Lawrence Jing Yueh Liu

OFFICE

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RESEARCH INTERESTS

Mesoscale Dynamic Meteorology, Data Assimilation, Numerical Weather Prediction, Atmospheric Predictability, Radar Meteorology, and Machine Learning Weather Prediction

EDUCATION

M.S., September 2022, Atmospheric Sciences, National Central University (NCU), TAIWAN
- Advisor: Professor Shu-Chih Yang
- Thesis: "Analyzing the convection development over northern Taiwan using a multi-scale radar data assimilation system with rapid update cycles"
- GPA: 4.18/4.3

B.S., June 2021, Atmospheric Sciences, National Central University (NCU), TAIWAN
- Honors: College Dean's Award (Rank #2 in class)
- GPA: 4.18/4.3

EXPERIENCE

Research Assistant, Department of Atmospheric Sciences, National Central University, TAIWAN
- Research on multi-scale radar data assimilation, October 2022 – present
- Research on Taiwan-Area Heavy rain Observation and Prediction Experiment / Prediction of Rainfall Campaign in the Pacific (TAHOPE/PRECIP) IOP3 events (with a multi-scale radar data assimilation framework), April 2023 – present
- Research on scale-dependent inflation methods within WRF-LETKF (WRF model with Localized Ensemble Transform Kalman Filter), April 2023 – present

Teaching Assistant, Department of Atmospheric Sciences, National Central University, TAIWAN
- Numerical Analysis I, August 2021 – January 2022
- Special Topics on Data Assimilation, February 2022 – July 2022

Summer Internship, Central Weather Bureau, TAIWAN
- Special topic on simulating typhoon using an idealized barotropic vorticity equation, July 2020 – August 2020

Member of Field Campaign, Department of Atmospheric Sciences, National Central University, TAIWAN
- Collecting sounding data in the Yilan Experiment for Severe Rainfall (YESRain), November 2021

SELECTED PROJECTS

- Designed and implemented an idealized barotropic vorticity equation model:
    - Investigated the path and strength of typhoons approaching Taiwan.
    - Simulated the interaction of multiple typhoons.
- Used WRF-LETKF radar data assimilation system to reconstruct 4D analysis fields and improve forecast skills of multi-scale extreme weather events:
    - Investigated the predictability of the position and strength of extreme precipitation events in Taiwan.
    - Analyzed the cross-scale interactions in dynamic and thermodynamic aspects in extreme rainfall events.
- Used MATLAB to construct an Ensemble Transform Kalman Filter to perform an OSSE of Burger equation:
    - Evaluated the error reduction with inflation method or tuning assimilation frequency.
    - Designed methods to enhance the efficiency and accuracy for capturing nonlinearity behavior.
- Used WRF model to perform an idealized simulation of a supercell thunderstorm with different microphysics schemes:
    - Evaluated dynamic differences in cold pools produced by different schemes.

SKILLS

Languages: Python, FORTRAN, MATLAB, and GrADS

OS: MS-WINDOW, UNIX, and LINUX

Others: Weather Forecasting and Research Model (WRF), Localized Ensemble Transform Kalman Filter (LETKF), National Central University Radar Kit (RAKIT, a radar quality control system), The Model for Prediction Across Scales (MPAS)

COURSES

- Atmospheric Dynamics
- Numerical Simulation
- Mesoscale Meteorology
- Radar Meteorology
- Data Assimilation
- Numerical Analysis
- Atmospheric Physics
- Atmospheric Thermodynamics
- Synoptic Meteorology and Weather Analysis
- Programming Languages
- Atmospheric Measurements

PUBLICATIONS

1. Lawrence Jing-Yueh Liu, Shu-Chih Yang, Kuan-Jen Lin, Guo-Yuan Lien and Chih-Chien Tsai. Analyzing the convection development over northern Taiwan using a multi-scale radar data assimilation system with long-hour rapid update cycles. *In preparation* for journal QJR.
2. Shu-Chih Yang, Lawrence Jing-Yueh Liu, and Hao-Lun Yeh. Investigating TAHOPE/PRECIP IOP3 event with a multi-scale radar data assimilation framework. *In preparation* for journal publication.

PRESENTATIONS

1. Shu-Chih Yang, Lawrence Jing-Yueh Liu, Pao-Liang Chang. Investigating the Development of Heavy Rainfall Over Northern Taiwan on 8 September 2018 with the WLRAS Rapid-update Analyses. *Asia Oceania Geoscience Society 18th Annual Meeting*, August 2021
2. Lawrence Jing-Yueh Liu, Shu-Chih Yang, Pao-Liang Chang, Wei-Yu Chang, Chih-Chien Tsai. Rapid-update Analysis with Multi-scale Correction and Its Impact on the Heavy Rainfall Development Over the Taipei Basin. *Asia Oceania Geoscience Society 19th Annual Meeting*, August 2022
3. Lawrence Jing-Yueh Liu, Shu-Chih Yang, Hao-Lun Yeh, Kuan-Jen Lin, Pao-Liang Chang. Leveraging Multi-Scale Radar Data Assimilation to Investigate Multi-Scale Convection Events in Taiwan. *The 104th American Meteorology Society Annual Meeting*, January 2024. (*Submitted*)

HONORS & ACHIEVEMENTS

Awards:

- Atmospheric Science Section Best Student Poster Award, Asia Oceania Geoscience Society, **2022**
- Graduation with College Dean's Award (Rank #2 in class), June **2021**
- The Zhu Shun Yi He Qin Scholarship (Rank 1st of the college in the semester; $3000 Award), National Central University, **2020**
- Rank #3 in National Earth Science System Special Research Competition ($300 Award), Chinese Geoscience Union, Taiwan, **2020**
- The Liu Ren Jie Alumni Scholarship ($600 Award), National Central University, **2020**
- Academic Excellence Award (top 2% of class in semester; $150), National Central University, **Fall 2018, Spring 2018, Fall 2020**

Research Grants:

- "How to Improve the Rainfall Forecast of Multiscale Weather System in Northern Taiwan using Radar Data Assimilation." College Student Research Scholarship with grant **$1500**, Ministry of Science and Technology, Taiwan, 2019

REFERENCE

Available upon request