AtticSim Tool for Enhanced Building Design
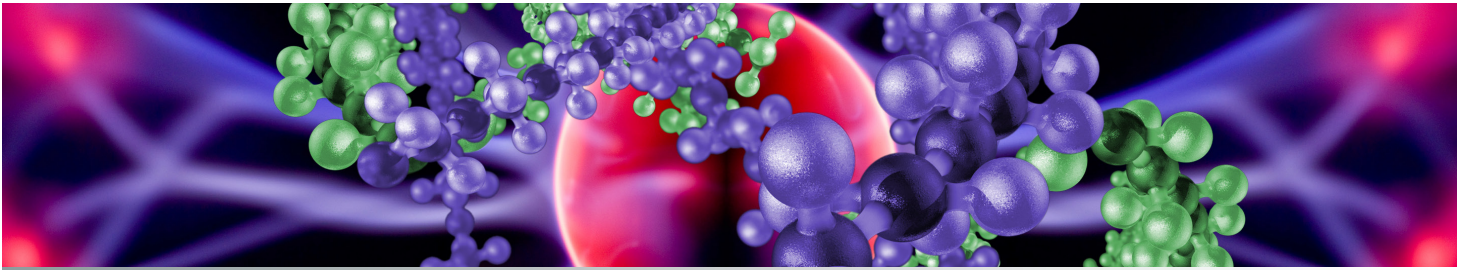
Technology Summary

AtticSim is a Fortran 95-based computer tool for predicting the thermal performance of residential attics. It mathematically describes the conduction through the gables, eaves, roof deck, and ceiling; the convection at the exterior and interior surfaces; the radiosity heat exchange between surfaces within the attic enclosure; the heat transfer to the ventilation air stream; and the latent heat effects due to sorption and desorption of moisture at the wood surfaces. Solar reflectance, thermal emittance, and water vapor permeance of the various surfaces are inputs. The model can account for different insulation R-values and/or radiant barriers attached to the various attic surfaces. Unique among such programs, it also has an algorithm for predicting the effect of air-conditioning ducts placed in the attic.

The tool was validated against field experiments and is capable of predicting ceiling heat flows integrated over time to within 10% of the field measurements. AtticSim can predict the thermal performance of attics having direct nailed roof products, but it has not been used to predict the heat flow across a tile roof having a venting occurring on the underside of the roof, between the roof deck and exterior roof cover. It runs on various platforms from PCs through supercomputers; however, currently it does not run on Apple platforms.

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