

Temporal variations in tropospheric NO₂ vertical column densities from Pandora instrument at Yokosuka, Japan

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Nitrogen dioxide (NO₂) is a gaseous air pollutant that plays a role in the formation reaction of tropospheric ozone. Though orbital satellites are useful to monitor and identify major emission sources of NO₂, its low temporal resolution makes it difficult to capture the temporal variation of NO₂. Therefore, the ground-based Pandora can be an alternative to investigate the high temporal variability of NO₂ at the fixed location by compensating for the satellite observation. In this study, we investigated NO₂ tropospheric vertical column density (TropoVCD) from Pandora (146). Pandora is installed at Yokosuka (35.32°N, 139.65°E), Japan, which can represent the characteristic of an urban area since June 2021. The monthly mean variation of NO₂ TropoVCD showed the highest in winter and lowest in summer due to the reduced solar irradiance in winter (increased lifetime of NO₂). The seasonally-averaged diurnal variation generally showed an increasing pattern in the morning and a decreasing trend in the afternoon likely due to the viewing direction with less pollution. However, the peak times and magnitude of diurnal variations in NO₂ TropoVCD varied depending on the season (early peak with small variability in the warm season and late peak with large variability in the cold season). A more detailed investigation will be conducted including backward trajectory analysis to identify the main source of NO₂ TropoVCD in Tokyo Metropolitan Area.

Keywords: Pandora, NO₂ TropoVCD, Diurnal variation, Monthly variation