Geophysical Research Abstracts
Vol. 15, EGU2013-501, 2013
EGU General Assembly 2013

Modeling of microclimatic characteristics of highland area

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Microclimatic characteristics of highlands may vary considerably over distances of a few meters depending on slope and aspect. There is a problem of estimation of components of surface energy balance based on observation of single stations for description of microclimate highlands. The aim of this paper is to develop a method that would restore microclimatic characteristics of terrain, based on observations of the single station, by physical extrapolation.
The input parameters to obtain the microclimatic characteristics are as follows: air temperature, relative humidity, and wind speed on two vertical levels, air pressure, surface temperature, direct and diffused solar radiation and surface albedo.
The recent version of the Meteorological Radiation Model (MRM) has been used to calculate a solar radiation over the area and to estimate an influence of cloudiness amounts.
The height, slope and aspect were accounted at each point with using a digital elevation model. Have been supposed that air temperature and specific humidity vary with altitude only. Net radiation was calculated at all points of the area. Supposed that the difference between the surface temperature and the air temperature is a linear function of net radiation. The empirical coefficient, which depends on wind speed with adjustment of given area. Latent and sensible fluxes are calculated by using the modified Bowen ratio, which varies on the area.
Method was tested on field research in Krasnodar region (RF). The meteorological observations were made every three hour on actinometric and gradient sites. The editional gradient site with different orientation of the slope was organized from 400 meters of the main site. Topographic survey of area was made 1x1,3 km in size for a digital elevation model constructing. At all points of the area of radiation and heat balance were calculated. The results of researches are the maps of surface temperature, net radiation, latent and sensible fluxes. The calculations showed that the average value of components of heat balance by area differ significantly from the data observed on meteorological station.