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Changes in springtime tropospheric ozone observed at Mt. Happo, Japan: New insights for the roles of Asian emissions and long-range transport

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We revisited and updated the long-term trend of tropospheric ozone at Mt. Happo, Japan, based on continuous measurements for the period from 1998 to 2016. We focused on the springtime ozone concentration and possible influences by the continental outflow from East Asia. Since 1998 the springtime ozone concentration has shown a large increase until 2007, very likely caused by the increase in the emissions of ozone precursors associated with economic growth in eastern China, as evidenced from satellite observations of nitrogen dioxides. In 2008 and 2012, two large decreases in ozone were observed, followed by a stabilization until now. The residence time of air masses passed over central eastern China, which is the most polluted region in China, showed high levels during 2004–2007, and then decreased in 2008. Meteorological variability as well as emissions of ozone precursors are important factors controlling the ozone concentration at Mt. Happo.