

Analysis and comparison of two vegetative roof heat and mass transfer models in three different climates

Vera, S., Pinto, C., Tabares-Velasco, P. C., Molina, G., Flamant, G., Bustamante, W., ... & Kincaid, N. (2019). Analysis and comparison of two vegetative roof heat and mass transfer models in three different climates. *Energy and Buildings*, 202, 109367. Accessed 10 Mar 2021.

Abstract

This study analyzed and compared in detail two existing heat and mass transfer models for vegetative roofs, which were developed by Sailor (2008) and Tabares-Velasco and Srebric (2012). The main equations governing the heat transfer through a vegetative roof were compared side by side. Similarities and differences were highlighted. Both models were programmed in MATLAB, and thermal capacitance of the substrate was implemented by using the finite difference method. The accuracy of both models was evaluated by comparing their results with experimental data obtained on six extensive vegetative roofs, located in three different climate zones, during different seasons of the year. Overall, results showed that both models provide similar predictions of the substrate temperatures. Furthermore, these are in close agreement with the experimental data: for five out of six investigated vegetative roofs, the root mean square deviation is limited to the range of 1.2 °C to 2.5 °C for the Sailor model and of 0.6 °C to 3.0 °C for the Tabares-Velasco and Srebric model. Despite the close agreement between both models, the study also revealed that they greatly differ in the way they evaluate the latent (evaporation) and sensible (convective) heat fluxes, suggesting that at least one of them is miscalculating these heat fluxes. Further research on this topic is recommended..