

REMKO A. DUURSMA

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PERSONAL DETAILS

Date of birth 22 May 1976
Nationality the Netherlands
Country of residence Australia (permanent resident status)
Human Languages Dutch (*native*), English (*excellent*), German (*good*),
Finnish (*basic*), French (*basic*)
Programming Languages R, Fortran, Latex

EDUCATION

Wageningen University, the Netherlands 1999
M.Sc. and B.Sc. in Forestry

University of Idaho, United States 2004
Ph.D. in Natural Resources

EMPLOYMENT

University of Western Sydney February 2010 - current
Senior Lecturer Richmond, NSW

- Academic promotion to Senior Lecturer as of January 2014.
- Since February 2013, permanent lectureship at the Hawkesbury Institute for the Environment.
- Research lectureship 2010-2013, with teaching at the School of Computing, Engineering and Mathematics.

University of Western Sydney February 2008 - February 2010
Post-doctoral Fellow Richmond, NSW

- Project : *Trade-off between carbon sequestration in forests and water yields under rising CO₂*. with Belinda Medlyn (Macquarie U.), David Ellsworth (U. Western Sydney), and collaborators in the Hawkesbury Forest Experiment.

University of Helsinki June 2004 - January 2008
Post-doctoral Fellow Helsinki, Finland

- Project : *Mechanistic explanation of regional variation in forest productivity and growth* (MereGrowth), with Annikki Mäkelä and Eero Nikinmaa (Helsinki), and Roderick Dewar (INRA, Bordeaux, France).

Wageningen University September 1999 - June 2000
Interim teaching position Wageningen, the Netherlands

- Development of new teaching materials, and teaching of the course *Dendrology and ecology of forest trees*. Assistant in practicals for two other ecology courses.

PUBLICATIONS

Peer-reviewed publications

1. Drake, J.E., Power, S.A., **Duursma**, R.A., Medlyn, B.E., Aspinwall, M.J., Choat, B., Creek, D., Eamus, D., Maier, C., Pfautsch, S., Smith, R.A., Tjoelker, M.G., Tissue, D.T., 2017. Stomatal and non-stomatal limitations of photosynthesis for four tree species under drought: A comparison of model formulations. *Agricultural and Forest Meteorology* 247, 454-466. doi:10.1016/j.agrformet.2017.08.026
2. Broughton, K.J., Bange, M.P., **Duursma**, R.A., Payton, P., Smith, R.A., Tan, D.K.Y., Tissue, D.T., 2017. The effect of elevated atmospheric [CO₂] and increased temperatures on an older and modern cotton cultivar. *Functional Plant Biol.* doi:10.1071/FP17165
3. Medlyn, B., De Kauwe, M., Lin, Y-S., Knauer, J., **Duursma**, R., Williams, C.A., Arneeth, A., Clement, R., Isaac, P., Limousin, J-M, Linderson, M-L., Meir, P., Martin-StPaul, N., Wingate, L. How do leaf and ecosystem measures of water-use efficiency compare? *New Phytologist*, *in press*.
4. Drigo, B., Nielsen, U.N., Jeffries, T.C., Curlevski, N.J.A., Singh, B.K., **Duursma**, R.A., Anderson, I.C. 2017. Interactive effects of seasonal drought and elevated atmospheric carbon dioxide concentration on prokaryotic rhizosphere communities. *Environmental Microbiology*, *in press*.
5. Charbonnier, F., Roupsard, O., le Maire, G., Guillemot, J., Casanoves, F. Lacoite, A., Vaast, P., Allinne, C., Audebert, L., Cambou, A., Clment-Vidal, A., Defrenet, E., **Duursma**, R., Jarri, L., Jourdan, C., Khac, E., Leandro, P., Medlyn, B.E., Saint-Andr, L., Thaler, P., Van den Meersche, K., Barquero Aguilar, A., Lehner, P., Dreyer, E. 2017. Increased light-use efficiency sustains net primary productivity of shaded coffee plants in agroforestry system. *Plant, Cell and Environment*, 40, 1592-1608.
6. Company, C.E., Medlyn, B.E., **Duursma**, R.A. 2017. Reduced growth due to belowground sink limitation is not fully explained by reduced photosynthesis. *Tree Physiology*, doi:10.1093/treephys/tpx038.
7. **Duursma**, R., Choat, B., 2017. fitplc - an R package to fit hydraulic vulnerability curves. *Journal of Plant Hydraulics* 4, 002. doi:10.20870/jph.2017.e002
8. Broughton, K.J., Smith, R.A., **Duursma**, R.A., Tan, D.K.Y., Payton, P., Bange, M.P., Tissue, D.T., 2017. Warming alters the positive impact of elevated [CO₂] on cotton growth and physiology during soil water deficit. *Functional Plant Biology* 44, 267-278.
9. Company, C.E., Tjoelker, M.G., von Caemmerer, S., **Duursma**, R.A., 2016. Coupled response of stomatal and mesophyll conductance to light enhances photosynthesis of shade leaves under sunflecks. *Plant, Cell & Environment* 39, 2762-2773.
10. Moore, C.E., Brown, T., Keenan, T.F., **Duursma**, R.A., van Dijk, A.I.J.M., Beringer, J., Culvenor, D., Evans, B., Huete, A., Hutley, L.B., Maier, S., Restrepo-Coupe, N., Sonnentag, O., Specht, A., Taylor, J.R., van Gorsel, E., Liddell, M.J., 2016. Reviews and syntheses: Australian vegetation phenology: new insights from satellite remote sensing and digital repeat photography. *Biogeosciences* 13, 5085 - 5102. doi:10.5194/bg-13-5085-2016
11. Medlyn, B.E., De Kauwe, M.G., **Duursma**, R.A., 2016. New developments in the effort to model ecosystems under water stress (commentary). *New Phytol* 212, 57. doi:10.1111/nph.14082
12. **Duursma**, R.A., Falster, D.S., 2016. Leaf mass per area, not total leaf area, drives differences in above-ground biomass distribution among woody plant functional types. *New Phytologist* 212: 368-376.
13. Whitley, R., Beringer, J., Hutley, L.B., Abramowitz, G., De Kauwe, M.G., **Duursma**, R., Evans, B., Haverd, V., Li, L., Ryu, Y., Smith, B., Wang, Y.-P., Williams, M., Yu, Q., 2016. A model inter-comparison study to examine limiting factors in modelling Australian tropical savannas. *Biogeosciences* 13: 32453265. doi:10.5194/bg-13-3245-2016.

14. Gherlenda, A.N., Esveld, J.L., Hall, A.A., **Duursma**, R.A., Riegler, M., 2016. Boom and bust: rapid feedback responses between insect outbreak dynamics and canopy leaf area impacted by rainfall and CO₂. *Global change biology*. doi: 10.1111/gcb.13334.
15. Drake, J.E., Tjoelker, M.G., Aspinwall, M.J., Reich, P.B., Barton, C.V.M., Medlyn, B.E., **Duursma**, R.A., 2016. Does physiological acclimation to climate warming stabilize the ratio of canopy respiration to photosynthesis? *New Phytol* 211, 850863. doi:10.1111/nph.13978
16. Medlyn, B.E., De Kauwe, M.G., Zaehle, S., Walker, A.P., **Duursma**, R.A., Luus, K., Mishurov, M., Pak, B., Smith, B., Wang, Y.-P., Yang, X., Crous, K.Y., Drake, J.E., Gimeno, T.E., Macdonald, C.A., Norby, R.J., Power, S.A., Tjoelker, M.G., Ellsworth, D.S., 2016. Using models to guide field experiments: a priori predictions for the CO₂ response of a nutrient- and water-limited native Eucalypt woodland. *Global Change Biology*. doi:10.1111/gcb.13268
17. Blackman, C.J., Pfautsch, S., Choat, B., Delzon, S., Gleason, S.M., **Duursma**, R.A., 2016. Toward an index of desiccation time to tree mortality under drought. *Plant, Cell & Environment*. doi: 10.1111/pce.12758.
18. Mitchell, P.J., O'Grady, A.P., Pinkard, E.A., Brodribb, T.J., Arndt, S.K., Blackman, C.J., **Duursma**, R.A., Fensham, R.J., Hilbert, D.W., Nitschke, C.R., Norris, J.N., Roxburgh, S., Ruthrof, K.X., Tissue, D.T., 2016. An ecoclimatic framework for evaluating the resilience of vegetation to water deficit. *Global Change Biology* 22: 1677-1689.
19. **Duursma**, R.A., Gimeno, T.E., Boer, M.M., Crous, K.Y., Tjoelker, M.G., Ellsworth, D.S. 2016. Canopy leaf area of a mature evergreen Eucalyptus woodland does not respond to elevated atmospheric [CO₂] but tracks water availability. *Global Change Biology* 22: 1666-1676.
20. Lu, Y., **Duursma**, R.A., Medlyn, B.E. 2016. Optimal stomatal behaviour under stochastic rainfall. *Journal of Theoretical Biology* 394: 160-171.
21. Kelly, J.W.G., **Duursma**, R.A., Atwell, B.J., Tissue, D.T., Medlyn, B.E. 2016. Drought x CO₂ interactions in trees: a test of the low-Ci mechanism. *New Phytologist* 209: 1600-1612.
22. Norby, R.J., De Kauwe, M.G., Domingues, T.F., **Duursma**, R.A., Ellsworth, D.S., Goll, D.S., Lapola, D.M., Luus, K.A., MacKenzie, A.R., Medlyn, B.E., Pavlick, R., Rammig, A., Smith, B., Thomas, R., Thonicke, K., Walker, A.P., Yang, X., Zaehle, S., 2016. Model-data synthesis for the next generation of forest free-air CO₂ enrichment (FACE) experiments. *New Phytologist* 209: 17-28.
23. De Kauwe, M.G., Zhou, S.-X., Medlyn, B.E., Pitman, A.J., Wang, Y.-P., **Duursma**, R.A., Prentice, I.C. 2015. Do land surface models need to include differential plant species responses to drought? Examining model predictions across a mesic-xeric gradient in Europe. *Biogeosciences* 12, 7503-7518.
24. **Duursma**, R.A. 2015. plantecophys - an R package for analysing and modelling leaf gas exchange data. *PLoS one* 10, e0143346.
25. Nolf M., Creek D., **Duursma** R., Holtum J., Mayr S., Choat B. 2015. Stem and leaf hydraulic properties are finely coordinated in three tropical rainforest tree species. *Plant, Cell & Environment* 38: 2652-2661.
26. Duan, H., O'Grady, A.P., **Duursma**, R.A., Choat, B., Huang, G., Smith, R.A., Jiang, Y., Tissue, D.T. 2015. Drought responses of two gymnosperm species with contrasting stomatal regulation strategies under elevated [CO₂] and temperature. *Tree Physiology* 35: 756-770.
27. Pangle, R., Kavanagh, K., **Duursma**, R.A. 2015. Decline in canopy gas exchange with increasing tree height, atmospheric evaporative demand, and seasonal drought in co-occurring inland Pacific Northwest conifer species. *Canadian Journal of Forest Research* 45: 1086 - 1101.

28. Falster, D.S., **Duursma**, R.A., Ishihara, M.I., Barneche, D.R., FitzJohn, R.G., Varhammar, A. and 86 co-authors. 2015. BAAD: a Biomass And Allometry Database for woody plants. *Ecology* 96: 1445.
29. Lin, Y.-S., Medlyn, B.E., **Duursma**, R.A., Prentice, I.C. and 50 co-authors. 2015. Optimal stomatal behaviour around the world. *Nature Climate Change* 5: 459-464.
30. De Kauwe, M.G., Kala, J., Lin, Y.-S., Pitman, A.J., Medlyn, B.E., **Duursma**, R.A., Abramowitz, G., Wang, Y.-P., Miralles, D.G. 2015. A test of an optimal stomatal conductance scheme within the CABLE Land Surface Model. *Geoscientific Model Development* 8: 431-452.
31. **Duursma**, R.A., Barton, C.V.M., Lin, Y.-S., Medlyn, B.E., Eamus, D., Tissue, D.T., Ellsworth, D.S., McMurtrie, R.E., 2014. The peaked response of transpiration rate to vapour pressure deficit in field conditions can be explained by the temperature optimum of photosynthesis. *Agricultural and Forest Meteorology* 189-190: 2-10.
32. Duan, H., **Duursma**, R.A., Huang, G., Smith, R.A., Choat, B., O'Grady, A.P., Tissue, D.T., 2014. Elevated [CO₂] does not ameliorate the negative effects of elevated temperature on drought-induced mortality in *Eucalyptus radiata* seedlings. *Plant Cell Environ.* 37: 1598-1613.
33. Medlyn, B.E., **Duursma**, R.A., De Kauwe, M.G., Prentice, I.C., 2013. The optimal stomatal response to atmospheric CO₂ concentration: Alternative solutions, alternative interpretations. *Agricultural and Forest Meteorology* 182-183: 200-203.
34. Duan, H., Amthor, J.S., **Duursma**, R.A., O'Grady, A.P., Choat, B., Tissue, D.T., 2013. Carbon dynamics of eucalypt seedlings exposed to progressive drought in elevated [CO₂] and elevated temperature. *Tree Physiology* 33: 779-792.
35. Zhou, S., **Duursma**, R.A., Medlyn, B.E., Kelly, J.W.G., Prentice, I.C., 2013. How should we model plant responses to drought? An analysis of stomatal and non-stomatal responses to water stress. *Agricultural and Forest Meteorology* 182-183: 204-214.
36. Sterck, F.J., R.A. **Duursma**, R.W. Pearcy, F. Valladares, M. Cieslak and M. Weemstra. 2013. Plasticity influencing the light compensation point offsets the specialization for light niches across shrub species in a tropical forest understorey. *Journal of Ecology* 101: 971-980.
37. **Duursma**, R.A., Payton, P., Bange, M.P., Broughton, K.J., Smith, R.A., Medlyn, B.E., Tissue, D. T., 2013, Near-optimal response of instantaneous transpiration efficiency to vapour pressure deficit, temperature and [CO₂] in cotton (*Gossypium hirsutum* L.). *Agricultural and Forest Meteorology*. 168: 168-176.
38. **Duursma**, R.A. and B.E. Medlyn. 2012. MAESPA: a model to study interactions between water limitation, environmental drivers and vegetation function at tree and stand levels, with an example application to [CO₂] x drought interactions. *Geosci. Model Dev.* 5: 919-940.
39. Peltoniemi, M.S., R.A. **Duursma** and B.E. Medlyn. 2012. Co-optimal distribution of leaf nitrogen and hydraulic conductance in plant canopies. *Tree Physiology* 32: 510-519.
40. Peltoniemi, M., M. Pulkkinen, P. Kolari, R.A. **Duursma**, L. Montagnani, S. Wharton, F. Lagergren, K. Takagi, H. Verbeeck, T. Christensen, T. Vesala, M. Falk, D. Loustau and A. Mäkelä. 2012. Does canopy mean nitrogen concentration explain variation in canopy light use efficiency across 14 contrasting forest sites? *Tree Physiology* 32: 200-218.
41. Crous, K.Y., J. Zaragoza-Castells, D.S. Ellsworth, R.A. **Duursma**, M. Löw, D.T. Tissue and O.K. Atkin. 2012. Light inhibition of leaf respiration in field-grown *Eucalyptus saligna* in whole-tree chambers under elevated atmospheric CO₂ and summer drought. *Plant, Cell & Environ.* 35: 966-981.
42. Warton, D.I., R.A. **Duursma**, D.S. Falster and S. Taskinen. 2012. smatr 3- an R package for estimation and inference about allometric lines. *Methods in Ecology and Evolution* 3: 257-259.

43. **Duursma**, R.A., D.S. Falster, F. Valladares, F.J. Sterck, R.W. Pearcy, C.H. Lusk, K.M. Sendall, M. Nordenstahl, N.C. Houter, B.J. Atwell, N. Kelly, J.W.G. Kelly, M. Liberloo, D.T. Tissue, B.E. Medlyn and D.S. Ellsworth. 2012. Light interception efficiency explained by two simple variables: a test using a diversity of small- to medium-sized woody plants. *New Phytologist* 193: 397-408.
44. Barton, C.V.M., R.A. **Duursma**, B.E. Medlyn, D.S. Ellsworth, D. Eamus, D.T. Tissue, M.A. Adams, J. Conroy, K.Y. Crous, M. Liberloo, M. Löw, S. Linder and R.E. McMurtrie. 2012. Effects of elevated atmospheric [CO₂] on instantaneous transpiration efficiency at leaf and canopy scales in *Eucalyptus saligna*. *Global Change Biology* 18: 585-595.
45. Zeppel, M.J.B., J.D. Lewis, B. Medlyn, C.V.M. Barton, R.A. **Duursma**, D. Eamus, M.A. Adams, N. Phillips, D.S. Ellsworth, M.A. Forster and D.T. Tissue. 2011. Interactive effects of elevated CO₂ and drought on nocturnal water fluxes in *Eucalyptus saligna*. *Tree Physiology* 31: 932-944.
46. **Duursma**, R.A., C.V.M. Barton, D. Eamus, B.E. Medlyn, D.S. Ellsworth, M.A. Forster, D.T. Tissue, S. Linder and R.E. McMurtrie. 2011. Rooting depth explains [CO₂] x drought interaction in *Eucalyptus saligna*. *Tree Physiology* 31: 922-931.
47. Medlyn, B.E., R.A. **Duursma**, D. Eamus, D.S. Ellsworth, I.C. Prentice, C.V.M. Barton, K.Y. Crous, P. De Angelis, M. Freeman and L. Wingate. 2011. Reconciling the optimal and empirical approaches to modelling stomatal conductance. *Global Change Biology* 17: 2134-2144. (*Corrigendum* 2012, 18:3476).
48. Medlyn, B.E., R.A. **Duursma** and M.J.B. Zeppel. 2011. Forest productivity under climate change: a checklist for evaluating model studies. *Wiley Interdisciplinary Reviews: Climate Change* 2: 332-355.
49. Barton, C.V.M., D.S. Ellsworth, B.E. Medlyn, R.A. **Duursma**, D.T. Tissue, M.A. Adams, D. Eamus, J.P. Conroy, R.E. McMurtrie, J. Parsby and S. Linder. 2010. Whole-tree chambers for elevated atmospheric CO₂ experimentation and tree scale flux measurements in south-eastern Australia: The Hawkesbury Forest Experiment. *Agricultural and Forest Meteorology* 150: 941-951.
50. **Duursma**, R.A., A. Mäkelä, D.E.B. Reid, E.J. Jokela, A.J. Porté and S.D. Roberts. 2010. Self-shading affects allometric scaling in trees. *Functional Ecology* 24: 723-730.
51. Ilvesniemi, H., J. Pumpanen, R. **Duursma**, P. Hari, P. Keronen, P. Kolari, M. Kulmala, I. Mammarella, E. Nikinmaa, U. Rannie, T. Pohja, E. Siivola and T. Vesala. 2010. Water balance of a boreal Scots pine forest. *Boreal Environment Research* 15: 375-396.
52. Härkönen, S., Pulkkinen, M., **Duursma**, R., Mäkelä, A. 2010. Estimating annual GPP, NPP and stem growth in Finland using summary models. *Forest Ecology and Management* 259: 524-533.
53. **Duursma**, R.A., Kolari P., Perämäki M., Pulkkinen, M., Mäkelä, A., Nikinmaa, E., Hari, P., Aurela, M., Berbigier, P., Bernhofer, Ch., Grünwald, T., Loustau, D., Mülder, M., Verbeeck, H., Vesala, T. 2009. Contributions of climate, canopy structure, and leaf physiology to the variation in GPP of coniferous forests across Europe: a model-based analysis. *Tree physiology* 29: 621-639.
54. **Duursma** R.A., Kolari P., Perämäki M., Nikinmaa E., Hari P., Delzon S., Loustau D., Ilvesniemi H., Pumpanen J., Mäkelä A. 2008. Predicting the decline in daily maximum transpiration rate of two pine stands during drought based on constant minimum leaf water potential and plant hydraulic conductance. *Tree Physiology* 28: 265-276.
55. **Duursma**, R.A., Mäkelä, A. 2007. Summary models for light interception and light-use efficiency for non-homogenous canopies. *Tree Physiology* 27: 859-870.
56. **Duursma** R.A., Marshall J.D., Robinson A.P., Pangle R.E. 2007. Description and test of a simple process-based model of forest growth for mixed-species stands. *Ecological Modelling* 203: 297-311.

57. **Duursma**, R.A., Marshall, J.D. 2006. Vertical canopy gradients in $\delta^{13}\text{C}$ correspond with leaf nitrogen content in a mixed-species conifer forest. *Trees: structure and function* 20: 496-506.
58. **Duursma**, R.A., Marshall, J.D., Nippert, J.B., Chambers, C.C., Robinson, A.P. 2005. Estimating leaf-level parameters for ecosystem process models: a study in mixed conifer canopies on complex terrain. *Tree physiology* 25: 1347-1359.
59. Robinson, A.P., **Duursma**, R.A., Marshall, J.D. 2005. A regression-based equivalence test for model validation: shifting the burden of proof. *Tree physiology* 25: 903-913.
60. Harlow, B.A., **Duursma**, R.A., Marshall, J.D. 2005. Leaf longevity of western redcedar (*Thuja plicata* J. Donn ex D. Don) increases with depth in the canopy. *Tree physiology* 25: 635-640.
61. Nippert, J.B., **Duursma**, R.A., Marshall, J.D. 2004. Seasonal variation in photosynthetic capacity of montane conifers. *Functional Ecology* 18: 876-886.
62. **Duursma**, R.A., Robinson, A.P. 2003. Bias in the mean tree model as a consequence of Jensen's inequality. *Forest Ecology and Management* 186: 373-380.
63. **Duursma**, R.A., Marshall, J.D., Robinson, A.P. 2003. Leaf area index inferred from solar beam transmission in mixed conifer forests on complex terrain. *Agricultural and Forest Meteorology* 118: 221-236.

Other publications

1. **Duursma**, R.A., Powell, J.R., Stone, G. 2015. Data analysis and visualization with R. bit.ly/RDataCourse. 236p.
2. **Duursma**, R.A. 2011. (Book review, invited). Physiological ecology of forest production: principles, processes, and models. *Tree Physiology* 31: 680-681.
3. Pearcy R.W., R.A. **Duursma**, D.S. Falster, PrometheusWiki contributors. 2011. Studying plant architecture with Y-plant and 3D digitising. PrometheusWiki. [WWW document].
4. **Duursma**, R.A., Kolari, P., Perämäki, M., Hari, P. 2008. Maximum transpiration rate and water tension during drought. In: Hari, P. and Kulmala, L. (Eds.) *Boreal Forest and Climate Change*. Springer. Dordrecht, Netherlands, pp: 382-387.

CODE

I am the developer and maintainer of the **Maespa** model (see Duursma & Medlyn 2012). See this website for a full description, and the code : maespa.github.io

I have developed a number of packages for the R computing environment. Below is a list of the packages that are available on CRAN (<http://cran.r-project.org/>).

plantecophys	A toolkit for analysis and modelling of leaf gas exchange data
fitplc	Fit hydraulic vulnerability curves
YplantQMC	An R implementation of Yplant, combined with the QuasiMC raytracer. Co-author : Mik Cieslak (University of Calgary, Canada).
smatr	(Standardised) major axis estimation and testing routines I maintain the R package of these methods developed by David Warton (UNSW) and colleagues. See Warton <i>et al.</i> 2012 in the publication list above.
Maeswrap	Tools for running and analyzing Maespa/Maestra simulations
LeafAngle	Analysis of leaf angle distributions

A full list of R packages with links to publications and code can be found here: <http://www.remkoduursma.com/funecopack/>.