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Chi-Hua Wu (吳奇樺)

Research Center for Environmental Changes (RCEC), Academia Sinica
No. 128, Sec. 2, Academia Rd., Nankang, Taipei, Taiwan 115
Office Tel: +886-2-2787-5934
Email: chhwu@gate.sinica.edu.tw
Lab website link: http://idv.sinica.edu.tw/chhwu

EDUCATION

2004/09 – 2010/06 Ph.D. Atmospheric Sciences, National Taiwan University, Taiwan
2001/09 – 2003/06 M.S. Atmospheric Sciences, National Taiwan University, Taiwan
1997/09 – 2001/06 B.S. Earth Sciences (minor: Mathematics), National Taiwan Normal University, Taiwan

EMPLOYMENT

2020/04 - present Associate Research Fellow RCEC, Academia Sinica, Taiwan
2015/01 - 2020/04 Assistant Research Fellow RCEC, Academia Sinica, Taiwan
2012/08 - 2015/01 Postdoctoral Researcher RCEC, Academia Sinica, Taiwan
2010/08 - 2012/07 Postdoctoral Researcher Department of Atmospheric Sciences, National Central University, Taiwan

HONORS & AWARDS

2019/8 – 2023/7 Project for Excellent Junior Research Investigators, MOST
2019/8 – 2020/7 Research Project Grants, MOST (institution applied)
2018/8 – 2019/7 Research Project Grants, MOST (institution applied)
2016/8 – 2017/7 Research Project Grants, MOST (institution applied)

PROFESSIONAL SERVICE

- Journal review: *Advances in Atmospheric Sciences, Atmospheric Science Letters, Asia-Pacific Journal of Atmospheric Sciences, Atmospheric Sciences (in Chinese), Climate Dynamics, Coastal Engineering Journal, Frontiers in Earth Science, Geophysical Research Letters, International Journal of Climatology, Journal of Climate, Journal of Geophysical Research – Atmospheres, Meteorological Applications, Nature Geoscience, Progress in Earth and Planetary Science, Scientific Online Letters on the Atmosphere, Scientific Reports, Terrestrial, Atmospheric and Oceanic Sciences*

RESEARCH INTEREST

My research lies in the field of monsoon, with a longstanding interest in the origin and process mechanisms of the East Asian seasonality. Investigating seasonal and regional mechanisms of the monsoons is the general goal of my research. How to conduct climate diagnostics, by combining

empirical data analysis and model simulation, and how to pinpoint the physical processes affecting climate variability and change are the central questions that drive most of my research activities. My research projects aim to understand the Afro–Asian monsoon evolution and change in Earth history. From basic to application levels of science, our previous and ongoing monsoon studies include topographic effects, synchronous (among regions) and asymmetric seasonality (regarding annual cycle), decadal changes, and paleomonsoon and orbital impact. We have been being provided insights into paleoclimate dynamics, climate change, and climate modeling with respect to monsoon behaviors, and raising concern about state-dependent noise in climate change studies.

RESEARCH HIGHLIGHTS

1. **The role of Indochina Peninsula topography in East Asian seasonality**

   Stage–wise precipitation over East Asia, primarily from spring to summer, is influenced by nearby monsoons and can be topographically driven. This study reviews the role of the Indochina Peninsula in modulating the seasonality of nearby monsoons, primarily based on previous modeling works [11, 16], and expands the analysis for a full view of the annual monsoon cycle [5]. We pointed to the role of the topographical processes of the Indochina Peninsula in driving the rapid monsoonal transitions, which correspond to the early summer vertical circulation coupling over the Bay of Bengal–Indochina Peninsula and the late–July WNP monsoon onset. Therefore, asymmetric characteristics of East Asian seasonality could be partly attributed to the existence of Indochina Peninsula.

2. **Seasonal perspective on the role of precession and obliquity in the early Holocene**

   On orbital timescales, higher summer insolation is thought to strengthen the continental monsoon while weakening the maritime monsoon in the northern hemisphere [13]. Presently, interior Asian continental heating drives the South and East Asian monsoons in late spring–early summer. The broad-scale monsoonal circulation further expands zonally in July–August, corresponding to the development of summer monsoons in West Africa and oceanic regions. Tropical and oceanic heating becomes crucial in late summer [4]. With this seasonal regard, our modeling results suggested that precession dominates the atmospheric heating change over the Tibetan Plateau–Himalayas and Maritime Continent, whereas obliquity is responsible for the heating change over the equatorial Indian Ocean. Thus, precession and obliquity can play contrasting roles in driving the monsoons on orbital timescales [6].

3. **Decadal climate changes**

   The present-day monsoon area may have expanded in timescales of short-term climate, and in some regions the result is comparable with paleoclimate records. It is instructive to understand how sensitive of the large-scale dry-wet patterns to climate variability and even macroclimate change. Whether decadal changes could be considered a changing climatology may be a further challenge. In the 1990s, observations have confirmed a changing dynamical control of the Asian summer monsoon, with a novel insight into a growing midlatitude influence on the early Asian

summer monsoon; with this regard, the continental thermal control as thought a dominant driver of summer monsoon can be comparable [2].

4. **Coordinated evolution of the Holocene Afro–Asian summer monsoons**

   The asynchronous Holocene evolution of Afro–Asian summer monsoons provides valuable insight into climate dynamics and changes. Although still a matter of debate, monsoons changed somewhat abruptly in the mid-Holocene. By investigating data–model synthesis, with the major focus on the differential seasonal responses of solar insolation and monsoons to orbital changes, we observed coordinated and stepwise seasonal evolution of summer monsoons across the mid-Holocene. Prior to the mid-Holocene, insolation had decreased considerably during the early summer; the continental monsoons migrated southeastward, which corresponded to a more pronounced rainy season in coastal East Asia. By contrast, late-summer insolation did not decrease until the mid-Holocene. The continued weakening of the continental monsoons, combined with weakened insolation, accelerated a large-scale migration of monsoons.

REPRESENTATIVE PUBLICATIONS (* corresponding author, _representative)

1. **Wu, C. H.***, and P. C. Tsai, 2020: Obliquity-driven changes in East Asian seasonality. *Global and Planetary Change*, 189, 103161. https://doi.org/10.1016/j.gloplacha.2020.103161
2. **Wu, C. H.***, P. C. Tsai, and N. Freychet, 2020: Changing dynamical control of early Asian summer monsoon in the mid-1990s. *Climate Dynamics*, 54(1), 85-98. doi:10.1007/s00382-019-04989-6
3. **Wu, C. H.***, I. C. Tsai, P. C. Tsai, and Y. S. Tung, 2019: Large-scale seasonal control of air quality in Taiwan. *Atmospheric Environment*, 214, 116868. https://doi.org/10.1016/j.atmosenv.2019.116868
4. **Wu, C. H.***, S. Y. Wang, and H. H. Hsu, 2018: Large-scale control of the Arabian Sea monsoon inversion in August. *Climate Dynamics*, 51(7), 2581-2592. DOI: 10.1007/s00382-017-4029-7
5. **Wu, C. H.***, W. R. Huang, and S. Y. Wang, 2018: Role of Indochina Peninsula topography in precipitation seasonality over East Asia. Atmosphere, 9(7): 255. doi: 10.3390/atmos9070255 (Special Issue Monsoons)
6. **Wu, C. H.***, S. Y. Lee, and J. C. H. Chiang, 2018: Relative influence of precession and obliquity in the early Holocene: topographic modulation of subtropical seasonality during the Asian summer monsoon. Quaternary Science Reviews, 191, 238-255. https://doi.org/10.1016/j.quascirev.2018.05.021
7. **Wu, C. H.***, M. D. Chou, and Y. H. Fong, 2018: Impact of the Himalayas on the Meiyu-Baiu migration. Climate Dynamics, 50(3), 1307-1319. DOI: 10.1007/s00382-017-3686-x
8. **Wu, C. H.***, 2017: Thermodynamic and dynamic influences in the Far East-Okhotsk region on stagnant Meiyu-Baiu. J. Geophys. Res. Atmos., 122, 7276–7288. doi:10.1002/2017JD026558

9. **Wu, C. H.***, N. Freychet, C. A. Chen, and H. H. Hsu, 2017: East Asian presummer precipitation in the CMIP5 models at high versus low horizontal resolution. International Journal of Climatology, 37(11), 4158-4170. DOI: 10.1002/joc.5055
10. Freychet N.*, A. Duchez, **C. H. Wu**, C. A. Chen, H. H. Hsu, J. Hirschi, A. Forryan, B. Sinha, A. L. New, T. Graham, M. B. Andrews, C. Y. Tu, and S. J. Lin, 2017: Variability of hydrological extreme events in East Asia and their dynamical control: a comparison between observations and two high-resolution global climate models. *Climate Dynamics*, 48(3), 745-766. DOI:10.1007/s00382-016-3108-5
11. **Wu, C. H.***, and H. H. Hsu, 2016: Role of the Indochina Peninsula narrow mountains in modulating the East Asia-Western North Pacific summer monsoon. J. Climate, 29, 4445-4459. http://dx.doi.org/10.1175/JCLI-D-15-0594.1
12. **Wu, C.-H.***, S.-Y. Lee, J. C. H. Chiang, and H.-H. Hsu, 2016: The influence of obliquity in the early Holocene Asian summer monsoon, Geophys. Res. Lett., 43, 4524–4530. doi:10.1002/2016GL068481
13. **Wu, C. H.***, J. C. H. Chiang, H. H. Hsu, and S. Y. Lee, 2016: Orbital control of the western North Pacific summer monsoon. *Climate Dynamics*, 46(3), 897-911. DOI:10.1007/s00382-015-2620-3
14. Chiang, J. C. H.*, I. Y. Fung, **C. H. Wu**, Y. J. Cai, J. P. Edman, Y. W. Liu, J. A. Day, T. Bhattacharya, Y. Mondal, and C. A. Labrousse, 2015: Role of seasonal transitions and westerly jets in East Asian paleoclimate. *Quaternary Science Reviews*, 108, 111-129. doi:10.1016/j.quascirev.2014.11.009
15. Freychet, N.*, H. H. Hsu, C. Chou, and **C. H. Wu**, 2015: Asian summer monsoon in CMIP5 projections: A link between the change in extreme precipitation and monsoon dynamics. J. Climate, 28, 1477-1493. doi: http://dx.doi.org/10.1175/JCLI-D-14-00449.1
16. **Wu, C. H.***, H. H. Hsu, and M. D. Chou, 2014: Effect of the Arakan Mountains in the northwestern Indochina Peninsula on the late May Asian Monsoon transition. J. Geophys. Res. Atmos. 119, 10769-10779. DOI: 10.1002/2014JD022024
17. **Wu, C. H.***, and M. D. Chou, 2013: Tibetan Plateau westerly forcing on the cloud amount over Sichuan Basin and the Early Asian summer monsoon. J. Geophys. Res. Atmos., 118, 7558-7568. DOI: 10.1002/jgrd.50580
18. **Wu, C. H.***, and M. D. Chou, 2012: Upper-tropospheric forcing on late-July monsoon transition in East Asia and Western North Pacific. J. Climate, 25, 3929-3941. doi: http://dx.doi.org/10.1175/JCLI-D-11-00343.1
19. Chou, M. D.*, **C. H. Wu**, and W. S. Kau, 2011: Large-scale control of summer precipitation in Taiwan. J. Climate, 24, 5081-5093. doi: http://dx.doi.org/10.1175/2011JCLI4057.1

20. **Wu, C. H.**, W. S. Kau*, and M. D. Chou, 2009: Summer monsoon onset in the subtropical western North Pacific. Geophys. Res. Lett., 36, L18810, doi:10.1029/2009GL040168.

RECENT SYMPOSIUM PAPER, CONFERENCE PROCEEDING, & INVITED TALK

1. **Wu, C. H.**, H. H. Hsu, N. Freychet, C. Y. Tu, S. J. Lin, and P. G. Chiu, 2015: Asian monsoon simulation in GFDL High Resolution Atmospheric Model (HiRAM). High-resolution Climate Simulation, Projection, and Application, 19–21 January, Taipei, Taiwan.
2. **Wu, C. H.**, and H. H. Hsu, 2015: Role of the Indochina Peninsula narrow mountains in modulating the subseasons of East Asia-Western North Pacific summer monsoon. Asia Oceania Geosciences Society (AOGS), 2–7 August, Suntec, Singapore.
3. **Wu, C. H.**, H. H. Hsu, N. Freychet, C. Y. Tu, S. J. Lin, and P. G. Chiu, 2015: Future changes in space-time characteristics of Asian monsoon region: role of horizontal resolution and topography. Asia Oceania Geosciences Society (AOGS), 2–7 August, Suntec, Singapore.
4. **Wu, C. H.**, 2015: Role of topography in modulating Asian monsoon. National Taiwan Normal University, Department of Earth Sciences, 1 December, Taipei, Taiwan.
5. **Wu, C. H.**, 2016: Role of topography in modulating the Asian summer monsoon seasonality. Taiwan Geosciences Assembly (TGA), 16–20 May, Taipei, Taiwan.
6. **Wu, C. H.**, 2016: A geographical and astronomical perspective on the Meiyu-Baiu migration. The Consortium for Climate Change Study (CCliCS) workshop on climate system modeling, 25-27 October, Taipei, Taiwan.
7. **Wu, C. H.**, Simon, S. Y. Wang, H. H. Hsu, and P. C. Hsu, 2016: Large-scale control of the Arabian Sea summer monsoon inversion and low clouds: A new perspective. American Geophysical Union (AGU) fall meeting, 12–16 December, San Francisco, CA, US.
8. **Wu, C. H.**, 2017: Thermodynamic and dynamic influences in the Far East-Okhotsk region on Meiyu-Baiu evolution. Asia Oceania Geosciences Society (AOGS), 6–11 August, Suntec, Singapore.
9. **Wu, C. H.**, P. C. Tsai, and N. Freychet, 2019: Growing Midlatitude Forcing on Early-summer South Asian High in the Mid-1990s. Asia Oceania Geosciences Society (AOGS), 28 July–2 August, Suntec, Singapore.
10. **Wu, C. H.**, 2019: Topographic effects on precipitation seasonality over East Asia. Institute of Hydrological and Oceanic Sciences, National Central University, 19 November, Taoyuan, Taiwan.
11. **Wu, C. H.**, M. D. Chou, and Y. H. Fong, 2019: Regulation of the Meiyu–Baiu migration by the Himalayas. American Geophysical Union (AGU) fall Meeting, 9–13 December, San Francisco, CA, US.
12. **Wu, C. H.**, 2020: Evolution and change in East Asian seasonality. Department of Atmospheric Sciences, National Central University, 5 March, Taoyuan, Taiwan.