

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Methane is a greenhouse gas of anthropogenic origin but also natural since it is produced especially during the decomposition of organic matter under anaerobic conditions. To evaluate and differentiating the sources of Methane in the 1.5 million habitants of Lyon urban area (downtown, industrial areas, tertiary activities and University Lyon 1 campus places), a 2 months long measurement campaign has been performed. It was realized in the framework of 2th year master program in ocean, atmosphere and climate sciences of Lyon 1 University and Ecole Centrale de Lyon. Measurements were realized following the protocol used in the MEMO2 EU-funding program (MEthane goes MOBILE - MEasurements and MOdelling) [1, 2]. Therefore, mobile measurements were performed on the ground level and close to potential sources to estimate, for the first time in Lyon, the spatial and temporal concentration variations and to localize the different diffuse emission sources like as: organic degradation, oil plant and animals dejection. The measurements were performed with an LGR-ICOS™ GLA132-GGA greenhouse gas analyzer [3] having a 1.4 ppb detection limit within a maximum 1000 ppm measurement range. We present in this abstract only few results from the whole mapping of CH₄ emission in Lyon area. Figure 1 shows the evolution of methane concentration in the vegetal waste place of University Lyon 1. It shows an 18% increase of CH₄ concentration above the 2,22 ppm background concentration level. Figure 2 shows CH₄ concentration in the Croix-Rousse tunnel (3 km long). Measurement in the tunnel has been performed at a 50 km/h constant velocity. There, CH₄ emission from traffic increase up to 8 % above the same background level. Interestingly, both concentration increase are of the same order of magnitude. These results will be presented in more details and discussed during the conference.

[1] Sara M. Defratyka et al. (2021), *Environ. Sci. Technology*, 55, 8583–8591. doi.org/10.1021/acs.est.1c00859

[2] J.M. Fernandez et al. (2022), *Atm. Env. X* 13, 100153. doi.org/10.1016/j.aeaoa.2022.100153

[3] ABB Inc., (2021) LGR-ICOS™ GLA132-GGA, Technical manual.

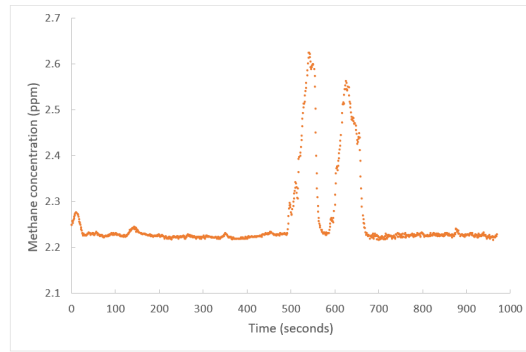


Figure 1 : Evolution of methane concentration as a function of time in the vegetal waste place of University Lyon Claude Bernard, 03/12/2022, 14h50.

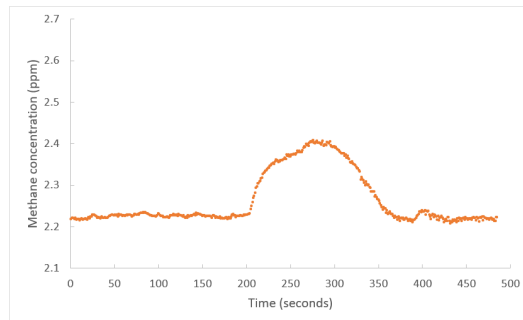


Figure 2: Evolution of the methane concentration as a function of time in the Croix-Rousse tunnel (3km long), 03/12/2022, 15h30, measurement realized at the regulated velocity (50 km/h) crossing the tunnel.