

Publications

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August 22, 2024

The sectioning is according to the classification by Ministry of Education and Culture. The ten most important publications are marked with a star (*). The DOI numbers are clickable in the pdf version.

A PEER-REVIEWED SCIENTIFIC ARTICLES

[1] [Marko Laine](#), Gemma Kulk, Bror F. Jönsson, Shubha Sathyendranath: A machine learning model-based satellite data record of dissolved organic carbon concentration in surface waters of the global open ocean. *Frontiers in Marine Science - Ocean Observation*, **11**, 2024. [doi:10.3389/fmars.2024.1305050](https://doi.org/10.3389/fmars.2024.1305050)

[2] Anu Kauppi, Antti Kukkurainen, Antti Lipponen, [Marko Laine](#), Antti Arola, Hannakaisa Lindqvist, Johanna Tamminen: A Bayesian framework to quantify uncertainty in aerosol optical model selection applied to TROPOMI measurements, **16(11):1945**, *Remote Sensing*, 2024. [doi:10.3390/rs16111945](https://doi.org/10.3390/rs16111945)

*[3] O. Rätty, [M. Laine](#), U. Leijala, J. Särkkä, M. M. Johansson: Bayesian hierarchical modelling of sea-level extremes in the Finnish coastal region, *Natural Hazards and Earth System Sciences*, **2023(23)**, pages 2403–2418, 2023. [doi:10.5194/nhess-23-2403-2023](https://doi.org/10.5194/nhess-23-2403-2023)

[4] Antti Solonen, Ramona Maraia, Sebastian Springer, Heikki Haario, [Marko Laine](#), Olle Rätty, Jukka-Pekka Jalkanen, Matti Antola: Hierarchical Bayesian propulsion power models – A simplified example with cruise ships, *Ocean Engineering*, **285**, page 115226, 2023. [doi:10.1016/j.oceaneng.2023.115226](https://doi.org/10.1016/j.oceaneng.2023.115226)

[5] Zengmiao Wang, Peiyi Wu, Lin Wang, Bingying Li, Yonghong Liu, Yuxi Ge, Ruixue Wang, Ligui Wang, Hua Tan, Chieh-Hsi Wu, [Marko Laine](#), Henrik Salje, Hongbin Song: Marginal effects of public health measures and COVID-19 disease burden in China: a large-scale modelling study, *PLOS Computational Biology*, **19(9)**, 24 pages, 2023. [doi:10.1371/journal.pcbi.1011492](https://doi.org/10.1371/journal.pcbi.1011492)

[6] R. J. Brewin, S. Sathyendranath, G. Kulk, M.-H. Rio, J. A. Concha, T. G. Bell, A. Bracher, C. Fichot, T. L. Frölicher, M. Galí, D. A. Hansell, T. S. Kostadinov, C. Mitchell, A. R. Neeley, E. Organelli, K. Richardson, C. Rousseaux, F. Shen, D. Stramski, M. Tzortziou, A. J. Watson, C. I. Addey, M. Bellacicco, H. Bouman, D. Carroll, I. Cetinić, G. Dall’Olmo, R. Frouin, J. Hauck, M. Hieronymi, C. Hu, V. Ibello, B. Jönsson, C. E. Kong, Ž. Kovač, [M. Laine](#), J. Lauderdale, S. Lavender, E. Livanou, J. Llort, L. Lorinczi, M. Nowicki, N. A. Pradisty, S. Psarra, D. E. Raitsos, A. B. Ruescas, J. L. Russell, J. Salisbury, R. Sanders, J. D. Shutler, X. Sun, F. G. Taboada, G. Tilstone, X. Wei, D. K. Woolf: Ocean carbon from space: Current status and priorities for the next decade. *Earth-Science Reviews*, page 104386, 2023. [doi:10.1016/j.earscirev.2023.104386](https://doi.org/10.1016/j.earscirev.2023.104386)

[7] Kallio, K., Malve, O., Siivola, E., Kervinen, M., Koponen, S., Lepistö, A., Lindfors, A., [Laine, M.](#): Spatiotemporal analysis of lake chlorophyll-a with combined in situ and satellite data, *Environmental Monitoring and Assessment*, **195(465)**, 15 pages, 2023. [doi:10.1007/s10661-023-11064-5](https://doi.org/10.1007/s10661-023-11064-5)

[8] Ekblom, M., Tuppi, L., Rätty, O., Ollinaho, P., [Laine, M.](#), Järvinen, H.: Filter likelihood as an observation-based verification metric in ensemble forecasting, *Tellus A: Dynamic Meteorology and Oceanography*, **75(1)**, pages 69–87, 2023. [doi:10.16993/tellusa.96](https://doi.org/10.16993/tellusa.96)

[9] Zengmiao Wang, Peiyi Wu, Jingyuan Wang, José Lourenço, Bingying Li, Benjamin Rader, [Marko Laine](#), Hui Miao, Ligui Wang, Hongbin Song, Nita Bharti, John S. Brownstein, Ottar N. Bjornstad, Christopher Dye, Huaiyu Tian: Assessing the asymptomatic proportion of SARS-CoV-2 infection with age in China before mass vaccination, *Journal of The Royal Society Interface*, **19(195)**, page 20220498, 2022. [doi:10.1098/rsif.2022.0498](https://doi.org/10.1098/rsif.2022.0498)

*[10] M. Gunia, [M. Laine](#), O. Malve, K. Kallio, M. Kervinen, S. Anttila, N. Kotamäki, E. Sivola, J. Kettunen, T. Kauranne: Data fusion system for monitoring water quality: Application to chlorophyll-a in Baltic sea coast, *Environmental Modelling & Software*, pages 105465, 2022. [doi:10.1016/j.envsoft.2022.105465](https://doi.org/10.1016/j.envsoft.2022.105465)

[11] Leila Hieta, Mikko Partio, [Marko Laine](#), Marja-Liisa Tuomola, Harri Hohti, Tuuli Perttula, Erik Gregow, Jussi S. Ylhäisi: Smartmet nowcast - Rapidly updating nowcasting system at Finnish Meteorological Institute, *Meteorologische Zeitschrift*, **30(4)**, pages 369–377, 2021. [doi:10.1127/metz/2021/1070](https://doi.org/10.1127/metz/2021/1070)

[12] Robert J.W. Brewin, Shubha Sathyendranath, Trevor Platt, Heather Bouman, Stefano Ciavatta, Giorgio Dall’Olmo, James Dingle, Steve Groom, Bror Jönsson, Tihomir S. Kostadinov, Gemma Kulk, [Marko Laine](#), Victor Martínez-Vicente, Stella Psarra, Dionysios E. Raitsos, Katherine Richardson, Marie-Hélène Rio, Cécile Rousseaux, Joe Salisbury, Jamie D. Shutler, Peter Walker: Sensing the ocean biological carbon pump from space: A review of capabilities, concepts, research gaps and future developments, *Earth-Science Reviews*, **217**, pages 103604, 2021. [doi:10.1016/j.earscirev.2021.103604](https://doi.org/10.1016/j.earscirev.2021.103604)

[13] Kaisa Ylinen, Olle Rätty, [Marko Laine](#): Operational statistical postprocessing of temperature ensemble forecasts with station-specific predictors, *Meteorological Applications*, **27(6)**, e1971, 2020. [doi:10.1002/met.1971](https://doi.org/10.1002/met.1971)

[14] A. Shcherbacheva, T. Balehowsky, J. Kubečka, T. Olenius, T. Helin, H. Haario, [M. Laine](#), T. Kurtén, H. Vehkamäki: Identification of molecular cluster evaporation rates, cluster formation enthalpies and entropies by Monte Carlo method, *Atmospheric Chemistry and Physics*, **20(24)**, pages 15867–15906, 2020. [doi:10.5194/acp-20-15867-2020](https://doi.org/10.5194/acp-20-15867-2020)

[15] Tomi Karppinen, Otto Lamminpää, Simo Tukiainen, Rigel Kivi, Pauli Heikkinen, Juha Hatakka, [Marko Laine](#), Huilin Chen, Hannakaisa Lindqvist, Johanna Tamminen: Vertical Distribution of Arctic Methane in 2009–2018 Using Ground-Based Remote Sensing, *Remote Sensing*, **12(6)**, 2020. [doi:10.3390/rs12060917](https://doi.org/10.3390/rs12060917)

[16] Madeleine Ekblom, Lauri Tuppi, Vladimir Shemyakin, [Marko Laine](#), Pirkka Ollinaho, Heikki Haario, Heikki Järvinen: Algorithmic tuning of spread-skill relationship in ensemble forecasting systems, *Quarterly Journal of the Royal Meteorological Society*, **146(727)**, pages 598–612, 2020. [doi:10.1002/qj.3695](https://doi.org/10.1002/qj.3695)

[17] Yidan Li, Bernard Cazelles, Guoqing Yang, [Marko Laine](#), Zheng X.Y. Huang, Jun Cai, Hua Tan, Nils Chr. Stenseth, Huaiyu Tian: Intrinsic and extrinsic drivers of transmission dynamics of hemorrhagic fever with renal syndrome caused by Seoul hantavirus, *PLoS Neglected Tropical Diseases*, **13(9)**, 2019. [doi:10.1371/journal.pntd.0007757](https://doi.org/10.1371/journal.pntd.0007757)

[18] Otto Lamminpää, Jonathan Hobbs, Jenný Brynjarsdóttir, [Marko Laine](#), Amy Braverman, Hannakaisa Lindqvist, Johanna Tamminen: Accelerated MCMC for satellite-based measurements of atmospheric CO₂, *Remote Sensing*, **11(17)**, 2019. [doi:10.3390/rs11172061](https://doi.org/10.3390/rs11172061)

[19] Ella Kivimäki, Hannakaisa Lindqvist, Janne Hakkarainen, [Marko Laine](#), Ralf Sussmann, Aki Tsuruta, Rob Detmers, Nicholas M. Deutscher, Edward J. Dlugokencky, Frank Hase, Otto Hasekamp, Rigel Kivi, Isamu Morino, Justus Notholt, David F. Pollard, Coleen Roehl, Matthias Schneider, Mahesh Kumar Sha, Voltaire A. Velazco, Thorsten Warneke, Debra Wunch, Yukio Yoshida, Johanna Tamminen: Evaluation and Analysis of the Seasonal Cycle and Variability of the Trend from GOSAT Methane Retrievals, *Remote Sensing*, **11(7)**, page 882, 2019. [doi:10.3390/rs11070882](https://doi.org/10.3390/rs11070882)

*[20] [Marko Laine](#): Introduction to dynamic linear models for time series analysis. Chapter in book *Geodetic Time Series Analysis in Earth Sciences*, Springer Geophysics, 2019. [doi:10.1007/978-3-030-21718-1_4](https://doi.org/10.1007/978-3-030-21718-1_4) [arXiv:1903.11309](https://arxiv.org/abs/1903.11309)

- [21] Otto Lamminpää, Marko Laine, Simo Tukiainen, Johanna Tamminen: Likelihood informed dimension reduction for inverse problems in remote sensing of atmospheric constituent profiles, *2017 MATRIX Annals*, pages 65–78, Springer, 2019. [arXiv:1709.02611](https://arxiv.org/abs/1709.02611) [doi:10.1007/978-3-030-04161-8_6](https://doi.org/10.1007/978-3-030-04161-8_6)
- [22] Huaiyu Tian, Shixiong Hu, Bernard Cazelles, Gerardo Chowell, Lidong Gao, Marko Laine, Yapin Li, Huisuo Yang, Yidan Li, Qiqi Yang, Xin Tong, Ru Huang, Ottar N. Bjornstad, Hong Xiao, Nils Chr. Stenseth: Urbanization prolongs hantavirus epidemics in cities, *Proceedings of the National Academy of Sciences*, **115**(18), pages 4707–4712, 2018. [doi:10.1073/pnas.1712767115](https://doi.org/10.1073/pnas.1712767115)
- [23] Erkki Kyrölä, Monika E. Andersson, Pekka T. Verronen, Marko Laine, Simo Tukiainen, Daniel R. Marsh: Middle atmospheric ozone, nitrogen dioxide, and nitrogen trioxide in 2002–2011: SD-WACCM simulations compared to GOMOS observations, *Atmospheric Chemistry and Physics*, **18**(7), pages 5001–5019, 2018. [doi:10.5194/acp-18-5001-2018](https://doi.org/10.5194/acp-18-5001-2018)
- [24] Jouni Susiluoto, Maarit Raivonen, Leif Backman, Marko Laine, Jarmo Mäkelä, Olli Peltola, Timo Vesala, Tuula Aalto: Calibrating the sqHIMMELI v1.0 wetland methane emission model with hierarchical modeling and adaptive MCMC, *Geoscientific Model Development*, **11**(3), pages 1199–1228, 2018. [doi:10.5194/gmd-11-1199-2018](https://doi.org/10.5194/gmd-11-1199-2018)
- *[25] J. E. Campbell, J. A. Berry, U. Seibt, S. J. Smith, S. A. Montzka, T. Launois, S. Belviso, L. Bopp, M. Laine: Large historical growth in global gross primary production, *Nature*, **544**, pages 84–87, 2017. [doi:10.1038/nature22030](https://doi.org/10.1038/nature22030)
- [26] Veera Norros, Marko Laine, Risto Lignell, Frede Thingstad: Parameterisation of aquatic ecosystem functioning and its natural variation: Hierarchical Bayesian modelling of plankton food web dynamics, *Journal of Marine Systems*, **174**, pages 40–53, 2017. [doi:10.1016/j.jmarsys.2017.05.004](https://doi.org/10.1016/j.jmarsys.2017.05.004)
- [27] Zenith Purisha, Heikki Haario, Aki Kallonen, Marko Laine, Esa Niemi, Samuli Siltanen: Shape recovery for sparse-data tomography, *Mathematical Methods in the Applied Sciences*, **40**(18), pages 6649–6669, 2017. [doi:10.1002/mma.4480](https://doi.org/10.1002/mma.4480)
- *[28] H. Tian, P. Yu, B. Cazelles, L. Xu, H. Tan, J. Yang, S. Huang, B. Xu, J. Cai, C. Ma, J. Wei, S. Li, J. Qu, M. Laine, J. Wang, S. Tong, N. C. Stenseth, B. Xu: Interannual cycles of Hantaan virus outbreaks at the human-animal interface in Central China are controlled by temperature and rainfall, *Proceedings of the National Academy of Sciences*, **114**(3), pages 8041–8046, 2017. [doi:10.1073/pnas.1701777114](https://doi.org/10.1073/pnas.1701777114)
- [29] Anu Kauppi, Pekka Kolmonen, Marko Laine, Johanna Tamminen: Aerosol-type retrieval and uncertainty quantification from OMI data, *Atmospheric Measurement Techniques*, **10**(11), pages 4079–4098, 2017. [doi:10.5194/amt-10-4079-2017](https://doi.org/10.5194/amt-10-4079-2017)
- [30] V. F. Sofieva, E. Kyrölä, M. Laine, J. Tamminen, D. Degenstein, A. Bourassa, C. Roth, D. Zawada, M. Weber, A. Rozanov, N. Rahpoe, G. Stiller, A. Laeng, T. von Clarmann, K. A. Walker, P. Sheese, D. Hubert, M. van Roozendaal, C. Zehner, R. Damadeo, J. Zawodny, N. Kramarova, P. K. Bhartia: Merged SAGE II, Ozone_cci and OMPS ozone profiles dataset and evaluation of ozone trends in the stratosphere, *Atmospheric Chemistry and Physics*, **17**(20), 2017. [doi:10.5194/acp-17-12533-2017](https://doi.org/10.5194/acp-17-12533-2017)
- [31] Emmihenna Jääskeläinen, Terhikki Manninen, Johanna Tamminen, Marko Laine: The Aerosol Index and Land Cover Class Based Atmospheric Correction Aerosol Optical Depth Time Series 1982–2014 for the SMAC Algorithm, *Remote Sensing*, **9**(11), 17 pages, 2017. [doi:10.3390/rs9111095](https://doi.org/10.3390/rs9111095)
- [32] A. Tsuruta, T. Aalto, L. Backman, J. Hakkarainen, I. T. van der Laan-Luijkx, M. C. Krol, R. Spahni, S. Houweling, M. Laine, E. Dlugokencky, A. J. Gomez-Pelaez, M. van der Schoot, R. Langenfelds, R. Ellul, J. Arduini, F. Apadula, C. Gerbig, D. G. Feist, R. Kivi, Y. Yoshida, W. Peters: Global methane emission estimates for 2000–2012 from CarbonTracker Europe-CH₄ v1.0, *Geoscientific Model Development*, **10**(3), pages 1261–1289, 2017. [doi:10.5194/gmd-10-1261-2017](https://doi.org/10.5194/gmd-10-1261-2017)
- *[33] Virpi Junttila, Marko Laine: Bayesian principal component regression model with spatial effects for forest inventory under small field sample size, *Remote Sensing of Environment*, **192**, pages 45–57, 2017. [doi:10.1016/j.rse.2017.01.035](https://doi.org/10.1016/j.rse.2017.01.035)

- [34] H.-Y. Tian, P. Yu, O. Bjørnstad, B. Cazelles, J. Yang, H. Tan, S. Huang, Y. Cui, L. Dong, C. Ma, C. Ma, S. Zhou, M. Laine, X. Wu, Y. Zhang, J. Wang, R. Yang, N. C. Stenseth, B. Xu: Anthropogenically driven environmental changes shift the ecological dynamics of hemorrhagic fever with renal syndrome. *PLoS Pathogens*, **13**(1), 2017. doi:10.1371/journal.ppat.1006198
- [35] V. F. Sofieva, I. Ialongo, J. Hakkarainen, E. Kyrölä, J. Tamminen, M. Laine, A. Hauchecorne, F. Dalaudier, J.-L. Bertaux, D. Fussen, L. Blanot, G. Barrot, A. Dehn: Improved GOMOS/Envisat ozone retrievals in the upper troposphere and the lower stratosphere, *Atmospheric Measurement Techniques*, **10**(1), pages 231–246, 2017. doi:10.5194/amt-10-231-2017
- [36] Simo Tukiainen, Jesse Railo, Marko Laine, Janne Hakkarainen, Rigel Kivi, Pauli Heikkinen, H. Chen, Johanna Tamminen: Retrieval of atmospheric CH₄ profiles from FTIR data using dimension reduction and MCMC, *Journal of Geophysical Research: Atmospheres*, **121**(17), pages 10312–10327, 2016. doi:10.1002/2015JD024657
- [37] F. Vanhellefont, N. Mateshvili, L. Blanot, C. E. Robert, C. Bingen, V. Sofieva, F. Dalaudier, C. Tétard, D. Fussen, E. Dekemper, E. Kyrölä, M. Laine, J. Tamminen, C. Zehner: AerGOM, an improved algorithm for stratospheric aerosol extinction retrieval from GOMOS observations – Part 1: Algorithm description, *Atmospheric Measurement Techniques*, **9**(9), pages 4687–4700, 2016. doi:10.5194/amt-9-4687-2016
- [38] Lassi Roininen, Marko Laine, Thomas Ulich: Time-varying ionosonde trend: Case study of Sodankylä hmF₂ data 1957–2014, *Journal of Geophysical Research: Space Physics*, **120**(8), pages 6851–6859, 2015. doi:10.1002/2015JA021176
- [39] Huai-Yu Tian, Peng-Bo Yu, Angela D. Luis, Peng Bi, Bernard Cazelles, Marko Laine, Shan-Qian Huang, Chao-Feng Ma, Sen Zhou, Jing Wei, Shen Li, Xiao-Ling Lu, Jian-Hui Qu, Jian-Hua Dong, Shi-Lu Tong, Jing-Jun Wang, Bryan Grenfell, Bing Xu: Changes in rodent abundance and weather conditions potentially drive hemorrhagic fever with renal syndrome outbreaks in Xi’an, China, 2005–2012, *PLoS Neglected Tropical Diseases*, **9**(3), pages e0003530, 2015. doi:10.1371/journal.pntd.0003530
- [40] Tummon, F., Hassler, B., Harris, N. R. P., Staehelin, J., Steinbrecht, W., Anderson, J., Bodeker, G. E., Bourassa, A., Davis, S. M., Degenstein, D., Frith, S. M., Froidevaux, L., Kyrölä, E., Laine, M., Long, C., Penckwitt, A. A., Sioris, C. E., Rosenlof, K. H., Roth, C., Wang, H. J., Wild, J.: Intercomparison of vertically resolved merged satellite ozone data sets: interannual variability and long-term trends, *Atmospheric Chemistry and Physics*, **15**(6), pages 3021–3043, 2015. doi:10.5194/acp-15-3021-2015
- *[41] Santtu Mikkonen, Marko Laine, Hanna M. Mäkelä, Hilppa Gregow, Heikki Tuomenvirta, Matti Lahtinen, Ari Laaksonen: Trends in the average temperature in Finland, 1847–2013, *Stochastic Environmental Research and Risk Assessment*, **29**(6), pages 1521–1529, 2015. doi:10.1007/s00477-014-0992-2
- [42] Harris, N. R. P., Hassler, B., Tummon, F., Bodeker, G. E., Hubert, D., Petropavlovskikh, I., Steinbrecht, W., Anderson, J., Bhartia, P. K., Boone, C. D., Bourassa, A., Davis, S. M., Degenstein, D., Delcloo, A., Frith, S. M., Froidevaux, L., Godin-Beekmann, S., Jones, N., Kurylo, M. J., Kyrölä, E., Laine, M., Leblanc, S. T., Lambert, J.-C., Liley, B., Mahieu, E., Maycock, A., de Mazière, M., Parrish, A., Querel, R., Rosenlof, K. H., Roth, C., Sioris, C., Staehelin, J., Stolarski, R. S., Stübi, R., Tamminen, J., Vigouroux, C., Walker, K., Wang, H. J., Wild, J., Zawodny, J. M.: Past changes in the vertical distribution of ozone — Part 3: Analysis and interpretation of trends, *Atmospheric Chemistry and Physics*, **15**(17), pages 9965–9982, 2015. doi:10.5194/acp-15-9965-2015
- *[43] Marko Laine, Niilo Latva-Pukkila, Erkki Kyrölä: Analysing time-varying trends in stratospheric ozone time series using the state space approach, *Atmospheric Chemistry and Physics*, **14**(18), pages 9707–9725, 2014. doi:10.5194/acp-14-9707-2014
- [44] Johnathan M. Bardsley, Antti Solonen, Heikki Haario, Marko Laine: Randomize-then-optimize: A Method for Sampling from Posterior Distributions in Nonlinear Inverse Problems, *SIAM Journal on Scientific Computing*, **36**(4), pages A1895–A1910, 2014. doi:10.1137/140964023

- [45] Pirkka Ollinaho, Heikki Järvinen, Peter Bauer, Marko Laine, Peter Bechtold, Jouni Susiluoto, Heikki Haario: Optimization of NWP model closure parameters using total energy norm of forecast error as a target, *Geoscientific Model Development*, **7(5)**, pages 1889–1900 2014. doi:10.5194/gmd-7-1889-2014
- [46] Anu Määttä, Marko Laine, Johanna Tamminen, J. Pepijn Veefkind: Quantification of uncertainty in aerosol optical thickness retrieval arising from aerosol microphysical model and other sources, applied to Ozone Monitoring Instrument (OMI) measurements, *Atmospheric Measurement Techniques*, **7(5)**, pages 1185–1199, 2014. doi:10.5194/amt-7-1185-2014
- [47] V.F. Sofieva, N. Kalakoski, S.-M. Päivärinta, J. Tamminen, E. Kyrölä, M. Laine, L. Froidevaux: On sampling uncertainty of satellite ozone profile measurements, *Atmospheric Measurement Techniques*, **7(6)**, pages 1891–1900, 2014. doi:10.5194/amt-7-1891-2014
- [48] Teemu Näykki, Mirja Leivuori, Katarina Björklöf, Ritva Väisänen, Marko Laine, Tero Väisänen, Ivo Leito: Field Proficiency Test of pH, Conductivity and Dissolved Oxygen Measurements in River Water, *Accreditation and Quality Assurance*, **19(4)**, pages 259–268, 2014. doi:10.1007/s00769-014-1064-5
- [49] Erkki Kyrölä, Marko Laine, Viktoria Sofieva, Simo Tukiainen, Johanna Tamminen, Sanna Päivärinta, J. Zawodny, L. Thomason: Combined SAGE II-GOMOS ozone profile data set for 1984–2011 and trend analysis of the vertical distribution of ozone, *Atmospheric Chemistry and Physics*, **13(21)**, pages 10645–10658, 2013. doi:10.5194/acp-13-10645-2013
- [50] Pirkka Ollinaho, Peter Bechtold, Martin Leutbecher, Marko Laine, Antti Solonen, Heikki Haario, Heikki Järvinen: Parameter variations in prediction skill optimization at ECMWF, *Nonlinear Processes in Geophysics*, **20(6)**, pages 1001–1010, 2013. doi:10.5194/npg-20-1001-2013
- [51] Pirkka Ollinaho, Marko Laine, Antti Solonen, Heikki Haario, Heikki Järvinen: NWP model forecast skill optimization via closure parameter variations, *Quarterly Journal of the Royal Meteorological Society*, **139(675)**, pages 1520–1532, 2013. doi:10.1002/qj.2044
- [52] Janne Hakkarainen, Antti Solonen, Alexander Ilin, Jouni Susiluoto, Marko Laine, Heikki Haario, Heikki Järvinen: A dilemma of the uniqueness of weather and climate model closure parameters, *Tellus A*, **65**, pages 8, 2013. doi:10.3402/tellusa.v65i0.20147
- [53] Heikki Haario, Leonid Kalachev, Marko Laine: Reduction and identification of dynamic models. Simple example: generic receptor model, *Discrete and Continuous Dynamical Systems - Series B*, **18(2)**, pages 417–425, 2013. doi:10.3934/dcdsb.2013.18.417
- [54] Risto Lignell, Heikki Haario, Marko Laine, T. Frede Thingstad: Getting the "right" parameter values for models of the pelagic microbial food web, *Limnology and Oceanography*, **58(1)**, pages 301–313, 2013. doi:10.4319/lo.2013.58.1.0301
- [55] Janne Hakkarainen, Alexander Ilin, Antti Solonen, Marko Laine, Heikki Haario, Johanna Tamminen, Erkki Oja, Heikki Järvinen: On closure parameter estimation in chaotic systems, *Nonlinear Processes in Geophysics*, **19(1)**, pages 127–143, 2012. doi:10.5194/npg-19-127-2012
- [56] Antti Solonen, Pirkka Ollinaho, Marko Laine, Heikki Haario, Johanna Tamminen, Heikki Järvinen: Efficient MCMC for climate model parameter estimation: parallel adaptive chains and early rejection, *Bayesian Analysis*, **7(3)**, pages 715–736, 2012. doi:10.1214/12-BA724
- [57] Heikki Järvinen, Marko Laine, Antti Solonen, Heikki Haario: Ensemble prediction and parameter estimation system: the concept, *Quarterly Journal of the Royal Meteorological Society* **138(663)**, pages 281–288, 2012. doi:10.1002/qj.923
- *[58] Marko Laine, Antti Solonen, Heikki Haario, Heikki Järvinen: Ensemble prediction and parameter estimation system: the method, *Quarterly Journal of the Royal Meteorological Society* **138(663)**, pages 289–297, 2012. doi:10.1002/qj.922
- [59] Antti Solonen, Heikki Haario, Marko Laine: Simulation-based optimal design using a response variance criterion, *Journal of Computational and Graphical Statistics*, **21(1)**, pages 234–252, 2012. doi:10.1198/jcgs.2011.10070

- [60] Heikki Järvinen, Petri Räisänen, Marko Laine, Johanna Tamminen, Alexander Ilin, Erkki Oja, Antti Solonen, Heikki Haario: Estimation of ECHAM5 climate model closure parameters with adaptive MCMC, *Atmospheric Chemistry and Physics*, **10(1)**, pages 9993–10002, 2010. doi:10.5194/acp-10-9993-2010
- [61] J. Tamminen, E. Kyrölä, V. F. Sofieva, M. Laine, J.-L. Bertaux, A. Hauchecorne, F. Dalaudier, D. Fussen, F. Vanhellefont, O. Fanton-d'Andon, G. Barrot, A. Mangin, M. Guirlet, L. Blanot, T. Fehr, L. Saavedra de Miguel, R. Fraisse: GOMOS data characterization and error estimation, *Atmospheric Chemistry and Physics*, **10(19)**, pages 9505–9519, 2010. doi:10.5194/acp-10-9505-2010
- [62] Svante V. Henriksson, Elja Arjas, Marko Laine, Johanna Tamminen, Ari Laaksonen: Comment on "Using multiple observationally-based constraints to estimate climate sensitivity" by J. D. Annan and J. C. Hargreaves, *Geophys. Res. Lett.*, 2006, *Climate of the Past*, **6(4)**, pages 411–414, 2010. doi:10.5194/cp-6-411-2010
- [63] Heikki Haario, Leonid Kalachev, Marko Laine: Reduced models of algae growth, *Bulletin of Mathematical Biology*, **71(7)**, pages 1626–1648, 2009. doi:10.1007/s11538-009-9417-7
- [64] Marko Laine, Johanna Tamminen: Aerosol model selection and uncertainty modelling by adaptive MCMC technique, *Atmospheric Chemistry and Physics*, **8(24)**, pages 7697–7707, 2008. doi:10.5194/acp-8-7697-2008
- [65] Olli Malve, Marko Laine, Heikki Haario, Teija Kirkkala, Jukka Sarvala: Bayesian modelling of algae mass occurrences – using adaptive MCMC methods with a lake water quality model, *Environmental Modelling & Software*, **22(7)**, pages 966–977, 2007. doi:10.1016/j.envsoft.2006.06.016
- *[66] Heikki Haario, Marko Laine, Antonietta Mira, Eero Saksman: DRAM: Efficient adaptive MCMC. *Statistics and Computing*, **16(4)**, pages 339–354, 2006. doi:10.1007/s11222-006-9438-0
- [67] Olli Malve, Marko Laine, Heikki Haario: Estimation of winter respiration rates and prediction of oxygen regime in a lake using Bayesian inference, *Ecological Modelling*, **182(2)**, pages 183–197, 2005. doi:10.1016/j.ecolmodel.2004.07.020
- [68] Heikki Haario, Marko Laine, Markku Lehtinen, Eero Saksman, Johanna Tamminen: MCMC methods for high dimensional inversion in remote sensing, *Journal of the Royal Statistical Society, Series B*, **66**, pages 591–607, 2004. doi:10.1111/j.1467-9868.2004.02053.x
- [69] Veli-Matti Taavitsainen, Heikki Haario, Marko Laine: Rapid estimation of chemical kinetics by implicit calibration. II, *Journal of Chemometrics*, **17(2)**, pages 140–150, 2003. doi:10.1002/cem.779
- [70] T. Johansson, H. Ahola-Luttilla, Tuula Pirhonen, A. Taimisto, Heikki Haario, Marko Laine, Mirja Salkinoja-Salonen: Improved detection of *Listeria monocytogenes* in soft-mould ripened cheese, *Journal of Applied Microbiology*, **88**, pages 870–876, 2000. doi:10.1046/j.1365-2672.2000.01030.x

B NON-REFEREED SCIENTIFIC ARTICLES

- [71] S. Bohlmann, M. Laine: Statistical calibration of probabilistic medium-range fire weather index forecasts in Europe. *Natural Hazards and Earth System Sciences Discussions*, **2024:1–12**, 2024. doi:10.5194/nhess-2024-57
- [72] K. Jylhä, U. Leijala, M. M. Johansson, M. Laine, T. K. Laurila, A. Luomaranta, T. Olsson, M. Virman, M. Rantanen, J. Rauhala, O. Räty, J. Särkkä: Predicting extreme weather and sea level for nuclear power plant safety (PREDICT), in: J. Hämäläinen, V. Suolanen (eds): SAFIR2022 — The Finnish Research Programme on Nuclear Power Plant Safety 2019–2022. Final Report. VTT Technology, **414**, 621 pages, 2023. doi:10.32040/2242-122X.2023.T414
- [73] Zengmiao Wang, Peiyi Wu, Jingyuan Wang, José Lourenço, Bingying Li, Benjamin Rader, Marko Laine, Hui Miao, Ligui Wang, Hongbin Song, Nita Bharti, John S. Brownstein, Ottar N. Bjornstad, Christopher Dye, Huaiyu Tian: Asymptomatic SARS-CoV-2 infection and the demography of COVID-19, *medRxiv*, 2021. doi:10.1101/2021.09.03.21262757

- [74] A. Kauppi, A. Kukkurainen, A. Lipponen, [M. Laine](#), A. Arola, H. Lindqvist, J. Tamminen: Bayesian uncertainty quantification in aerosol optical depth retrieval applied to TROPOMI measurements, *Atmospheric Measurement Techniques Discussions*, **2021**, pages 1–35, 2021. [doi:10.5194/amt-2021-328](#)
- [75] Antti Solonen, Ramona Maraia, Sebastian Springer, Heikki Haario, [Marko Laine](#), Olle Rätty, Jukka-Pekka Jalkanen, Matti Antola: Hierarchical Bayesian propulsion power models for marine vessels, submitted preprint, 2020. [arXiv:2004.11267](#)
- [76] Otto Lamminpää, Marko Laine, Simo Tukiainen, Johanna Tamminen: Likelihood informed dimension reduction for inverse problems in remote sensing of atmospheric constituent profiles, submitted preprint, 2017. [arXiv:1709.02611](#)
- [77] Emmihenna Jääskeläinen, Terhikki Manninen, Johanna Tamminen, Marko Laine: An Aerosol Optical Depth time series 1982–2014 for atmospheric correction based on OMI and TOMS Aerosol Index, *Atmospheric Measurement Techniques Discussions*, 2016:1–37, 2016. [doi:10.5194/amt-2016-180](#)
- [78] Emmihenna Jääskeläinen, Terhikki Manninen, Johanna Tamminen, Marko Laine: Method for constructing an AOD-related atmospheric correction time series for the CLARA-A2 SAL data record, *Finnish Meteorological Institute reports n:o 2017:2*, 2017. <http://hdl.handle.net/10138/224308>
- [79] A. Tsuruta, T. Aalto, L. Backman, J. Hakkarainen, I. T. van der Laan-Luijckx, M. C. Krol, R. Spahni, S. Houweling, M. Laine, M. van der Schoot, R. Langenfelds, R. Ellul, W. Peters: Development of CarbonTracker Europe-CH₄ – Part 1: system set-up and sensitivity analyses, *Geoscientific Model Development Discussions*, **2016**, pages 1–31, 2016. [doi:10.5194/gmd-2016-181](#)
- [80] A. Tsuruta, T. Aalto, L. Backman, J. Hakkarainen, I. T. van der Laan-Luijckx, M. C. Krol, R. Spahni, S. Houweling, M. Laine, E. Dlugokencky, A. J. Gomez-Pelaez, M. van der Schoot, R. Langenfelds, R. Ellul, J. Arduini, F. Apadula, C. Gerbig, D. G. Feist, R. Kivi, Y. Yoshida, W. Peters: Development of CarbonTracker Europe-CH₄ – Part 2: global methane emission estimates and their evaluation for 2000–2012, *Geoscientific Model Development Discussions*, **2016**, pages 1–52, 2016. [doi:10.5194/gmd-2016-182](#)
- [81] Anu Määttä, Marko Laine, Johanna Tamminen, Pepijn Veefkind: Uncertainty quantification in aerosol optical thickness retrieval from Ozone Monitoring Instrument (OMI) measurements, *Proceedings of SPIE Vol. 8890, Remote Sensing of Clouds and the Atmosphere XVIII*, 2013. [doi:10.1117/12.2028749](#)
- [82] Janne Hakkarainen, Marko Laine, Johanna Tamminen: GOMOS one-step retrieval algorithm, *Proceedings of SPIE Vol. 8890, Remote Sensing of Clouds and the Atmosphere XVIII*, 2013. [doi:10.1117/12.2027109](#)
- [83] Marko Laine, Johanna Tamminen, Pepijn Veefkind: Bayesian model selection and averaging for remote sensing inverse problems, *Proceedings of the Living Planet Symposium*, European Space Agency, 2010.
- [84] Heikki Haario, Leonid Kalachev, Marko Laine: Reduction and identification of dynamic models. Simple example: generic receptor model, The University of Montana Department of Mathematical Sciences, Technical report #25/2009, 2009.
- [85] Marko Laine, Johanna Tamminen, Erkki Kyrölä, Heikki Haario: Aerosol model selection and uncertainty modelling by RJMCMC technique, *Proceedings of the Envisat Symposium 2007*, European Space Agency, 2007.
- [86] Heikki Haario, Leonid Kalachev, Marko Laine: Reduced models for algae growth, The University of Montana Department of Mathematical Sciences, Technical report #10/2007, 2007.
- [87] Marko Laine: Combining MATLAB with NAG and MAPLE, pages 61–68 in *Proceedings of the Workshop on Symbolic and Numeric Computing 1993*, Rolf Nevanlinna Institute Research Reports B10, 1994.

D PUBLICATIONS INTENDED FOR PROFESSIONAL COMMUNITIES

- [88] Marko Laine, Heikki Haario, Juhani Kettunen, Olli Malve: Havaintojen yhdistämisellä tehoa vedenlaatuseurantaan. *Vesitalous*, 2, 2017.
- [89] Marko Laine: Pätevyyskokeiden tilastostandardi ISO 13528 päivittyy, *Moodi*, 2014:6, pages 202–204, Labquality Oy, 2014.
- [90] Karline Soetaert, Marko Laine: R-package FME: MCMC tests, Documentation vignette for R package FME, 2010. <http://cran.r-project.org/web/packages/FME/vignettes/FMEcmc.pdf>
- [91] Marko Laine: Matematiikan opiskelijat projektikurssilla IL:ssä, *Puhuri*, 2007:2, pages 16–17, Ilmatieteen laitos, 2007.
- [92] Marko Laine: Linux tutkijan työasemassa, *CSC: tieteen tietotekniikan uutisia*, ISSN 1238-4798, 1997:5, pages 14–15, CSC Tieteellinen laskenta, 1997.
- [93] Marko Laine: Yliopiston tietokoneet ja ohjelmistot, *Atk-keskus tiedottaa*, ISSN 0789-1946, 1997:3, pages 10–13, Helsingin yliopisto, 1997.
- [94] Marko Laine: Mitä VAXin jälkeen tilasto-ohjelmaksi, *Atk-keskus tiedottaa*, ISSN 0789-1946, 1996:1, pages 9–11, Helsingin yliopisto, 1996.
- [95] Marko Laine: SAS-peruskurssi, Helsingin yliopiston atk-keskus, Atk-keskuksen oppaat, No 24, ISBN 951-45-6935-0, ISSN 1236-259X, 96 pages, Helsinki, 1995.
- [96] Marko Laine: Mitä - miksi - miten tietysti tietokoneella!!, *Atk-keskus tiedottaa*, ISSN 0789-1946, 1994:3, pages 5–9, Helsingin yliopisto, 1994.
- [97] Marko Laine: BMDP-opas, Helsingin yliopiston atk-keskus, Atk-keskuksen oppaat - Guides of Computing Centre No 23, ISBN 191-45-6614-9, ISSN 1236-259X, Helsinki, 1993.
- [98] Heikki Apiola, Marko Laine, Pirkka Peltola, Unix ESC Introductory Guide, Guides of Computing Centre, No 19, Computing Centre, University of Helsinki, 1993.
- [99] Marko Laine: Satunnaislukugeneraattoreista, Selvityksiä ja suunnitelmia, No 5, 28 pages, ISBN 951-45-5658-5, ISSN 0357-5421, Helsingin yliopiston laskentakeskus, 1990.

G THESES

- [100] Marko Laine: Adaptive MCMC methods with applications in environmental and geophysical models, PhD Thesis, Lappeenranta University of Technology, in Finnish Meteorological Institute Contributions, number 69, 2008. [ISBN:978-951-697-662-7](https://doi.org/10.1007/978-951-697-662-7)
- [101] Marko Laine: Asymptoottinen voimakkuus säännöllisissä tilastollisissa kokeissa, Licentiate Thesis, University of Helsinki, Department of Mathematics, August 10th, 1999.
- [102] Marko Laine: Epästandardi stokastinen integraali, Master's Thesis, University of Helsinki, Department of Mathematics, 1990.

I AUDIOVISUAL MATERIAL, ICT SOFTWARE

- [103] Marko Laine: MCMC toolbox for Matlab, 2020. [doi:10.5281/zenodo.4105824](https://doi.org/10.5281/zenodo.4105824), <https://github.com/mjlaine/mcmcstat>
- [104] Marko Laine: Fastgrid: Fast interpolation of spatial point values to a regular grid, 2020. [doi:10.5281/zenodo.4312892](https://doi.org/10.5281/zenodo.4312892), <https://github.com/mjlaine/fastgrid>
- [105] Marko Laine: EPPES - ensemble prediction and parameter estimation system, 2022. [doi:10.5281/zenodo.3757580](https://doi.org/10.5281/zenodo.3757580), <https://github.com/mjlaine/eppes>
- [106] Marko Laine: DLM - Dynamic Linear Model toolbox for Matlab, 2021. [doi:10.5281/zenodo.5078706](https://doi.org/10.5281/zenodo.5078706), <https://github.com/mjlaine/dlm>