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EDUCATION

2006/09 – 2011/08 Ph.D. Department of Physics, Virginia Polytechnic Institute and State University, VA, USA
2000/09 – 2002/06 M.S. Department of Physics, Chung-Yuan Christian University, Taiwan
1996/09 – 2000/06 B.A. Department of Physics, Chung-Yuan Christian University, Taiwan

EMPLOYMENT

2016/04 - present Postdoctoral Research Fellow RCEC, Academia Sinica, Taiwan
2019/02 – 2019/06 Adjunct Assistant Professor School of Big Data Management, Soochow University, Taiwan
2013/01 - 2014/04 Guest Scientist Max Planck Institute for the Physics of Complex Systems, Germany
2011/10 - 2012/12 Postdoctoral Research Fellow Department of Physics, North Dakota State University, USA

HONORS & AWARDS

2010 Dr. James A. Jacobs Memorial Graduate Fellowship, Virginia Tech

2010 Sigma Xi Research Award, Virginia Tech

2010 Sigma Xi Member, Virginia Tech

2007 Sigma Pi Sigma Member, Virginia Tech

PROFESSIONAL SERVICE

RESEARCH INTEREST

Cross-tropopause exchange through cloud top overshooting and wave breaking,

Applications of deep learning on weather and climate, Cloud microphysics parameterizations and severe weather modeling,

Empirical study on motion of falling hydrometeors,

Dynamics of complex systems and stochastic models.

RESEARCH HIGHLIGHTS

Estimate the global scale of cross-tropopauses exchange of water using an AI model

Our research aims to provide a parameterization scheme of cross-tropopauses exchange of water that could be incorporated into global circulation models (GCMs). Specifically, we focus on the transport of water vapor and hydrometeors caused by phenomena of overshooting and wave breaking occurred on the cloud top of severe storms, which usually touch the tropopause. Since water is an important greenhouse material, transport of water from troposphere to stratosphere might contribute to global warming to an appreciable extent. Overshooting and wave breaking are microscale meteorology that have been successfully simulated using the cloud-resolving model, WISCDYMM-II, but not being observed in numerical weather prediction systems with coarser resolutions, not to mention GCMs. Therefore, how to accurately calculate the amount water transport due to these mechanisms using GCM directly becomes a challenge. In this study, we massively simulate storms using state-of-the-art numerical model with cloud-resolving resolution. The water transport of each events are then being calculated, and served as the targets to be train on our AI model, which takes low-resolution metrology variables as inputs. In this manner, we could estimate the amount of water transport on global scale using data generated by GCM. In the long term, we plan to incorporate the AI with GCM to directly simulate the cross-tropopauses exchange of water. This could help us to understand how global warming being affected by the water stayed in the stratosphere.

A sensitivity study of the shape parameter of hail on the structures of developing supercells

In cloud-resulting models, the assumed particle size distribution (PDS) for a specific type of hydrometeors (species) is one of the critical microphysics parameterizations that could substantially affect the features of storms developed. Following the previous study by using WISCDYMM-II, we found that altering the PDS to increase the percentages of large particles could enhance the convective cells in a developing storm. A PDS defines the probability of size a species needs to follow as they grow in a convective cell. In this study, we control the shape parameter of the gamma distribution that describes the size distribution of hails. The sensitivity study shows that modifying the shape parameter leads to a significant change in the structures of the developing storms. A change that increases the existing probability of larger hails results in increasing the maximum updrafts and downdrafts in storms. The fraction of convective cell in terms of cloud volumes increases as well. In turn, it help to sustain the deep convective systems, and elongate the lifespans of storms.

A sensitivity study of the ventilation effect on the structures of developing supercells

In this study we analysis the sensitivity of the ventilation effect of precipitation hydrometeors using the cloud-resolving model, WISCDYMM-II. The ventilation effect could either enhance or reduce the diffusion growth rates of hydrometeors, depending on whether they are in supersaturated or sub-saturated environments. Although the diffusion processes are believed to have minor impact on hydrometeor growths comparing to other microphysics processes, our simulations show altering the ventilation effect, which directly varies the diffusion growth rates, does change the structures of supercells significantly. Consequently, they affect the precipitation magnitudes and durations, and the lifespans of the supercells. We analyze the cloud volumes, densities and mean particle sizes of hydrometeors at various environments such as altitudes and vertical wind speeds. This allows us to explore the distinctive natures of different hydrometeors in the convective cells and the stratiform regions separately. Our results show that increasing the ventilation effect increases the fraction of cloud volumes of the convective cells, as well as and the masses and the mean particle sizes of precipitation hydrometeors.

REPRESENTATIVE PUBLICATIONS (*: corresponding author)

1. **Yen-Liang Chou** and Thomas Ihle, Active matter beyond mean-field: Ring-kinetic theory for self-propelled particles. Phys. Rev. E, **91**, 022103 (2015).
2. Thomas Ihle and **Yen-Liang Chou**, Discussion on Ohta et al., “Traveling bands in self-propelled soft particles”. Eur. Phys. J. Special Topics **223**, 1409–1415 (2014).
3. **Yen-Liang Chou**, Rylan Wolfe, and Thomas Ihle, Kinetic theory for systems of self-propelled particles with metric-free interactions. Phys. Rev. E **86**, 021120 (2012).
4. **Yen-Liang Chou*** and Michel Pleimling, Kinetic roughening and fluctuation-dissipation relations. Physica A **391** 3585–3593 (2012).
5. **Yen-Liang Chou** and Michel Pleimling, Ising metamagnets in thin film geometry: equilibrium properties. Phys. Rev. B **84**, 134422 (2011).
6. **Yen-Liang Chou** and Michel Pleimling, Characterization of non-equilibrium growth through global two-time quantities. J. Stat. Mech. P08007 (2010).

7. **Yen-Liang Chou**, Michel Pleimling, and R. K. P. Zia, Changing growth conditions during surface growth. Phys. Rev. E **80**, 061602 (2009).
8. **Yen-Liang Chou** and Michel Pleimling, Parameter-free scaling relation for nonequilibrium growth processes. Phys. Rev. E **79**, 051605 (2009).
9. Tsong-Ming Liaw, Ming-Chang Huang, Yu-Pin Luo, Simon C. Lin, **Yen-Liang Chou**, and Youjin Deng, Self-similarity in the classification of finite-size scaling functions for toroidal boundary conditions. Phys. Rev. E **77**, 010101(R) (2008).
10. Tsong-Ming Liaw, Ming-Chang Huang, **Yen-Liang Chou**, Simon C. Lin, and Feng-Yin Li, Partition functions and finite-size scalings of Ising model on helical tori. Phys. Rev. E **73**, 055101(R) (2006).
11. **Yen-Liang Chou** and Ming-Chang Huang, Distribution and density of the partition function zeros for the diamond-decorated Ising model. Phys. Rev. E **67**, 056109 (2003).
12. Tsong-Ming Liaw, Ming-Chang Huang, **Yen-Liang Chou**, and Simon C. Lin, Evolution and structure formation of the distribution of partition function zeros: Triangular type Ising lattices with cell decoration. Phys. Rev. E **65**, 066124 (2002).

Others (Invited Talks，Keynote speech et al.)