CURRICULUM VITAE

Name: Aino Annikki Mäkelä-Carter

Address: University of Helsinki, Dept. Forest Ecology PO.Box 27 (Latokartanonkaari 7)FIN-00014 University of Helsinki
Home: Kivimäentie 52, 00670 Helsinki

Date and Place of Birth: 10.7.1954 Tampere, Finland

Citizenship: Finnish

Family: Married with two children (1990, 1991)

University Education:

M.Sc.Eng. (Systems theory) Helsinki University of Technology	28.1.1980
Lic.Tech. (Systems theory) Helsinki University of Technology	23.2.1982
Ph.D.(Forestry); University of Helsinki	5.4.1988
Docent (Forest Biology); University of Helsinki	25.4.1991

Languages: Finnish (mother tongue), English (fluent), Swedish (working knowledge), German (working knowledge)

Present Position: Professor of silviculture / forest production, University of Helsinki (1.4.2005-)

Former Employment:
Project researcher, University of Helsinki, Dept. Silviculture: 1.3.1978-31.8.1980
Assistant in Systems Theory, Helsinki University of Technology: 1.9.1980-31.12.1980
Research Assistant, Academy of Finland: 1.1.1981-31.1.1985
Research Scholar, International Institute for Applied Systems Analysis, Vienna, Austria:1.2.1985-31.1.1987
Junior Researcher, Academy of Finland 1.2.1987-31.7.1995
Project researcher, Univ. Helsinki, Dept Forest Ecology 1.8.1995-31.9.1996
Researcher, University of Joensuu, Faculty of Forestry,1.10.1996-31.12.1996
Project researcher, Univ. Helsinki, Dept Forest Ecology 1.1.1997-31.7.1998
Academy Researcher; (Academy of Finland) 1.8.1998 – 31.7.2003
University Lecturer (UK equivalent: Reader), University of Helsinki 1.8.2003-31.3.2005

Leaves of Absence:
Maternity leave 24.1.1990-4.12.1990
Maternity and child care leave 21.8.1991-22.8.1993

Extended Visits:
Visiting Scientist, The Grassland Research Institute, Hurley, U.K. 1.8.1982-28.2.1983
Visiting Scientist, Forestry Commission, Farnham, UK. 1.7.1988 - 31.12.1989
Visiting Scientist, USDA Forest Service, Durham, NH, USA 11.10.-26.10.2010

Examinations of doctoral theses:
Opponent for Timo Kuuluvainen, University of Joensuu (Finland),
1991, Christine Deleuze, University of Lyon (France) 1996, Karl Jäghagen, Swedish University of Agricultural Sciences, Umeå (Sweden) 1997; Hank Bartelink, Wageningen Agricultural University (Holland)1998; Sihong Wu, Kungliga Tekniska Högskolan, Stockholm (Sweden) 2011; Carina Ortiz, Swedish University of Agricultural Sciences, Stockholm (Sweden) 2012, Joannes Guillemot, Universite Paris Sud, Paris, 2015; Joanna Horemans, University of Antwerp, Belgium, 2017, Laith AlRahahleh, University of Easterm Finland, 2018. *Pre-examiner* for Eero Nikinmaa, University of Helsinki (1992), Pekka Nygren, University of Helsinki (1995), Jari Hynynen, University of Helsinki (1995), Oskar Franklin, Swedish University of Agricultural Sciences, Uppsala (2003). Tea Thum, Univ. Helsinki Dept Physics (2009), Linnea Berglund, Swedish University of Agricultural Sciences, Uppsala (2012), Christopher Thurnher, University of Natural Resources and Life Sciences, Vienna, Austria (2014), Guangqi Li, MacQuarie University, Sydney, Australia (2015), Maurizio Bagnara, University of Bologna, Bologna, Italy (2015), Samuel Egbäck, Swedish University of Agricultural Sciences, Umeå, Sweden (2016).

Supervision of students: *M.Sc*: Tarja Oksanen (1982), Maria Holmberg (1984), Katri Virtanen (1993), Petteri Vanninen (1994), Hanna Ylitalo (1996), Tuulikki Parviainen (1999), Hanna Happonen (2007), Isabel Clar Brines (2007),

Janne Yrjönen (2008), Marko Lehtosalo (2008), Henna Järvinen (2008), Sini Miettinen (2008), Laura Kärki (2008), Aija Perälä (2008), Pauliina Schiestl-Aalto (2009), Leila Grönlund (2011), Jussi Saarinen (2012). *Ph.D*: Petteri Vanninen (2003), Aleksi Lehtonen (2005), Anu Kantola (2008), Tianjian Cao (2010), Sanna Härkönen (2012), Pauliina Schiestl-Aalto (2017). *Several co-supervised* students in addition.

Positions of trust:

Chair of IUFRO Working Party 4.01.09 "Process-based models for predicting forest growth and timber quality" 1995-2005
Member of the editors' board of *Tree Physiology* (2006-)
Member of the reviewers' board of *Annals of Forest Science*
Member of the reviewers' board of *Forest Ecology and Management*
Member of the editorial board of *Scandinavian Journal of Forest Research* (2001-2004)
Editor-in-Chief (Terrestrial Ecology) of *Boreal Environment Research* (1999-2002)
Guest editor of Tree Physiology, special issue on Process-Based Models for Forest Management (nr 5-6, vol 20, 2000)
Guest editor of Tree Physiology, special issue on Modeling Forest Production (nr 7, vol 25, 2005)
Member of the governing board of the Finnish Society of Forest Science (2002-2005)
Member of the Finnish Academy of Science and Letters (2004-)
Guest editor of Tree Physiology, special issue on Wood Structure in Ecophysiology (nr 8, vol 34, 2014)

Service to University

Member of University Collegium 2010-2013
Member of the steering group of the Department of Forest Ecology (1998-2000, 2005-2009, 2014-)
Vice-head of Department 2007-March 2009
Head of Department April 2009-December 2009
Member of the strategic planning committee of the Faculty of Agric.&For. 2007-2009
Vice-member of the smaller faculty council (suppea tdk-neuvosto) 2007-March 2009
Member of the smaller faculty council (suppea tdk-neuvosto) April-December 2009
Member of the nominations board for the professorships on horticulture (2005) and forest pathology (2006)
Chair of the nominations board for the professorships on tropical silviculture (2009) and forest soil science (2009)
Chair of the steering group for Värriö research station (2005-2009)
Chair of the doctoral programme AGFOREE (2014-2018)
Co-vice-head of department responsible for research (2014-2018)
Member of the research and post-graduate studies committee of the Faculty of Agric.&For. 2014-2018
Member of the nominations board for the professorships of Air quality – weather – climate interactions (2018)

Expert tasks

Member of advisory board for Metla research programme Forests and water, 1.1.2013-31.12.2017
Chair of the external evaluation board of the MIL research programme of the Finnish Forest Research Institute (Climate change impacts on forests) (2010)
External evaluator for the professorship in Silviculture, Faculty of Forestry, Swedish University of Agricultural Sciences (2009)
Member of Panel 8 (Forest Management and Products) in the external Quality and Impact Assessment of the Swedish University of Agricultural Sciences (2009)
Member of the Appointments board concerning the professorship in Forest Production, Faculty of Forestry, Swedish University of Agricultural Sciences (1999)
Member of the evaluators board of the Academy of Finland
Assessment of applications to NERC (Great Britain)
Member of the Management Committee and steering committee of COST Action FP0603 2008-2011, Work Package leader
Member of the Management Committee of COST Action FP0763 2008-2011
Member of the Management Committee of COST Action FP1106 2012-2015
Member of the Management Committee and steering committee of COST Action FP1304 2014-2017, Work Package leader
External evaluator for Professor/Associate Professor in forest ecology at Norwegian University of Life Sciences (2018)
External evaluator for promotion to professor, (1) Swedish University of Agricultural Sciences and (2) University of Gothenburg (2018)

Acted as Referee of scientific journals (e.g. *Tree Physiology, Ecological Modelling, Forest Science, Forest Ecology and Management, Annals of Botany, Ecology, Annals of Forest Science, Scandinavian Journal of Forest Research, Silva Fennica, Plant Cell and Environment, Global Change Biology, Journal of Theoretical Biology, New Phytologist)*

Organisation of conferences

Member of scientific evaluation board: Second workshop on "Connection between silviculture and wood quality through modelling approaches and simulation softwares", South Africa, August 26-31 1996. IUFRO WP S5.01-04
Member of scientific evaluation board: Third workshop on "Connection between silviculture and wood quality through modelling approaches and simulation softwares", France, September 5-12 1999. IUFRO WP S5.01-04
Member of scientific evaluation board: Fourth workshop on "Connection between forest resources and wood quality: modelling approaches and simulation softwares", Canada, September 8-15 2002. IUFRO WP S5.01-04
Member of organising committee: Helsinki workshop on functional-structural tree models (Special issue of Silva Fennica 31(3) 1997) Finland 12-13 September 1996.
Head of organising committee: Process-Based Models for Forest Management. IUFRO WP 4.0.09. Saariselkä, Finland. August 30-September 1998 (Special issue of Tree Physiology 20(5/6) 2000)
Member of organising committee: Challenges and limitations of the optimality approach in plant ecology. Hyytiälä 9-12.4.2000.
Co-chair of organising committee: Modeling Forest Production: Data needs and sources. IUFRO WP 4.0.09. Vienna, Austria. April 19-22 2004 (http://www.boku.ac.at/formod)
Member of organising committee: Forest Growth and Timber Quality: Crown Models and Simulation Methods for Sustainable Forest Management IUFRO WP 4.0.09 7-10 August 2007 Portland, Oregon, USA.
Co-chair of organising committee: Challenges of physiology-based tree and forest modelling. 27-29 November 2007. Biarritz, France.
Member of organising committee: COST action FP0603 final meeting. Bordeaux, France, 1-2 March 2012
Member of scientific evaluation board: New Frontiers in Forecasting forests. Stellenbosch, South Africa September 25-28 2018

Received research funding

1981-1985: Systems analysis of forest stand development. A small project to go with the position of Research Assistant with the Academy of Finland

1987-1989, 1992-1995: Systems analysis of forest stand development A small project to go with the position of Junior Researcher with the Academy of Finland

1998-2001 A process-based model of wood quality development (1Mmk) The Academy of Finland, Wood Wisdom programme

1998 Visit of Joe Landsberg to Finland for 3 months (40 000 mk)

1998-2000 Effect of versatile forest management on stand establishment (Young stand simulator). Ministry of Forests and Agriculture (260 000 mk)

2000-2003 Structural dynamics in a hierarchical system: mathematical and computational methods for forest growth models (2.2 Mmk) Project includes groups at University of Helsinki (Mäkelä), Metla (Risto Sievänen) and Helsinki University of Technology (Olavi Nevanlinna). The Academy of Finland, MaDaMe programme

2001-2003 together with Anu Kantola, a grant for Kantola's PhD study on wood quality modelling in *Picea abies* (Foundation for Research of Natural Resources in Finland)

2003-2005 Optimization of the quantity and quality of wood raw material in forest management and industrial processes. Coordinator of consortium including 6 projects. Total funding 400 000 € . Jubilee grant by the Foundation for Research of Natural Resources in Finland.

2004-2007 Mechanistic explanation of regional variation in forest productivity and growth (MereGrowth) 285 900 €. Project leader, with INRA Bordeaux, France. The Academy of Finland.

2004-2007. Prediction of the regional variation of forest productivity using process-based models. Post-doctoral funding for Dr Remko Duursma. The Academy of Finland.

2004-2007. Subproject leader in the consortium Multi-sectorial data base, model system and case studies, supporting innovative use of wood and fibers. Finnish Swedish consortium under the research programme on Wood Material Science and Engineering. 100000 €. Tekes.

2006-2007 What do provenance experiments tell about adaptation to climate change? A grant for supervising a Master's thesis. 6 000 €. Ministry of Forests and Agriculture

2006 – 2008 Forest management in a changing climate. Development of a general model system and application to Scots pine stands. 12 500 €. Ministry of Forests and Agriculture

2007-2009 Cambial growth in Scots pine and Norway spruce during a growing season. 180 000 €. The Academy of Finland.

2008-2010. Impact of the environment on wood formation (WOVEN). 96 000 €. The Academy of Finland (WoodWisdom-ERA-NET programme).

2009-2011. Carbon balance in northern latitudes: Novel assessment methods applying combined ground-based and earth observation data (CARB-BAL). Member of a consortium of 5 partners. 157 000 €. The Academy of Finland.

2010-2011. Ecological modelling of uneven-aged mixed stands. Senior researcher's grant for one year to cover my own salary and travel. The Academy of Finland.

2011-2014. Climforisk. PI in EU-funded Life+ consortium. 100 000 €.

2011-2012. Carbon balance of uneven spruce stands. A grant for PhD work. 26 000 €. Nessling foundation.

2012-2015. FORest management strategies to enhance the MITigation potential of European forests (FORMIT). PI in EU-funded consortium. 307 760 €.

2013-2016. Enabling intelligent GMES services for carbon and water balance modelling of northern forest ecosystems (North State). PI in EU-funded consortium. 157 880 €.

2013-2017. Climate change indicators and vulnerability of boreal zone applying innovative observation and modeling techniques (MONIMET). PI, EU-funded Life+ consortium. 267 000 €

2015-2017. Potential of continuous cover forestry for climate change mitigation, wood production and biodiversity protection. 410 000 €. PI and consortium leader in project funded by HENVI (Helsinki University Environment Unit).

2015-2020: Physiological Branch-Points with Ecosystem Consequences: Isotopic Coupling of Carbon and Water in Boreal Forests. PI in consortium funded by the Wallenberg foundation, Sweden and led by SLU Umeå: 303000 €.

2018-2020 Integrated Biodiversity Conservation and Carbon Sequestration in the Changing Environment (IBC-CARBON). PI in consortium funded by the Finnish Strategic Council of Research. 600000 €

2019- 2021 Forest Carbon Flux and Forest Mapping Service. PI in innovation project funded by EU Horizon 2020. 169000 €

Honours and awards

Member of the Finnish Academy of Science and Letters (2004-)
The bronze A.K. Cajander medal from The Finnish Society of Forest Sciences (2009)
The IUFRO Scientific Achievement Award (2014)
1st class medal of the Order of the Finnish White Rose (2015)

Invited plenary and keynote presentations

Mäkelä, A. Modelling tree and stand growth: towards a hierarchical treatment of multi-scale processes. *Plenary* presentation in Forest Modelling for Ecosystem Management, Forest Certification, and sustainable Management Conference. Vancouver, Canada. 2001.

Mäkelä A. Eco-physiological models for forest management: How far do we get with the carbon balance? *Keynote* in Les Secondes Rencontres d'Ecophysiologie de l'Arbre, La Rochelle, France. 2003.

Mäkelä A., Perttunen J., Nikinmaa E. and Sievänen R. Two-way interactions between process-based tree growth models and 3D structural-functional models – lessons learned from a scaling exercise. *Keynote* in the 4th Congress on Functional-Structural Plant Models. Montpellier, France. 2004.

Mäkelä, A. A modular approach to growth modelling for sustainable forest management. *Keynote* in IUFRO: Sustainable forestry in theory and practice. Edinburgh, U.K. 2005.

Mäkelä, A. The significance of structural adaptations and acclimations for modelling growth allocation. *Keynote* in 3rd International Symposium of SFB 607. Mechanisms of Growth, Competition and Stress Defense in Plants. Munich, Germany. 2006.

Mäkelä A. Methods for combining empirical and theory-based knowledge in growth and yield models

Keynote in International scientific conference "Forest growth and timber quality: Crown models and simulation methods for sustainable forest management". Portland, Oregon, USA. 2007.

Mäkelä A. An ecological approach to management-oriented forest growth models. *Keynote* in International meeting of the Resource Modeling Association. Helsinki, Finland. 2010.

Mäkelä A. Modelling forest growth and development from carbon fluxes and stocks – challenges and opportunities. *Keynote* in a IUFRO meeting "Mixed and pure forests in a changing world". Vila Real, Portugal. 2010.

Mäkelä A. Carbon and nitrogen interactions in forest stand growth – an optimality approach. *Invited presentation* in 2011 seminar on Modelling in Plant Biology: Models at whole plant scale. 17-18th of March 2011. Montpellier, France.

Mäkelä A. Crown architecture and its evolutionary significance for the carbon economy of trees. *Invited presentation* in the meeting Modelling tree crown architecture for wood quality prediction. University of Alberta, Edmonton, Alberta. June 5-7, 2011

Mäkelä A. 2014. Modelling stand growth for optimal management under climate change: experiences from Scots pine stands in Finland. *Keynote* in the meeting 5th International Conference on Mediterranean Pines (medpine5) Solsona, Spain 22.-26.9.2014.

Mäkelä A. 2014. Tree modelling to estimate wood production under climate change. *Keynote* in COST WG Meeting of STReESS. Estoril, Portugal 22-23.10.2014.

Mäkelä A. 2016. Prospects and critical issues in applying optimality concepts to up-scale physiological processes. *Keynote* in COST Final COnference of STReESS. Eberswald,Germany 12-15.4.2016.

Mäkelä A. 2016. Significance of long-term environmental and physiological records for understanding and predicting forest ecosystem function. *Plenary presentation* in 2nd ICOS Science Conference, Helsinki, 27-29.9.2016

Mäkelä A. 2018. Trends in process-based and statistical approaches: how we will model future forest attributes in the 3rd millenium. *Keynote* in Conference New Frontiers in Forecasting Forests Stellenbosch 25-28 September 2018

Hosted extended visits / stays of foreign students and post-docs

Christine Deleuze (France) Post-doc with CIMO funding, 2 months 1996
Remko Duursma (The Netherlands), Post-Doc in MereGrowth project (Academy of Finland) 2004-2007
Isabel Clar Brines (Spain), Masters thesis supervision, 12 months 2006-2007
Robert Schneider (Canada), PhD student at UQAM, Montreal , Canada, 4 weeks to do wood quality modelling work 2008
Angelo Nole (Italy), Post-Doc, working on models of carbon and water balance of stands, 4 weeks, 2009 (COST FP0603 STSM)
Ricardo Ruiz-Penado (Spain), PhD student, allometry of pines, 2 weeks 2011 (COST FP0603 STSM)
Ruediger Grote (Germany), senior researcher, modelling the eco-physiology of forest stands, 2 weeks, 2011 (COST FP0603 STSM)
Barbara del Perugia (Italy), Masters student, an Erasmus internship related to forest management methods and carbon sequestration (EU project FORMIT), 3 months, 2014.

Summary of publications record.

106 of the refereed journal-articles were listed in the ISI data base (January 2019). The total number of citations was 3870 (36 per article on average). My H index among the papers in the ISI data base is 38 (38 papers have been cited at least 38 times).

Type	International	Finnish	First-authored	Single-authored	Total
Refereed journal articles	122		37	12	122
Refereed book chapters	4	1	3	1	5
Articles in Proceedings	14		8	4	14
Theses		3	3	3	3
Monographs		2	2	1	2
Other	8	15	13	9	23
Abstracts	24		10	5	24
Total	172	21	76	35	193

LIST OF PUBLICATIONS
Annikki Mäkelä

A. Articles in peer-reviewed journals *(38 first-authored, 12 single-authored, 41 last authored)*
106 of these in the ISI data base, 3940 citations (37 per item), H-index=39 (September 2018)
The 10 papers most relevant for this study have been marked with ** and coloured red.

121 **Böttcher, K., Rautiainen, K., Aurela, M., Kolari, P., Mäkelä, A., Arslan, A. N., Black, T. A. & Koponen, S.** 2018. Proxy Indicators for Mapping the End of the Vegetation Active Period in Boreal Forests Inferred from Satellite-Observed Soil Freeze and ERA-Interim Reanalysis Air Temperature. *Journal of photogrammetry, remote sensing and geoinformation science.* 86: 169-185

120 **Kumpu, A., Mäkelä, A., Pumpanen, J., Saarinen, J. & Berninger, F.** 2018. Soil CO_2 efflux in uneven-aged and even-aged Norway spruce stands in southern Finland. *IForest.* 11: 705-712

119 **Kalliokoski T., Mäkelä A., Fronzek T., Minunno F., Peltoniemi M.** 2018. Decomposing sources of uncertainty in climate change projections of boreal forest primary production. Agricultural and Forest Meteorology 262: 192-205

117 **Dewar, R., Mauranen, A., Makela, A., Holtta, T.,Medlyn, B., Vesala, T**. 2018. New insights into the covariation of stomatal, mesophyll and hydraulic conductances from optimisation models incorporating non-stomatal limitations to photosynthesis. *New Phytologist* 217: 571–585

118 **Alam, S. , Huang, J., Stadt, K. J., Comeau, P. G., Dawson, A., Gea-Izquierdo, G., Aakala, T, Hölttä, T, Vesala, T., Mäkelä A. & Berninger, F**. 2017. Effects of competition, drought stress and photosynthetic productivity on the radial growth of white spruce in western Canada. Frontiers in Plant Science. 8, 1915-1929

116** **Pulliainen JT, Aurela M, Laurila T, Aalto T, Takala M, Salminen M, Kulmala M, Barr A, Heimann M, Lindroth A, Laaksonen A, Derksen C, Mäkelä A, Markkanen T, Lemmetyinen J, Susiluoto J, Dengel S, Mammarella I, Tuovinen J-P, Vesala T**. 2017. Early snowmelt significantly enhances boreal springtime carbon uptake. *Proceedings of the National Academy of Sciences of the United States of America.* 114, 42, p. 11081-11086 6 p.

115 **Hölttä T., Lintunen A., Chan T., Mäkelä A., Nikinmaa E. 2017.** A steady-state stomatal model of balanced leaf gas exchange, hydraulics and maximal source–sink flux. *Tree Physiology*, 1-18

114 **Schiestl-Aalto P., Mäkelä A.** 2017. Temperature dependence of needle and shoot elongation before bud break in Scots pine. *Tree Physiology* 37:316-325

113 **Kalliokoski T., Mäkinen H., Linkosalo T., Mäkelä A**. 2016. Evaluation of stand-level hybrid PipeQual model with permanent sample plot data of Norway spruce. *Canadian Journal of Forest Research* 47:234-245.

112** **Minunno F, Peltoniemi M, Launiainen S, Aurela M, Mammarella I, Lindroth A, Lohela A, Minkkinen K, Mäkelä A** 2016. Calibration and validation of a semi-empirical flux ecosystem model for coniferous forests in the Boreal region. *Ecological Modelling* 341:37-52.

111 **Grönlund L., Hölttä T., Mäkelä A.** 2016. Branch age and light conditions determine leaf-area specific conductivity in current shoots of Scots pine. *Tree Physiology* 36:994-1006.

110** **Mäkelä A., Pulkkinen M., Mäkinen H.** 2016. Bridging empirical and carbon-balance based forest site productivity - significance of below-ground allocation. *Forest Ecology and Management* 372:64-77.

109** **Schiestl-Aalto, P., Kulmala, L., Mäkinen, H., Nikinmaa, E., Mäkelä, A.** 2015. CASSIA – a dynamic model for predicting intra-annual sink demand and interannual growth variation in Scots pine. *New Phytologist* New Phytologist 206: 647–659 DOI: 10.1111/nph.13275

108** **Mäkipää, R., Linkosalo, T., Komarov, A., Mäkelä, A.** 2015. Mitigation of climate change with biomass harvesting in Norway spruce stands — are harvesting practices carbon neutral? *Canadian Journal of Forest Research* **45**: 217–225. dx.doi.org/10.1139/cjfr-2014-0120.

107 **Aalto T., Peltoniemi M., Aurela M., Böttcher K., Gao Y., Härkönen S., Härmä P., Kilkki J., Kolari P., Laurila T., Lehtonen A., Manninen T., Markkanen T., Mattila O.-P., Metsämäki S., Muukkonen P., Mäkelä A., Pulliainen J., Susiluoto J., Takala M., Thum T., Ťupek B., Törmä M. & Arslan A.N.** 2015: Preface to the special issue on Monitoring and Modelling of Carbon-Balance-, Water- and Snow-Related Phenomena at Northern Latitudes. *Boreal Env. Res.* 20: 145–150

106 **Peltoniemi, M., Pulkkinen, M., Aurela M., Pumpanen, J., Kolari, P., Mäkelä, A**. 2015. A semi-empirical model of boreal forest gross primary production, evapotranspiration, and soil water – calibration and sensitivity analysis. *Boreal Environment Research* 20: 151–171.

105** **Peltoniemi, M.S., Markkanen, T., Härkönen, S., Muukkonen, P., Thum, T., Aalto, T., Mäkelä, A.** 2015. Convergent estimates of gross primary production of Finnish forests --- comparison of two processmodels. *Boreal Environment Research*. 20: 196–212

104 **Hari, P., Bäck, J., Heliövaara, K., Kerminen, V.M., Kulmala, L., Mäkelä, A., Nikinmaa, E., Petäjä, T., Kulmala, M.** 2014. Towards quantitative ecology: Newton's principia revisited. *Boreal Environment Research* 19: 142-152.

103 **Battipaglia G., De Micco V., Sass-Klaassen U., Tognetti R. and Mäkelä A**. 2014. Special issue: WSE symposium: Wood growth under environmental changes: the need for a multidisciplinary approach. *Tree Physiology* 34: 787–791 5

102 **Mäkelä, A.** 2013. En route to improved phenological models: can space-for-time substitution give guidance? *Tree Physiology* 33: 1253-1255.

101 **Schiestl-Aalto P., Nikinmaa E. and Mäkelä A.** 2013. Duration of shoot elongation in Scots pine varies within the crown and between years. *Annals of Botany*. doi:10.1093/aob/mct180

100 **Niinimäki S., Tahvonen O, Mäkelä A. and Linkosalo T.** 2013. On the economics of Norway spruce stands and carbon storage. *Canadian Journal of Forest Research* 7: 637-648.

99** **Härkönen S., Tokola T., Packalen P., Korhonen L. and Mäkelä A.** 2013. Predicting forest growth based on airborne light detection and ranging data, climate data, and a simplified process-based model. *Canadian Journal of Forest Research* 43:354-375.

98 **Nikinmaa E., Hölttä T., Hari P., Kolari P., Mäkelä A., Sevanto S., Vesala T.** 2013. Assimilate transport in phloem sets conditions for leaf gas exchange. *Plant Cell and Environment* 36:655-669.

97 **Valentine H.T., Amateis R.L., Gove H., Mäkelä A.** 2013. Crown rise and crown-length dynamics: application to loblolly pine. *Forestry*. 86:371-375

96** **van Oijen, M., Reyer C., Bohn F.J., Cameron D.R:, Deckmyn G., Felchsig M., Härkönen S., Hartig F., Huth A., Kiviste A., Lasch P., Mäkelä A., Mette T., Minunno F., Rammer W.** 2013. Bayesian calibration, comparison and averaging of six forest models, using data from Scots pine stands across Europe. *Forest Ecology and Management* 289: 255–268

95 **Mäkelä A., del Rio M., Hynynen J., Hawkins M.J., Reyer C., Soares P., van Oijen M., Tome M.** 2012. Using stand-scale forest models for estimating sustainable forest management. *Forest Ecology and Management.* 285 :164–178

94 **Nikinmaa E., Hölttä T., Hari P., Kolari P., Mäkelä A., Sevanto S., Vesala T,** 2012. Assimilate transport in phloem sets conditions for leaf gas exchange. *Plant, Cell and Environment.* 36:655-669.

93 **Mäkelä A.** 2012. On guiding principles for carbon allocation in eco-physiological growth models. *Tree Physiology* 32:644-647.

92** **Valentine H.T, Mäkelä, A.** 2012. Modeling forest stand dynamics from optimal balances of carbon and nitrogen. *New Phytologist.* 194: 961–971

91 **Niinimäki S., Tahvonen O., Mäkelä A.** 2012. Applying a process-based model in Norway spruce management. *Forest Ecology and Management* 265:102-115.

90 **Peltoniemi M., Pulkkinen M., Kolari, P., Duursma, R., Montagnani, L., Wharton, S., Lagergren, F., Takagi, K., Verbeeck, H., Christensen, T., Vesala, T., Falk, M., Loustau, D., Mäkelä, A.** 2012. Does canopy mean N concentration explain differences in light use efficiencies of canopies in 14 contrasting forest sites? *Tree Physiology, 32(2): 200-218*

89 **Valentine H.T., Mäkelä A., Green E.J., Amateis R.L., Mäkinen H., Ducey M.J.** 2012. Models relating stem growth to crown length dynamics: application to loblolly pine and Norway spruce. *Trees Structure and Function*. 26:469–478

88** **Härkönen, S., Lehtonen, A., Eerikäinen, K., Peltoniemi, M., Mäkelä, A.** 2011. Estimating carbon fluxes for large regions in Finland based on process-based modeling, NFI data and Landsat satellite images. *Forest Ecology and Management* 262:2364-2377.

87 **Schneider R., Berninger F., Ung C.H., Mäkelä A., Swift D.E., Zang S.Y.** 2011. Within crown variation in the relationship between foliage biomass and sapwood area in jack pine. *Tree Physiology* 31:22-29.

86 **Mäkipää R., Linkosalo T., Niinimäki S., Komarov A., Bykhovets S., Tahvonen O. and Mäkelä A.** 2011. How forest management and climate change affect the carbon sequestration of a Norway spruce stand. *Journal of Forest Planning* 16:107-120.

85 **Gea-Izquiedro G., Mäkelä A, Margolis H., Bergeron Y., Black A.T., Dunn A., Hadley J., Pa U K.T., Falk M., Wharon S. Monson R., Hollinger D.Y., Laurila T., Aurela M., McCaughey H., Bourque C., Vesala T. and Berninger F.** 2010. Modeling acclimation of photosynthesis to temperature in evergreen conifer forests. *New Phytologist.* 188:175-186.

84 **Mäkelä A., Grace J.C., Deckmyn G., Kantola A. and Campioli M.** 2010. Simulating wood quality in forest management models. *Journal of Forest Systems* 19(4):48-68.

83 **Hölttä T., Mäkinen H., Nöjd P., Mäkelä A. and Nikinmaa E.** 2010. A physiological model of softwood cambial growth. *Tree Physiology* 30:1235-1252

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