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Enhanced NO_2 in Okinawa Island, Japan by rapid airmass transport from mainland China as observed by MAX-DOAS

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Continuous NO_2 profile observation using ground-based Multi Axis Differential Optical Absorption Spectroscopy (MAX-DOAS) at Cape Hedo (26.87°N, 128.25°E) in Okinawa Island, Japan has been conducted since March 2007. MAX-DOAS NO_2 observation covering a period more than one year shows low concentration particularly during northern summer with less than 0.3 ppbv at 0-1 km for most cases, whereas higher concentration (more than 1 ppbv) was sometimes observed during winter-spring. The higher concentration with high variability during winter-spring is also found by Global Ozone Monitoring Experiment (GOME2) and Ozone Monitoring Instrument (OMI) satellite observations for tropospheric column NO_2 under less cloud condition. Trajectory analysis using the meteorological analysis data set from Japan Meteorological Agency shows that the high NO_2 concentration is mainly caused by rapid airmass transport from mainland China within $\sim$24 hours in accordance with strong westerly wind. Such rapid airmass transport is one of the most important components for NO_2 variations at Cape Hedo, even though the Hedo area is located about 700 km away from the coast of China.