

Ting-Chi Wu

吴婷琦

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Education

- 2009–2014 **PhD in Meteorology and Physical Oceanography.**
Rosenstiel School of Marine and Atmospheric Science, UNIVERSITY OF MIAMI, Miami, FL
- PhD Dissertation: Understanding the Influence of Assimilating Satellite-Derived Observations on Mesoscale Analyses and Forecasts of Tropical Cyclone Track and Structure. Advisor: Dr. *Sharanya J. Majumdar*.
- 2007–2009 **MS in Atmospheric Science.**
Institute of Atmospheric Physics, NATIONAL CENTRAL UNIVERSITY, Jhongli, Taiwan
- Master Thesis: Impacts of Meteorological Surface Nudging on Air Quality Simulation in Taiwan. Advisor: Dr. *Julius S. Chang*.
- 2003–2007 **BS in Atmospheric Science.**
Department of Atmospheric Sciences, NATIONAL CENTRAL UNIVERSITY, Jhongli, Taiwan

Professional Experiences

- 2019 July – present **Research Scientist/Scholar II.**
Cooperative Institute for Research in the Atmosphere, COLORADO STATE UNIVERSITY
- Lead development and implementation of capability to assimilate data from operational and experimental satellites into numerical weather prediction models.
 - Actively engage in cross group discussions to form future directions and participate in the production of proposals in response to various solicitations.
- 2019 Spring **Teaching Assistant.**
Department of Atmospheric Science, COLORADO STATE UNIVERSITY
- Work with students one-on-one to enhance their learning and problem-solving skills and evaluate their homework assignments with constructive feedback
- Course: *ATS 651 Data Assimilation*. Instructor: Prof. Peter Jan van Leeuwen
- 2017 May – April 2018 **Visitor.**
Developmental Testbed Center, NATIONAL CENTERS FOR ATMOSPHERIC RESEARCH
- Principal Investigator on evaluating and merging the capability of assimilating satellite hydrometeor retrievals into GSI for HWRF application
- 2016 July – 2019 June **Research Scientist/Scholar I.**
Cooperative Institute for Research in the Atmosphere, COLORADO STATE UNIVERSITY
- Lead development and implementation of hybrid GSI capability to assimilate satellite all-sky microwave radiances into HWRF.
 - Co-lead development of interfacing the CSU RAMS with MLEF for strongly coupled aerosol-atmosphere data assimilation with satellite retrieved aerosol dataset.

- 2015-2016, **Data Assimilation Training Lecturer.**
 2018-2019 Cooperative Institute for Research in the Atmosphere, COLORADO STATE UNIVERSITY
 • Participate in training of individuals as part of a NOAA awarded internship that covers both practical and theoretical aspects of data assimilation.
 • Mentor visiting scholars and students via providing guidance on their research topics.
- 2014 **Postdoctoral Fellow.**
 September Cooperative Institute for Research in the Atmosphere, COLORADO STATE UNIVERSITY
 –2016 June • Assimilate satellite moisture and precipitation-affected observations in hurricane inner core using the NOAA HWRF system. Supervisor: Dr. Milija Zupanski
- 2013 Summer **Graduate Student Visitor.**
 Mesoscale & Microscale Meteorology, NATIONAL CENTERS FOR ATMOSPHERIC RESEARCH
 • Investigate the impact of the assimilation of AIRS soundings and total precipitable water derived from MODIS and AMSR-E in Hurricane Ike (2008) with WRF-DART.
- 2010 Fall **Graduate Teaching Assistant.**
 Rosenstiel School of Marine and Atmospheric Science, UNIVERSITY OF MIAMI
 • Lead lab hours, grade student homework assignments, and occasionally lecture for the course. Responsible for 8 senior undergraduate students.
 Course: *MSC 407 Weather Analysis*. Instructor: Prof. David Nolan
- 2009–2014 **Graduate Research Assistant.**
 Rosenstiel School of Marine and Atmospheric Science, UNIVERSITY OF MIAMI
 • Work with scientists in CIMSS and NCAR on improving the tropical cyclone prediction via assimilating high-resolution satellite-derived observations under the framework of WRF-DART.
- 2008–2009 **Teaching Assistant.**
 Center of General Education, NATIONAL CENTRAL UNIVERSITY
 • Serve as head TA to coordinate TA efforts for all 130 students.
 • Lead weekly discussion with thirty freshmen and grade their homework assignment.
 Course: *Global Environment Change*. Instructor: Prof. Julius S. Chang
- 2007–2009 **Graduate Student Researcher.**
 Mesoscale Atmospheric Environmental Simulation Lab, NATIONAL CENTRAL UNIVERSITY
 • Analyze the impact of ingesting weather station wind fields on the long-term air quality simulation in Taiwan with MM5 coupled with U.S. EPA CMAQ.

Scholarships and Awards

- 2013 Advanced Study Program Graduate Student Visitor Award, NATIONAL CENTERS FOR ATMOSPHERIC RESEARCH
- 2007 Atmospheric Physics Department Scholarship, NATIONAL CENTRAL UNIVERSITY
- 2007 Student Award of Excellence, NATIONAL CENTRAL UNIVERSITY
- 2006 Lin Hsiung Chen Memorial Scholarship
- 2005/2006 Dean's List Recipient, NATIONAL CENTRAL UNIVERSITY

Funded Projects (all external)

- 1 **Enabling Cloud Condensate Cycling for All-Sky Radiance Assimilation in HWRF**, *Role: PI*, Funding Agency: NOAA/NWS/HFIP, Period: September 2018 - August 2020. Amount: \$238K.
- 2 **Evaluation of Small-Satellite Architectures to Address the Future Needs of the NOAA Enterprise and its Stakeholders**, *Role: Co-I*, Funding Agency: NOAA/NESDIS/STAR, Period: September 2018 - August 2019. Amount: \$500K.
- 3 **Data assimilation of GLM observations in HWRF/GSI system**, *Role: Co-PI*, Funding Agency: NOAA/NESDIS/GOES-R Risk Reduction, Period: July 2017 - June 2020. Amount: \$525K.
- 4 **Evaluation of the Newly Developed Observation Operators for Assimilating Satellite Cloud and Precipitation Observations in GSI within the HWRF system**, *Role: PI*, Funding Agency: UCAR/DTC, Period: May 2017 - April 2018. Amount: \$13K.
- 5 **Advancing littoral zone aerosol prediction via holistic studies in regime-dependent flows**, *Role: Co-I*, Funding Agency: ONR, Period: July 2015 - June 2020. Amount: \$7.5M.
- 6 **Assimilation of Moisture and Precipitation Observations in Cloudy Regions of Hurricane Inner Core Environments to Improve Hurricane Intensity, Structure and Precipitation**, *Role: Co-I*, Funding Agency: NOAA/OAR, Period: July 2014 - June 2017. Amount: \$607K.

Peer-Reviewed Publications

- 2020 Grasso, L., D. Bikos, J. Dostalek, **T.-C., Wu**, K. Hilburn, E. Szoke, J. W. Zeitler, W. E. Line, and A. E. Cohen: Application of the GOES-16 Advanced Baseline Imager: Morphology of a pre-convective environment on 17 April 2019. *Electronic J. Severe Storms Meteor.*, **15** (2), 1-24.
- 2019 Miller, S. D., L. Grasso, Q. Bian, S. Kreidenweis, J. Dostalek, J. Solbrig, J. bukowski, S. van den Heever, Y. Wang, X. Xu, J. Wang, A. Walker, **T.-C., Wu**, M. Zupanski, C. Chiu, and J. Reid: A Tale of Two Dust Storms: Analysis of A Complex Dust Event in the Middle East. *Atmos. Chem. Phys.* **12**, 5101–5118
- 2019 **Wu, T.-C.**, M. Zupanski, L. D. Grasso, C. D. Kummerow, and S-A. Boukabara: All-Sky Radiance Assimilation of ATMS in HWRF: A Demonstration Study. *Mon. Wea. Rev.* **147**, 85-106.
- 2018 Grasso, L., D. Lindsey, Y.-J. Noh, C. O ' Dell, **T.-C. Wu**, and F. Kong: Improvements to cloud top brightness temperatures computed from the CRTM at 3.9 μm . *Mon. Wea. Rev.*, **146**, 3972-3944.
- 2017 **Wu, T.-C.** and M. Zupanski: Assimilating GPM Hydrometeor Retrievals in HWRF: Choice of Observation Operators. *Atmos. Sci. Lett.*, **18**, 6, 238-245
- 2016 **Wu, T.-C.**, M. Zupanski, L. D. Grasso, P. J. Brown, C. D. Kummerow, and J. A. Knaff: The GSI Capability to Assimilate TRMM and GPM Hydrometeor Retrievals in HWRF. *Q. J. Roy. Meteor. Soc.*, **142**, 700, 2768-2787

- 2015 **Wu, T.-C.**, C. S. Velden, S. J. Majumdar, H. Liu, and J. Anderson: Understanding the Influence of Assimilating Subsets of Satellite-Derived Atmospheric Motion Vectors on Numerical Analyses and Forecasts of Tropical Cyclone Track and Intensity with an Ensemble Kalman Filter. *Mon. Wea. Rev.*, **143**, 2506-2531
- 2014 **Wu, T.-C.**, H. Liu, S. J. Majumdar, C. S. Velden, and J. Anderson: Influence of Assimilating Satellite-Derived Atmospheric Motion Vector Observations on Numerical Analyses and Forecasts of Tropical Cyclone Track and Intensity. *Mon. Wea. Rev.*, **142**, 49-71.

Selected Presentations

- 2020 **EGU General Assembly, Vienna, Austria.**
Poster (remote presentation): Assessment of the Assimilation of TEMPEST-D in the NCEP Global Forecast System <https://meetingorganizer.copernicus.org/EGU2020/EGU2020-1949.html>
- 2019 **AMS Joint Satellite Conference: Air Quality and Atmospheric Composition session, Boston, MA.**
Poster: Quality Control of the Small Satellite TEMPEST-D
- 2019 **17th JCSDA Review Meeting and Technical Workshop, Washington, DC.**
Poster: Lessons Learned and Initial Assessment of Small Satellite for Data Assimilation: Part I - TEMPEST-D <https://cpaess.ucar.edu/meetings/2019/17th-jcsda-technical-review-meeting-poster-gallery>
Poster 2: Lessons Learned and Initial Assessment of Small Satellite for Data Assimilation: Part II -ADM Aeolus https://cpaess.ucar.edu/sites/default/files/meetings/2019/posters/JCSDA_Kliewer_Poster_Lessons_Learned_Part_Two.pdf
- 2019 **7th International Symposium on Data Assimilation, Kobe, Japan.**
Poster: Evaluation of GLM Lightning Flash Rate Observation Operators for HWRF <http://www.data-assimilation.riken.jp/isda2019/program/abstracts/p2-20.html>
- 2017 **18th Annual WRF User's Workshop, Boulder, CO.**
Talk: Assimilation of Microwave All-Sky Radiances and Hydrometeor Retrievals in HWRF <http://www2.mmm.ucar.edu/wrf/users/workshops/WS2017/WorkshopPapers.php>
- 2016 **5th Annual International Symposium on Data Assimilation, Reading, UK.**
Poster 1: Assimilating Satellite Cloud and Precipitation Observations in NOAA HWRF System <http://www.isda2016.net/abstracts/posters/WuAssimilatingSatellite.html>
Poster 2: Practical details of assimilating GPM hydrometeor retrievals in HWRF <http://www.isda2016.net/abstracts/posters/WuPracticaldetails.html>
- 2016 **14th JCSDA Workshop on Satellite Data Assimilation, Moss Landing, CA.**
Talk: The GSI Capability to Assimilate TRMM and GPM Hydrometeor Retrievals in HWRF http://www.jcsda.noaa.gov/meetings_wkshp2016_agenda.php
Poster: Status of O2R and R2O Activities at JCSDA and NESDIS http://www.jcsda.noaa.gov/documents/meetings/wkshp2016/posters/KKumar_JCSDAwkshp2016poster1.pdf

- 2015 **13th JCSDA Workshop on Satellite Data Assimilation**, *College Park, MD*.
Poster: GSI Capability to Assimilate Precipitation-Affected Satellite Observations in Application to HWRF: Assimilation of TRMM Cloud Water Retrievals
http://www.jcsda.noaa.gov/meetings_Wkshp2015_posters.php
- 2013 **WMO 6th Symposium on Data Assimilation**, *College Park, MD*.
Poster: Towards Understanding the Contributions of Satellite-Derived Atmospheric Motion Vectors to the Mesoscale Tropical Cyclone Analyses and Forecasts
- 2012 **5th Ensemble Kalman Filter Workshop**, *Albany, NY*.
Talk: Influence of Assimilating Satellite-Derived High-Resolution Data on Analyses and Forecasts of Tropical Cyclone Track and Structure
- 2011 **65th Interdepartmental Hurricane Conference**, *Miami, FL*.
Poster: Improving the Assimilation of High-Resolution Satellite Wind data into Mesoscale Prediction Models

Invited Talks/Lectures

- 2020 **Central Weather Bureau of Taiwan**, *Taipei, Taiwan*.
Recent CIRA/CSU Developments on Satellite Data Assimilation for NWP https://www.dropbox.com/scl/fi/koabln3mprsi5i1s5jkmo/CWB_Seminar_20200115_TW.pptx?dl=0&rlkey=s5segxkeo95x3koqirw5qbc16u
- 2019 **NOAA/NASA Satellite Meteorology Summer Workshop**, *Fort Collins, CO*.
Tropical Cyclone Data Assimilation (with HWRF) <https://www.cira.colostate.edu/conferences/satellite-meteorology-summer-workshop/>
- 2018 **NCAR DTC Visitor Program**, *Boulder, CO*.
A DTC Visitor Program Project: Evaluating and Merging the Capability of Assimilating Satellite Hydrometeor Retrievals into GSI for HWRF Application https://dtcenter.org/sites/default/files/visitor-projects/Ting-Chi-Wu-DTC_Visitor_Program_2017_Final_Report.pdf
- 2018 **NOAA Environmental Modeling Center (EMC) GSI Bi-Weekly Meeting**, *Remote*.
A DTC Visitor Program Project: Evaluating and Merging the Capability of Assimilating Satellite Hydrometeor Retrievals into GSI for HWRF Application
- 2017 **NOAA EMC HWRF GSI Bi-Weekly Meeting**, *College Park, MD*.
HWRF Activities at CIRA Data Assimilation Group
- 2018 **NOAA Data Assimilation Training**, *Fort Collins, CO*.
Building and Running GSI on S4 https://da.cira.colostate.edu/wp-content/uploads/2018/10/BuildRunGSI_TCW.pdf
- 2018 **NOAA Data Assimilation Training**, *Fort Collins, CO*.
An Introduction to GSI https://da.cira.colostate.edu/wp-content/uploads/2018/10/IntroGSI_TCW_2018.pdf
- 2016 **NOAA Data Assimilation Training**, *Fort Collins, CO*.
Adding New Observations in GSI
- 2015 **NOAA Data Assimilation Training**, *Fort Collins, CO*.
Review on Data Assimilation and Introduction to GSI - Part II

- 2015 **NOAA Data Assimilation Training**, *Fort Collins, CO*.
Review on Data Assimilation and Introduction to GSI - Part I

Trainings

- 2019 **JEDI (Joint Efforts for Data Assimilation Integration) Academy**, *Boulder, CO*.
2017 **Joint DTC-EMC-JCSDA GSI-EnKF Tutorial**, *College Park, MD*.
2015 **GSI/EnKF Community Tutorial**, *Boulder, CO*.
2015 **JCSDA Summer Colloquium on Satellite Data Assimilation**, *Fort Collins, CO*.
2011 **Banff International Research Station Summer School: Advanced Mathematical Methods to Study Atmospheric Dynamical Processes**, *Banff, Canada*.

Referee Work

Reviewer *Weather and Forecasting, Journal of Geophysical Research - Atmospheres, Journal of Advances in Modeling Earth Systems, Advances in Atmospheric Sciences, Journal of Atmospheric and Oceanic Technology, Quarterly Journal of the Royal Meteorological Society, Journal of the Meteorological Society of Japan, Natural Hazards, Monthly Weather Review*

Mentoring Experiences

- PhD Student **Rute Costa Ferreira**, *National Institute for Space Research & Center for Weather Forecast and Climate Studies, Brazil*.
• Research Topic: Lightning Data Assimilation with WRF-ARW using GSI for Severe Weather Events in Brazil
- PhD Student **Yoonjin Lee**, *Department of Atmospheric Science, Colorado State University, Fort Collins, CO*.
• Research Topic: Satellite Data Assimilation with WRF-GSI using ABI and GLM latent heat retrievals
- NOAA Data Assimilation **Biljana Orescanin**, *Cooperative Institute for Research in the Atmosphere, Fort Collins, CO. (Now at NOAA/JCSDA)*.
Intern (MS) • Research Topic: Data Assimilation of Land Surface Emissivity in GSI
- NOAA Data Assimilation **James D. Taylor**, *Cooperative Institute for Research in the Atmosphere, Fort Collins, CO. (Now at RIKEN DA Team)*.
Intern (PhD) • Research Topic: Data Assimilation with HWRF

Computer skills

Operating System UNIX, Linux, Mac OS, and Windows

Programming Language Fortran, shell script, Python, GrADS, MatLab, and NCL

HPC Experience NOAA Jet, Theia (decommissioned), and Hera; NCAR Yellowstone (decommissioned) and Cheyenne, Navy Gordon and Conrad, and JCSDA S4

Job Scheduler SLURM, PBS, and Rucoto

Version Control Git: NOAA Vlab, GitHub, and GitLab

Editing L^AT_EX and Microsoft Office

Languages

English (fluent), Chinese and Taiwanese (native)