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Ground Surface Temperature Monitoring under Different Types of Surfaces – the Three Year Results

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Three year results (2003-2005) of the ground surface temperature monitoring under different surface types presented by grass, barren soil, sand and asphalt are discussed. The experimental site is located at the campus of Geophysical Institute, Prague (50˚ 02’ 27" N, 14˚ 28’ 39" E, 274 m a.s.l.). The monitoring has been running since June 2002. The soil temperatures at depths of 2, 5, 10, 20 and 50 cm below surface and the air temperatures at 5 cm above surface in each of the 4 different surfaces are recorded every 5 minutes together with the air temperature of the site at 200 cm height. Additionally soil moisture is measured under the sand and the grassy soil at the depths of 5, 20 and 50 cm. Data on precipitation are available from the older observatory site located 100 m aside.

The mean annual ground temperature depends strongly on the surface albedo, the intensity of insolation and evaporation, and the insulation type, such as e.g. snow or vegetation cover. The mean annual (2005) soil temperature at the depth of 2 cm under the grass was 11.0 ˚C and the mean soil – air difference amounted to +1.1 ˚C. The soil temperature ranged from –0.3 ˚C to +30.0 ˚C during the year. Corresponding values for barren soil, sand and asphalt are (11.2 ˚C, +1.3 ˚C, -5.1 ˚C to +47.0 ˚C), (11.8 ˚C, +1.9 ˚C, -6.2 ˚C to +44.1 ˚C) and (14.0 ˚C, +4.1 ˚C, -9.6 ˚C to +59.1 ˚C), respectively. It means that the ground temperatures were warmer than the surface air temperatures in all monitored surfaces. The differences between the minimal and maximal temperatures are controlled mainly by different thermal diffusivities under the individual surfaces. The mean thermal diffusivities computed for the period March through October for the grassy soil, bare soil, sand and asphalt in the depth layer between 2 and 5 cm are $1.8 * 10^{-7}$ m^2s^{-1}, $1.2 * 10^{-7}$ m^2s^{-1}, $4.4 * 10^{-7}$ m^2s^{-1}, and $8.0 * 10^{-7}$ m^2s^{-1}, respectively.