

BOOK REVIEW

FORESTS AT THE LAND-ATMOSPHERE INTERFACE

Edited by M. Mencuccini, J. Grace, J. Moncrieff, and K.G. McNaughton

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The interaction between forests and the aerial environment is central to many aspects of forest science. Recent concerns over the effects of elevated CO₂ levels on the earth's climate have led to a greater awareness of the interrelationships between forest ecosystems and the atmosphere. Such interactions occur at scales ranging from individual stoma to whole forest ecosystems. This book contains a selection of invited papers from a conference held in Edinburgh to celebrate the achievements of Professor Paul Jarvis, who retired in 2001 after 26 years at the University of Edinburgh. These papers were selected to reflect the range of Professor Jarvis' interests, as well as the range of scales that this field spans, and are grouped together in six parts: (1) stomatal function; (2) large-scale processes; (3) radiation modelling; (4) forest meteorology; (5) carbon sequestration; and (6) links between science and natural-resource management. The book also contains a foreword written by Dr Keith McNaughton and Dr John Grace which describes the career of Prof. Jarvis. This insight into a person's scientific career is not something that can be easily discerned from reading technical papers in journals and makes interesting reading.

Historical perspectives are also provided on stomatal control of transpiration (Chapter 1), the development of the forest canopy radiation absorption and photosynthesis model, MAESTRO (Chapter 8), forest evaporation studies (Chapter 11), and forest science, i.e., the description, analysis, and prediction of forest growth (Chapter 17). New Zealand readers will be interested to read about the significant role that the New Zealand Forest Research Institute, and in particular Dr Jenny Grace, had in the development of the MAESTRO model. The work in New Zealand was part of a broader goal by the New Zealand Forest Research Institute (FRI) to develop a process-based growth model for *Pinus radiata*. A more detailed description of the history of growth modelling research at FRI is provided in Chapter 16 by Jenny Grace which compares empirical and process-based

approaches. This chapter also describes the development of a model for predicting the location, orientation, and size of *P. radiata* branches (BLOSSIM). There is further discussion of process-based models in Chapter 4 which describes the 3-PG model developed by Dr Joe Landsberg and Dr Richard Waring. While New Zealand historically opted for an empirical approach to growth and yield modelling, there has been quite a lot of recent interest by members of the research community in New Zealand in the use of process-based models. This chapter provides a very readable description of this model and is a good starting point for researchers and practitioners alike who want to learn more about the model.

The section of the book on carbon sequestration contains three interesting chapters. Chapter 13 provides a good overview of the Kyoto Protocol, including the principles of the Protocol and the negotiation process which took place that ultimately led to the inclusion of land sinks. There is also a discussion of a number of issues concerning land-sinks including the definition of a forest, unintended outcomes, additionality, and leakage. The next chapter in this section uses an artificial neural network (ANN) to provide spatial and temporal estimates of carbon fluxes in European forests. The results from the ANN are shown graphically in a colour plate presented at the start of the book which shows the spatial pattern of net ecosystem exchange for each month throughout the year. These show the onset of a large European sink in May which results largely from the switch from respiration to photosynthesis of the northern boreal forests. The final chapter in the section compares the processes regulating photosynthesis in two forests with contrasting structural and physiological properties — *Dacrydium* in Westland, New Zealand, and *Quercus* in the north-eastern United States.

This book covers a wide range of topics and requires careful and attentive reading in order to digest the wealth of material presented. Like many edited books it covers a vast scope and the treatment of topics ranges from discussion overviews to in-depth quantitative analysis. Unfortunately, it was not possible within the space available in this review to cover all the chapters. However, I have attempted to highlight a few chapters which may be of particular interest to New Zealand readers. (This is not to say that the other chapters will not be of interest.) I am confident that scientists working in any part of the field of plant-atmosphere interactions will find this book interesting and stimulating.

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