Climate regulation provided by street trees - examples from Gothenburg, Sweden

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Trees has shown to be an effective measure for reducing heat stress in high latitude cities in summer, especially in dense urban areas (e.g. Lindberg and Grimmond 2011). During the day the cooling effect provided by trees is foremost due to shading, i.e. evaporative cooling is of less importance. In summer deciduous trees (foliated) block 95-98% of the direct solar radiation and in winter (un-foliated) 45-53% of the direct solar radiation (Larsson 2011, unpublished results). This means that trees provide significant shading both in summer (desired) and in winter (undesired) (Thorsson 2012). In order to design better cities and mitigate heat problems, quantitative information on the shading effect of street trees is required. This paper presents the influence of street trees (amount, location, size etc.) on the outdoor thermal comfort in the high latitude city of Gothenburg, Sweden. The shading effect of street trees on a neighborhood scale is analyzed using the SOLWEIG-model (2.2 version) (Lindberg et al. 2008, Lindberg and Grimmond 2011). The model simulates spatial variations of 3D radiation fluxes and mean radiant temperature (Tmrt) as well as shadow patterns in complex urban settings. Model evaluation shows good agreement between modelled and observed values of Tmrt as well as shadow patterns (Lindberg and Grimmond 2011), which shows that the SOLWEIG model is an appropriate tool to quantify the influence of vegetation on Tmrt and shadow patterns within the urban environment. The SOLWEIG model is designed to run using a user friendly interface which makes it possible for practitioners and planners as well as researchers to make use of the model in a climate planning perspective. The results presented in this paper highlight a number of possible climate sensitive planning practices for urban areas at the local scale.

Keywords: Mean radiant temperature, SOLWEIG, urban vegetation, shadow patterns

1. References

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