Dr. Huang-Hsiung Hsu (HHH 許晃雄)

Distinguished Research Fellow
Research Center for Environmental Changes, Academia Sinica
No. 128, Sec. 2, Academia Rd., Nankang, Taipei, Taiwan, R.O.C.
Tel: 886-2-2787-5845
Fax: 886-2-2783-3584
Email: hhhsu@gate.sinica.edu.tw

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EDUCATION

Ph.D., 1986: Atmospheric Sciences, University of Washington, Seattle, USA
B.S., 1978: Atmospheric Sciences, National Taiwan University, Taipei, Taiwan

EMPLOYMENT

2017/09– present: Distinguished Research Fellow, Research Center for Environmental Change, Academia Sinica
2011/08–2017/08: Research Fellow, Research Center for Environmental Change, Academia Sinica
1992/08–2011/07: Professor, Department of Atmospheric Sciences, National Taiwan University
1989/02–1997/07: Associate Professor, Department of Atmospheric Sciences, National Taiwan University
1987/12–1989/01: Post-doctoral Research Fellow, Department of Meteorology, University of Reading, UK

HONORS & AWARDS

2018 Annual Research Highlight, RCEC, Academia Sinica
2017 Annual Research Highlight, RCEC, Academia Sinica
2015 Annual Research Highlight, RCEC, Academia Sinica
2014 Fellow, ROC Meteorological Society

ACADEMIC SERVICE & RESEARCH PROJECTS

Professional positions (selected):

Chief Executive Officer, Anthropogenic Climate Change Research Center/RCEC (2021/1–present)
Deputy Director, Research Center for Environmental Changes, Academia Sinica (2013/1–2020/12)
Chairman, Department of Atmospheric Sciences, National Taiwan University (2002/8–2005/7)
Member, Modeling and Prediction Group, Asian Monson Year, CLIVAR
Member, TAO Array Implementation Panel, 1998–2000
Member, Expert Team on Climate Impacts on Monsoon Weather World Weather Research Program Monsoon Panel, WMO, 2007–2011
Leader, Taiwan's participation in Driftsonde program of THORPEX (2008)
Leader, Taiwan's participation in TOGA/COARE (1992/93)
Co-PI, AMIP diagnostics subproject "GCM Simulation of East Asian Climate" (1994–present); co-chair (2008–present)
Member, Executive Steering Committee, FORMOSAT-7/*COSMIC-2 program*
Member, Disaster Prevention and Protection Expert Consultation Committee (2011–2012, 2018–2021)
Member, several Taiwan national committees (IGBP, IHDP, IUGG, IAMAS), National Center for

High-performance Computing, National Space Organization

Coordinator, Atmospheric Science Program, National Science Council

Member, Advisory Panel for Atmospheric Science Program, National Science Council and Ministry of Science and Technology

Coordinator, "Data Bank for Atmospheric Research" (formerly "Subtropical Meteorological Data Bank"), a service project sponsored by the National Science Council, 1990-2008

PI of two national core projects in climate change: Taiwan Climate Change and Information Platform, and Consortium for Climate Change Study

Leader, Development of Taiwan Earth System Model (TaiESM) and Taiwan's participation in CMIP6

Journal and project proposal reviewer:

Journal: Bulletin of the American Meteorological Society, Monthly Weather Review, Journal of Atmospheric Sciences, Journal of Climate, Geophysical Research Letter, Journal of Geophysical Research (Atmosphere), Quarterly Journal of Royal Meteorological Society, International Journal of Climatology, Journal of Meteorological Society of Japan, SOLA, Theoretical and Applied Climatology, Atmosphere-Ocean, Advances in Atmospheric Sciences, Atmospheric Chemistry and Physics, Atmospheric Science Letter, Terrestrial Ocean and Atmosphere, Atmospheric Sciences (in Chinese)

Project proposal: National Science Council and the Ministry of science and Technology (Taiwan), National Science Foundation (USA), Research Grants Council (Hong Kong), German Federal Ministry of Education and Research, Swiss National Science Foundation

Editorial board:

Editor, Scientific On-line Letters on Atmosphere, the Meteorological Society of Japan, 2012–present

Editor, Asia-Pacific Journal of Atmospheric Sciences, Springer, 2012–2015

Associate Editor, Monthly Weather review, 2011

Executive Editor, Recent Progress in Atmospheric Sciences-Applications to the Asia-Pacific Region, World Scientific, 2008

Chief Editor: Scientific Report on Typhoon Morakot (2009), Climate Change in Taiwan: Scientific Report 2011, and Climate Change in Taiwan: Scientific Report 2017 (all in Chinese)

Professional societies and organizations:

American Meteorological Society, American Geophysical Union, ROC Meteorological Society, ROC Geophysical Union, Asia Oceania Geosciences Society

Teaching:

Courses: "Climatology", "Global Atmospheric Circulation", "Atmospheric Wave Dynamics", "Large Scale Dynamical Processes", "Weather and Climate", "Introduction to Global Change", "ENSO", "Introduction to the Earth System Science", "Climate Diagnostics", "Selected Reading of Popular Atmospheric Science Publication" in NTU; "Atmospheric Dynamics" in TIGP, Academia Sinica;

Supervised graduate students: 10 PhD. and 42 MS. Students in NTU; 2 PhD students in Academia Sinica

Community climate data service:

In the early 1990s, long-term climate data especially the global analyses could not be easily accessed in Taiwan. HHH assumed the responsibility of managing the Data Bank for Atmospheric Research for collecting and archiving long-term local and global atmospheric and oceanic data and disseminating the data to research community in Taiwan. He committed to the service for about 15 years. He also initiated the data rescue effort in Taiwan to digitize the historical meteorological data on paper dated back to 1895. The effort that was later continued by the Central Weather Bureau have digitized several tens millions of hand-written observation records since then.

National scientific reports:
HHH was the key person in initiating and organizing three national scientific reports (all in Chinese) sponsored by the National Science Council (later reorganized as the Ministry of Science and Technology) in Taiwan: 1. *Scientific Report of Typhoon Morakot*, and 2. *Climate Changes in Taiwan: Scientific Report 2011 and 2017*. These reports provided important scientific bases for research planning and policy-making in climate change adaptation. He has been the key person in Taiwan to lead the climate change-related research in Taiwan since the late 2000s.

International atmospheric and oceanic field campaigns and research projects:
HHH planned and led Taiwan's participation in the atmospheric and oceanic field campaigns during TOGA/COARE (1992-1993), TOGA/TAO (1992-2000), and the THORPEX/Driftsonde campaign in WCRP/WWRP THORPEX-YOTC (2008). HHH is now the leader of Taiwan's participation in CMIP6. HHH was a co-founder of the international research project 'East Asian Climate' in 1994 and has been a co-leader in organizing international workshops since then.

RESEARCH INTERESTS

Atmosphere-Ocean Teleconnection, Intraseasonal Oscillation, ENSO, Asian Monsoon, Subseasonal Multiscale Interaction, Decadal-Interdecadal Variation, Climate Change

RESEARCH HIGHLIGHTS

- **Teleconnection:** HHH has been continuing his research on teleconnection since his PhD work and expanded the scope from atmospheric to atmosphere-ocean coupled teleconnection. He identified the clockwise propagation of near-surface teleconnection pattern around the mountain ranges in the Northern Hemisphere and interpreted the phenomena as the topographic Rossby wave. He was the first to conduct the global teleconnectivity study using streamfunction and documented interhemispheric teleconnection, the Rossby-wave like energy propagation in the waveguide along the jet streams, and the interhemispheric propagation of wave activity through the equatorial westerly ducts. In the investigation of the Pacific-Japan pattern, they identified the upstream precursors originating from the Eurasian continent, in addition to the traditional tropical-origin concept that had prevailed since the finding of the pattern, and contributed to the understanding of the pattern as an intrinsic mode. HHH and collaborators identified the enhanced triggering effect of the tropical Atlantic sea surface temperature anomaly on the western North Pacific-northern Indian Ocean (atmosphere-ocean) coupled mode, a dominant pattern affecting the interannual variability of the East Asian summer monsoon. They also identified new teleconnection patterns such as the South Pacific Decadal Oscillation and the Eurasian-Pacific Multidecadal Oscillation.

- **Madden-Julian Oscillation**: HHH and collaborators have studied the MJO/ISO since the late 1980s. They were the first to suggest the extratropical forcing of the MJO, which has recently been revisited and emphasized 20 years later by several studies in the MJO community. Proper simulation of MJO in climate models has been and continues to be a great challenge for general circulation models. HHH and collaborators made a breakthrough in early 2010s by demonstrating that coupling a high-resolution one-column ocean mixed-layer model (named SIT) to the atmospheric general circulation model (AGCM) ECHAM5 dramatically improves the simulation of the MJO to have realistic strength, period, and propagation speed. The ECHAM5-SIT was identified as one of few top models in MJO simulation in a model intercomparison study conducted by the WCRP-WWRP YOTC MJO Task Force / GEWEX GASS MJO Global Model Evaluation Project. HHH and collaborators further coupled the same ocean model to several other AGCMs and found the similar improvement. Better resolving the fine structure of upper ocean temperature, especially the warm layer, produces more vigorous

atmosphere-ocean interaction and strengthens intraseasonal variations in both SST and atmospheric circulation. HHH was one of the first few researchers to systematically investigate the orographic effect of the Maritime Continent (MC) on the MJO, which is an important mechanism having been largely neglected in the MJO research and recently receiving more attention because of the Year of Maritime Continent field campaign. In addition to empirical diagnostics, HHH and collaborators conducted a series of numerical experiments with realistic topography, without orography, and with oceans only in the MC region and successfully demonstrated the significant local and remote effects of the orography and land–sea contrast in the MC on the MJO. They recently identified the effect of the MJO westerly anomalies on driving eastward currents, which transported riverine eastward to the nutrition-poor seas encircled by the MC and enriched the phytoplankton activity.

- **Multiscale Interaction in the Western North Pacific**: HHH and collaborators explored the multiscale interaction between tropical cyclone (TC), submonthly perturbation, and intraseasonal oscillation in the western North Pacific (WNP) during the boreal summer. They proposed mechanisms explaining the northwestern propagation of the ISO in the WNP. TCs were found to enhance the amplitude of wave-like perturbation in the WNP, indicating the importance of the two-way interaction in driving the climate variability in the WNP. HHH and collaborators found that the existence of TCs significantly enhanced the monsoon trough and weakened the subtropical high in the WNP, and amplified the intraseasonal–interannual climate variability by 40–60 percent. This finding suggests that TC is a part of climate system and should be considered as an integral component to understand climate variability and climate change. Similarly, a climate model needs to properly resolve TC activity to reliably simulate climate variability and project changes. HHH was invited to write three review articles because of these works.

- **Weather and climate extremes:** HHH and collaborators conducted a series of studies on record-breaking extreme events and found: 1) similar anomalous weather and climate events (but with milder amplitudes) could be induced by different factors, and 2) similar events with extreme amplitude occurred when several of these factors constructively synchronized. They proposed that the compound effect of various influencing factors caused the weather and climate extremes. Each seemingly random event might be caused by different combination of various factors. This randomness is seemingly the reason for the low predictability of the extremes and why statistical study such as composite or correlation analysis often failed to explain the extremes. An increase in the probability of synchronization would increase the occurrence probability of weather and climate extremes. Whether the global warming trend would provide such an environment favorable for synchronization is an intriguing and pressing issue that needs to be seriously considered. An investigation of this issue is needed for a more reliable projection of extreme weather and climate.

- **Climate model development:** In view of the lack of climate modeling capability in Taiwan, HHH organized an effort at climate model development in 2011 under the support of the MOST to nurture local talents in climate modeling and develop/implement climate models for the use in Taiwan. Since 2011, a climate modeling team has been established with the ability in modifying the existing climate models and implementing new modules developed locally. This effort has led to the implementation of Taiwan Earth System Model (TaiESM) developed locally and the High-resolution Atmospheric Model (GFDL) developed by the GFDL. Research community in Taiwan is now participating in CMIP6 using both models and contributes to the climate change projection, as well as for the better understanding and improvement in climate modeling. The HiRAM has been used to conduct several tens of long-term high-resolution (25 and 50 km) climate projections that resolve the future changes in tropical cyclone and other high-impact weathers. The simulation results have been provided to Taiwan's research

community for further dynamic downscaling to project climatic impact on Taiwan's extreme weather/climate and environment under the warming scenarios and provide useful information for policy making in climate change adaptation.

- **Climate change projection under RCP emission scenarios:** Using the high-resolution projection data from the HiRAM and MRI-AGCM (including d4PDF data) and also coarser-resolution CMIP5/6 models (including TaiESM) to conduct a series of climate change studies with the focus on East Asian monsoon and climate systems (e.g., front, drought, atmospheric river) that affect Taiwan.

PUBLICATIONS (*corresponding author, #senior author guiding study and writing)

Manuscripts (in preparation/to be submitted):

1. Shiu, C.-J., H.-H. Hsu, W.-L. Tseng, Y.-H. Chen, I-C. Tsai, and J.-P. Chen, 2022: Does Cumulus Parameterization with Convective Microphysics Affect Simulations of the Madden-Julian Oscillation? To be submitted to *Climate Dynamics*.
2. Shiu, C.-J. , Y.-H. Chen, J.-P. Chen, I-C. Tsai, W.-T. Chen, and H.-H. Hsu, 2022: Implementation of a two-moment warm-cloud and rain microphysics parameterization for convective clouds in a global climate model: Methodology and simulation results. To be submitted to *J. Geophys. Res.-Atmosphere*.
3. Tsai, I.-C., C.-J. Shiu, W.-C. Wang, C.-A. Chen, and H.-H. Hsu, 2022: Causes for biases in cloud diurnal variation in global climate model. To be submitted.
4. Hsu, P.-C., H.-H. Hsu*, H.-J. Hong, Y.-T. Chen, Y.-L. Chen, and W.-L. Tseng, 2022: 2021 Texas Cold Snap: Manifestation of Natural Variability and Recent Warming Trend. To be submitted to *Weather and Climate Extremes*.

Manuscripts (under review):

1. Tsai, I.-C., P.-R. Hsieh, C.-T. Cheng, Y.-S. Tung, L.-Y. Lin, H.-H. Hsu, 2022: Impacts of 2 and 4 °C global warmings on extreme temperatures under different land-use types in Taiwan. Submitted to *Int. J. Climatology*.
2. Lan, Y.-Y., H.-H. Hsu*, B.-J. Tsuang, C.-Y. Tu, W.-L. Tseng, L.-C. Jiang, 2021: Embedding a one-column ocean model in CAM5 for improving the simulation of boreal winter Madden–Julian oscillation. Submitted to *Geosci. Model Dev. Discussions,* https://doi.org/10.5194/gmd-2021-346.

Peer-reviewed papers:

1. Ko, K.-C., H.-H. Hsu#, J.-H. Liu, 2022: Impact of global warming on Summertime Submonthly Wave Patterns and Tropical Cyclone Activity in the Western North Pacific. Accepted by *Clim. Dyn.*
2. Chen, C.-A., and H.-H. Hsu#, 2022: Future Change in Extreme Precipitation in East Asian Spring and Mei-yu Seasons in Two High-Resolution AGCMs. *Weather and Climate Extremes*, https://doi.org/10.1016/j.wace.2022.100408.
3. Martin, M., O. Sendra, A. Bastos, N. Bauer, C. Bertram, T. Blenckner,..., H.-H. Hsu,... J. Woodcock, 2021: Ten new insights in climate science 2021 – a horizon scan. *Global Sustainability*, 1-39, doi:10.1017/sus.2021.25.
4. Wang, Y.-C., W.-L. Tseng, and H.-H. Hsu, 2021: Role of convection–circulation coupling in the propagation mechanism of the Madden–Julian Oscillation over the Maritime Continent in a climate model. *Clim. Dyn*. 1-16, https://doi.org/10.1007/s00382-021-06013-2

5. Wang, Y. C., H.-H. Hsu*, W.-L. Tseng, C.-A. Chen, C.-H. Wu, P.-C. Hsu, Y.-L. Chen, C.-W. Lin, L.-C. Jiang, Y.-C. Lee, H.-C. Liang, and W.-M. Chang, 2021: Performance of the Taiwan Earth System Model in Simulating Climate Variability Compared With Observations and CMIP6 Model Simulations. *Journal of Advances in Modeling Earth Systems*, **13**,7, 1-28, https://doi.org/10.1029/2020MS002353
6. Arakane, S., and H.-H. Hsu#, 2021: Tropical Cyclone Footprints in Long-Term Mean State and Multiscale Climate Variability in the Western North Pacific as Seen in the JRA-55 Reanalysis. J. Climate, 34,18, 7443-7460, https://doi.org/10.1175/JCLI-D-20-0887.1.
7. Hong, C.-C., W.-L. Tseng, H.-H. Hsu*, M.-Y. Lee, and C.-C. Chang, 2021: Relative Contribution of Trend and Interannually Varying SST Anomalies to the 2018 Heat Waves in the Extratropical Northern Hemisphere, *J. Climate*, **34**,15, 6319–6333, http://dx.doi.org/10.1175/jcli-d-20-0556.1.
8. Henny, L., C. D. Thorncroft, H.-H. Hsu, L. F. Bosart, 2021: Extreme Rainfall in Taiwan: Seasonal Statistics and Trends. *J. Climate*, **34**,12, 4711-4731, DOI: https://doi.org/10.1175/JCLI-D-20-0999.1.
9. Hsu, P.-C., K.-C. Chen, C.-H. Tsou, C.-C. Hong, H.-C. Liang, H.-H. Hsu, C.-Y. Tu, and A. Kitoh, 2021: Future Changes in the Frequency and Destructiveness of Landfalling Tropical Cyclones Over East Asia Projected by High-Resolution AGCMs. *Earth's Future*, **9**, 3, 1-20, https://doi.org/10.1029/2020EF001888.
10. Darmawan, Y., H.-H. Hsu#, and J.-Y. Yu, 2021: Characteristics of Large-Scale Circulation Affecting the Inter-Annual Precipitation Variability in Northern Sumatra Island during Boreal Summer. *Atmosphere*, **12**,2, 136; https://doi.org/10.3390/atmos12020136.
11. Wang, C.-C., H.-H. Hsu#, and Y.-T. Chen, 2021: Observed and projected frontal activities in East Asia. *J. Climate*, **34,** 8, 3067-3085. https://doi.org/10.1175/JCLI-D-19-0959.1.
12. Chen, C.-A., and H.-H. Hsu#, 2021: Evaluation and comparison of CMIP6 and CMIP5 model performance in simulating the seasonal extreme precipitation in the Western North Pacific and East Asia. Weather and *Climate Extremes*,**31**, https://doi.org/10.1016/j.wace.2021.100303.
13. Shiu, C.-J., Y.-C. Wang, H.-H. Hsu, W.-T. Chen, H.-L. Pan, R. Sun, Y.-H. Chen, and C.-A. Chen, 2021: GTS v1.0 : a macrophysics scheme for climate models based on a probability density function. *Geosci. Model Dev.*, **14**, 177-204, https://doi.org/10.5194/gmd-14-177-2021.
14. Chen, G., W.-C. Wang, C.-T. Cheng, and H.-H. Hsu, 2021: Extreme Snow Events along the Coast of the Northeast United States: Potential Changes due to Global Warming. *J. Climate*, 34, 6, 2337-2353, http://dx.doi.org/10.1175/jcli-d-20-0197.1.
15. Hong , C.-C., C.-H. Tsou, P.-C. Hsu, K.-C. Chen, H.-H. Hsu, C.-Y. Tu, S.-J. Lin, and A. Kitoh, 2021: Future Changes in Tropical Cyclone Intensity and Frequency over the Western North Pacific Based on 20-km HiRAM and MRI Models. *J. Climate*, **34**, 6, 2235-2251, http://dx.doi.org/10.1175/jcli-d-20-0417.1.
16. Tseng, W.-L., C.-C. Hong, M.-Y. Le, H.-H. Hsu*, and C.-C. Chang, 2020: Compound Effect of Local and Remote Sea Surface Temperatures on the Unusual 2018 Western North Pacific Summer Monsoon. *J. Meteor. Soc. Japan*, **98**, 6, 1369-1385, http://dx.doi.org/10.2151/jmsj.2020-071.
17. Teng, H.-F., J. Done, C.-S. Lee, H.-H. Hsu, and Y.-H. Kuo, 2020: Large-Scale Environmental Influences on Tropical Cyclone Formation Processes and Development Time. *J. Climate*, ***33***,22, 9763-9782, https://doi.org/10.1175/JCLI-D-19-0709.1.
18. Lin, Y.-L., W. Agyakwah, Justin G. Riley, H.-H. Hsu, and L.-C. Jiang, 2020: Orographic Effects on the Propagation and Rainfall Modification Associated with the 2007-08 Madden-Julian Oscillation (MJO) Past the New Guinea Highlands. *Meteorol Atmos Phys*, doi:https://doi.org/10.1007/s00703-020-00753-2
19. Lee, W.-L., Y.-C. Wang, C.-J. Shiu, I-chun Tsai, C.-Y. Tu, Y.-Y. Lan, J.-P. Chen, H.-L. Pan, and H.-H. Hsu, 2020: Taiwan Earth System Model: Description and Evaluation of Mean State.

Geoscientific Model Development, **13**, 9, 3887-3904, https://doi.org/10.5194/gmd-13-3887-2020.
20. Li, J.-L. F., W.-L. Lee, K.-M. Xu, J. H. Jiang, E. Fetzer, C.-A. Chen, Y.-H. Wang, J.-Y. Yu, P.-C. Hsu, H.-H. Hsu, 2020: The Role of Falling Ice Radiative effects on Climate Projections over Arctic under Global Warming**.** *Terr. Atmos. Ocean. Sci.*, **31**, 6, 633-648, DOI: 10.3319/TAO.2020.04.29.01
21. Ko, K.-C., H.-H. Hsu, and J.-H. Liu, 2020: Interdecadal changes of the ISO and the associated TC/submonthly Wave Pattern in the Western North Pacific. *Terr. Atmos. Ocean. Sci.*, **31**, 3, 295-311, http://dx.doi.org/10.3319/tao.2019.08.20.01.
22. Hsu, H.-H.*, and Y.-T. Chen, 2020: Simulation and Projection of Circulations Associated with Atmospheric Rivers along the North American Northeast Coast. *J. Climate*, **33**, 13, 5673–5695, http://dx.doi.org/10.1175/jcli-d-19-0104.1.
23. Arakane, S., and H.-H. Hsu#, 2020: A Tropical Cyclone Removal Technique Based on Potential Vorticity Inversion to Better Quantify TC contribution to the background Circulation. *Climate Dynamics*, **54**, 5-6, 3201-3226, http://dx.doi.org/10.1007/s00382-020-05165-x.
24. Huang, W.-R., P.-H. Huang, Y.-H. Chang, C.-T. Cheng, H.-H. Hsu, C.-Y. Tu, and A. Kitoh, 2019: Dynamical Downscaling Simulation and Future Projection of Extreme Precipitation Activities in Taiwan during the Mei-Yu Seasons. *J. Meteor. Soc. Japan*, 97, 481–499, doi:10.2151/jmsj.2019-028.
25. Tseng, W.-L., S.-Y. S. Wang, H.-H. Hsu, and J. D. D. Meyer, 2019: Intensification of the decadal activity in Equatorial Rossby Waves and linkage to changing tropical circulation. *Terr. Atmos. Ocean. Sci.*, **30**, 1-11, doi:10.3319/TAO.2019.01.18.02.
26. Lee, W.-L., K.-N. Liao, Y. Gu, C.-C. Wang, H.-H. Hsu, and J.-L. Li, 2019: Impact of 3-D Radiation-Topography Interactions on Surface Temperature and Energy Budget over the Tibetan Plateau in Winter. *J. Geophys. Res. Atmos*., **124**, 1537–1549. https://doi.org/10.1029/2018JD029592.
27. Chang, C. J., H.-H. Hsu*, W. Cheah, W.-L. Tseng, and L.-C. Jiang, 2019: Madden–Julian Oscillation Enhances Phytoplankton Biomass in the Maritime Continent. *Sci. Rep.*, **9**, 5421, doi:10.1038/s41598-019-41889-5.
28. Teng, H.-F., C.-S. Lee, H.-H. Hsu, J. Done, and G. Holland, 2019: Environmental Conditions Associated with Tropical Cloud Cluster Formation. *J. Climate*, 32, 4069–4088. https://doi.org/10.1175/JCLI-D-18-0679.1.
29. Wang, Y.-C., and H.-H. Hsu, 2019: Improving Diurnal Rainfall Phase Over the Southern Great Plains in Warm Seasons by Using a Convective Triggering Design. *Int J Climatol.* 2019; 1–10. https://doi.org/10.1002/joc.6117.
30. Bui, H. X., J.-Y. Yu, H.-W. Liu, C.-Y. Tu, P.-G. Chiu, and H.-H. Hsu, 2019: Convective structure changes over the equatorial Pacific with highly increased precipitation under global warming simulated in the HiRAM. *SOLA*, **15**, 119−124, doi:10.2151/sola.2019-022.
31. Chen, C.-A., H.-H. Hsu*, C.-C. Hong, P.-G. Chiu, C.-Y. Tu and S.-J. Lin, 2019: Projecting the Seasonal Precipitation Change in the Western North Pacific and East Asia under Global Warming. *Climate Dynamics*, 53, 5583–5605, doi.org/10.1007/s00382-019-04883-1.
32. Arakane, S., and H.-H. Hsu*, 2019: Remote Triggering Effect of a Tropical Cyclone in the Bay of Bengal on a Heavy Rainfall Event in Subtropical East Asia. *npj Climate and Atmospheric Science*, **2,** 25, doi:10.1038/s41612-019-0082-8.
33. Chen, G., W.-C. Wang, L. Tao, H.-H. Hsu, C.-Y. Tu, and C.-T. Cheng, 2019: Extreme snow events along the coast of the northeast United States: Analysis of observations and HiRAM simulations. *J. Climate*, 32, 7561–7574, DOI: 10.1175/JCLI-D-18-0874.1.
34. Tan, L., C.-C. Shen, L. Löwemark, S. Chawchai, R. L. Edwards, Y. Cai, S. Breitenbach, H. Cheng, Y.-C. Chou, H. Duerrast, J. W. Partin, W. Cai, A. Chabangborn, Y. Gao, O. Kwiecien,

C.-C. Wu, Z. Shi, H.-H. Hsu, and B. Wohlfarth, 2019: Rainfall variations in central Indo-Pacific over the past 2700 yr**.** *PNAS*, https://doi.org/10.1073/pnas.1903167116.

35. Hong, C.-C., M.-Y. Lee, H.-H. Hsu*, and W.-L. Tseng, 2018: Distinct Influences of the ENSO-Like and PMM-Like SST Anomalies on the Mean TC Genesis Location in the Western North Pacific: The 2015 Summer as an Extreme Example. *J. Climate*, **31**, 8, 3049-3059, doi:10.1175/JCLI-D-17-0504.1.
36. Wang, C.-C., H.-H. Hsu#, Y.-L. Chen, J.-K. Yang, and M.-P. Hung, 2018: The influence of single model ensemble on the simulated extratropical interannual variability. *Terr. Atmos. Ocean*, **29**, 6, 1-16, doi: 10.3319/TAO.2018.07.18.01.
37. Chen, C.-A., J.-L. F. Li, M. Richardson, W.-L. Lee, E. Fetzer, G. Stephens, H.-H. Hsu, Y.-H. Wang, J.-Y. Yu, 2018: Falling Snow Radiative Effects Enhance the Global Warming Response of the Tropical Pacific Atmosphere. *Journal of Geophysical Research - Atmosphere*, **123**, 18, 10109-10124, doi:10.1029/2018JD028655.
38. Hong, C.-C., C.-H. Tsou, M.-Y. Lee, C.-C. Chang, H.-H. Hsu, K.-C. Chen, 2018: Effect of ISO-SSE Interaction on Accelerating the TS to Severe TS Development in the WNP Since the Late 1990s. *Geophys. Res. Lett*., **45**, 21, 12008–12014, doi:10.1029/2018GL079548.
39. Freychet, N., H.-H. Hsu, A. Duchez, and C.-Y. Tu, 2017: Projection in snowfall characteristics over the European Alps and its sensitivity to the SST changes: Results from a 50km resolution AGCM. *Atmos Sci Lett.*, **18**, 6, 261-267, doi: 10.1002/asl.751.
40. Chow, C. H., Y.-H. Tseng, H.-H. Hsu, C.-C. Young, 2017: The interannual variability of the Subtropical Countercurrent's eddies in the North Pacific associated with the Western-Pacific teleconnection pattern. *Cont. Shelf Res.*, **143**, 175-184, doi:10.1016/j.csr.2016.08.006.
41. Wu, C.-H., F. Nicolas , C.-A. Chen , and H.-H. Hsu, 2017: East Asian presummer precipitation in the CMIP5 at high versus low horizontal resolution. *Int. J. Climato*., **37**, 11, 4158-5170, doi: 10.1002/joc.5055.
42. Ko, C.-Y., C.-C. Lai, H.-H. Hsu, F.-K. Shiah, 2017: Decadal phytoplankton dynamics in response to episodic climatic disturbances in a subtropical deep freshwater ecosystem. *Water Resource*, **109**, 102-113, doi:10.1016/j.watres.2016.11.011.
43. Weng, C.-H., and H.-H. Hsu*, 2017: Intraseasonal oscillation enhancing C5 typhoon occurrence over the tropical western North Pacific. *Geophys. Res. Lett.*, **44**, 7, 3339 – 3345, doi:10.1002/2017GL072743.
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12. 許晃雄(HHH)等，2018:台灣乾旱研究: 變遷、水資源衝擊、風險認知與溝通。中央研究院永續科學研究計畫成果報告，166 頁(pp)。(Report of Taiwan Drought Study: Change, Water Resource Impacts, and Risk Perception and Communication, Sustainability Science Research Program, Academia Sinica; HHH as the chief PI)
13. 臺灣深度減碳政策建議書中央研究院報告No. 15 108 年 6 月(Academia Sinica Report No.15: Taiwan Deep Decarbonization Policy Recommendation, June 2019; HHH as a co-author)
14. 許晃雄，2018：台灣氣候模擬系統—探索氣候的前世今生與來世。科技部自然科學及永續研究發展司自然科學簡訊，第三十卷第一期，18–23。
15. 周佳、李明安、許晃雄(HHH)、洪志誠、盧孟明、陳正達等，2018: 臺灣氣候變遷科學報告 2017 第一冊 物理現象與機制 (Climate Change in Taiwan: Scientific Report 2017)，666 頁(pp)。(HHH as a chapter author and the chief editor)
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Conference Proceedings

1. Hsu, H.-H., and Y.-T. Chen, 2019: Simulation and Projection of Atmospheric River Activity and Circulation along the North American Northeast Coast using GFDL HiRAM. 2019 Fourth Annual US-Taiwan PIRE Workshop, 5–6 August, Sun Moon Lake, Nantou, Taiwan.
2. Hsu, H.-H., and Y.-T. Chen, 2019: Simulation and Projection of Atmospheric River Activity and Circulation along the North American Northeast Coast using GFDL HiRAM. AOGS, 29 July–2 August, 2019, Singapore.
3. Hsu, H.-H., and S. Arakane, 2019: Remote Triggering Effect of a Tropical Cyclone in the Bay of Bengal on a Heavy Rainfall Event in Subtropical East Asia. AOGS, 29 July–2 August, 2019, Singapore. (invited)
4. Hsu, H.-H., and S. Arakane, 2019: Footprints of tropical cyclone in climate variability. IUGG, 8–18 July, 2019, Montreal, Canada.
5. Hsu, H.-H., and S. Arakane, 2019: Remote Triggering Effect of a Tropical Cyclone in the Bay of Bengal on a Heavy Rainfall Event in Subtropical East Asia. IUGG, 8–18 July, 2019, Montreal, Canada.
6. Hsu, H.-H., W.-L. Tseng, C.-Y. Tu, and Y.-Y. Lan, 2019: Coupling a High-resolution Oceanic Mixed Layer Model to AGCMs Improves the Madden-Julian Oscillation Simulation. APCC 2019 International Workshop on Climate Prediction: Past, Present, and Future, 3–4 June, 2019, Taipei, Taiwan. (invited)
7. Hsu, H.-H., W.-L. Tseng, C.-Y. Tu, and Y.-Y. Lan, 2019: Coupling a High-resolution Oceanic Mixed Layer Model to AGCMs Improves the Madden-Julian Oscillation Simulation. KIAPS 2019 International Workshop on Next-Generation NWP Models, 22–24 May, 2019, Jeju, Korea. (invited)
8. Hsu, H.-H., 2019: Reduced TC Activity and Enhanced Anticyclone in the WNP in a Warmer World: Projection and Mechanism. 2019 Conference on Pan-Pacific Anthropocene, 14–16 May, Taipei, Taiwan.
9. Hsu, H.-H., and S. Arakane, 2019: Remote Triggering Effect of a Tropical Cyclone in the Bay of Bengal on a Heavy Rainfall Event in Subtropical East Asia. The 14th ‘General Circulation Model Simulations of the East Asian Climate' (EAC) workshop, 27-29 April, 2019, Hong Kong. (meeting coordinator)
10. Hsu, H.-H., 2019: From Cross-scale Climate Modeling to Unified Climate-Weather Modeling. Atmospheric Sciences Annual Meeting, 15–16 February, 2019, Chungli, Taiwan. (keynote)
11. Hsu, H.-H., 2018: Climate change impacts on natural disasters in Taiwan. 2018 International Workshop on Disaster Prevention and Mitigation Technology for Large-Scale Landslides. Taipei, 11 October, 2018. (invited)
12. Hsu, H.-H., 2018: Circulation during high PM2.5 events in Taiwan and changes in stagnation

index in East Asia. 2018 Deep Decarbonization Pathway Project workshop, 29 August, 2018, Taipei.

13. Hsu, H.-H., 2018: Future Change in Spring Drought and its Impact on Water Resource in Taiwan. Asia Oceania Geosciences Society 15th Annual Meeting, Honolulu, Hawaii, June 3-8, 2018.
14. Hsu, H.-H., 2018: Simulation and Projection of Atmospheric River Activities Using a High-Resolution AGCM. Asia Oceania Geosciences Society 15th Annual Meeting, Honolulu, Hawaii, June 3-8, 2018. (Session Chairman)
15. Hsu, H.-H., 2018: Reduced TC Activity and Enhanced Anticyclone in the WNP in a Warmer World: Projection and Mechanism. 33rd Conference on Hurricanes and Tropical Meteorology, Ponte Vedra Beach, Florida, April 16-20, 2018.
16. Hsu, H.-H., 2018: Future Projection for Seasonal Precipitation in the Western North Pacific and East Asia by HiRAM under Global Warming. The 3rd International Workshop on Climate Change and Precipitation in the East Asia, Tokyo, February 22-23, 2018. (invited)
17. Hsu, H.-H., 2017: The Western North Pacific: A hot spot of climate variability and change. Research Center for Advanced Science and Technology (RCAST) Workshop on Climate variability and change, Tokyo, November 19-22, 2017. (invited)
18. Hsu, H.-H., 2017: Intraseasonal oscillation enhancing C5 typhoon occurrence over the tropical western North Pacific. The 11th East Asian Climate and Environment (EACE) Workshop, Chengdu, China, October 15-17, 2017. (invited)
19. Hsu, H.-H., 2017: A Brief Review of Asian Climate Variability. International Workshop on Climate Downscaling Studies, Tsukuba, October 2-4, 2017. (invited)
20. Hsu, H.-H., 2017: Intraseasonal Oscillation Enhances C5 Typhoon Occurrence over the Tropical Western North Pacific. 2017 Joint IAPSO-IAMAS-IAGA Assembly, Cape Town, South Africa, August 28-Septerber 1, 2017.
21. Hsu, H.-H., 2017: Projecting Future Tropical Cyclone Activity in the WNP Using High Projecting AGCMs. 2017 Joint IAPSO-IAMAS-IAGA Assembly, Cape Town, South Africa, August 28-Septerber 1, 2017.
22. Hsu, H.-H., 2017: Simulating and Projecting Tropical Cyclone Activity in the Western North Pacific Using a High-Resolution AGCM. Asia Oceania Geosciences Society 14th Annual Meeting, Singapore, August 6-11,2017.
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24. Hsu, H.-H., 2017: Improving Madden-Julian Oscillation Simulation: Atmosphere-Ocean Coupling and Land/Orographic Effect. 5th WGNE workshop on systematic errors in weather and climate models, Montreal, Canada, June 19-23, 2017.
25. Hsu, H.-H., 2017: Compound Effect: Cause of Weather and Climate Extremes? The 2nd International Workshop on Climate Change and Precipitation in the East Asia, Tokyo, March 27-28, 2017. (invited)
26. Hsu, H.-H., 2016: Potential Effect of Extratropical Forcing in Triggering an Unusually Strong MJO and the Onset of 2015-2016 El Niño. 2016 AGU Fall Meeting, San Francisco, December 12-16, 2016.
27. Hsu, H.-H., 2016: Simulating and projecting tropical cyclone activities using HiRAM. The First Taiwan West Pacific Global Forecast System Development Workshop, CWB, Taipei, Taiwan, May 24-27, 2016. (invited)
28. Hsu, H.-H., 2016: Topographic and Land-Sea Effect of the Maritime Continent on the Air-Sea Interacting MJO. Workshop on YMC and convective processes over the MC and SCS, TGA2016, May 18, 2016. (invited)
29. Hsu, H.-H., 2016: Topographic and Land-Sea Effect of the Maritime Continent on the Air-Sea

Interacting MJO. Workshop on Intraseasonal Processes and Prediction in the Maritime Continent, Singapore, April 11-15, 2016. (invited)

30. Hsu, H.-H., 2016: Simulating and Projecting Tropical Cyclone Activity in the WNP Using a High-Resolution AGCM. East Asian Climate 13th Workshop, Beijing, March 24-25, 2016.
31. Hsu, H.-H., 2016: Projection of Taiwan Climate. 2016 TCCIP workshop on Applications of Climate Change Projection, Taipei, March 24-25, 2016. (invited)
32. Hsu, H.-H., 2016: Expansion of Subtropical High and Associated TC Activity in a Warmer Climate. The International Workshop on "Climate Change and Precipitation in the East Asia, Tokyo, February 29-March 1, 2016. (invited)
33. Hsu, H.-H., 2015: The Madden-Julian Oscillation in a warmer world. 26th IUGG General Assembly, Prague, June 22-July 2, 2015.
34. Hsu, H.-H., 2015: On the extreme 2013/2014 Boreal Winter: role of sea surface temperature and sea ice. 26th IUGG General Assembly, Prague, June 22-July 2, 2015.
35. Hsu, H.-H., 2015: On the extreme circulations in winter 2013-2014: Role of sea surface temperature and sea ice anomalies. The Third Taiwan West Pacific Global Forecast System Planning Workshop, Taipei, June 3-4, 2015. (keynote)
36. Hsu, H.-H., 2015: Climate and topography in East Asia and Taiwan. US-Taiwan Geoscience workshop: Facet (Feedbacks and coupling among climate, erosion and tectonics during mountain building) 2015, Taipei, May 29-31, 2015. (keynote)
37. Hsu, H.-H., 2015: Compound Effects of Anomalous sea surface temperature and ice on extreme circulation in winter of 2013–2014. 2015 Taipei Severe Weather and Extreme Precipitation Workshop, Taipei, May 25-27, 2015. (keynote)
38. Hsu, H.-H., 2015: Development and implementation of TaiESM. Workshop on Modeling Aerosols, Monsoon and Climate: Collaborative Research, Beijing, April 13-14, 2015. (invited)
39. Hsu, H.-H., 2015: Simulating and Projecting Tropical Cyclone Activity in the WNP Using a High-Resolution AGCM. Third International Workshop on "Studies on future climate projection of the Asian region utilizing the CMIP5 multi-model ensemble data", Tokyo, March 27, 2015. (invited)
40. Hsu, H.-H., 2014: Modeling Activity at RCEC: Development and Implementation of a Global-to-Urban Modeling Suite. 7th Taiwan-France Earth Science Symposium: Geodynamics and Environment in East Asia (GEEA 2014), Hua-Lien, Taiwan, 13-14 November 2014. (keynote)
41. Hsu, H.-H., 2014: On the CCliCS Research Progress. 3rd CCliCS Workshop on Climate System Modeling, Taipei, November 11-13, 2014.
42. Hsu, H.-H., 2014: Modeling Activity at RCEC: Development and Implementation of a Global-to-Urban Modeling Suite. International Conference of Geo-Process Modeling in VGE: Managing and Sharing Geographic Knowledge, The Chinese University of Hong Kong, Hong Kong, 6-8 November 2014. (keynote)
43. Hsu, H.-H., 2014: Topographic Influence on the MJO in the Maritime Continent: Diabatic Heating and Moisture. AOGS, Sapporo, Japan, July, 2014.
44. Hsu, H.-H., 2014: Simulated and Projected Interannual Variability in Seasonal Prediction and CMIP Models. AOGS, Sapporo, Japan, July, 2014.
45. Hsu, H.-H., 2014: Modeling Activity at RCEC: Development and Implementation of a Global-to-Urban Modeling Suite. The International Climate and Earth System Modeling Symposium-2014, Nanjing University of Information Science and Technology (NUIST), Nanjing, on April 26-27th 2014. (invited)
46. Hsu, H.-H., W.-L. Tseng, B.-J. Tsuang, N. Keenlyside, and C.-Y. Tu, 2013: Resolving Upper-Ocean Warm Layer Improves MJO Simulation. Asian Monsoon Years (2007-2012) Open Science Conference, 26-27 October 2013, Zhuhai, China. (invited)
47. Hsu, H.-H., Chi-Cherng Hong, Tao-Chi Chang and Ming-Ying Lee: Influence of the Tropical

Atlantic on the western north Pacific subtropical high. Tropical Weather and Climate Dynamics (TWCD) Workshop, 9-11 October, 2013. (invited)

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49. Hsu, H.-H., Chi-Cherng Hong, Tao-Chi Chang, and Ming-Ying Lee, 2013: Influence of the Tropical Atlantic on the Western North Pacific Subtropical High. 12th AMIP/ East Asian Climate (EAC) Workshop, 1-3 July, Busan, Korea.
50. Hsu, H.-H., C.-C. Hong, T.-C. Chang, M.-Y. Lee, T.-T. Lo and N.-H. Lin, 2013: Influence of the Atlantic on Climate Variability in the East Asian Pacific. 2013 Taiwan Geosciences Assembly, 15-17 May, Taiwan. (invited)
51. Hsu, H.-H., T.-C. Chang, C.-C. Hong, 2013: Influence of the Tropical Atlantic on the Western Pacific Subtropical High in the boreal summer. 2nd CCliCS Workshop on Climate System Modeling, 1-3 April, Taipei, Taiwan.
52. Hsu, H.-H., S. Paul, W.-K. Huang, P.-Y. Hung ,2013: Simulated Interannual variability of East Asian Monsoon in DEMETER, CMIP3 and CMIP5: Tropical vs. Extratropical. 4th WGNE workshop on systematic errors in weather and climate models, 15-19 April, Exeter, United Kingdom.
53. Hsu, H.-H., 2013: Climate Modeling Activities of the Consortium for Climate Change Study. Workshop on High Performance Computing in Meteorological Application, 29-30 January, Taipei, Taiwan. (invited)
54. Hsu, H.-H., 2013: Introduction of Climate Change Program for National Science Council of Taiwan. 2013 TCCIP International Conference on Climate Change, 15-16 January, Taipei, Taiwan. (invited)
55. Hsu, H.-H., M.-Y. Lee, and R.-J. Wu, 2012: AMO-like Interdecadal Variability in the CMIP5 - Are Models Oversensitive to Prescribed Forcing? NTU International Science Conference on Climate Change: Multidecadal and Beyond, September, 17-20, 2012. (invited)
56. Hsu, H.-H., 2012: Impact of vertical resolution on climate simulation using CESM. 1st Pan-Global Atmospheric System Studies (GASS) Conference: Advances in the Modeling of Atmospheric Physical Processes, 10-14 September, Boulder, Colorado, USA.
57. Tseng, W.-L., B.-J. Tsuang, N. Keenlyside, H.-H. Hsu, C.-Y. Tu, 2012: Ocean-atmosphere Interaction: Key Aspect of the Madden-Julian Oscillation. AOGS-AGU (WPGM) Joint Assembly, 13-17 August, Sentosa, Singapore.
58. Hsu, H.-H., and Y. Cheng, 2012: Extratropical stationary wave activity in a warming climate. WCRP Workshop on Coupled Model Intercomparison Project Phase 5 (CMIP5) Model Analysis, 5-9 March, Honolulu, Hawaii.
59. Hsu, H.-H., 2012: Impact of vertical resolution on climate simulation using CESM. 1st Pan-Global Atmospheric System Studies (GASS) Conference: Advances in the Modeling of Atmospheric Physical Processes, 10-14 September, Boulder, Colorado, USA. NSC98-2111-M-001-013-MY3
60. Tseng, W.-L., B.-J. Tsuang, N. Keenlyside, H.-H. Hsu, C.-Y. Tu, 2012: Ocean-atmosphere Interaction: Key Aspect of the Madden-Julian Oscillation. AOGS-AGU(WPGM)Joint Assembly, 13-17 August, Sentosa, Singapore. NSC98-2111-M-001-013-MY3.
61. Tseng, W.-L., Hsu, B. J. Tsuang, N. Keenlyside, H.-H. Hsu, and C. -Y. Tu, 2012: Ocean-atmosphere interaction key aspect of the Madden-Julian Oscillation. 30th Conference on Hurricanes and Tropical Meteorology, 15-20 April, Jacksonville, Florida.
62. Hsu, H.-H., and K. C. Ko, and C.H. Tsou, 2012: Multiscale Interaction in the Western North Pacific: Do Tropical Cyclones Contribute to Climate Variability? 30th Conference on Hurricanes and Tropical Meteorology, 15-20 April, Jacksonville, Florida
63. Hsu, H.-H., and K. C. Ko, 2012: Propagation and Maintenance Mechanism of the

TC/submonthly Wave Pattern and TC feedback in the Western North Pacific. 30th Conference on Hurricanes and Tropical Meteorology, 15-20 April, Jacksonville, Florida

64. Hsu, H.-H., 2011: ISO and Multiscale Interaction in the Tropical Western Pacific: A Challenge for Climate Model? CCliCS Kick-off Workshop on Climate System Modeling, 17-18 November 2011, Taipei, Taiwan.
65. Hsu, H.-H., 2011: Multiscale interaction in the Western North Pacific: Do tropical cyclones contribute to climate variability? 2011 WCRP OSC Climate Research in Service to Society, 24-28 October, Denver, Colorado, USA.
66. Hsu, H.-H., and Y.-L. Chen, 2011: Decadal to bi-decadal rainfall variation in the western Pacific: A footprint of South Pacific decadal variability? WCRP OSC Climate Research in Service to Society, 24-28 October, Denver, Colorado, USA.
67. Ko, K.-C., and H.-H. Hsu, 2011: Propagation and energetic studies of the TC/submonthly Wave Pattern and the TC feedback in the Western North Pacific. Asian Ocean Geophysical Studies (AOGS) Conference, 8-12 August, Taipei, Taiwan.
68. Ko, K.-C., and H.-H. Hsu, 2011: Vorticity and energetic studies of the TC/submonthly Wave Pattern and the TC feedback in the Western North Pacific.11th AMIP/ East Asian Climate (EAC) Conference, 6-7 August, Kaohsiung, Taiwan.
69. Hsu, H.-H., and Y.-L. Chen, 2011: Decadal to Bi-Decadal Rainfall Variation in the Western Pacific: A Footprint of South Pacific Decadal Variability? 11th AMIP/ East Asian Climate (EAC) Conference, 6-7 August, Kaohsiung, Taiwan.
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71. Hsu, H.-H., 2011: Propagation and Maintenance mechanism of the TC/submonthly wave pattern in the Western North Pacific and the Upscaling Feedback of TCs: A barotropic view. 2011 International Union of Geodesy and Geophysics (IUGG) General Assembly, 29 June -5 July, Melbourne, Australia.
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