Geophysical Research Abstracts,
Vol. 11, EGU2009-7749, 2009
EGU General Assembly 2009

A methodology for developing distribution of anthropogenic heating flux parts in mega-cities: A case study in the Tehran region

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The diurnal profile and distribution of anthropogenic heating flux in Tehran mega-city is discussed on the basis of a defined heat emission inventory method that includes waste heat from vehicles traffic, electricity and fouls consumption in building, industrial sectors and metabolism. Spatial and temporal distribution of anthropogenic heating components is developed separately base on prepared GIS database for this purpose including key parameters such as landuse, population density, traffic parameters etc with all diurnal consumption profile that is generated for each subcategory. This methodology is adapted in order estimation of anthropogenic heat flux parts in order introducing into multi-scale meteorological modeling systems including mesoscale, urban canopy and building energy models (MM, UCM and BEM). Representative winter and summer weekday city-scale profiles are developed in order study of trends in this scale. The diurnal profiles have morning and evening peaks, with summertime and wintertime maxima up to 44 and 65 Wm2 respectively. The foul consumption component is the main one in winter with a 54% share and traffic with 44% in summer. Based on our distribution analysis with 500 meter resolution of Tehran region we find that the urban core region may have anthropogenic heating values 4-7 times the magnitudes of the city-scale values presented in this paper, especially in morning and evening and with higher spatial resolution, it is observed values more than this too.

Keyworks: Heat islands; Urban energy balance; Anthropogenic heat; GIS; Tehran