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1 **Analysis of seasonal ozone budget and spring ozone latitudinal gradient variation**
2 **in the boundary layer of the Asia-Pacific region**

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11

12 **Abstract**

13 The ozone (O₃) budget in the boundary layer of the Asia-Pacific region (AP) was
14 studied from 2001-2007 using the output of Model of Ozone and Related chemical
15 Tracers, version 4 (MOZART-4). The model-simulated O₃ data agree well with
16 observed values. O₃ budget analysis using the model output confirms that the
17 dominant factor controlling seasonal variation of O₃ differs by region. Photochemistry
18 was found to play a critical role over Japan, the Korean Peninsula and Eastern China.
19 Over the northwestern Pacific Ocean, advective flux was found to drive the seasonal
20 variation of O₃ concentrations. The large latitudinal gradient in O₃ with a maximum of
21 52 ppbv over the marine boundary layer around 35°N during the spring was mainly
22 due to chemistry; meanwhile, advection was found to weaken the gradient. The
23 contribution of stratospheric O₃ was ranked second (20%) to the local contribution
24 (25%) in Japan and the Korean Peninsula near 35°N. The rate of O₃ export from
25 China's boundary layer was the highest (approximately 30%) in low latitudes and
26 decreased with increasing latitude, while the contribution of North America and
27 Europe increased with increasing latitude, from 10% in lower latitudes to 24% in
28 higher latitudes.

29 **Keywords:** boundary layer; Asian-Pacific; ozone budget; seasonal variation;
30 latitudinal gradient

31 **1. Introduction**

32 Tropospheric Ozone(O₃) is affected by transport from the O₃-rich stratosphere,
33 photochemical production following oxidation of CO and volatile organic compounds
34 (VOCs) in the presence of nitrogen oxides (NO_x) and by removal via photolysis,
35 reaction with radicals, and deposition in the Earth's surface (Wild, 2007). It is

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