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Soil temperature variability under different land covers

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The aim of this presentation is to detect how far are soil temperatures influenced by type of the land cover. We analysed soil temperature data under different types of land cover (grass, bare soil, sand, and asphalt) in the period 2003 – 2015. The measurements took place on the grounds of the Institute of Geophysics in Prague (Czech Republic). Soil temperature data were collected from various depths (2, 5, 10, 20, 50 cm). Moreover, meteorological data such as air temperature, incoming solar radiation, precipitation etc. were collected too. In this contribution, results of soil temperature measurements from 2 cm and 50 cm depths and selected meteorological properties are presented. Since the temperature regime is changing during the year, various temporal resolutions were chosen – hour, day, month, season and annual. This allow us to see how/if different types of land cover have influence on soil temperatures in different parts of the year.

One of the studied factors was coefficient of variation (CV). It allows us to compare soil temperature datasets under different land covers in relation with their mean. In high temporal resolution (hours) the highest CV was found under the asphaltic land cover. CV in 2 cm under the bare soil and sand is almost as high as under the asphalt. The lowest CV was found under the grassy surface both in 2 cm and 50 cm depths. Under the sand, CV is slightly lower than under the bare soil, but has higher mean temperature than the bare soil. In lower temporal resolution (years) CV in both 2 cm and 50 cm depths is similar. The lower temporal resolution the lower soil temperature variability.

We also analysed a temperature offset (difference between soil and air temperature) in selected depths to detect possible surface specific coupling between soil and air temperature. Soil is warmer than air in general, but significant differences can be found over various land cover types. Soil under the grass in on average 1°C warmer than air, soil under asphalt is from 3°C to 4°C warmer than air. Effect of solar radiation on temperature offset is evident in 2 cm but is not so pronounced in deeper parts of the soil.

Soil under the asphalt in 50 cm depth was on average more than 2,5°C warmer than under other surfaces during the studied period. The temperature gradient between the surface and 50 cm depth was also highest under the asphalt. This effect may have many environmental or microclimatic impacts.