

TONG QIU

Email: tongqiu@live.unc.edu
Website: www.ecotongqiu.com
Office: 201A Coates Building

Department of Geography
University of North Carolina at Chapel Hill
Chapel Hill, NC, 27510, USA

EDUCATION

- May 2020
(Expected) **Ph.D., Geography, University of North Carolina at Chapel Hill, NC, USA**
Dissertation: Integrating multi-scale remote sensing and Bayesian models to characterize the impacts of urbanization, climate change, and extreme weather events on land surface phenology in the United States.
Committee: Drs. Conghe Song (chair and adviser), Jim. S. Clark (Duke), Erika Wise, Diego Riveros-Iregui, and Allen Hurlbert (UNC Biology)
- June 2015 **B.Eng., Remote Sensing, Wuhan University, Hubei Province, China**
(Graduated with the Highest Honor, GPA Ranking: 1/229)
Thesis¹: Water body extraction based on ZY-3 satellite imagery
Advisor: Drs. Yue Wang and Zhongqiu Liu

ACADEMIC APPOINTMENTS

- 2015 – Present **University of North Carolina at Chapel Hill, Chapel Hill, NC**
Graduate Research and Teaching assistant, Teaching fellow

HONORS, AWARDS, & FELLOWSHIPS

- 2019 Graduate Student Transportation Grant, UNC-Chapel Hill
- 2019 Finalist for 3-minute Thesis Competition, UNC-Chapel Hill
- 2019 James Carlton Ingram Summer Research Fellowship, UNC-Chapel Hill
- 2019 G. Herbert Stout Award for Innovative Use of GIS
- 2016/17/18/19 Conference Travel Award (*five times*), Dept. of Geography, UNC-Chapel Hill
- 2017 Finalist in Student Honors Paper, AAG Remote Sensing Specialty Group
- 2016 Best Student Paper, Second Congress of the Society for Urban Ecology
- 2016 Best Undergraduate Thesis (3%), Hubei Province of China
- 2015 Presidential Fellowship, equivalent to Full-ride Scholarship (0.4%), Wuhan University
- 2015 Geoway Remote Sensing Academic Star (0.4%), Wuhan University
- 2012/13/14 National Fellowship (2%, *three times*), Ministry of Education of China
- 2012/13/14 First-Class Scholarship (5%, *three times*), Wuhan University
- 2013/14 Pacemaker for Outstanding Student (0.4%, *two times*), Wuhan University
- 2012/13/14 Outstanding Student (5%, *three times*), Wuhan University
- 2013/14 Outstanding Engineer Fellowship (10%, awarded a summer school study in U.K.)

¹ Awarded best undergraduate thesis (3 %) in Hubei Province of China

- 2013 Best Group Presentation (10%), The University of Cambridge
2012 National Undergraduate Innovative Fellowship (2%), Wuhan University

PUBLICATIONS

JOURNAL ARTICLES

- T. Qiu**, C. Song, and J. Li. Impacts of urbanization on vegetation phenology over the past three decades in Shanghai, China. *Remote Sensing* 9.9 (2017): 970; doi:10.3390/rs9090970 (IF: 4.118, citation: 10)
- T. Qiu**, C. Song, Y. Zhang, H. Liu, and J. M. Vose, Urbanization and climate change jointly shift land surface phenology in the mid-latitude large cities, *accepted* on 10/15/2019, *Remote Sensing of Environment* (IF: 8.218, citation: 0)

MANUSCRIPTS UNDER REVIEW AND IN REVISION

- T. Qiu**, C. Song, and J. Li. Deriving annual double-season cropland phenology using Landsat imagery, *under review*, submitted on 9/3/2019, *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*
- T. Qiu**, C. Song, J. S. Clark, B. Seyednasrollah, N. Rathnayaka. Understanding the continuous phenological development at a daily time step with a Bayesian hierarchical space-time model: impacts of climate change and extreme weathers. *under review*, submitted on Nov. 5th, *Remote Sensing of Environment*
- S. Schmitt, **T. Qiu**, C. Song, N. Rathnayaka, D. Riveros-Iregui. Characterizing fog inundation along a topographic gradient on a tropical island with ground-based cameras, *in major revision*, *Agricultural and Forest Meteorology*
- Q. Zhang, Y. Wang, S. Tao, R. Bilsborrow, **T. Qiu**, S. Sannigrashi, C. Liu, Q. Huang, Z. Zhang, C. Song. The role of contextual factors in the effects of reforestation policy on labor migration in rural china, *under review*, submitted on 10/14/2019, *Environmental Science & Policy*

MANUSCRIPT IN PROGRESS

- T. Qiu** et al., Projecting future land surface phenology shifts from 2020 to 2099. *results ready and available upon request*, manuscript in preparation, to be submitted on *Earth's Future*
- Y. Zhang, **T. Qiu**, J. Mao, M. P. Dannenberg, C. Song. Is terrestrial vegetation greening persistent during 2000 to 2018? *results ready and available upon request*, manuscript in preparation, to be submitted on *Remote Sensing of Environment*

OTHER PUBLICATIONS

- T. Qiu**, Water body extraction based on ZY-3 satellite image data. *Undergraduate Thesis*, school of remote sensing and information engineering, Wuhan University, Hubei Province, China

INVITED TALKS & SCHOLARLY PRESENTATIONS

CONFERENCE PRESENTATIONS

- 2019 **T. Qiu**, invited talk for G. Herbert Stout Award “Extraction of Water Bodies using remotely sensed spectral signature: A case study in Wuhan City”, Winston Salem, NC, Feb 27th – March 1st
- 2019 **T. Qiu**, invited talk for UNC Geography Graduate Research Celebration Colloquium, “The combined effects of urbanization and climate change on vegetation phenology in the northern mid-latitude large cities”, Chapel Hill, NC, March 21st

- 2018 **T. Qiu**, C. Song, Y. Zhang, and H. Liu “Characterizing the impacts of urbanization and climate change on land surface phenology in the Northern Hemisphere.”
American Geophysical Union 2018 Fall Meeting, Washington, DC, December 10th –14th, (Poster)
- 2018 **T. Qiu**, **invited talk** for UNC-CH and UNC-G Joint Geography Colloquium, “The usage of remote sensing in understanding our environment”, Chapel Hill, NC, Oct. 26th
- 2018 **T. Qiu**, C. Song, Y. Zhang, and H. Liu “How urban vegetation responded to land use change and climate change?” *UNC 6th Annual Climate Change & Resilience Symposium*, Chapel Hill, NC, April 12th (Poster)
- 2018 **T. Qiu**, C. Song, “Using Google Earth Engine to estimate impervious surface area in the U.S. big cities.” *1st UNC Google Earth Engine Symposium*, Chapel Hill, NC, July 27th (Talk)
- 2017 **T. Qiu**, C. Song, “Understanding the effects of urban expansion on spatio-temporal variations of vegetation phenology at global scale from 1993 to 2014.” *American Geophysical Union 2017 Fall Meeting*, New Orleans, LA, December 11th – 15th (Talk)
- 2017 **T. Qiu**, C. Song, J. Li, “Spatial-temporal patterns of landscape phenology in the urban vegetation and the surrounding agricultural regions.” *2017 Annual Meeting of the American Association of Geographers*, Boston, MA, April 5th – 9th (Talk)
- 2017 **T. Qiu**, C. Song, J. Li, “Impacts of landscape metrics on vegetation phenology over the past three decades.” *UNC 3rd Annual Climate Change & Resilience Symposium*, Chapel Hill, NC, Mar 21st (Poster)
- 2016 **T. Qiu**, C. Song, J. Li, “Characterizing urbanization effects on landscape phenology along a rural-urban gradient using Landsat time series data.” *American Geophysical Union 2016 Fall Meeting*, San Francisco, CA, December 12nd – 16th (Poster)
- 2016 **T. Qiu**, C. Song, J. Li, “Detecting spatial and temporal variation of urban phenology over the past three decades using Landsat time series data.” *2nd Congress of the Society of Urban Ecology*, Shanghai, China, July 7th – 11th (Talk)

RESEACH EXPERIENCE

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

2015 – present: Dissertation Research

Chapter 2a: Understanding the impacts of climate change and extreme weather events on the continuous phenological development in the United States (one manuscript to be submitted)

- Developing a Bayesian Space-Time model for Land Surface Phenology (BHST-LSP).
- Processing 20+ TB continental remote sensing dataset (e.g. daily vegetation greenness from AVHRR and MODIS, annual land cover from ESA’s CCI project) and daily Daymet climate data using UNC Linux-based computing clusters.
- Implementing BHST-LSP model for 900+ ecoregions over 300+ CPU cores.

Chapter 2b: Projecting future land surface phenology shifts from 2020 to 2099 (one manuscript)

- Validating phenological transition dates from 1981 to 2014 using 80+ PhenoCam ground-based observations in the United States.
- Projecting future timing of land surface phenology using BHST-LSP model and MACA downscaled climate projections.

Chapter 1a: Characterizing the spatial effects of urbanization on phenology along a rural-to-

urban gradient (one published paper on *RS*, one manuscript under review)

- Developing an algorithm to derive Landsat-scale vegetation phenology for both urban vegetation and double cropping agricultural land.
- Implementing the phenology metrics extraction algorithm on 2+ TB multi-temporal Landsat images (e.g. surface reflectance and vegetation greenness).
- Conducting field-work at in-situ phenological observation station to validate the phenological metrics.
- Calculating landscape configuration and composition metrics from high resolution images and analyzing their impacts on urban phenology over a rural-to-urban gradient

Chapter 1b: Characterizing the temporal effects of urbanization and climate change on urban phenology (one accepted paper on *RSE*)

- Developing a framework to separate temporal effects of urbanization from that of climate change on vegetation phenology.
- Processing 40+ TB global remote sensing dataset (e.g. daily vegetation greenness from AVHRR and MODIS, annual impervious surface area from ESA's CCI project) and daily CRU-NCEP climate data.
- Validating derived urbanization- and phenology- metrics using Landsat images and PhenoCam in-situ ground observations, respectively.
- Implementing the proposed framework and conducting the statistical analysis for 196 large cities in the northern mid-latitude over 100+ CPU cores.

2015 – 2018: Graduate Research Assistant

NSF-CNH 1313756: The effects of China's Grain-for-Green program on the dynamics of coupled natural-human system in rural China (supervisor: Dr. Conghe Song, one co-author manuscript)

- Conducting field work (e.g. resident- and household-level socio-economic surveys) in Shanxi and Anhui province of China.
- Delineating paddy rice and residential area using high-resolution remote sensing images
- Entering survey data and helping with data cleaning and statistical analysis.

2017 – Present: Collaboration Research

With Dr. Yulong Zhang: Determining if the Earth's greening is sustainable or not after 2000 (one second-author manuscript)

- Implementing a piece-wise linear regression and multiple linear regression to understand the annual greening trend of global vegetation and its response to climate.
- Processing 4+ TB global remote sensing dataset (e.g. annual vegetation greenness from MODIS, sun-induced chlorophyll fluorescence from GOSIF) and Terra climate data.

With Dr. Yulong Zhang: Modeling global gross primary productivity (GPP) and evapotranspiration (ET) using Flux tower and remote sensing.

- Developing a random forest model and a support vector machine model to estimate GPP using Flux tower observations.
- Implementing the model on UNC Linux-based computing clusters and Google Earth Engine to generate a set of global GPP and ET based on Terra climate dataset and MODIS products (e.g. vegetation greenness and land cover).

With Dr. Sarah Schmitt: Characterizing spatio-temporal dynamics of fog in tropical islands (one second author manuscript under review)

- Processing ground-based digital repeat photography to identify fogs.
- Processing climate data from ground-based weather stations.
- Helping implementing random forest time series model to predict fog using climate covariates

WUHAN UNIVERSITY

2011 – 2015: Undergraduate Research

National Undergraduate Innovative Project: Designing and building a system to monitor haze pollution in Wuhan City (awarded by national undergraduate innovative fellowship, 2% selection in Wuhan University, team leader for 4 team members; results were awarded two software patents in China)

- Writing grant and presenting the proposal with 4 team members
- Developing an algorithm to identify Landsat-scale haze pollution
- Designing a software to automatically process Landsat images as well as creating a website and a mobile app to disseminate the results to the general public.

Undergraduate Thesis: Water body extraction system from ZY-3 imagery (funded by outstanding engineer project fellowship, 10% selection in the ministry of education; awarded a best undergraduate thesis, 3% selection in Hubei Province of China)

- Developing three algorithms to extract water bodies
- Designing a software to automatically process the ZY-3 high resolution images

TEACHING EXPERIENCE

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

2019: Instructor

GEOG 391: Quantitative methods for geographers (Fall 2019, 26 students in total)

- Teaching the concepts of fundamental statistics and their applications, including descriptive statistics, data visualization, probability theory, probability distribution, point estimation, hypothesis testing, ANOVA, and basic spatial statistics.
- Creating slides and notes from scratch (available upon request)
- Designing in-class activities (e.g. simulation games and on-line visualization) to help student better understand statistical concepts.
- Designing and Grading five homework, two mid-terms, and one final exams.

Course evaluation: will be available at end of 2019 fall semester

2018 – 2019: Teaching Assistant (*holding office hours and grading*)

GEOG 477: Introduction to Remote Sensing (Fall 2018)

GEOG 577: Advance Remote Sensing (Spring 2018)

GEOG 370: Introduction to Geographic Information (Spring 2019)

2019: Recitation Instructor (*teaching the usage of ArcGIS and leading problem-solving recitations*)

GEOG 370: Introduction to geographic information (Spring 2019)

2018: Lab Designer (*writing lab instructions and providing sample codes*)

Potential advanced course on Google Earth Engine (GEE). Labs (available upon request):

- Introduction to JavaScript on GEE platform
- Introduction to Application Programming Interface (API) on GEE platform
- Characteristics and basic operation on Image and Imagecollection on GEE platform
- Spectral transformation on GEE platform
- Time series analysis on GEE platform

2016 – 2019: Guest Lecture

GEOG 370: Introduction to geographic information (Spring 2019)

GEOG 577: Advanced Remote Sensing (Spring 2018, Spring 2019)

GEOG 441: Introduction to Watershed Systems (Spring 2016)

SERVICE & PROFESSIONAL ACTIVITIES

SERVICE TO DISCIPLINE

Co-organizer, *1st UNC Google Earth Engine Symposium*, Chapel Hill, NC, July 27th, 2018
Conference volunteer: AGU fall meeting volunteer (meeting services and public affairs/science policy)
Ad hoc manuscript reviews: *Remote Sensing* (9), *Sustainability* (2), *Science of the Total Environment*, *ISPRS Journal of remote sensing and photogrammetry*, *PLOS One*.

SERVICE TO DEPARTMENT AND UNIVERSITY

Technology Committee Representative, Graduate Association of Geography Students, 2015, UNC-Chapel Hill
Vice President, Mathematical Programming Association, 2014-2015, Wuhan University
Member of the Volunteer Association, 2012-2014, Wuhan University

PROFESSIONAL SOCIETY MEMBERSHIPS

American Association of Geographers (since 2016)
American Geophysical Union (since 2016)
American Society for Photogrammetry and Remote Sensing (since 2016)

SKILLS

PROGRAMMING & SCRIPTING:

Proficient in R, python, Markdown, Git and Github (@[tongqiugeog](https://github.com/tongqiugeog)), JAGS, JavaScript on Google Earth Engine, MATLAB, Shell, Linux-based computing clusters
Familiar with Shiny, Jupyter Notebook, Stan, C/C++, IDL, High Performance Computing (HPC), Object-Oriented Programming (OOP), Singularity container

QUANTITATIVE, GEOSPATIAL, & VISUALIZATION:

Bayesian hierarchical modeling, Markov Chain Monte Carlo (MCMC), Gaussian predictive process, Time series analysis, Nonlinear and linear regression, Large volume geospatial data analysis (100+TB remote sensing and climate data), Machine learning, deep learning (Long-term short-term memory neural network), Image analysis (multispectral and lidar)

REFERENCES

Dr. Conghe Song,
Professor,
Dept. of Geography,
UNC-Chapel Hill,
csong@email.unc.edu,
Tel: 919-843-4764
<http://csong.web.unc.edu/>

Dr. Erika Wise,
Associate Professor,
Dept. of Geography,
UNC-Chapel Hill
ekwise@email.unc.edu,
Tel: 919-843-4762
<http://wise.web.unc.edu/>

Dr. Diego Riveros-Iregui,
Associate Professor,
Dept. of Geography,
UNC-Chapel Hill
diegori@email.unc.edu,
Tel: 919-962-6814
<http://diegori.web.unc.edu/>