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Interactive comment on "Linking aerosol fluxes in street canyons to urban city-scale emissions" *by* B. K. Tay et al.

Anonymous Referee #1

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Using CFD model simulation data, this study examines how aerosol fluxes at street canyon top heights are related to ambient wind speed, inflow turbulence intensity, and building wall heating intensity and attempts to link the aerosol fluxes to city-scale emissions. This manuscript is well organized and contains interesting analysis results. I recommend the manuscript be accepted for publication in ACP, subject to some revisions. (1) In RANS modeling, the turbulent Schmidt number (Sc) is specified. However, the values of Sc used in urban flow and pollutant dispersion modeling are widely distributed (Tominaga and Stathopoulos 2007, AE). The magnitude of calculated turbulent aerosol flux directly depends on the value of Sc. Hence, the relative importance of mean and turbulent aerosol fluxes at the street canyon top height can be changed for a chosen value of Sc in the cases that the magnitude of turbulent aerosol flux is not much different from that of mean aerosol flux. What is the value of Sc used in this

study? Please discuss this issue. (2) Aerosol dynamical processes are not included in the CFD model. Why do authors consider two aerosol size modes (Aitken mode and accumulation mode)? (3) This manuscript nicely demonstrates that the calculated aerosol flux is very sensitive to the windward wall heating. A literature review indicates that simulated mean flow patterns in a street canyon can differ even with the same (or very similar) aspect ratio and heating intensity when the windward wall is heated, depending on CFD models. This potentially implies large uncertainties in calculated mean and turbulent aerosol fluxes. Please discuss this issue with relevant studies being cited. (4) Please explain reasons for the pattern of the heat flux vs. net aerosol flux for U = 2.5 m/sec in terms of mean flows in the street canyon. (5) Linking aerosol fluxes in two different spatial scales is an important problem. The manuscript title reflects this problem. However, this important problem is not so nicely dealt with in this manuscript. The term "city-scale" appears to be inappropriate considering the measuring height and the heterogeneity nearby the measurement tower. More proper to use the term "neighborhood-scale"? To what extent is each of the four simplifications valid? We know aerosol dynamical processes are not negligible in street canyons (e.g., coagulation). Comparing the diurnally averaged aerosol fluxes (observation) with simulation data is problematic.

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