Assessment of Urban Plantation Climate-Regulating Function based on Remote Sensing Data (Case Study Moscow)

Robert Sandlerskiy

A.N. Severtsov Institute of Ecology and Evolution RAS, Moscow, Russia, srobert_landy@mail.ru

A variety of active surfaces in combination with various building levels forms a specific urban mode of atmospheric turbulence. The spatial combination of green plantings, asphalt and building defines a temperature and wind mode, and creates various air circulation systems. Influence of spatial structure and buildings height on a wind mode of urban territories is full enough studied in town-planning. Assessment of the input to formation of urban climate of surfaces with various heat capacity and, vegetation is not developed. This assessment can be based on the multispectral remote sensing data which contain information on energetic surface condition. Multispectral data development make possible a calculation of the basic energetic characteristics of surfaces: input and absorption of solar energy, energy consumption on evapotranspiration, thermal scattering and accumulation, a heat flux and temperature of surface. This technique gives a possibility to estimate a thermal mode of surface at various spatial scales. In world practice urban landscapes condition estimation based on remote data (Urban Remote Sensing) is underdeveloped, and focused, mainly, on temperature and heat flux estimation.

For energetic characteristics estimation for Moscow territory we use Landsat 5 TM and 7 ETM + remote sensing data for three terms in the vegetational season: May (26/05/2003), July (21/07/2003), August (17/08/2007), with the spatial resolution 3030 m for 6 channels in a short-wave range and 6060 m – for the thermal channel. Mean values of calculated temperatures have been compared to daily temperatures on a municipal meteorological station. The calculated energetic characteristics have been analyzed to estimate independent factors which determine their spatial variation. Basing on the estimated factors we classify surface, and allocate surface types with a various temperature and energetic mode. Next we calculate mean values of energetic characteristics to each type. Type identification we make through high resolution images and maps. All data were joined in GIS. The neighborhood of types differing by energetic characteristics, leads to gradients and turbulence generation.

Function of urban plantation along roads is specific: it cools these territories on 3-4 degrees and act like buffer, isolating hot lines and creating special local circulation. Green plantings of court yard form kind of islands of the lowered temperature against hot streets. As a result of temperature fall by green plantings on 5-8 in comparison with other city territories special conditions of circulation of air weights are formed.