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Investigating unproductive water losses from irrigated agricultural crops in the humid tropics through analyses of stable isotopes of water

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Additional equations used for calculation of the fraction of evaporation loss (F_E) from Benettin et al., (2018):

$$10^3 ln[\alpha^+(^2H)] = 1158.8(T^3/10^9) - 1620.1(T^2/10^6) + 794.84(T/10^3) - 161.04 + 2.9992(10^9/T^3) \quad (1)$$

$$10^3 ln[\alpha^+(^{18}O)] = -7.685 + 6.7123(10^3/T) - 1.6664(10^6/T^2) + 0.3504(10^9/T^3) \quad (2)$$

$$\varepsilon_k = \theta n(1 - RH)(1 - D_i/D)10^3 \quad (3)$$

$$\delta_A = (\delta_P - \varepsilon^+)/\alpha^+ \quad (4)$$

where,

α^+ [–] and ε^+ [‰] are equilibrium fractionation factors,
T is air temperature [K],
RH is relative humidity,
δ_A is the isotopic composition of atmospheric vapor [‰],
ε_k is the kinetic fractionation factor [‰],
n is the aerodynamic diffusion parameter [–],
θ is the weighting term [–] (the possible influence of the evaporation flux on the ambient moisture and assumed as 1 (Gat, 1996)),
D_i/D is the ratio between the diffusivities [–] (D_i/D=0.9755 (for ^2H) and D_i/D =0.9723 (for ^{18}O) (Merlivat, 1978).

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