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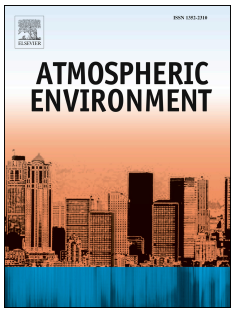

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PII: S1352-2310(15)30209-0

DOI: 10.1016/j.atmosenv.2015.07.010

Reference: AEA 13946

To appear in: *Atmospheric Environment*

Received Date: 5 December 2014

Accepted Date: 10 July 2015

Please cite this article as: Song, S.-K., Shon, Z.-H., Kang, Y.-H., Comparison of impacts of aircraft emissions within the boundary layer on the regional ozone in South Korea, *Atmospheric Environment* (2015), doi: 10.1016/j.atmosenv.2015.07.010.

Comparison of impacts of aircraft emissions within the boundary layer on the regional ozone in South Korea

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Abstract

In this study, the air pollutants emitted from aircraft within the boundary layer (BL) were investigated for their impacts on the ozone (O_3) concentration at and around three international airports (Incheon, RKSI; Gimpo, RKSS; and Jeju, RKPC) using the WRF-CMAQ modeling system during the summer of 2010. The analysis was performed using two sets of simulation scenarios: (1) with (i.e., TOTAL case) and (2) without aircraft emissions (i.e., BASE case). The model study suggested that aircraft emissions within the BL over the three airports can have a significant impact on the O_3 (and NO_x) concentrations in the source regions (the airports) and their surrounding/downwind areas. A significant negative impact of aircraft emissions on the O_3 concentrations in the late afternoon (19:00 LST) was predicted near the three airports with their largest impact of -20 ppb near the RKSI at 19:00 LST. This was attributed mainly to the high NO_x conditions in the VOC-limited areas and possibly in part to the rapid titration of O_3 by NO around these airports. The rate of photochemical O_3 destruction due to the aircraft emissions near the three airports was the most dominant contributor to the O_3 levels compared to the other physical processes.

Keywords: Aircraft emission; Airport; Photochemical destruction; O_3; NO_x emissions; WRF-CMAQ

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