Geophysical Research Abstracts
Vol. 14, EGU2012-1721, 2012
EGU General Assembly 2012

A simple non-invasive field based method for examining and parameterizing root-water-uptake models

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A simple non-invasive field based method for directly parameterizing root-water-uptake models is proposed. Stem psychrometers and sap flow meters are used to measure stem water potential and plant transpiration rate continuously and simultaneously. Predawn stem water potential is selected as a surrogate for root-zone soil water potential to examine and parameterize the root water-uptake water stress response functions. The method is applied to two drooping sheoak (Allocasuarina verticillata) trees for a period of 80 days, covering both a dry season and a wet season. The result indicates that the S-shape function is more appropriate than the Feddes piecewise linear function for drooping sheoak to explain the effect of soil moisture stress on its root water uptake performance. Besides, the water stress function was found to be not only the function of soil moisture, but also dependent on the atmospheric demand. As the result, the S-shape water stress function is corrected considering the effect of atmospheric conditions. The soil moisture modeling results indicated that the proposed method is capable in correctly choosing and calibrating the root-water-uptake models. In addition, the S-shape water stress function with atmospheric correction performed better than the classical S-shape function in modeling both root zone soil water potential and plant transpiration rate.