



Thermal behaviour of an urban lake during summer

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One of the undesirable effects of urbanisation is higher summer air temperatures in cities compared to rural areas. One of the most important self-cooling mechanisms of cities is the presence of water. Comparative studies showed that from all urban land-use types open water is the most efficient in reducing the heat in its surroundings. Urban water bodies vary from small ponds to big lakes and rivers, but already the presence of a swimming pool in a garden resulted in lower temperatures in the area. Moving and still water both exhibit slightly different patterns with respect to the environment. While ponds tend to respond more to air temperature changes, faster flowing rivers are expected to have more stable temperatures over time. There are two major components of the cooling effect of a surface water: (1) through evaporation, and (2) by storing heat and increasing its own temperature. This study shows results from detailed temperature measurements, using Distributed Temperature Sensing (DTS), in an urban lake in Delft (The Netherlands). A two-meter tall construction measuring temperature with 2 mm vertical spatial resolution was placed partly in the water, reaching all the way to the muddy underlayer, and partly in the air. Data from a continuous two-month measurement campaign show the development of water temperature with respect to solar radiation, air temperature, rain, and inflow of rainwater from surrounding streets, etc. Most interesting is the 1-2 cm thick layer of colder air right above the water surface. This layer reaches values lower than both the air and the water, which suggests that a certain part of the potential cooling capacity of open water is restricted by a small layer of air just above its surface.