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Contents

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Since 1727 when the phenomenon of root pressure was first described in detail, the mechanism has been poorly understood. Pickard has developed a quantitative model that considers the wide range of data available in the literature, including the recent *in situ* measurements of ionic concentrations within xylem vessels.

Special Section: Modelling Net Ecosystem Exchange

Contributed papers originating from presentations at the Modelling Net Ecosystem Exchange workshop, held in Canberra, Australia, April 2001

This paper compares three radiation models: two-stream approximation, Goudriaan's radiation model and Beer's law). It is found that Beer's law is not suitable for estimating canopy energy fluxes and other two models can be used to estimate quite accurately the surface energy and CO_2 fluxes for horizontally homogenous plant canopies.

This review tackles issues relating to the conversion of canopy-intercepted radiation to photosynthate, testing four basic types of models. As this process is well understood at the level of the leaf, this review examines some of the problems arising when such models are scaled up to a canopy, regional or global scale.

Gifford reviews the literature on the representation of plant respiration in ecosystem models of plant production, concluding that using a constant carbon use efficiency is the best shortcut, and identifies some still-unresolved problems. The topic is important for understanding how carbon storage in ecosystems and plant growth will respond to changes in climate.

This review brings together a number of aspects of water balance in Australian ecosystems, to test one of the more significant ecological and ecophysiological hypotheses, that of the correlation between ecosystem water balance and net primary productivity. Eamus reviews the mechanisms by which ecosystem water balance may determine net primary productivity.

Cover illustration: Diagrammatic representation of the key pools and fluxes that together determine the net ecosystem carbon exchange of vegetated land areas (see papers in 'Modelling Net Ecosystem Exchange' Special Section, pp. 143–237).