

Changliang Shao

Landscape Ecology & Ecosystem Science (LEES) Lab
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EDUCATION

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
National Key Laboratory of Vegetation and Environmental Change, Institute of Botany, Chinese Academy of Sciences <i>Advisor: Jiquan Chen (USA), Linghao Li (China)</i>	PhD	2005	Ecology Carbon and water cycles Energy balance
Qingdao Agricultural University, China <i>Advisor: Minglun Wang</i>	MS	2002	Agricultural Science
Laiyang Agricultural College, China	BS	1993	Agricultural Science

PROFESSIONAL EXPERIENCE

08.2014-present Michigan State University, USA. **Research Associate**
12.2011-08.2014 University of Toledo, Ohio, USA. **Postdoc**
06.2008-12.2012 Institute of Botany, Chinese Academy of Sciences, Beijing, China. **Research Assistant**
10.2008-01.2009 University of Toledo, Ohio, USA. **Visiting Scholar**
07.2008-09.2008 Southern Global Change Program, USDA Forest Service, North Carolina, USA. **Visiting Scholar**
07.1997-07.2002 Chinese Tobacco Company, Qingzhou Technical Secondary School. Shandong, China. **Instructor**

PUBLICATIONS

JOURNAL ARTICLES

2015

1. **Shao, C**, J. Chen, C. A. Stepien, H. Chu, Z. Ouyang, T. B. Bridgeman, K. P. Czajkowski, R. Becker, R. John. Diurnal to annual changes in latent, sensible heat and CO₂ fluxes over a Laurentian Great Lake: A case study in western Lake Erie, *Journal of Geographic Research – Biogeosciences* doi:10.1002/2015JG003025.
http://www.eurekalert.org/pub_releases/2015-07/agu-tw072215.php
2. **Changliang Shao**, Jiquan Chen, Linghao Li, Gang Dong, Juanjuan Han, Michael Abraha, Ranjeet John, Grazing effects on energy fluxes in a desert steppe on the Mongolian Plateau. *Agricultural and Forest Meteorology* (2nd revision).
3. Zutao Ouyang, **Changliang Shao**, Housen Chu, Becker Richard, Jiquan Chen, Bridgeman Thomas, Carol Stepien, Relating Chlorophyll-a to CO₂ flux in the western Lake Erie at multiple time scales. *Ecological Applications* (under revision).
4. Luping Qu; Jiquan Chen; Gang Dong; Shicheng Jiang; Linghao Li; Jixun Guo, **Changliang Shao***, Heat waves reduce ecosystem carbon sink strength in a Eurasian meadow steppe. *Environmental Research* (2nd revision).
5. Ranjeet John, Jiquan Chen, Jiaguo Qi, Yaoqi Zhang, Zutao Yang, **Changliang Shao**, Differentiating the effects of anthropogenic modification and precipitation-driven change on vegetation productivity on the Mongolian Plateau. *Landscape Ecology* (in press).
6. Jiquan Chen, Ranjeet John, Changliang Shao, Yi Fan, Yaoqi Zhang, Amartuvshin Amarjargalj, Daniel G. Brown, Jiaguo Qi, Juanjuan Han, Raffaele Laforteza, Gang Dong, 2015. Policy shifts influence the functional changes of the CNH systems on the Mongolian Plateau. *Environmental Research Letters*, doi:10.1088/1748-9326/10/8/085003
7. Tianjie Lei , Jianjun Wu, Guangpo Geng, Xiaohan Li, **Changliang Shao**, Hongkui Zhou, Qianfeng Wang, Leizhen Liu, 2015. A new framework for evaluating the impacts of drought on net primary productivity of grassland. *Science of the Total Environment* (536):161-172.
8. Chen, J., R. John, Y. Zhang, **C. Shao**, D. G. Brown, O. Batkhishig, A. Amarjargal, Z. Ouyang, G. Dong, D. Wang, and J. Qi, 2014. Divergences of two coupled human and natural systems on the Mongolia Plateau. *Bioscience* 65(6):559-570.

2014

9. Housen Chu, Johan F. Gottgens, Jiquan Chen, Ge Sun, Ankur R. Desai, Zutao Ouyang, **Changliang Shao**, Kevin Czajkowski, 2014. Climatic variability, hydrologic anomaly, and

methane emission can turn productive freshwater marshes into net carbon sources. *Global Change Biology*, doi: 10.1111/gcb.12760.

10. Xia, J, W. Yuan, S. Liang, J. Chen, L. Li, X. Li, L. Zhang, Y. Fu, T. Zhao, J. Feng, Z. Ma, M. Ma, S. Liu, G. Zhou, J. Asanuma, S. Chen, M. Du, G. Davaa, T. Kato, Q. Liu, S. Liu, S. Li, **C. Shao**, Y. Tang, X. Zhao, 2014. Satellite-based analysis of evapotranspiration and water balance of Dryland East Asia. *Plos One* 9 (5), e97295.
11. Ouyang, Z., J. Chen, R. Becker, H. Chu, J. Xie. **C. Shao**, Ranjeet John, 2014. Disentangling the confounding effects of PAR and air temperature on net ecosystem exchange in time and scale. *Ecological Complexity* 19: 46-58.
12. Han, J., J. Chen, G. Han, **C. Shao**, H. Sun, and L. Li, 2014. Legacy effects from historical grazing enhanced carbon sequestration in a desert steppe. *Journal of Arid Environment* 109: 1-9.
13. Feng Zhang, Ranjeet John, Guangsheng Zhou, **Changliang Shao**, Jiquan Chen, 2014. Estimating canopy characteristics of Inner Mongolia's grasslands from field spectrometry. *Remote Sensing* 6: 2239-2254. doi:10.3390/rs60.
14. **Changliang Shao**, Linghao Li, Gang Dong, Jiquan Chen, 2014. Spatial variation of net radiation and its contribution to energy balance closures in grassland ecosystems. *Ecological Processes* 3:7. doi:10.1186/2192-1709-3-7.

2013

15. **Shao CL**, Chen JQ, Li LH, 2013. Grazing alters the biophysical regulation of carbon fluxes in a desert steppe. *Environmental Research Letters* 8, doi:10.1088/1748-9326/1088/1082/025012.
16. Li, X., Liang, S., Yu, G., Yuan, W., Cheng, X., Xia, J., Zhao, T., Feng, J., Ma, Z., Ma, M., Liu, S., Chen, J., **Shao, C.**, Li, S., Zhang, X., Zhang, Z., Chen, S., Ohta, T., Varlagin, A., Miyata, A., Takagi, K., Saiqusa, N., Kato, T., 2013. Estimation of gross primary production over the terrestrial ecosystems in China. *Ecological Modelling* 261: 80-92.
17. Xiao, J., Sun, G., Chen, J., Chen, H., Chen, S., Dong, G., Gao, S., Guo, H., Guo, J., Han, S., Kato, T., Li, Y., Lin, G., Lu, W., Ma, M., McNulty, S., **Shao, C.**, Wang, X., Xie, X., Zhang, X., Zhang, Z., Zhao, B., Zhou, G., Zhou, J., 2013. Carbon fluxes, evapotranspiration, and water use efficiency of terrestrial ecosystems in China. *Agricultural and Forest Meteorology* 182–183: 76-90.
18. Zhao Changxing; **Shao Changliang**; Wang Yuefu; Song Chuanxue; Wang Minglun, 2013. Effects of different planting densities on population ecological characteristics and yield of peanut under the mode of single-seed precision sowing. *Journal of Agriculture* 2: 5-9.

2012

19. C. Shao*, J. Chen, L. Li, L. Zhang, 2012. Ecosystem responses to mowing in an Inner Mongolia prairies: an energy perspective. *Journal of Arid Environments* 82: 1-10.
20. Li, X., Liang, S., Yuan, W., Yu, G., Cheng, X., Chen, Y., Zhao, T., Feng, J., Ma, Z., Ma, M., Liu, S., Chen, J., Shao, C., Li, S., Zhang, X., Zhang, Z., Sun, G., Chen, S., Ohta, T., Varlagin, A., Miyata, A., Takagi, K., Saiqusa, N., Kato, T., 2012. Estimation of evapotranspiration over the terrestrial ecosystems in China. *Ecohydrology*, doi: 10.1002/eco.1341.
21. L. Zhang, D. Guo, S. Niu, C. Wang, C. Shao, L. Li, 2012. Effects of mowing on methane uptake in a semiarid grassland in northern China. *Plos One*, doi:10.1371/journal.pone.

2011&before

22. C. Shao*. J. Chen, L. Li, G. Tenney, W. Xu, J. Xu, 2011. Role of net radiation on energy balance closure in grassland ecosystems. *Biogeosciences Discussion* 8: 2001-11.
23. J. Xu, J. Chen, K. Brosfokske, Q. Li, M. Weintraub, R. Henderson, B. Wilske, R. John, R. Jensen, H. Li, C. Shao. 2011. Influence of Timber Harvesting Alternatives on Forest Soil Respiration and Its Biophysical Regulatory Factors over a 5-year Period in the Missouri Ozarks. *Ecosystems* 14: 1310-1327.
24. C. Shao*, J. Chen, L. Li, W. Xu, S. Chen, G. Tenney, J. Xu, W. Zhang, 2008. Spatial variability in soil heat flux at three Inner Mongolia steppe ecosystems. *Agricultural and Forest Meteorology* 10: 1433-1443.
25. C. Shao, M. Wang, 2003. Comments on industrialization development of peanut. *Journal of Peanut Science* 32: 73-76.
26. C. Shao, 1998. Talking about teacher's culture of professional ethics. Eastern Tobacco Newspaper.

BOOK CHAPTERS

27. C. Shao, M. Liu, W. Yuan, X. Cheng, J. Tang, L. Jiang, 2014. Gas fluxes measurements. In Chen, J., S. Yang (Eds.). Ecological methods for Terrestrial Ecosystems. *The Higher Education Press (HEP)* p74-97, 30,000 words in Chinese.
28. C. Shao, Chen, S, Chen, J., Li, L., 2013. Biophysical regulations of grassland ecosystem carbon and water fluxes in DEA. In Chen et al. (Eds). Dryland East Asia (DEA): Land Dynamics Amid Social and Climate Change. *The Higher Education Press (HEP) & De Gruyter Publisher*, p213-244, 12,000 words in English.

29. Chen, J. R. John, G. Qiao, O. Batkhishig, W. Yuan, Y. Zhang, **C. Shao**, Z. Ouyan, L.Li, K. Guo, and G. Sun, 2013. State and change of Dryland East Asia (DEA). In Chen et al., Pages 3-22. Dryland East Asia (DEA): Land Dynamics Amid Social and Climate Change. *The Higher Education Press (HEP) & De Gruyter Publisher*. 470 pp.
30. **C. Shao**, S. Chen, L. Li. J. Chen, 2012. Chapter 4: Energy balance in grassland. In Xingguo Han et al. (Eds). Mechanisms for Maintaining Inner Mongolian Grassland Ecosystems. *China Agriculture University press*. 23,000 words in Chinese.
31. **Changliang Shao**, 2008. Energy balance of three typical communities along three temperature gradients in Inner Mongolia steppe. *Doctoral dissertation*.
32. **Changliang Shao**, 2005. Study on theory and technology of single-seed precision sowing for saving seeds and high yield in peanut. *Master's thesis*.
33. **Changliang Shao**, Minglun Wang, Zhirong Zheng, Fuqing Wang, 2003. Impact of single-seed precision sowing on yield and growth of peanut. Study on peanut high quality and efficient production principles and techniques. In Shubo Wan et al. (Eds), p149-153. *China Agricultural Science and Technology Press*. In Chinese.
34. Minglun Wang, **Changliang Shao**, Fuqing Wang, Zhirong Zheng, 2003. Effect of mulching single-seed precision sowing on root vitality of peanut. Study on peanut high quality and efficient production principles and techniques. In Shubo Wan et al. (Eds), p161-164. *China Agricultural Science and Technology Press*. In Chinese.
35. **C. Shao**. Integrated use in Tobacco, 2001. In Tobacco and biology technology (Eds. Institute of Chinese Tobacco). 207-226. In Chinese.

BOOK TRANSLATIONS

36. **Changliang Shao**, Haiqiang Guo, Gang Dong, 2014. Eddy Covariance: A Practical Guide to Measurement and Data Analysis. Marc Aubinet, Timo Vesala, Dario Papale (Eds). *Higher Education Press (HEP)*. 438 pp, in press.

REASONABLE SUGGESTIONS

37. M. Wang, **C. Shao**, 2005. Suggestion to Shandong province Department of Agriculture: About improving our province industrialization development of peanut.
http://www.sdny.gov.cn/art/2005/1/14/art_625_31783.html

RESEARCH ATTENDINGS

1. Leading to build three eddy-covariance (EC) towers and do the field work with data analysis, and

paper writing in Mongolia country in June, 2014 and charge the LCLUC program of NASA (NNX14AD85G).

2. 01.2013-now Attended NSF FSML (Field Stations and Marine Laboratories) Grant award (DBI-1034791). Lake Erie Center Environmental Sensor Network. Maintaining two sets of permanent EC towers and one mobile EC systems. Main job is maintaining the systems, download/process the data and publish the new results. Project webpage see <http://research.eeescience.utoledo.edu/lees/LESensorN/index.html>.
3. 01.2012~now Achieving Chinese NSF of “Effects of heat waves and mowing on CO₂, H₂O and energy fluxes in Inner Mongolia semi-arid steppe: an experimental study”.
4. 07.2009~now Built six sets of EC towers in China and seven in the US, and maintaining three sets of them. One is in Mongolia, and the other two in Inner Mongolia. Main job is maintaining the systems, download/process the data and publish the new results. I processed two years’ paired fenced and grazed EC with the ancillary data and draft a manuscript “Disturbances and extreme climate alter the biophysical regulations of carbon fluxes in a desert-steppe ecosystem” published in *Environmental Research Letters* 8 doi:10.1088/1748-9326/1088/1082/025012.
5. 01.2009~now Attending collaborated NASA project of “Interactive changes of ecosystems and societies on the Mongolian plateau: From coupled regulations of land use and changing climate to adaptation”.
6. 07.2005~09.2006 Attended field work in joint NASA project between China and USA “Effects of land use change on the energy and water balance of the semi-arid region of Inner Mongolia, China”.

MANUSCRIPTS REVIEWS

1. 2010.5 Hydrological Processes
2. 2012.9 Journal of Plant Ecology
3. 2013.3 Chinese Science Bulletin
4. 2013.7 PlosOne
5. 2015.2 PlosOne

SELECTED PRESENTATIONS

1. **Changliang Shao**, Jiquan Chen, Ranjeet John, Zutao Yang, Michael Abraha, Daniel Brown, Ochirbat Batkhishig. Grazing effects on energy fluxes in a desert steppe on the Mongolian Plateau. ESA 100th annual meeting 2015.8.9-14, Baltimore, Maryland, USA.

2. **Changliang Shao**, Jiquan Chen, Ranjeet John, Daniel Brown, Linghao Li, Gang Dong, Ochirbat Batkhishig. Grazing effects on carbon fluxes in a desert steppe on the Mongolian Plateau. 2015.6.9-10, Building Resilience of Mongolia's Rangelands: A Trans-disciplinary Research Conference, Ulaanbaatar, Mongolia.
3. John, R., J. Chen, **C. Shao**, Y. Kim, Z. Ouyang, J. Xiao, H. Park et al. (2015). Differentiating between anthropogenic modification and climate change using long-term vegetation index trends adjusted for precipitation on the Mongolian plateau. Building Resilience of Mongolian Rangelands Conference, June 9-10, Blue Sky Hotel, Ulaanbaatar.
4. Chen, J., R. John, D. G. Brown, **C. Shao**, G. Allington, Q. Zhuang, J. Xiao, Y. Xie, G. Sun, P. Fan, and J. Qi (2015). LCLUC Synthesis: Ecosystem-Society Interactions on a Changing Mongolian Plateau. Session: Theme 4: Human influence on global ecosystems, NASA Carbon Science and Ecosystems joint science workshop, April 20-24, 2015, College Park Marriott Hotel and Conference Center, Maryland.
5. Jiquan Chen, Ranjeet John, Daniel Brown, **Changliang Shao**, Ginger Allington, Qianlai Zhuang, Jingfeng Xiao, Yichun Xie, Ge Sun, Peille Fan, Jiaguo Qi. LCLUC Synthesis: Ecosystem-Society Interactions on a Changing Mongolian Plateau. 2015 NASA Carbon Cycle & Ecosystems Joint Science Workshop at the Washington D.C. 2015.4.20, Theme 4: Human influence on global ecosystems.
6. Zutao Ouyang, **Changliang Shao**, Housen Chu, Richard Becker, Jiquan Chen, Thomas Bridgeman, Carol Stepien, Ranjeet John. Relating Chlorophyll-a to CO2 flux western Lake Erie. Association of American Geographers (AAG) Annual Conference 2015.4.21-25, Chicago, Illinois, USA.
7. Ranjeet John, Jiquan Chen, Youngwook Kim, Zutao Yang, Jingfeng Xiao, **Changliang Shao**, Ochirbat Batkhishig (C31B-0474) Differentiating between Land Use and Climate-driven Change using Long-term Vegetation Index Trends adjusted for Precipitation on the Mongolian Plateau. AGU annual meeting 2014.12.15-19, San Francisco, California, USA.
8. **Changliang Shao**, Jiquan Chen, Carol Stepien, Thomas Bridgeman, Kevin Czajkowski, Richard Becker, Housen Chu, 2014. Lake Erie Center Environmental Sensor Network. LEC Board meeting, Ohio, USA.
9. Carol Stepien, Jiquan Chen, **Changliang Shao**, Thomas Bridgeman, Kevin Czajkowski, Richard Becker, 2014. A new land-lake sensor network for measuring greenhouse gas, water, and energy exchanges: use in education and outreach. May18-23, 2014 Joint Aquatic Sciences Meeting, Portland.
10. **Changliang Shao**, Jiquan Chen, Carol Stepien, Housen Chu, Thomas Bridgeman, Kevin Czajkowski, Richard Becker, Zutao Ouyang, Ranjeet John, 2013. Eddy covariance measurements

of carbon, latent and sensible heat fluxes from western Lake Erie. AGU annual meeting 210443, 2013.12.9-13, San Francisco, California, USA.

11. Y Su, J Chen, **C Shao**, W Shen, T Zenone, R John, M Deal, SK Hamilton, 2013. Response of soil respiration to climate across biofuel crops and land use histories. AGU annual meeting 0467, San Francisco, California, USA.
12. **Changliang Shao**, Jiquan Chen, Linghao Li, 2012. Grazing and climate effect on carbon, water and energy fluxes in a desert steppe. International Workshop on Climate Change and Grassland Management. 2012.9.7, Huhhot, China.
13. J Chen, R John, N Lu, B Wilske, **C Shao**, L Li, 2009. Changes of ecosystem & societies on the Mongolia plateau: coupled regulations of landuse and changing climate. AGU annual meeting, San Francisco, California, USA.

MEMBERSHIP IN PROFESSIONAL SOCIETIES

1. Ecological Society of American (ESA) member, 2015-present
2. Fellow of the US-China Carbon Consortium (USCCC), 2008-present
3. American Geophysical Union (AGU) member, 2013-present
4. Ecological Society of China member, 2008-present

VISITING ABROAD

USA (2008-2009, 2012-2015); MONGOLIA (2012, 2014, 2015)