

# Christoph K. Thomas

*Last update: August 06, 2021*



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Professor, Micrometeorology

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## CONTACT

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## EDUCATION

**Ph.D. (Dr. rer. nat.)** in Micrometeorology, University of Bayreuth, June 2005, *summa cum laude*

**M.S. (Dipl. Geoeckol.)** in Geoeology (Environmental Sciences), University of Bayreuth, December 2001, *passed with distinction*

## PROFESSIONAL EXPERIENCE

### **Teaching and Research Faculty**

Full Professor in Micrometeorology, Faculty of Biology, Chemistry, and Geosciences, University of Bayreuth, Bayreuth, Germany, *October 2014 – present*

Courtesy Faculty, College of Earth, Ocean and Atmospheric Sciences, Oregon State University, Corvallis, OR, United States of America, *September 2014 – present*

Associate Professor in Physics of Oceans and Atmospheres, College of Earth, Ocean and Atmospheric Sciences, Oregon State University, Corvallis, OR, United States of America, *July 2014 – August 2014*

Assistant Professor in Atmospheric Sciences, College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR, United States of America, *October 2008 – June 2014*

Adjunct Professor in Forest Ecosystems & Society, College of Forestry, Oregon State University, Corvallis, OR, United States of America, *February 2009 – August 2014*

### **Associate Editor**

Agricultural and Forest Meteorology, Impact factor 3.8; *April 2015 – August 2019*

Water Resources Research, American Geophysical Union, Impact factor 2.96; *November 2011 – 2015*

### **Editorial Board Member**

Agricultural and Forest Meteorology, Impact factor 3.8; *June 2008 – August 2019*

### **Advisory Board Member**

National Ecological Observatory Network (NEON), Fundamental Instrument Unit Working Group (FIU-WG), *June 2011 – present*

### **Other leadership**

Member of the Executive Committee of the Long Term Ecological Research (LTER) Site HJ Andrews Experimental forest, *November 2012 – August 2014*

### **Postdoctoral Research**

Research Associate in workgroup of Prof. B. Law, Department of Forest Science, Oregon State University, Corvallis, OR, United States of America *September 2006 – September 2008*

Research Associate in the AmeriFlux QA/QC group, Prof. B. Law and Dr. H. Loescher, Department of Forest Science, Oregon State University, Corvallis, OR, United States of America, *April 2005 – September 2006*

### **Doctoral Research**

Research Fellow, Department of Micrometeorology/ Climatology, Institute of Terrestrial Ecosystem Research Bayreuth (BITÖK), University of Bayreuth, Germany, *January 2002 – April 2005*

### **Graduate Research**

Department of Micrometeorology, University of Bayreuth, Germany, *March – December 2001*

Department of Hydrology and Meteorology, Limnological Institute, Siberian Branch of the Russian Academy of Science, Irkutsk, Russian Federation, *September 1999 – November 2000*

### **PROFESSIONAL AWARDS**

European Research Council (ERC) Consolidator Award, Projekt DarkMix, European Union: Horizon 2020; 2017

Career Award in Dynamical & Physical Meteorology, National Science Foundation, USA; 2010

### **THIRD-PARTY FUNDING AWARDS**

*In Germany at the University of Bayreuth (October 2014 – present):*

Total of 5.5 Mill. Euro; share Thomas 3.7 Mill. Euro

“REINELUFFT? REInigen NEue LUFTfiltersysteme von urbanem Stickstoffdioxid?” (Do active air cleaning systems remove nitrogen dioxide from urban air?), Subproject AIR, Bavarian State Ministry of the Environment and Consumer Protection (StUMV); October 2020 – September 2023; 1.53 Mill. € (PI)

“Monitoring and managing protected tropical rainforest biodiversity under climate”, DAAD Summer School; Summer 2019; 23 k€ (PI)

“Untersuchung der Treibhausgasbilanz und Luftdurchmischung an einem Wiesenstandort im hohen Fichtelgebirge“ (Investigating the greenhouse gas budget and mixing processes at a mountainous grassland in the Fichtelgebirge); Oberfrankenstiftung; February 2019 – June 2022; 132 k€ (Co-PI)

„Verhalten von Mikroplastik im System Landoberfläche-Atmosphäre und gegliedertem Gelände“ (Transport and fate of microplastics at the land surface- air interface and structured terrain), Projekt B05, SFB 1357 Microplastics; DfG; Jan 2019 – Dec 2022; 500 k€ (Co-PI)

“Minimierung Städtischer Klima- und Ozonrisiken (MiSKOR)”; Verbundprojekt Klimawandel und Gesundheit; Bavarian State Ministry of the Environment and Consumer Protection (StUMV); April 2018 – March 2020; 410 k€ (PI)

“DarkMix: Illuminating the dark side of surface meteorology: creating a novel framework to explain atmospheric transport and turbulent mixing in the weak-wind boundary layer”,

European Research Council (ERC) Consolidator Award, European Union, Horizon 2020; May 2017 – April 2022; 1.9 Mill. € (PI)

*In the USA at Oregon State University (October 2008 – August 2014):*

Total of 3.6 Mill USD; share Thomas 1.6 Mill USD

Supplement to “CAREER: A new direction into atmospheric near-surface transport for weak-wind conditions in plant canopies”, Faculty Early Career Development Program, National Science Foundation, Sep 2010- Aug 2015; 29,001 USD; (PI)

“Sensitivity of the Andrews’ complex landscape to past, current, and future climate change: Analysis of spatiotemporal patterns and variability of air temperatures and flow using the regional long-term climate record”, HJ Andrews Faculty Seed Money Program 2012, Long Term Ecological Research (LTER) program funded by National Science Foundation, 20,000 USD; Mar 2012 – Dec 2012; (PI)

“Collaborative Research: ABI Innovation: RUI: From Data to Knowledge in Grand Challenge Environmental Science Research: VISualization of Terrestrial-Aquatic Systems (VISTAS)”; National Science Foundation. 886,346 USD; Sep 2011 – Sep 2014; (Collaborator; share 28,000 USD)

“CAREER: A new direction into atmospheric near-surface transport for weak-wind conditions in plant canopies”, Faculty Early Career Development Program, National Science Foundation, Sep 2010- Aug 2015; 736,680 USD; (PI)

“The effects of disturbance and climate on carbon storage and the exchanges of carbon dioxide, water vapor and energy of coniferous forests in the Pacific Northwest: integration of measurements at a cluster of supersites”, Department of Energy, \$1,049,381, 3-year extension, Sep 2010-Sep 2013; (Co-I, share 284,100 USD)

“Observing Spatial Structure of Near Surface Atmospheric Motions Using a Combination of Optical and Acoustic in-situ and Remote Sensing techniques”, Army Research Office, July 2010 – June 2013; 319,976 USD; (PI; share 238,807 USD)

“The effects of disturbance and climate on carbon storage and the exchanges of CO<sub>2</sub>, water vapor and energy of coniferous forests in the Pacific Northwest: integration of measurements at a cluster of supersites”, Terrestrial Carbon Processes Program, Department of Energy, Sep 2009 – Sep 2010; 447,194 USD; (Co-I; share 116,354 USD)

“Methane and carbon dioxide eddy-covariance flux monitor”, SBIR, Department of Energy; Jan – Aug 2010; 62,348 USD; (Collaborator)

“Economical Three-Dimensional Interrogation of Complex Flows near the Surface and their Transport”, Defense University Research Investment Program, Army Research Office, May 2009-May 2010; 168,434 USD; (PI)

Annual Student Scholarship granted by the German Academic Exchange Service DAAD, 1999; 6,000 EUR, (PI)

**PUBLICATIONS, PEER REVIEWED**

(Underlined = advisee)

*ResearcherID statistics: 57 publications, 1398 citations, h-index 22; 27.4 average citations per article*

Vogl, T., Hrdina, A., & **Thomas, C. K.** (2020). Choosing an Optimal  $\beta$  Factor for Relaxed Eddy Accumulation Applications Across Vegetated and non-Vegetated Surfaces. *Biogeosciences Discussions*, 2020, 1–26. <https://doi.org/10.5194/bg-2020-445>

Fischer, W., **Thomas, C.**, Zimov, N., & Göckede, M. (2021). Grazing enhances carbon cycling, but reduces methane emission in the Siberian Pleistocene Park tundra site. *Biogeosciences Discussions*, 2021, 1–33. <https://doi.org/10.5194/bg-2021-110>

Fritz, A. M., Lapo, K., Freundorfer, A., Linhardt, T., & **Thomas, C. K.** (2021). Revealing the Morning Transition in the Mountain Boundary Layer Using Fiber-Optic Distributed Temperature Sensing. *Geophysical Research Letters*, 48(9), e2020GL092238. <https://doi.org/https://doi.org/10.1029/2020GL092238>

Pfister, L., Lapo, K., Mahrt, L., & **Thomas, C. K.** (2021). Thermal Submeso-scale Motions in the Nocturnal Stable Boundary Layer - Part 2: Generating Mechanisms & Implications. *Boundary-Layer Meteorol.*, accepted.

Pfister, L., Lapo, K., Mahrt, L., & **Thomas, C. K.** (2021). Thermal Submesoscale Motions in the Nocturnal Stable Boundary Layer. Part 1: Detection and Mean Statistics. *Boundary-Layer Meteorology*. <https://doi.org/10.1007/s10546-021-00618-0>

Peltola, O., Lapo, K., Martinkauppi, I., O'Connor, E., **Thomas, C. K.**, & Vesala, T. (2021). Suitability of fibre-optic distributed temperature sensing for revealing mixing processes and higher-order moments at the forest–air interface. *Atmospheric Measurement Techniques*, 14(3), 2409–2427. <https://doi.org/10.5194/amt-14-2409-2021>

Peltola, O., Lapo, K., & **Thomas, C. K.** (2021). A Physics-Based Universal Indicator for Vertical Decoupling and Mixing Across Canopies Architectures and Dynamic Stabilities. *Geophysical Research Letters*, 48(5), e2020GL091615. <https://doi.org/https://doi.org/10.1029/2020GL091615>

Lapo, K., Freundorfer, A., Fritz, A., Schneider, J., Olesch, J., Babel, W., & **Thomas, C. K.** (2021). The Large-eddy Observatory Voitsumra Experiment 2019 (LOVE19) with high-resolution, spatially-distributed observations of air temperature, wind speed, and wind direction from fiber-optic distributed sensing, towers, and ground-based remote sensing. *Earth System Science Data Discussions*, 2021, 1–26. <https://doi.org/10.5194/essd-2020-392>

Zeller, M.-L., Huss, J.-M., Pfister, L., Lapo, K. E., Littmann, D., Schneider, J., Schulz, A., & **Thomas, C.K.** (2021). The NY-Alesund Turbulence Fiber Optic eXperiment (NYTEFOX): investigating the Arctic boundary layer, Svalbard. *Earth System Science Data*, 13(7), 3439–3452. <https://doi.org/10.5194/essd-13-3439-2021>

Lapo, K., Freundorfer, A., Pfister, L., Schneider, J., Selker, J., & **Thomas, C.** (2020). Distributed observations of wind direction using microstructures attached to actively heated fiber-optic cables. *Atmospheric Measurement Techniques*, 13(3), 1563–1573. <https://doi.org/10.5194/amt-13-1563-2020>

Mahrt, L., Pfister, L., & **Thomas, C. K.** (2020). Small-Scale Variability in the Nocturnal Boundary Layer. *Boundary-Layer Meteorology*, 174(1), 81–98. <https://doi.org/10.1007/s10546-019-00476-x>

Freundorfer, A., Rehberg, I., Law, B. E., & **Thomas, C. K.** (2019). Forest wind regimes and their implications on cross-canopy coupling. *Agric. For. Meteorol.*, 279, 107696. <https://doi.org/https://doi.org/10.1016/j.agrformet.2019.107696>

Foken, T.; Babel, W.; **Thomas, C.K.**: Possible errors in flux measurements due to limited digitalization, *Atmospheric Measurement Techniques*, 12, 971–976 (2019), online: 13.02.2019, doi:10.5194/amt-12-971-2019

Linhardt, T; Levy, JS; **Thomas, C.K.**: Water tracks intensify surface energy and mass exchange in the Antarctic McMurdo Dry Valleys, *The Cryosphere*, 2019, 1-16 (2019), doi:10.5194/tc-2019-8

Pfister, L; Lapo, K; Sayde, C; Selker, JS; Mahrt, L; **Thomas, C.K.**: Classifying the nocturnal atmospheric boundary layer into temperature and flow regimes, *Quarterly Journal of the Royal Meteorological Society* (2019), doi:10.1002/qj.3508

Sigmund, A; Freier, K; Rehm, TM; Ries, L; Schunk, C; Menzel, A; **Thomas, C.K.**: Multivariate statistical air mass discrimination for the high-alpine observatory at the Zugspitze mountain, Germany, *Atmospheric Chemistry and Physics*, 2019, 1-31 (2019), doi:10.5194/acp-2019-211

Kwon, H., Law, B.E., **Thomas, C.K.**, Johnson, B.G., 2018. The influence of hydrological variability on inherent water use efficiency in forests of contrasting composition, age, and precipitation regimes in the Pacific Northwest. *Agric. For. Meteorol.* 249, 488–500. doi:https://doi.org/10.1016/j.agrformet.2017.08.006

Mahrt, L., **Thomas, C.K.**, Grachev, A.A., Persson, P.O.G., 2018. Near-Surface Vertical Flux Divergence in the Stable Boundary Layer. *Boundary-Layer Meteorol.* 169, 373–393. doi:10.1007/s10546-018-0379-x

Pfister, L., Sigmund, A., Olesch, J., Thomas, C.K., 2017. Nocturnal Near-Surface Temperature, but not Flow Dynamics, can be Predicted by Microtopography in a Mid-Range Mountain Valley. *Boundary-Layer Meteorol.* 165, 333–348. doi:10.1007/s10546-017-0281-y

Sigmund, A., Pfister, L., Sayde, C., **Thomas, C.K.**, 2017. Quantitative analysis of the radiation error for aerial coiled-fiber-optic distributed temperature sensing deployments using reinforcing fabric as support structure. *Atmos. Meas. Tech.* 10, 2149–2162. doi:10.5194/amt-10-2149-2017

Argerich, A., Haggerty, R., Johnson, S.L., Wondzell, S.M., Dosch, N., Corson-Rikert, H., Ashkenas, L.R., Pennington, R., **Thomas, C.K.**, 2016. Comprehensive multiyear carbon budget of a temperate headwater stream. *J. Geophys. Res. Biogeosciences* n/a--n/a. doi:10.1002/2015JG003050

Sayde C., **Thomas CK**, Wagner J, Selker JS. High-resolution wind speed measurements using actively heated fiber optics. *Geophys Res Lett.* 2015;42(22):10,064–10,073. doi:10.1002/2015GL066729.

Kleinknecht, G., Lintz, H., Kruger, A., Niemeier, J., Salino-Hugg, M., **Thomas, C.**, Still, C., Kim, Y., 2015. Introducing a sensor to measure budburst and its environmental drivers. *Front. Plant Sci.* 6, 1–11. doi:10.3389/fpls.2015.00123

Mahrt L, **Thomas CK**. Surface stress with non-stationary weak winds and stable stratification. *Boundary-Layer Meteorol.* 2015:online first. doi:10.1007/s10546-015-0111-z.

Zeeman MJ, Selker JS, **Thomas CK**. Near-surface motion in the nocturnal, stable boundary layer observed with fibre-optic distributed temperature sensing. *Boundary-Layer Meteorology.* 2015;154:189-205. doi:10.1007/s10546-014-9972-9.

Vickers D., **Thomas C.K.**, 2014 Observations of the scale-dependent turbulence and evaluation of the flux–gradient relationship for sensible heat for a closed Douglas-fir canopy in very weak wind conditions. *Atmos Chem Phys.*;14(18):9665-9676. doi:10.5194/acp-14-9665-2014.

Vickers, D., **Thomas, C.K.**, 2013. Some aspects of the turbulence kinetic energy and fluxes above and beneath a tall open pine forest canopy. *Agric. For. Meteorol.* 181, 143–151. DOI 10.1016/j.agrformet.2013.07.014

**Thomas, C.K.**, Martin, J.G., Law, B.E., Davis, K., 2013. Toward biologically meaningful net carbon exchange estimates for tall, dense canopies: multi-level eddy covariance observations and canopy coupling regimes in a mature Douglas-fir forest in Oregon. *Agric. For. Meteorol.* 173, 14–27. DOI: 10.1016/j.agrformet.2013.01.001

- Thomas, C.K., Smoot, A.R.**, 2013. An effective, economic, aspirated radiation shield for air temperature observations and its spatial gradients. *J. Atmos. Ocean. Technol.* 30, 526–537. DOI: 10.1175/JTECH-D-12-00044.1
- Mahrt, L., **Thomas, C.K.**, Richardson, S., Seaman, N., Stauffer, D., **Zeeman, M.J.**, 2013. Generation of weak mixing for very stable and weak-wind conditions. *Boundary-Layer Meteorol.* DOI: 10.1007/s10546-012-9782-x
- Zeeman, M.J.**, Eugster, W., **Thomas, C.K.**, 2013. Concurrency of coherent structures and conditionally sampled daytime sub-canopy respiration. *Boundary-Layer Meteorol.* 146, 1–15. DOI: 10.1007/s10546-012-9745-2
- Vickers, D., **Thomas, C.K.**, Pettijohn, C., Martin, J.G. and Law, B.E., 2012. Five years of carbon fluxes and inherent water-use efficiency at two semi-arid pine forests with different disturbance histories. *Tellus B*, 64: 17159. DOI: 10.3402/tellusb.v64i0.17159.
- Thomas, C.K.**, **Kennedy, A.M.**, Selker, J.S., **Moretti, A.**, Schroth, M.H., **Smoot, A.R.**, Tuffillaro, N.B. and **Zeeman, M.J.**, 2012. High-resolution fibre-optic temperature sensing: A new tool to study the two-dimensional structure of atmospheric surface layer flow. *Boundary-Layer Meteorol.*, 142: 177-192. DOI: 10.1007/s10546-011-9672-7.
- Thomas, C.K.**, 2011. Variability of subcanopy flow, temperature, and horizontal advection in moderately complex terrain. *Boundary-Layer Meteorol.*, 139: 61-81. DOI: 10.1007/s10546-010-9578-9.
- Serafimovich, A., **Thomas, C.K.** and Foken, T., 2011. Vertical and horizontal transport of energy and matter by coherent motions in a tall spruce canopy. *Boundary-Layer Meteorol.*, 140: 429-451. 10.1007/s10546-011-9619-z.
- Petrides, A.C., Huff, J., Arik, A., Van de Giesen, N., Kennedy, A.M., **Thomas, C.K.** and Selker, J.S., 2011. Shade Estimation Over Streams Using Distributed Temperature Sensing. *Water Resour Res*, 47: W07601. DOI: 10.1029/2010WR009482.
- Zhang, Y., Heping, L., Foken, T., Williams, Q.L., Mauder, M. and **Thomas, C.K.**, 2010. Coherent structures and flux contribution over an inhomogeneously irrigated cotton field. *Theor. Appl. Climatol.*: DOI: 10.1007/s00704-010-0287-6.
- Vickers, D., **Thomas, C.K.**, Martin, J.G. and Law, B., 2010. Reply to the comment on Vickers et al. (2009): Self-correlation between assimilation and respiration resulting from flux partitioning of eddy-covariance CO<sub>2</sub> fluxes. *Agric. For. Meteorol.*, 150(2): 315-317.
- Thomas, C.K.**, Law, B.E., Irvine, J., Martin, J.G., Pettijohn, J.C. and Davis, K.J., 2009. Seasonal hydrology explains inter-annual and seasonal variation in carbon and water exchange in a semi-arid mature Ponderosa Pine forest in Central Oregon. *J. Geophys. Res.-Biogeosci.*, 114, G04006: doi: 10.1029/2009JG001010.
- Mahrt, L., **Thomas, C.K.** and Prueger, J.H., 2009. Space-time structure of mesoscale modes in the stable boundary layer. *Quart. J. Roy. Meteorol. Soc.*: 67-75.
- Turner, D.P., Ritts, W.D., Wharton, S., **Thomas, C.**, Monson, R., Black, T.A. and Falk, M., 2009. Assessing FPAR source and parameter optimization scheme in application of a diagnostic carbon flux model. *Remote Sensing of Environment*, 113(7): 1529-1539.
- Vickers, D., **Thomas, C.K.**, Martin, J.G. and Law, B., 2009. Self-correlation between assimilation and respiration resulting from flux partitioning of eddy-covariance CO<sub>2</sub> fluxes. *Agric. For. Meteorol.*(149): 1552-1555.
- Vickers, D., **Thomas, C.** and Law, B.E., 2009. Random and systematic CO<sub>2</sub> flux sampling errors for tower measurements over forests in the convective boundary layer. *Agricultural and Forest Meteorol.*, 149: 73-83.
- Thomas, C.**, Martin, J.G., Goeckede, M., Siqueira, M.B.S., Foken, T., Law, B.E., Loescher, H.W. and Katul, G., 2008. Estimating daytime subcanopy respiration from conditional sampling methods applied to multi-scalar high frequency turbulence time series. *Agricultural and Forest Meteorol.*, 148: 1210–1229.

Waring, R., Nordmeyer, A., Whitehead, D., Hunt, J., Newton, M., **Thomas, C.** and Irvine, J., 2008. Why productivity of Douglas-fir is higher in New Zealand than in its native range. *Forest Ecology & Management* 255: 4040-4046.

Goekede, M, **Thomas, C.**, Markkanen, T, Mauder, M, Ruppert, J and Foken, T, 2007. Sensitivity of Lagrangian Stochastic footprints to turbulence statistics. *Tellus Series B-Chemical and Physical Meteorology*, 59(3): 577-586.

**Thomas, C.**; Foken, T, 2007: Flux contribution of coherent structures and its implications for the exchange of energy and matter in a tall spruce canopy, *Boundary-Layer Meteorology*, 123, 317-337

**Thomas, C.**; Foken, T, 2007: Organised motion in a tall spruce canopy: temporal scales, structure spacing and terrain effects, *Boundary-Layer Meteorology*, 122, 123-147

Zhang, G., **Thomas, C.**, Leclerc, M.Y., Karipot, A., Gholz, H.L. and Foken, T., 2007. On the effect of clearcuts on forest canopy fluxes. *Theor. Appl. Climatol.*, 88: 133-137.

Foken, T., Wimmer, F., Mauder, M., **Thomas, C.** and Liebethal, C., 2006. Some aspects of the energy balance closure problem. *Atmos. Chem. Phys.*, 6: 4395–4402.

Ruppert, J; Mauder, M; **Thomas, C.**; Lüers, J, 2006: Innovative gap-filling strategy for annual sums of CO<sub>2</sub> net ecosystem exchange, *Agricultural and Forest Meteorology*, 138, 5-18

Ruppert, J; **Thomas, C.**; Foken, T, 2006: Scalar similarity for relaxed eddy accumulation methods, *Boundary-Layer Meteorology*, 120, 39-63

**Thomas, C.**, Mayer, J.-C., Meixner, F.X. and Foken, T., 2006. Analysis of low-frequency turbulence above tall vegetation using a Doppler sodar. *Boundary-Layer Meteorol.*, 119: 563-587.

**Thomas, C.** and Foken, T., 2005. Detection of Long-term Coherent Exchange over Spruce Forest Using Wavelet Analysis. *Theor. Appl. Climatol.*, 80: 91-104.