Chien-Yung Tseng

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RESEARCH INTERESTS

- Fluid Mechanics: Turbulent Mixing, Interfacial Gas Transfer, Fluid-structure Interaction
- Ecohydraulics: Flow-vegetation Interactions
- Environmental Hydraulics: Sediment Transport, Gravity Currents, Coastal Processes

RESEARCH SKILLS

- Experimental Fluid Mechanics (PIV, PLIF, PTV, ADV)
- Image Analysis and Processing (MATLAB & Python)
- Numerical Modeling and Computational Fluid Dynamics (SUNTANS, PROBE)
- Stochastic Process, Uncertainty Quantification, and Machine Learning Application (Python & R)

EDUCATION

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN (UIUC) **2017 – 2022**

Ph.D. in Civil Engineering - Water Resources Engineering and Science GPA: 3.88/4.0

Minor in Statistics

Graduate Concentration in Computational Science and Engineering

- *Dissertation Title:* "From Substrate to Surface: An Integrated Study on the Interfacial Transfer and Sediment Dynamics on Vegetated Flows"
- *Advisor:* Prof. Rafael Tinoco
- *Committee Members:* Prof. Marcelo Garcia, Prof. Leonardo Chamorro, Prof. Maria Maza

NATIONAL TAIWAN UNIVERSITY (NTU) **2013 – 2015**

M.S. in Applied Mechanics - Fluid Mechanics GPA: 4.18/4.3 (Rank 1/66)

- *Thesis Title:* "Non-hydrostatic Numerical Study of Hyperpycnal River Plumes on Sloping Continental Shelves"
- *Advisor:* Prof. Yi-Ju Chou
- *Committee Members:* Prof. Hsi-Heng Dai, Prof. Yueh-Jen Lai, Prof. Zhi-Cheng Huang

NATIONAL TSING HUA UNIVERSITY (NTHU) **2009 – 2013**

B.S. in Physics GPA: 3.6/4.0

RESEARCH APPOINTMENT

Research Fellow, Department of Civil and Environmental Engineering, UIUC **Aug. 2017 – Present**

Interfacial Gas Transfer and Sediment-Oxygen Dynamics in Flows with Aquatic Vegetation

Advisor: Prof. Rafael Tinoco

- Designed and conducted a series of multi-scale flume experiments with different density and submergence configurations of the array of simulated plants to study flow-vegetation interactions, vegetation effects on sediment transport, sediment-oxygen dynamics, and surface gas transfer mechanism.

Research Assistant, Illinois Water Resources Center, Prairie Research Institute, UIUC **Oct. 2019 – Mar. 2021**

Uncertainty Quantification and Bayesian Experimental Design on Hydraulic Conductivity Mapping in a Watershed

Advisor: Dr. Maryam Ghadiri, Prof. Hadi Meidani

- Constructed a Gaussian Processes statistical model for the multi-fidelity source of data.
- Conducted uncertainty quantification on hydraulic conductivity via the developed multi-fidelity Gaussian Processes model with the multi-source field observation data in Sangamon Watershed, Illinois.
- Applied Bayesian Experimental Design to infer the future sampling locations to enhance the model/data capability.

Research Assistant, Illinois State Geological Survey, Prairie Research Institute, UIUC **Apr. 2018 – Aug. 2019**

Development of the Portable Thermal Response Testing (TRT) Device

Advisor: Dr. Yu-Feng Forrest Lin

- Developed the portable Thermal Response Testing (TRT) device for Geothermal Energy Exchange and wrote a technical report for publication.
- Collected and analyzed the geothermal field data with TRT at Geothermal Research Station at the University of Illinois Energy Farm.

Research Associate, Department of Engineering Science and Ocean Engineering, NTU **Feb. 2017 – May. 2017**

Poisson Pressure Solver Improvement of Curvilinear Mapped Hydrodynamics Numerical Model

Advisor: Prof. Wu-Ting Tsai

- Improved the iterative method of the Poisson pressure solver in wave-resolved curvilinear mapped DNS numerical model.

Research Assistant, Institute of Applied Mechanics, NTU **Sep. 2013 – Jan. 2016**

Non-hydrostatic Numerical Modeling of Hyperpycnal River Plumes on Continental Slopes

Advisor: Prof. Yi-Ju Chou

- Implemented the sediment component into SUNTANS coastal ocean model via the diffusive scalar approach.
- Performed non-hydrostatic pressure solver in SUNTANS to investigate the non-hydrostatic pressure effect and the plunging momentum transport of hyperpycnal plumes on riverine-coastal regions.

TEACHING/MENTORING EXPERIENCE

Mavis Future Faculty Fellows, Grainger College of Engineering, UIUC **Aug. 2021 – Dec. 2021**

Mavis Mentor Program

- Mentored less experienced graduate or undergraduate students for one semester conducting research.
- Set a semester-long research plan for students and guide them through the research process.

Student Research Mentor, Department of Civil and Environmental Engineering, UIUC

Graduate Student Summer Research Mentor *May. 2020 - Aug. 2020*

- Mentored an M.S. student to conduct experiments with flow tracking imaging techniques (PIV & PTV) in the lab for summer research.
- Research project: Sediment dynamics in random patch vegetated flows

Undergraduate Student Research Mentor *Feb. 2019 – Jun. 2019*

- Mentored a 3+2 program student to conduct experiments with cutting-edge flow measurement techniques (PIV & ADV) in the lab for undergraduate research.
- Research project: Hydrodynamics of flexible vegetated flows

Teaching Assistant, Earth System Science Program, NTU **Feb. 2015 – Jun. 2015**

IPCS7001 Earth Environmental Problems and Resolutions (Spring 2015)

- Guided the assigned discussions in the class.
- Guided students to finish their final project on the environmental issue with possible resolutions.

Teaching Assistant, Institute of Applied Mechanics, NTU **Sep. 2014 – Jun. 2015**

AM7097 Fundamental of Fluid Dynamics (Fall 2014, Spring 2015)

- Graded students' assignments and hosted the TA office hour to solve students' problems.
- Demonstrated the assignment solutions in TA class.

PUBLICATIONS

Peer-reviewed Journal/Technical Report

- **Tseng, C. Y.** and Tinoco, R. O. (In revision). From substrate to surface: A turbulence-based model for gas transfer across sediment-air-water interfaces in vegetated streams, *Water Resources Research*
- **Tseng, C. Y.**, Ghadiri, M., Larson, T. H., Kumar, P., Meidani, H. (In revision). Estimation of hydraulic conductivity in a watershed using multi-source data via co-kriging and Bayesian experimental design, *Journal of Hydrology*
- **Tseng, C. Y.** and Tinoco, R. O. (2021). A two-layer turbulence-based model to predict suspended sediment concentration in flows with aquatic vegetation, *Geophysical Research Letters*, e2020GL091255
- Lin, Y. F., **Tseng, C. Y.**, Sargent, S. L. (2020). User's manual for the portable thermal response test device, *Technical Report*, *Illinois State Geological Survey, Prairie Research Institute*, Circular no. 603
- **Tseng, C. Y.** and Tinoco, R. O. (2020). A model to predict surface gas transfer rate in streams based on turbulence production by aquatic vegetation, *Advances in Water Resources,* 103666
- **Tseng, C. Y.** and Chou, Y. J. (2018). Nonhydrostatic simulation of hyperpycnal river plumes on sloping continental shelves: flow structures and nonhydrostatic effect, *Ocean Modelling*, 124, 33-47

Manuscript in Preparation

- **Tseng, C. Y.** and Tinoco, R. O. (In prep). Scale and heterogeneous effects on the interfacial transfer process in flows with aquatic vegetation, *Water Resources Research*
- **Tseng, C. Y.** and Tinoco, R. O. (In prep). Turbulent eddies-induced bedform undulation in vegetated flows, *Journal of Geophysical Research: Earth Surface*

CONFERENCE AND INVITED TALK

- **Tseng, C. Y.** and Tinoco, R. O. (2021). From substrate to surface: a turbulence-based model to predict interfacial gas transfer across sediment-air-water interfaces in vegetation streams with sediments, *AGU Fall Meeting*, New Orleans, LA, USA
- **Tseng, C. Y.** and Tinoco, R. O. (2021). From substrate to surface: the interfacial transfer across air-water and sediment-water interface in vegetated flows, *Invited talk at the Hydro-Geo Seminar at UIUC*, Urbana, IL, USA
- **Tseng, C. Y.** and Tinoco, R. O. (2021). From substrate to surface: an integrated study on the interfacial transfer and sediment dynamics based on a turbulence perspective in environmental vegetated flows, *Invited talk at the Rowland Institute at Harvard*, Boston, MA, USA
- **Tseng, C. Y.** and Tinoco, R. O. (2021). A turbulence-based, two-layer model to predict sediment suspension in vegetated flows, *9th International Symposium on Environmental Hydraulics*, Seoul, Korea
- **Tseng, C. Y.** and Tinoco, R. O. (2020). Effects of aquatic vegetation on gas exchange process across air-water and sediment-water interface, *AGU Fall Meeting*, San Francisco, CA, USA
- Ghadiri, M., **Tseng, C. Y.**, Meidani, H. (2020). Investigation of multi-fidelity co-kriging model for hydraulic conductivity in Sangamon Watershed, *AGU Fall Meeting*, San Francisco, CA, USA
- Tinoco, R. O. and **Tseng, C. Y.** (2020). From substrate to surface: the effect of vegetation-generated turbulence on surficial gas transfer, *River Flow 2020*, Delft, Netherlands
- **Tseng, C. Y.** and Tinoco, R. O. (2019). Quantifying the effect of aquatic vegetation on interfacial gas transfer in

streams, *AGU Fall Meeting*, San Francisco, CA, USA

- **Tseng, C. Y.**, Kurtis H. D., Tinoco, R. O. (2019). Laboratory study of gravity currents over submerged vegetation canopies, *AGU Fall Meeting*, San Francisco, CA, USA
- **Tseng, C. Y.** and Chou, Y. J. (2016). Numerical investigation of plunging hyperpycnal plume on an idealized shelf slope, *The 38th Ocean Engineering Conference in Taiwan*, Taipei, Taiwan
- **Tseng, C. Y.** and Chou, Y. J. (2015). Nonhydrostatic numerical simulation of plunging hyperpycnal river plumes on continental shelves, *Gordon Research Conference on Coastal Ocean Modeling*, Biddeford, ME, USA

HONORS & AWARDS

- UIUC Grainger College of Engineering - Mavis Future Faculty Fellowship 2021 - 2022
- Best Young Professional Award - IAHR - The 9th International Symposium on Environmental Hydraulics 2021
- UIUC Spring 2020 Graduate College Conference Travel Award 2020
- Taiwan MOE - UIUC Graduate Student Fellowship (4yrs Ph.D. Fellow Award) 2017
- Membership of the Phi Tau Phi Scholastic Honor Society (Summa Cum Laude), NTU 2015
- NTHU International Public Service Leader Scholarship 2013
- NTHU - University of Science and Technology of China Summer Research Program Scholarship 2011

PROFESSIONAL ACTIVITY/SERVICE

Professional Registration

- American Physical Society (APS) – Fluid and Computational Physics Division 2020-present
- International Association for Hydro-Environment Engineering and Research (IAHR) 2020-present
- American Geophysical Union (AGU) 2018-present
- International Water Resources Association (IWRA) 2017-present

Student Chapter Service

- Elected Treasurer of the local IAHR Student Chapter at UIUC 2021-present

Official Journal Reviewer

- Ocean Engineering (4 reviews)
- Geophysical Research Letters (2 reviews)
- Journal of Hydrology (2 reviews)