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EDUCATION

2009/09 – 2014/08 Ph.D. Institute. of Atmospheric Physics, National Central University, Taiwan
2002/09 – 2005/08 M.S. Institute. of Atmospheric Physics, National Central University, Taiwan
1998/09 – 2002/08 B.A. Depart. of Atmospheric Science, National Central University, Taiwan

EMPLOYMENT

2018/03 - present PostDoc. RCEC, Academia Sinica, Taiwan
2015/03 – 2018/01 PostDoc Department of Land, Air and Water Resources, UC, Davis, USA.
2012/12 - 2015/02 Visiting Scholar Department of Atmosphere Science, Universit of Hawaii, USA.

HONORS & AWARDS

2022 Department of Defense Academic Cooperation Program Quality Project Award

2022 The Third AII American DAVINCI International Innovation and Invention Expo – Gold medal

2023 International Warsaw Innovation Show – Gold medal

PROFESSIONAL SERVICE

- Journal Reviewer: Atmosphere (MDPI), Remote Sensing (MDPI), Geoscience Letters (Springer)
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RESEARCH INTEREST

My research focuses on enhancing mesoscale weather prediction with three main approaches: (1) improving tropical cyclone (TC) intensity forecasts through initialization methods in global models, (2) applying advanced data assimilation to improve short-term wind power forecasts in Southern California, and (3) integrating lightning data assimilation to enhance convective storm forecasts in Taiwan.For TC initialization, my PhD research used the WRF model to improve TC track and intensity forecasts in the Western Pacific. Since 2015, I've applied this technique in global models, achieving a 30–40% improvement in central pressure and a 10–20% increase in maximum wind accuracy. For wind power forecasting, I joined a UC Davis project, using hybrid data assimilation to

enhance forecast accuracy by 6.7%. Additionally, lightning data assimilation has significantly improved convective storm forecasts, as seen in a severe 2012 Taiwan storm case.In the future, I aim to expand these methods to functional data analysis, apply them to observational data, and explore “Big Data” and “Machine Learning” applications for renewable energy..

RESEARCH HIGHLIGHTS

1. **Lidar data assimilation for severe weather/precip system.**

   On 4 June 2021, short-duration extreme precipitation occurred in Taipei. Within 2 h, over 200 mm of rainfall accumulated in the Xinyi district. In this study, advanced data assimilation technology (e.g., hybrid data and 3D variations) was incorporated to develop a high-resolution, small-scale (e.g., northern Taiwan) data assimilation forecast system, namely the weather research and forecast-grid statistical interpolation (WRF-GSI) model. The 3D wind field data recorded by the Doppler wind lidar system of Taipei Songshan Airport were assimilated for effective simulation of the extreme precipitation. The results revealed that the extreme rainfall was caused by the interaction between the northeast wind incurred by a front to the north of Taiwan, a humid southerly wind generated by Typhoon Choi-wan, and the regional sea–land breeze circulation. For the Xinyi district, the WRF-GSI_lidar model reported accumulated rainfall 30 mm higher than that in the non-assimilated experiment (WRF-GSI_noDA), indicating that the WRF-GSI model with lidar observation was improved 15% more than the nonassimilated run..

   Reference: [1]. Chen et al, 2022(1).

2. **Portable Computing system for Weather/Energy applications.**

   Numerical weather prediction (NWP) systems are crucial tools in atmospheric science education and weather forecasting, and high-performance computing (HPC) is essential for achieving such science. The goals of NWP systems are to simulate different scales of weather systems for educational purposes or to provide future weather information for operational purposes. Supercomputers have traditionally been used for NWP systems; however, supercomputers are expensive, have high power consumption, and are difficult to maintain and operate. In this study, the Raspberry Pi platform was used to develop an easily maintained high-performance NWP system with low cost and power consumption—the Improved Raspberry Pi WRF (IRPW). With 316 cores, the IRPW had a power consumption of 466 W and a performance of 200 Gflops at full load. IRPW successfully simulated a 48-h forecast with a resolution of 1 km and a domain of 32,000 km^2 in 1.6 h. Thus, IRPW could be used in atmospheric science education or for local weather forecasting applications. Moreover, due to its small volume and low power consumption, it could be mounted to a portable weather observation system..

   Reference: [1]. Chen et al. 2022(2).

REPRESENTATIVE PUBLICATIONS (*: corresponding author)

1. Chen C.-S., C.-L. Liu, M.-C. Yen, **C.-Y. Chen**, P.-L. Lin, C.-Y. Huang and J.-H. Teng, 2010 : Terrain Effects on an Afternoon Heavy Rainfall Event, Observed over Northern Taiwan on 20 June 2000 during Monsoon Break, Journal of the Meteorological Society of Japan, **88**, No.4., pp.649-671
2. Chen C.-S., Y.-L. Lin, N.-N. Hsu, C.-L. Liu, and **C.-Y. Chen.**, 2011 : Orographic effects on localized heavy rainfall events over southwestern Taiwan on 27 and 28 June 2008 during the post-Mei-Yu period, Atmospheric Research. **101,** 595-610.
3. Lin, P.-L., Y.-L. Chen, C.-S. Chen, C.-L. Liu, and **C.-Y. Chen**, 2011: Numerical experiments investigating the orographic effects on a heavy rainfall event over the northwestern coast of Taiwan during TAMEX IOP 13. Meteorol Atmos Phys, **114**, 35-50
4. Chen, S.-H., **J.-Y. Chen**, W.-Y. Chang, P.-L. Lin, P.-H. Lin, and W.-Y. Sun,2011: Observing System Simulation Experiment: Development of the system and preliminary results, J. Geophys. Res., **116**, D13202, doi:10.1029/2010JD015103
5. Tao, W.-K., J. J. Shi, P.-L. Lin, **J. Chen,** S. Lang, M.-Y. Chang, M.-J. Yang ,C.-C. Wu**,** Christa P.L., C.-H. Sui, and Ben J.-D. Jou, 2011: High-Resolution Numerical Simulation of the Extreme Rainfall Associated with Typhoon Morakot. Part I: Comparing the Impact of Microphysics and PBL Parameterizations with Observations. *Terr. Atmos. Ocean. Sci.*, **22**, 673-696. doi: 10.3319/ TAO.2011.08.26.01
6. Ching-Sen Chen, Yuh-Lang Lin, Hui-Ting Zeng, **Chih-Ying Chen**, Che-Ling Liu, 2013: Orographic effects on heavy rainfall events over northeastern Taiwan during the northeasterly monsoon season. Atmospheric Research ,**122**,310–335. DOI:10.1016/j.atmosres.2012.10.008
7. **Chen, Chih-Ying**, Y.-L. Chen, C.-S. Chen, P.-L. Lin and C.-L. Liu, 2013: Revisiting the Heavy Rainfall Event over Northern Taiwan on 3 June 1984, *Terr. Atmos. Ocean. Sci.*, **24**, 673-696. doi: 10.3319/ TAO.2013.07.04.01(A)
8. **Chen, Chih-Ying**, Yi-Leng Chen, and Hiep Van Nguyen, 2014: The Spin-up Process of a Cyclone Vortex in a Tropical Cyclone Initialization Scheme and Its Impact on the initial TC Structure. SOLA, 2014, Vol. **10**, 92-95, doi:10.2151/sola.2014-019
9. Mei-Ying Lin, Ming-Da Chiou, **Chih-Ying Chen**, Hao-Yuan Cheng, and WenYih Sun, 2018: Development and Evaluation of Storm Surge Warning System in Taiwan. Ocean Dynamics, Vol. 68, Issue 8, pp.1025-1049. (New!!)
10. Yang, Shu-Chih, Shu-Hua Chen, **Chih-Ying Chen**, Corneils van Dam, Aubryn Cooperman,Henry Shiu, Clinton MacDonald, John Zack ,2019: Application of Bias Corrections to Improve Hub-height Ensemble Wind Forecasts over the Tehachapi Wind Resource Area, Wind Energy, Renewable Energy, **140**, 281-291. (New!!)

11. Choi, Y., S. H. Chen, C.-C. Huang, K. Earl, **C.-Y. Chen,** C. S., Schwartz, and T. - Matsui (2020, Apr). Evaluating the impact of assimilating aerosol optical depth observations on dust forecasts over North Africa and the East Atlantic using different data assimilation method. Journal of Advances in Modeling Systems, 12(4),e2019MS001890.
12. Chen, S.-H., C.-C. Huang, Y.-C. Kuo, Y.-H. Tseng, Y. Gu, K. Earl, **C.-Y.Chen,** Y. Choi, K.-N. Liou (2021, Feb). Impacts of Saharan Mineral Dust on Air-Sea Interaction over North Atlantic Ocean Using a Fully Coupled Regional Model. Journal of Geophysical Research: Atmospheres, 126(4),e2020JD033586.
13. Yeh, Nan-Ching, Yao-Chung Chuang, Hsin-Shuo Peng, and **Chih-Ying Chen** (2021, Dec). Application of AIRS Soundings to Afternoon Convection Forecasting and Nowcasting at Airports. Atmosphere, 13(1):61.
14. **Chen, Chih-Ying,** Nan-Ching Yeh, and Chuan-Yao Lin. (2022, Jun). Data Assimilation of Doppler Wind Lidar for the Extreme Rainfall Event Prediction over Northern Taiwan: A Case Study. Atmosphere, 13(6):987.
15. **Chen, Chih-Ying,** Nan-Ching Yeh, Yao-Chung Chuang, and Chuan-Yao Lin (2022, Sep). Development of a Low-Cost Portable Cluster for Numerical Weather Prediction. Electronics, 11, no. 17: 2769.