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Transpacific transport of ozone pollution and the effect of recent Asian emission increases on air quality in North America: an integrated analysis using satellite, aircraft, ozonesonde, and surface observations

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Abstract. We use an ensemble of aircraft, satellite, sonde, and surface observations for April–May 2006 (NASA/INTEX-B aircraft campaign) to better understand the mechanisms for transpacific ozone pollution and its implications for North American air quality. The observations are interpreted with a global 3-D chemical transport model (GEOS-Chem). OMI NO₂ satellite observations constrain Asian anthropogenic NO_x emissions and indicate a factor of 2 increase from 2000 to 2006 in China. Satellite observations of CO from AIRS and TES indicate two major events of Asian transpacific pollution during INTEX-B. Correlation between TES CO and ozone observations shows evidence for transpacific ozone pollution. The semi-permanent Pacific High and Aleutian Low cause splitting of transpacific pollution plumes over the Northeast Pacific. The northern branch circulates around the Aleutian Low and has little impact on North America. The

southern branch circulates around the Pacific High and some of that air impacts western North America. Both aircraft measurements and model results show sustained ozone production driven by peroxyacetylnitrate (PAN) decomposition in the southern branch, roughly doubling the transpacific influence from ozone produced in the Asian boundary layer. Model simulation of ozone observations at Mt. Bachelor Observatory in Oregon (2.7 km altitude) indicates a mean Asian ozone pollution