

## Vertical structural measures of atmospheric pollutants using XU-S

\*Kazuho Yamaji<sup>1</sup>, Tetsuya Miyakoshi<sup>2</sup>, Satoshi Komatsu<sup>2</sup>, Isao Kanda<sup>3</sup>

1. Kobe University, 2. ShinMaywa Industries, Ltd. , 3. Japan Meteorological Corporation

Vertical profiles of meteorological properties and atmospheric pollutant concentrations and these diurnal patterns were collected by using XU-S (Experimental Unmanned / Utility aircraft by ShinMaywa) over the northeast side of Awaji Island faced to the Osaka bay on early December, 2020, under a drone utilization promotion project by Hyogo prefecture and the New Industry Research Organization. In the early morning of 2nd December, monitoring data of the ground site indicated more chill and ground surface NO and NO<sub>2</sub> concentrations were increased, on the other hand, Oxidant (Ox) concentration became lower in comparison with the other days. Diurnal vertical profiles of O<sub>3</sub> and PM<sub>2.5</sub> concentrations and meteorological parameters were measured by POM (Personal Ozone Monitor), p-sensor, iMet-XQ2 mounted on XU-S, respectively. In the monitoring launched at 7:00 on 2nd December, atmospheric temperature profile suggested that the ground inversion layer was developed until around 50-100m alt. Meanwhile, O<sub>3</sub> concentrations were very low, less than 10 ppbv up to 50 m alt., but 20-40 ppbv in 50-500 m layers. PM<sub>2.5</sub> concentrations were around 13 mg/m<sup>3</sup> on the surface and were decreased to around 5 mg/m<sup>3</sup> in the upper layers from 50 m alt. Primary pollutants were trapped in the developed ground inversion layer within 50 m alt., where O<sub>3</sub> concentrations were depressed through the process of the NO titration until the early morning. During the second monitoring launched at 11:00, constructed atmospheric vertical gradient started to be disappearing and the vertical O<sub>3</sub> and PM<sub>2.5</sub> concentrations were close to constant values up to 500 m alt., respectively. In the afternoon, the atmospheric vertical gradient was mostly disappeared. Comparisons between observed and simulated vertical and diurnal profiles will be conducted to understand the uncertainties of simulated O<sub>3</sub>.

Keywords: vertical profiles of atmospheric pollutants, vertical observations by using the fixed-wing unmanned aircraft, ozone, PM2.5