

Martin Stefan Brandt  
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## Short presentation

Martin Brandt received his PhD from the University of Bayreuth, Germany in 2014. He works as Assistant Professor at the University of Copenhagen since 2015. His major fields are remote sensing and physical Geography and his work concentrates on the monitoring of vegetation dynamics, with a special focus on West Africa and Southern China. Martin Brandt's research is breaking new ground, with 15 manuscripts published in Nature/Science journals between 2018 and 2021 (5 as first author). His recent work, published in Nature, was the first applying deep learning on hundreds of thousands of sub-metre satellite images to map billions of individual tree crowns in desert areas that were often assumed as free of any trees. In 2020, he received an ERC starting grant and an DFF Sapere Aude grant to study trees outside forests at global scale.

## Employment

### Associate Professor

Geography 2

København K, Denmark

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## Research outputs

### Even low levels of tree cover improve dietary quality in West Africa

den Braber, B., Hall, C., Brandt, Martin Stefan, Reiner, Florian, Mugabowindekwe, Maurice & Rasmussen, Laura Vang, 1 Feb 2024, In: PNAS Nexus. 3, 2, pgae067.

### Changes in vegetation-water response in the Sahel-Sudan during recent decades

Lu, Tingting, Zhang, Wenmin, Abel, Christin, Horion, Stéphanie, Brandt, Martin Stefan, Huang, Ke & Fensholt, Rasmus, 2024, In: Journal of Hydrology: Regional Studies. 52, 10 p., 101672.

### Satellite observed aboveground carbon dynamics in Africa during 2003–2021

Wang, M., Ciais, P., Fensholt, Rasmus, Brandt, Martin Stefan, Tao, S., Li, W., Fan, L., Frappart, F., Sun, R., Li, X., Liu, X., Wang, H., Cui, T., Xing, Z., Zhao, Z. & Wigneron, J. P., 2024, In: Remote Sensing of Environment. 301, 19 p., 113927.

### Scattered tree death contributes to substantial forest loss in California

Cheng, Yan, Oehmcke, Stefan, Brandt, Martin Stefan, Rosenthal, L., Das, A., Vrieling, A., Saatchi, S., Wagner, F., Mugabowindekwe, Maurice, Verbruggen, Wim, Beier, Claus & Horion, Stéphanie, 2024, In: Nature Communications. 15, 1, p. 1-13 641.

### Trees on smallholder farms and forest restoration are critical for Rwanda to achieve net zero emissions

Mugabowindekwe, M., Brandt, M. S., Mukuralinda, A., Ciais, P., Reiner, F., Kariryaa, A., Igel, C., Chave, J., Mertz, O., Hiernaux, P., Tong, X., Rwanyiziri, G., Gominiski, D. P. J., Li, S., Liu, S., Gasangwa, I., Hategekimana, Y., Ndoli, A., Nduwamungu, J., Saatchi, S. & 1 others, Fensholt, Rasmus, 2024, In: Communications Earth & Environment. 5, 1, 10 p., 113.

### Beyond tree cover: Characterizing southern China's forests using deep learning

Li, Q., Yue, Y., Liu, Siyu, Brandt, Martin Stefan, Chen, Z., Tong, Xiaowei, Wang, K., Chang, J. & Fensholt, Rasmus, 2023, In: Remote Sensing in Ecology and Conservation. 9, 1, p. 17-32

**Deep learning enables image-based tree counting, crown segmentation and height prediction at national scale**

Li, Sizhuo, Brandt, Martin Stefan, Fensholt, Rasmus, Kariryaa, Ankit, Igel, Christian, Gieseke, Fabian Cristian, Nord-Larsen, Thomas, Oehmcke, Stefan, Carlsen, Ask Holm, Junttila, S., Tong, Xiaoye, d'Aspremont, A. & Ciais, P., 2023, In: PNAS Nexus. 2, 4, 16 p., pgad076.

**Deep learning for mapping water bodies in the Sahel**

de FLEURY, M., Kergoat, L., Brandt, Martin Stefan, Fensholt, Rasmus, Kariryaa, Ankit, Kovács, Gyula Mate, Horion, Stéphanie & Grippa, M., 2023. 1 p.

**FORMS: Forest Multiple Source height, wood volume, and biomass maps in France at 10 to 30 m resolution based on Sentinel-1, Sentinel-2, and Global Ecosystem Dynamics Investigation (GEDI) data with a deep learning approach**

Schwartz, M., Ciais, P., De Truchis, A., Chave, J., Ottlé, C., Vega, C., Wigneron, J., Nicolas, M., Jouaber, S., Liu, Siyu, Brandt, Martin Stefan & Fayad, I., 2023, In: Earth System Science Data. 15, 11, p. 4927-4945 19 p.

**Forest Plan - pilot project on mapping of forest resources**

Nord-Larsen, Thomas, Tsatsakis, M., Li, Sizhuo, Avila, Linsey Marie, Brandt, Martin Stefan, Liu, Siyu, Morueta-Holme, Naia, Davison, Charles W. & Fensholt, Rasmus, 2023, Copenhagen: Department of Geosciences and Natural Resource Management, University of Copenhagen. 128 p. (IGN Report; No. March 2023).

**Global increase in biomass carbon stock dominated by growth of northern young forests over past decade**

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**Iterative integration of deep learning in hybrid Earth surface system modelling**

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**MAPPING TREE MORTALITY IN CALIFORNIA FROM VERY HIGH RESOLUTION IMAGERY USING DEEP LEARNING**

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**Mapping and characterising tree mortality in California at individual tree level using deep learning**

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**Mapping tree species diversity of temperate forests using multi-temporal Sentinel-1 and -2 imagery**

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**More than one quarter of Africa's tree cover is found outside areas previously classified as forest**

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**Nation-wide mapping of tree-level aboveground carbon stocks in Rwanda**

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**Projected Rainfall-Driven Expansion of Woody Cover in African Drylands**

Zhang, Wenmin, Fensholt, Rasmus & Brandt, Martin Stefan, 2023, In: Geophysical Research Letters. 50, 15, 10 p., e2023GL103932.

**Recent decrease of the impact of tropical temperature on the carbon cycle linked to increased precipitation**

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**Reforestation policies around 2000 in southern China led to forest densification and expansion in the 2010s**

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**Reliability of using vegetation optical depth for estimating decadal and interannual carbon dynamics**

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**Rural outmigration generates a carbon sink in South China karst**

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**Siberian carbon sink reduced by forest disturbances**

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**Sub-continental-scale carbon stocks of individual trees in African drylands**

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**The overlooked contribution of trees outside forests to tree cover and woody biomass across Europe**

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**Woody plant decline in the Sahel of western Niger (1996–2017): is it driven by climate or land use changes?**

Hiernaux, P., Adamou Kalilou, A., Kergoat, L., Brandt, Martin Stefan, Mougou, E. & Fitts, Y., May 2022, In: Journal of Arid Environments. 200, 12 p., 104719.

**A global increase in tree cover extends the growing season length as observed from satellite records**

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**A large but transient carbon sink from urbanization and rural depopulation in China**

Zhang, Xiaoxin, Brandt, Martin Stefan, Tong, Xiaowei, Ciais, P., Yue, Y., Xiao, X., Zhang, Wenmin, Wang, K. & Fensholt, Rasmus, 2022, In: Nature Sustainability. 5, p. 321-328 8 p.

**Global quantification of the bidirectional dependency between soil moisture and vegetation productivity**

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**Globally Increasing Atmospheric Aridity Over the 21st Century**

Fang, Zhongxiang, Zhang, Wenmin, Brandt, Martin Stefan, Abdi, A. M. & Fensholt, Rasmus, 2022, In: Earth's Future. 10, 10, 13 p., e2022EF003019.

**Large loss and rapid recovery of vegetation cover and aboveground biomass over forest areas in Australia during 2019–2020**

Qin, Y., Xiao, X., Wigneron, J., Ciais, P., Canadell, J. G., Brandt, Martin Stefan, Li, X., Fan, L., Wu, X., Tang, H., Dubayah, R., Doughty, R., Crowell, S., Zheng, B. & Moore, B., 2022, In: Remote Sensing of Environment. 278, 16 p., 113087.

#### **Large scale rocky desertification reversal in South China karst**

Yue, Y., Qi, X., Wang, K., Liao, C., Tong, Xiaowei, Brandt, Martin Stefan & Liu, B., 2022, In: Progress in Physical Geography. 46, 5, p. 661-675

#### **Mapping global lake dynamics reveals the emerging roles of small lakes**

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#### **Mapping the Abundance of Multipurpose Agroforestry *Faidherbia albida* Trees in Senegal**

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#### **Quantifying understory vegetation density using multi-temporal Sentinel-2 and GEDI LiDAR data**

Xi, Y., Tian, Q., Zhang, Wenmin, Zhang, Z., Tong, Xiaoye, Brandt, Martin Stefan & Fensholt, Rasmus, 2022, In: GIScience and Remote Sensing. 59, 1, p. 2068-2083 16 p.

#### **The Carbon Sink Potential of Southern China After Two Decades of Afforestation**

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#### **The carbon sink potential of southern China after two decades of afforestation**

Zhang, X., Brandt, Martin Stefan, Yue, Y., Tong, Xiaowei, Wang, K. & Fensholt, Rasmus, 2022, 21 p. (Earth's Future).

#### **UNSUPERVISED SEGMENTATION OF SMALLHOLDER FIELDS IN MOZAMBIQUE USING PLANETSCOPE IMAGERY**

Picoli, M. C. A., Radoux, J., Tong, Xiaoye, Bey, A., Rufin, P., Brandt, Martin Stefan, Fensholt, Rasmus & Meyfroidt, P., 2022, In: International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives. 43, B3-2022, p. 975-981 7 p.

#### **Socio-economic and climatic changes lead to contrasting global urban vegetation trends**

Zhang, Wenmin, Randall, Mark Taylor, Jensen, Marina Bergen, Brandt, Martin Stefan, Wang, Q. & Fensholt, Rasmus, Nov 2021, In: Global Environmental Change. 71, 9 p., 102385.

#### **Climatic and non-climatic vegetation cover changes in the rangelands of Africa**

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#### **Mapping the dynamics of winter wheat in the north china plain from dense landsat time series (1999 to 2019)**

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#### **The confounding effect of snow cover on assessing spring phenology from space: A new look at trends on the Tibetan Plateau**

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#### **Global-scale assessment and inter-comparison of recently developed/reprocessed microwave satellite vegetation optical depth products**

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### **Responses and feedbacks of African dryland ecosystems to environmental changes**

Wei, F., Wang, S., Brandt, Martin Stefan, Fu, B., Meadows, M. E., Wang, L., Wang, L., Tong, Xiaowei & Fensholt, Rasmus, Feb 2021, In: *Current Opinion in Environmental Sustainability*. 48, p. 29-35 7 p.

### **Carbon loss from forest degradation exceeds that from deforestation in the Brazilian Amazon**

Qin, Y., Xiao, X., Wigneron, J., Ciais, P., Brandt, Martin Stefan, Fan, L., Li, X., Crowell, S., Wu, X., Doughty, R., Zhang, Y., Liu, F., Sitch, S. & Moore, B., 2021, In: *Nature climate change*. 11, 5, p. 442-448 7 p.

### **Country-scale mapping of individual forest and non-forest trees and shrubs in Africa - the example of Rwanda**

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### **Eco-engineering controls vegetation trends in southwest China karst**

Zhang, Xuemei, Yue, Y., Tong, Xiaowei, Wang, K., Qi, X., Deng, C. & Brandt, Martin Stefan, 2021, In: *Science of the Total Environment*. 770, 145160.

### **Response to concerns about the African fire trends controlled by precipitation over recent decades**

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### **50 years of woody vegetation changes in the Ferlo (Senegal) assessed by high-resolution imagery and field surveys**

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### **Accelerating land cover change in West Africa over four decades as population pressure increased**

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### **Do afforestation projects increase core forests? Evidence from the Chinese Loess Plateau**

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### **Vegetation Optical Depth Retrieval from AMSR-E/AMSR2 Observations Using L-MEB Inversion**

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### **An unexpectedly large count of trees in the West African Sahara and Sahel**

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### **Forest management in southern China generates short term extensive carbon sequestration**

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### **Large scale reforestation of farmlands on sloping hills in South China karst**

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### **Nonlinear dynamics of fires in Africa over recent decades controlled by precipitation**

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### **Recent divergence in the contributions of tropical and boreal forests to the terrestrial carbon sink**

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### **The forgotten land use class: Mapping of fallow fields across the Sahel using Sentinel-2**

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### **Tropical forests did not recover from the strong 2015-2016 El Nino event**

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### **Uncovering Dryland Woody Dynamics Using Optical, Microwave, and Field Data—Prolonged Above-Average Rainfall Paradoxically Contributes to Woody Plant Die-Off in the Western Sahel**

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### **Changes in rainfall distribution promote woody foliage production in the Sahel**

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### **Detecting Hardly Visible Roads in Low-Resolution Satellite Time Series Data**

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### **Ecosystem structural changes controlled by altered rainfall climatology in tropical savannas**

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### **From woody cover to woody canopies: How Sentinel-1 and Sentinel-2 data advance the mapping of woody plants in savannas**

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### **Satellite-observed pantropical carbon dynamics**

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### **Towards improved remote sensing based monitoring of dryland ecosystem functioning using sequential linear regression slopes (SeRGS)**

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**Trends of land surface phenology derived from passive microwave and optical remote sensing systems and associated drivers across the dry tropics 1992–2012**

Tong, Xiaoye, Tian, F., Brandt, Martin Stefan, Liu, Y., Zhang, Wenmin & Fensholt, Rasmus, 2019, In: Remote Sensing of Environment. 232, 12 p., 111307.

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**An evaluation of SMOS L-band vegetation optical depth (L-VOD) data sets: high sensitivity of L-VOD to above-ground biomass in Africa**

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