



Investigation of the effect of sealed surfaces on local climate in urban areas

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Local climate is driven by the interaction between energy balance and energy transported by advected air. Short-wave and long-wave radiation are major components in this interaction. Some few studies (e.g. Santamouris et al.) showed that adjusting the grade of reflection of surfaces is an efficient way to influence temperature.

The present study investigates the influence of high albedo concrete surfaces on local climate.

The first step of the study consisted of experimental investigations: routine measurements of the short and long-wave radiation balance, of the ground and of the air temperature and humidity at different heights above 6 different types of sealed surfaces were performed. During this measurement campaign the above mentioned components were measured over a duration of 4 months above two conventional asphalt surfaces, one conventional concrete and three newly developed concrete surfaces with increased reflectances. Measured albedo values amounted to 0.12 ± 0.02 for the asphalt surfaces and to maximum values of 0.56 for high albedo concrete. The maximum difference in surface temperature between the asphalt surfaces and the high albedo concrete surfaces amounted to 15°C. In addition the emission constants of the different sealed surfaces were also determined and were compared to values from literature..

In a second step the urban energy balance model Envi_Met was used to simulate the surface temperature of the six surfaces. The simulated surface temperatures were compared to the measured surface temperatures and statements as to uncertainties of the model simulations were made

In a third step, Envi_Met was used to simulate the local climate of an urban district in Vienna. The surface and air temperature and the SW, LW fluxes were calculated for different types of sealed surfaces. By performing calculations of thermal stress indices (UTCI, PMV), statements as to the influence of the type of sealed surface on thermal stress on humans was made.