

Japan Geoscience Union Meeting 2011

(May 22-27 2011 at Makuhari, Chiba, Japan)

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AAS021-19

Room:102

Time:May 23 14:45-15:00

Regional O₃ trend and its chemical linearity in recent anthropogenic emissions change over East Asia

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Regional O₃ response to perturbations of Chinese anthropogenic emissions is investigated using the brute force method by a regional chemical transport model. Both springtime and summertime ozone responses are unlikely to show nonlinearly in the emissions perturbation of 70%–200% over East Asia. Observed NO₂ in the east central China in 2003–2008 is ranging within a factor of 0.82–1.35 of the 2004 level, and that explains recent O₃ change stays within the linear O₃ response range. As for observed O₃ at Japanese remote sites, the O₃ response is 11.7 ppbv with respect to a 100% increase at the east central China from NO₂ level in 2004. The simulated relationship between O₃ and NO₂ shows 5.9 ppbv of O₃ growth is caused by doubled NO₂ from the 2004 level.

Keywords: tropospheric O₃, chemical linearity, emissions, East Asia