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Dual versus single source models for estimating surface temperature of African savannah

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Abstract. Predictions of average surface temperature of a sparsely vegetated West-African savannah by both single and dual source models of surface energy partitioning are compared. Within the single source model, the ``excess resistance" to heat transfer away from the canopy (compared to momentum absorption) is characterised by parameter kB^{-1}, where k is the von Kármán constant and B is the Stanton number. Two values of this parameter are used; first kB^{-1} = 2 (a value often used within surface energy balance models but primarily applicable to permeable vegetation types) and then 12.4 (a value applicable to the savannah in question, which consists more of bluff roughness elements). As expected, the latter parameterisation generates better predictions of surface temperature.
To make accurate predictions of surface temperature using a dual source model, then that model's in-canopy aerodynamic resistance must be increased. Information on this increase is found through direct model intercomparison with the single source model parameterised with kB^{-1} = 12.4.

Keywords: Penman-Monteith equation; Surface temperature; Canopy resistance; Savannah; Dual-Source model

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