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Soil evaporation measurements and modeling in a sugarcane plantation

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Abstract: The expansion of sugarcane planted area in Brazil (86,800 km²) is expected to increase by 49% in the next ten years. The pre-harvest burning is practiced in almost 60% of the area leaving the soil uncovered and promoting a non-productive water flow i.e. the soil evaporation which can influence the yields due to the inter-annual variability of the rainfall in the Southwest of Brazil where 60% of the plantations are concentrated. The total evapotranspiration (ET) was measured by the eddy covariance and the soil evaporation (Es) was observed during the initial regrowth from the stubble and when the plantation was re-established. The Es normalized by the potential evapotranspiration exhibited an exponential relationship with the relative soil water content in the 0.3 m soil layer. This relationship has been modified by a factor (≤ 1) based on the evidence that the available energy decreases as a function of leaf area index in order to represent the increasing soil shading conditions during the crop growth. The ET and Es totals were 845 and 153 mm respectively during the first sugarcane cycle (393 days long) and 669 and 162 mm in the second cycle (374 days long). Therefore the Es represented 18 and 24% of the total evapotranspiration. The ET and Es totals simulated by the calibrated Agro-IBIS model in the first sugarcane cycle were 872 mm and 141 mm respectively similar to the observed values.

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