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Baseline climate network in Hungary for high accuracy detection of the local effects of climate change

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Automated synoptic and climatological observation network consists of nearly 100 stations in Hungary. Measurements are performed according to the WMO standards. Long term data series from research oriented sites for energy, water vapor and trace gas budget measurements (as CarboEurope, NitroEurope) are also available.

The aim to establish a high precision baseline climatological network is to detect local effects of the global climate change with the highest possible accuracy and reliability. Five background climate stations have been installed, each of them representing different characteristic sites of the country. Quality control of data provided by the meteorological service, state of the art measurements and data processing techniques used in the research programs are unified. In the first year of the three-year project (2006-2008) installation conditions of the targeted observation system, its measurement program and accuracy of the measurement of climate parameters (as air temperature, precipitation, radiation) were investigated. Separation of the surface effects, estimation of each footprint area, and optimization of long term profile (tower) measurements were also analyzed.

The measurement program of the central station (with 20 m tower) and another 4 baseline climate stations consists of: (i) detection of long term changes in basic climate parameters with the highest accuracy (for all elements of standard synoptic stations), (ii) besides the conventional 2 m measurements, profile measurements (wind speed,

temperature and moisture) and calculation of stratification, (iii) high accuracy radiation budget measurements, (iv) soil temperature and moisture profiles, soil energy budget measurements, (v) determination of energy budget components using the eddy covariance and/or the Bowen ratio methodologies.

Location of the new baseline network, the measuring and data acquisition program and the first results from the central station (Agrometeorological Observatory Debrecen, Northeast of Hungary) are presented. Methodology of standardization of previous measurements and new data series (standard meteorological elements, profiles and energy budget components) is also investigated.

Important additional aim of the project is to follow up the solar radiation transmissivity of the atmosphere that is more or less undisturbed by the direct human activity. In order to perform it a solar radiation observatory has been installed on the highest peak of Hungary called Kékes (1015 m a.s.l.). Both classical broad band solar radiation components (different downward and upward radiation components in the visible, near infrared, far infrared and UV ranges) and spectral irradiances at selected wavelengths (to estimate aerosol optical depth and other aerosol optical parameters) are carried out as it is done in the solar radiation observatory in Budapest (139 m a.s.l.). Simultaneous operation of the two solar observatories on the one hand will give us a reference for the targeted solar radiation transmission studies, on the other, by comparing the measuring results from the two solar observatories, radiation budget of the lowest and most polluted layer of the atmosphere and its variation will be exactly recognized.