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The impact of lake area on microclimate

K. Bartůňková (1,2) and Z. Sokol (1)

(1) Institute of Atmospheric Physics, Academy of Sciences, Czech Republic, (2) Faculty of Science, Charles Univerzity in Prague, Czech Republic

Large artificial lakes, which arise due to reclamation of mined open pit mines, evoke the changes of the surface characteristics in the locality. These changes consist primarily in different thermal properties (heat capacity, thermal conductivity), different surface roughness and different albedo compared to the original surface. The aim of our contribution is to quantitatively estimate the impact of these changes on the air temperature, humidity and other meteorological elements in their surroundings.

The study is performed for the former coal mine Ležáky – today's lake Most in northern Bohemia. The lake lies at the altitude of 199 m above sea level, its size is 311 ha and its maximum depth is 75 m. The calculations are made by the numerical weather prediction model COSMO with a very high horizontal resolution (333 m). The domain size is 200x99 grids and time step is 3 s. The COSMO model is coupled with the lake model Flake on idealized conditions to model water surface / air interactions. The input data for the model are obtained (i) from the meteorological observatory Kopisty that lies about 1 km far from the lake coast, (ii) from a lake station that measures among others also the water temperature up to the depth of 20 m, (iii) from the analysis of meteorological fields from European Centre for Medium-Range Forecast. The calculations have been made for different sizes of the lake.

Obtained results show significant impact of the Most lake area on air temperature especially in the summer period (June, July and August). On certain conditions the water area may decrease air temperature by more than 2K in the vicinity of the lake. The impact of the lake on air temperature is evident also in winter.