Geophysical Research Abstracts, Vol. 9, 05243, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-05243

Radiation balance of an isolated holm oak tree (*Quercus rotundifolia* Lam.) in a mediterranean savannah-type woodland

F. Pereira (1), F. Valente (2), J. S. David (2)

(1) Escola Superior Agrária, Instituto Politécnico de Castelo Branco, Castelo Branco, Portugal, (2) Instituto Superior de Agronomia, Universidade Técnica de Lisboa, Lisboa, Portugal (flpereira@esa.ipcb.pt / Phone:+351-272339974)

In closed canopy forests the energy absorbed by the trees can be adequately estimated solely from the vertical radiation fluxes. However, in isolated or widely spaced trees this approach is no longer valid and radiation fluxes in all directions must be accounted for. An adequate estimate of the tree available energy is critical to model and calculate both interception losses and transpiration. Within a study where interception loss in a sparse evergreen oak woodland (*montado*) of Southern Portugal is evaluated and modelled, the net amount of radiant energy absorbed by an isolated holm oak tree (Q) was measured under different radiation conditions. The measuring and calculating procedure was based on the integration of the flux density of net radiation (Rn) at different points of a cylindrical surface (S) enclosing the tree crown. A set of 4 net radiometers were used: one at a fixed position, on the top of the crown, and the remaining 3 mounted on a standing structure that could be moved around the tree to measure Rn fluxes through the inferior and lateral sides. Measurements of Q were made for 8 different days, during the first 3 months of 2006. Night time measurements of Rn were also done, but with the net radiometers at fixed positions around the tree. The meteorological conditions during the measurements included clear sky and cloudy days, some of which with light rain. Net radiation at the top of the crown accounted for about 72 % of the total energy absorbed by the tree, and this is reflected by the good linear fit between Q and Rn above the crown. Meteorological conditions seem to have some influence on this relationship, as suggested by the differences on the adjusted linear models when total, clear sky, cloudy or rainy data sets were used. The occurrence of rain tends to cause a slight increase in Q in comparison to dry conditions, for identical

levels of Rn. Q also shows a strong linear response to solar radiation (Rs), given the dependence of net radiation upon short wave radiation. The same happens with the component of Q received by the top crown surface. However, energy absorbed laterally is much less dependent on Rs, and the inferior component of Q is completely independent of solar radiation. Under conditions when rainfall interception is most likely to occur, i.e. cloudy/rainy days, the daily time-course of Q follows closely those of Rs and Rn, with a maximum of only 75 W m^{-2} (expressed per unit of leaf area). Similar maximum daily values were observed in other studies with different species but under similar weather conditions. During the night, net radiation should not have a significant spatial variability and Rn around the canopy should be relatively homogeneous. Accordingly, night time estimates of Q were obtained from measurements of Rn at fixed positions, which were considered representative of the Rn fluxes around the tree.