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Modelling temporal variance of component temperatures and directional anisotropy over vegetated canopy

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Land surface temperature (LST) as a key variable plays an important role on hydrological, meteorology and climatological study. Thermal infrared directional anisotropy is one of essential factors to LST retrieval and application on longwave radiance estimation. Many approaches have been proposed to estimate directional brightness temperatures (DBT) over natural and urban surfaces. While less efforts focus on 3-D scene and the surface component temperatures used in DBT models are quiet difficult to acquire. Therefor a combined 3-D model of TRGM (Thermal-region Radiosity-Graphics combined Model) and energy balance method is proposed in the paper for the attempt of synchronously simulation of component temperatures and DBT in the row planted canopy. The surface thermodynamic equilibrium can be final determined by the iteration strategy of TRGM and energy balance method. The combined model was validated by the top-of-canopy DBTs using airborne observations. The results indicated that the proposed model performs well on the simulation of directional anisotropy, especially the hotspot effect. Though we find that the model overestimate the DBT with Bias of 1.2K, it can be an option as a data reference to study temporal variance of component temperatures and DBTs when field measurement is inaccessible