BIOGRAPHICAL SKETCH

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NAME: Qinqin Kong

eRA COMMONS USER NAME (credential, e.g., agency login): qqkong

POSITION TITLE: Postdoctoral Scholar

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Peking University	BS	07/2012	Geography
University of the Chinese Academy of Science	PhD	07/2017	Physical Geography
Purdue University	PhD	08/2024	Atmospheric Science

A. Personal Statement

I am currently a Postdoctoral Scholar in the Departments of Medicine and Health Policy at Stanford University, after earning a PhD in atmospheric science from Purdue University. My research interests lie at the intersection of climate change—particularly extreme heat—and human society. I aim to advance our understanding of the physical mechanisms, cascading impacts, and the effectiveness of potential mitigation strategies for human heat stress. My PhD research focused on how land-atmosphere interactions modulate heat stress, as well as the economic and energy impacts of increasing heat stress in the context of climate change. My postdoctoral research at Stanford evaluates the impact of heat stress on public health, especially human fertility, in low- and middle-income countries. My methodological areas of expertise include climate modeling, human biophysics modeling, and econometric modeling, which I am further developing at Stanford.

Publications that represent my range of activities include:

a. **Kong, Q.** & Huber, M. (2023) Regimes of soil moisture-wet bulb temperature coupling with relevance to moist heat stress. *Journal of Climate* 1–45, https://doi.org/10.1175/JCLI-D-23-0132.1.
b. Vecellio, D., **Kong, Q.** (co-leading author), Kenney, L., & Huber, M. (2023) Greatly enhanced risk to humans as a consequence of empirically determined lower moist heat stress tolerance. *Proceedings of the National Academy of Sciences* 120, e2305427120, https://doi.org/10.1073/pnas.2305427120
c. Saeed, W., Haqiqi, I., **Kong, Q.**, Huber, M., Buzan, J. R., Chonabayashi, S., et al. (2022). The poverty impacts of labor heat stress in West Africa under a warming climate. *Earth's Future*, 10, e2022EF002777, https://doi.org/10.1029/2022EF002777.
d. **Kong, Q.**, & Huber, M. (2022). Explicit calculations of Wet Bulb Globe Temperature compared with approximations and why it matters for labor productivity. *Earth's Future*. https://doi.org/10.1029/2021EF002334
e. **Kong, Q.**, Guerreiro, S. B., Blenkinsop, S., Li, X.-F., & Fowler, H. J. (2020). Increases in summertime concurrent drought and heatwave in Eastern China. *Weather and Climate Extremes*, 28, 100242. https://doi.org/10.1016/j.wace.2019.100242.

B. Positions, Scientific Appointments, and Honors

Positions and Employment

2024- Postdoctoral Scholar, Stanford University

2017-2019 Assistant research scientist, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences

Honors and Awards

2023	NCAR ASP Summer Program NSF funded
2023	June L. and Tan (Mark) Sun Chen Research Scholarship
2022	NASA Future Investigators in Earth and Space Science Technology
2022	Henry Silver Graduate Scholarship
2017	National Scholarship for doctoral students in China
2016	Pacemaker to Merit Student of Chinese Academy of Science
2016	Scholarship by China Scholarship Council

C. Contributions to Science

Manuscripts selected from 14 peer-reviewed research publications

1. Better modeling and theoretical understanding of human heat stress

   Many metrics have been developed for measuring heat stress. The wet-bulb globe temperature (WBGT) has become the standard metric for heat regulation in occupational, military, and athletic settings due to its good representation of the physiological impacts of heat. WBGT incorporates the complex, nonlinear interactions between multiple environmental parameters, which, however, makes calculating this metric and understanding the physical mechanisms driving its changes challenging. To address these challenges, I developed a Python implementation for the most sophisticated WBGT model and used it as a benchmark to evaluate biases in commonly used ad-hoc approximations of WBGT. The Python implementation has been widely used by other researchers, improving estimates of heat stress and its associated impacts. Additionally, I developed a linear sensitivity framework that connects WBGT with more intuitively understandable variables in a straightforward and mathematically tractable way. This allows us to leverage existing theories and methodologies to better understand the physical drivers of WBGT changes.

   a. **Kong, Q.**, & Huber, M. (2022). Explicit calculations of Wet Bulb Globe Temperature compared with approximations and why it matters for labor productivity. *Earth's Future*. https://doi.org/10.1029/2021EF002334
   b. **Kong, Q.**, & Huber, M. (2024). A new, zero-iteration analytic implementation of wet-bulb globe temperature: Development, validation, and comparison with other methods. *GeoHealth*, 8, e2024GH001068. https://doi.org/10.1029/2024GH001068
   c. **Kong, Q.** & Huber, M. (2024) A linear sensitivity framework to understand the drivers of the wet-bulb globe temperature changes. Under review at *Journal of Geophysical Research: Atmospheres*.

2. Understanding the impact of soil moisture on human heat stress

   Irrigation and wetter soil have been widely considered effective in heat mitigation by facilitating evaporative cooling. However, heat stress depends jointly on temperature and humidity. Wetter soils reduce temperature but also raise humidity, making the collective impact on heat stress unclear. To better understand these interactions, we use ERA5 to examine the coupling between soil moisture and wet-bulb temperature (T_w, a commonly used measure of heat stress combining temperature and humidity). We identify a global soil moisture–T_w coupling pattern with both widespread negative and positive correlations depending on local evapotranspiration regimes (whether surface evapotranspiration is limited by solar radiation or soil moisture). Our findings suggest that the effectiveness of evaporative cooling strategies in heat mitigation may vary regionally depending on local hydroclimate.

   a. **Kong, Q.** & Huber, M. (2023) Regimes of soil moisture-wet bulb temperature coupling with relevance to moist heat stress. *Journal of Climate* 1–45, https://doi.org/10.1175/JCLI-D-23-0132.1.

3. Evaluating economic and energy impact of increasing heat stress.

   Increasing heat stress due to climate change is a major and growing threat to human health with wide-ranging social and economic impact. The assessment of such impact is essential for informing climate intervention policies and requires the integration of multiple disciplines. I have collaborated with economists at Purdue University to study the social welfare impact of heat-induced labor productivity loss by coupling the climate model with a global general equilibrium economic model. I also worked with energy system researchers at the University of Michigan to assess how rising temperatures compromise the reliability of global rooftop photovoltaic systems.

   a. Saeed, W., Haqiqi, I., **Kong, Q.**, Huber, M., Buzan, J. R., Chonabayashi, S., et al. (2022). The poverty impacts of labor heat stress in West Africa under a warming climate. *Earth's Future*, 10, e2022EF002777, https://doi.org/10.1029/2022EF002777.
   b. Wu, H., **Kong, Q.**, Huber, M., Sun, M. & Craig, M. (2024) Climate Change Will Increase High Temperature Risks, Degradation, and Costs of Rooftop Photovoltaics Globally. Under review at *Joule*

4. Future projection of heat stress.

   Robust future projections of heat stress are essential for refining impact assessments, informing climate policies, and enhancing preparedness. However, the reliability of such projections is compromised by the use of ad-hoc, biased approximations of heat stress metrics and systematic biases in climate model outputs. To address this issue, I developed a novel and effective statistical bias-correction approach that corrects climate model outputs against observational data. This approach is then used to generate a global, high-resolution dataset of future heat stress projections based on three commonly used heat stress metrics, calculated using the most accurate methods. We apply this dataset to investigate future population exposures to uncompensable heat stress under different warming targets.

   a. **Kong, Q**. & Huber, M. (2024) A global high-resolution and bias-corrected dataset of CMIP6 projected heat stress metrics. Under review at Scientific Data.
   b. Vecellio, D., **Kong, Q.** (co-leading author), Kenney, L., & Huber, M. (2023) Greatly enhanced risk to humans as a consequence of empirically determined lower moist heat stress tolerance. Proceedings of the National Academy of Sciences 120, e2305427120, https://doi.org/10.1073/pnas.2305427120

Complete List of Published Work:
https://scholar.google.com/citations?user=Z0GkE-UAAAAJ&hl=zh-CN