

無人載具搭載微型採樣器採集分析工業區 VOCs 及其產源溯源模擬

Extracting VOCs Using a Micro Sampler Carried by a Drone Assisting in

Tracing the Potential Sources by a Dispersion Model-A Case Study of

VOC Emissions from an Industrial Complex

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Abstract

Volatile organic compounds (VOCs) related air pollution cause public panic and pose adverse effect on human health in the communities in most developed and developing countries. Our recent studies have applied a quadrotor drone (Mavic Pro, DJI) equipped with an needle trap sampler (NTS), which could fast arrive at the polluted locations for immediately sampling and further tracking the suspended VOC sources. Notably, a remote-controlled telescoping sampling device was also equipped on the drone in order to extend the NTS outside the disturbed downward wind zone, which was resulted by the rotating propellers. Two petrochemical manufacturing plants at an industrial complex in Kaohsiung City, southern Taiwan, were applied as the targets for VOCs sampling and further qualitative and quantitative analysis in the laboratory. Additionally, an air mass backward trajectory model, FYTRAJ, was used to track the paths of VOC emitted from the potential sources and transported in the ambient air. According to the analyzed constituents of VOCs and the raw material data of the suspected factories, which was combined with the backward trajectory tracking simulation of VOC plumes, an NTS carried by the drone has been proven as a cost-effective air pollution monitoring apparatus for locating the VOC emission sources.

Keywords: Drone, Micro sampler, Backward trajectory simulation, Volatile organic compounds, Source tracking