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Asian dust storm influence on North American ambient PM levels: observational evidence and controlling factors

T. L. Zhao¹, S. L. Gong^{1,2}, X. Y. Zhang², and D. A. Jaffe³

¹Air Quality Research Division, Science and Technology Branch, Environment Canada, 4905 Dufferin Street, Toronto, Ontario, M3H 5T4, Canada

²Centre for Atmosphere Watch and Services of CMA, Chinese Academy of Meteorological Sciences, Beijing 100081, China

³University of Washington-Bothell, 18115 Campus Way NE, Bothell, WA 98011-8246, USA

Abstract. New observational evidence of the trans-Pacific transport of Asian dust and its contribution to the ambient particulate matter (PM) levels in North America was revealed, based on the interannual variations between Asian dust storms and the ambient PM levels in western North America from year 2000 to 2006. A high correlation was found between them with an R^2 value of 0.83. From analysis of the differences in the correlation between 2005 and 2006, three factors explain the variation of trans-Pacific transport and influences of Asian dust storms on PM levels in western North America. These were identified by modeling results and the re-analysis data. They were 1) *Strength of frontal cyclones from Mongolia to north eastern China*: The frontal cyclones in East Asia not only bring strong cold air outbreaks, generating dust storms in East Asia, but also lift Asian dust into westerly winds of the free troposphere for trans-Pacific transport; 2) *Pattern of transport pathway over the North Pacific*: The circulation patterns of westerlies over the North Pacific govern the trans-Pacific transport pattern. Strong zonal airflow of the westerly jet in the free troposphere over the North Pacific favor significant trans-Pacific transport of Asian dust; 3) *Variation of precipitation in the North Pacific*: The scavenging of Asian dust particles by precipitation is a major process of dust removal on the trans-Pacific transport pathway. Therefore, variation of precipitation in the North Pacific could affect trans-Pacific transport of Asian dust.

[Final Revised Paper](#) (PDF, 1179 KB) [Discussion Paper](#) (ACPD)

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