Accuracy of Soil Heat Flux Measurements made with Flux Plates of Contrasting Properties. (A03-sauer150621-Oral)

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Abstract:

Flux plate measurements of soil heat flux (G) may include significant errors unless plates are carefully installed and known errors accounted for. The objective of this research was to quantify potential errors in G when using soil heat flux plates of contrasting designs. Five flux plates with thermal conductivity (k) ranging from 0.23 to 1.0 W/(m K), face area from 4.9 to 50 sq cm, and thickness from 2.6 to 7 mm were evaluated in laboratory and field experiments. Under steady-state laboratory conditions, all plates underestimated G in dry and saturated sand by 4 to 45% and 6 to 71%, respectively. Field measurements in a bare clay loam soil showed trends similar to the laboratory experiments. Measured G generally decreased with decreasing plate k. Data trends suggest factors such as thermal contact resistance also influence plate performance. Available theory failed to accurately adjust G measurements for the disparity between plate and sand/soil k. More precise algorithms to account for differences between plate and soil k and the impact of couple heat and water flow around plates are needed to improve the accuracy of plate G measurements.

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