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Anthropogenic heat fluxes estimation for metropolitan areas and urban regions

A. Ginzburg, N. Raspletina

A.M. Obukhov Institute of Atmospheric Physics RAS, gin@ifaran.ru,

The development of climate change and weather forecasting numerical models and increasing computing facilities make possible to decrease the model grid cells size and take into account same additional climate change factors didn't considered before.

One of these factors is the anthropogenic heat fluxes over the large urbanized areas, such as world capitals and rapidly growing megacities, especially in Southeast Asia and Latin America.

The growing energy consumption made anthropogenic heat fluxes very high within the megacities itself and already comparative with other energy fluxes in the climate and weather model grid cells, contain large urbanized areas.

Urban areas cover less than 1% of the Earth surface but their anthropogenic heat fluxes could be significant for local, regional and some continental size climate processes.

Average energy fluxes in the Earth climate system (in W/m^2) are the following:

Net solar radiation flux at the top of the atmosphere - 235

Solar radiation, absorbed by Earth surface - 168

Thermal radiation balance at the Earth surface - 66

Latent heat flux from the surface - 78

Convective and turbulent fluxes from the surface - 24

Geothermal flux through the Earth surface - 0.05

Anthropogenic heat flux over the globe - 0.03

Anthropogenic heat flux over the land surface - 0.1

Anthropogenic heat flux (central Tokyo in daytime) - 400

Anthropogenic heat flux (Tokyo suburbs at night) - 30

Anthropogenic heat fluxes over the some largest metropolitan areas are estimated using the national population (census) and energy consumption data. The role of urban regions heat fluxes are studied for different sizes grid energy balance for global, regional and local types of climate models.

This investigation show, that urban regions heat fluxes became the main climate related energy driving force inside the grid cells with horizontal size less than 100x100 km.