

Spatiotemporal variations of nitrogen dioxide (NO₂) over Fukuoka , observed by multiple MAX-DOAS instruments and 3-D coherent Doppler lidar

*Hironobu Ueki¹, Hisahiro Takashima¹, Martina M. Friedrich²

1. Fukuoka university, 2. Belgian Institute for Space Aeronomy (BIRA-IASB), Belgium

To understand spatiotemporal variations and transport/mixing processes in nitrogen dioxide (NO₂) over Fukuoka, an urban area in Japan, continuous NO₂ profile observations with a high temporal resolution of four minutes by MAX-DOAS (Multi Axis Differential Optical Absorption Spectroscopy) at three sites in Fukuoka have been conducted from October 2018 to January 2019. Two sites (Yakuin (33.580°N, 130.396°E) and Sohara (33.580°N, 130.356°E)) are located near the city center and pointing towards the north (towards the sea), and one site (Fukuoka University (33.550°N, 130.364°E)) is located outside of the city center pointing towards the city center.

In the case of 29 November 2018, an air mass with a high NO₂ concentration was observed near the ground in the morning (until 10:30 am) and later, around 10:30 to 11:30 am, an increased concentration of NO₂ gradually appeared at a higher altitude over the city center. This increased NO₂ concentration disappeared around 13:30-14:00 pm. From the simultaneous three-dimensional (3-D) wind observations by 3-D coherent Doppler lidar installed at Fukuoka University, it is suggested that the air mass with high NO₂ concentration was transported upward from the ground by vertical convection, and after that, a clean air-mass was advected from sea by sea-breeze. In this presentation, we will show several results observed by the multipoint MAX-DOAS and 3-D wind observations, focusing on the 3-D transport over Fukuoka using the high NO₂ air mass as a tracer.

Keywords: MAX-DOAS