Duo Chan

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I use statistical methods and physical modeling to understand the dynamics of Earth's climate. My recent work involves using the physics of air-sea coupling to homogenize historical records of land and ocean surface temperatures. Other ongoing work involves (1) using the dynamics of ocean circulation to study ocean heat uptake throughout the past 20k years; (2) using machine-learning methods to perform data assimilation for early observations and paleo proxies.

EDUCATION

2015-21 Ph.D. in Earth and Planetary Sciences, Harvard University (Advisor: Peter Huybers)

2013-15 M.S. in Meteorology, Nanjing University, China

2009-13 B.S. in Applied Meteorology and Minor in Finance, Nanjing University, China

APPOINTMENTS

2021- Postdoctoral Scholar, Physical Oceanography Department, WHOI

AWARDS AND HONORS

2021 Weston Howland Jr. Postdoctoral **Fellowship**, WHOI

2021 High Meadows Environmental Institute **Fellowship**, Princeton (Declined)

2021 Outstanding Student Oral Presentation, 101st AMS

2020 Harvard Horizons **Fellow**

2019 Harvard GSAS professional development award

2015-16 William Benjamin and Jill Kowal Graduate Aid Fund in Environmental Studies

PROFESSIONAL SERVICE

Reviewer: *Nature Communications, Science Advances, PNAS, GRL, Journal of Climate, Earth's Future, Climate Dynamics, Earth and Space Science, Stochastic Environmental Research and Risk Assessment, 2021 NOAA Small Business Innovation Research Funding*

Presentation Judge: Ocean Science Meeting (2022), National Collegiate Research Conference (2022)

Organizer: Harvard ClimaTea seminar (2017)

Mentor or Advisor: Glenn Liu (2022-), Yifei-Fan (2021-), Chenggong Wang (2021-), Charlotte Henke (2021), National Collegiate Research Conference (2021), Sarah King (2020-2021), David Ma (Summer, 2020), Alexandria Berry (2018-19)

PUBLICATIONS

Peer-reviewed publication (* co-first author)

[16] Proctor J., Rigden A., **Chan D.**, & Huybers P. (2022). Soil moisture measurements improve prediction of crop yields and reduce projected climate change damages. Nature Food (In press).

[15] **Chan D.**, Rigden A., Proctor J., Chan P. H. & Huybers P. (2022). Differences in radiative forcing, not sensitivity, explain differences in summertime land temperature variance change between CMIP5 and CMIP6. *Earth's Future,* e2021EF002402.

[14] **Chan D.**, Vecchi G., Yang W. & Huybers P (2021). Improved simulation of 19th- and 20th-century North Atlantic hurricane frequency after correcting historical sea surface temperatures. *Science Advances*. 7(26), eabg6931.

[13] **Chan D.**, & Huybers P (2021). Correcting sea surface temperature observations removes World War II warm anomaly. *Journal of Climate*, 34(11), 4585-4602.

[12] **Chan D.** (2021). Combining statistical, physical, and historical evidence to improve historical sea surface temperature records. *Harvard Data Science Review*. 3(1), doi: 10.1162/99608f92.edcee38f

[11] Dai C., **Chan D*.**, Huybers P., & Pillai, N. (2021). Late 19th-century navigational uncertainties and their influence on sea surface temperature estimates. *Annals of Applied Statistics*, 15(1): 22-40.

[10] **Chan D.**, & Huybers P. (2020). Systematic differences in bucket sea surface temperatures caused by misclassification of engine room intake measurements. *Journal of Climate*. 33(18), 7735–7753

[9] **Chan D.**, Cobb A., Vargas L., Battisti D., & Huybers P. (2020). Summertime temperature variability increases with local warming in mid-latitude regions. *Geophysical Research Letters*, e2020GL087624.

[8] **Chan D.**, Zhang, Y., Wu Q., & Dai X. (2020). Quantifying the dynamics of the interannual variabilities of the wintertime East Asian Jet Core. *Climate Dynamics*, 54(3), 2447-2463.

[7] **Chan D.**, Kent E., Berry D. & Huybers P. (2019). Correcting datasets leads to more homogeneous early 20th century sea surface warming. *Nature*, 571, 393-397. (Selected media coverage: NPR)

[6] **Chan D.** & Huybers P. (2019). Systematic differences in bucket sea surface temperature measurements amongst nations identified using a linear-mixed-effect method. *Journal of Climate*, 32(5), 2569-2589.

[5] Hu, C., Wu, Q., Yang, S., Yao, Y., **Chan, D.**, Li, Z., & Deng, K. (2016). A linkage observed between austral autumn Antarctic Oscillation and preceding Southern Ocean SST anomalies. *Journal of Climate*, 29(6), 2109-2122.

[4] Wu, Q., Cheng, L., **Chan, D.**, Yao, Y., Hu, H., & Yao, Y. (2016). Suppressed mid-latitude summer atmospheric warming by Arctic sea ice loss during 1979–2012. *Geophysical Research Letters*, 43(6), 2792-2800.

[3] **Chan, D.**, Wu, Q., Jiang, G., & Dai, X. (2016). Projected shifts in Köppen climate zones over China and their temporal evolution in CMIP5 multi-model simulations. *Advances in Atmospheric Sciences*, 3(33), 283-293.

[2] **Chan, D.**, & Wu, Q. (2015). Significant anthropogenic-induced changes of climate classes since 1950. *Scientific Reports*. 5. 13487. (Selected media coverage: Yale Climate Connections)

[1] **Chan, D.**, & Wu, Q. (2015). Attributing observed SST trends and sub-continental land warming to anthropogenic forcing during 1979–2005. *Journal of Climate*, 28, 3152–3170.

Manuscripts under review or in prep. († student or mentee)

- **Chan D.**, Gebbie G., & Huybers P. Global and Regional Discrepancies between Early 20th Century Coastal Air and Sea-Surface Temperature Detected by a Coupled Energy-Balance Analysis. Under review at *JCLIM*.
- **Wang C. †**, **Chan D.**, Soden B., Yang W., & Vecchi G. Using interhemispheric temperature asymmetry to constrain climate sensitivity. Under review at *PNAS*.
- **Chan D.** Gebbie G., & Huybers P. Are we already at a 1.5C warming threshold: homogenized sea surface and land temperatures indicate between 1.2 to 1.5C warming from 1880 to 2022. In prep.
- **Fan Y. †, Chan D.**, Li L. Varying sensitivity between AMOC and subpolar North Atlantic SSTs. In prep.
- Rigden A., Proctor J., **Chan D.**, & Huybers P. Solar-induced fluorescence improves estimation of global crop productivity by identifying the critical growing season. In prep.

SEA-GOING EXPERRIENCE

2021 One Ocean Expedition, *Statsraad Lehmkuhl*: Miami-New York, Dec. 10-18

TEACHING EXPERIENCE

Teaching Assistant: Responsibilities included developing new class materials, preparing and giving lectures, leading class discussions, grading all assignments, and meeting with students individually. I have an average Harvard course evaluation score (Q-score) of 4.6 out of 5.0.

[5] **Paleoclimate as prologue** (Spring, 2021)	Harvard EPS, 4 undergrads (UGs) and 5 grads (Gs)
[4] **Weather, Water, and Climate** (Winter, 2019-20)	Perry School, ~10 7th grades (Public school outreach)
[3] **Climate change debate** (Spring, 2019)	Harvard college, 28 UGs
[2] **Paleoclimate as prologue** (Fall, 2016)	Harvard EPS, 3 UGs and 6 Gs
[1] **General Circulation of the Atmosphere** (Fall, 2014)	Nanjing University, ~5 UGs and ~30 Gs

CONFERENCES AND PRESENTATIONS

Invited Talks

- Are we already at a 1.5C warming threshold: homogenized sea surface and land temperatures indicate between 1.2 to 1.5C warming from 1880 to 2022 (*Southampton U*, 2022)
- Combining the physics of air-sea interaction and data-driven methods to improve historical estimates of earth surface temperatures (*WHOI GFD summer school*, 2022; *U Miami*, 2022)
- Combining statistical, physical, and historical methods to improve historical sea surface temperature data (Ocean Dynamics Seminar, 2022; *PSU*, 2022; *UC Irvine*, 2021; *University of Washington*, 2021; *WHOI*, 2021; *Nanjing University*, 2021; *U.K. National Oceanography Centre*, 2021; *Harvard Horizons*, 2021; *Princeton University*, 2020; *Yale University*, 2020)
- Applying statistical methods to climate reconstructions -- Late 19th-century navigational errors and their influence on sea surface temperatures (*Virtual Joint Statistical Meeting*, 2020)
- Correcting datasets leads to more homogeneous early-twentieth-century sea surface warming (*Fudan University*, 2019; *Nanjing University*, 2019)

Conference Talks

- Coastal air-sea coupling represented using a simple model & implications for historical warming. (OSM, 2022).
- Why the variance of continental summer temperature increases in some models but not others? (*AGU*, 2021)
- Improved simulation of 19th and 20th-century hurricane frequency after correcting historical SSTs (*AMS*, 2021)
- Correcting sea surface temperature observations removes World War II warm anomaly (*AGU*, 2020)
- Correcting datasets leads to more homogeneous early-twentieth-century sea surface warming (*International meeting on statistical climatology*, 2019; *CLIMAR5 Workshop on Advances in Marine Climatology*, 2019)
- Remote control of surface soil moisture on projections of summertime mid-latitude land temperature variability (*ACDC, 10-year reunion*, 2019; *EGU*, 2018)
- On the dynamics of the interannual variability of the East Asian jet (*15th AOGS Meeting*, 2018)

Posters

- Improved SSTs better predict multi-decadal variability of Atlantic TC count (*AGU*, 2019; *AMS*, 2020)
- Correcting datasets leads to more homogeneous early-twentieth-century sea surface warming (*AGU* 2018; *Frontiers in Oceanic, Atmospheric, and Cryospheric Boundary Layers*, KITP, 2018; *AGU* 2017)
- Are the diurnal cycles of sea surface temperature increasing since the 1970s? (*AGU*, 2016)

- Significant anthropogenic-induced changes of climate classes since 1950 (*AGU*, 2014)
- Attribution of observed SST and sub-continental land warming during 1979-2005 (*AGU*, 2013)
- The dynamics of the Inter-annual variability in the position and strength of the East Asian jet stream (*EGU*, 2013)

SUMMER SCHOOLS

2019 Ecole Polytechnique: Fluid Dynamics of Sustainability and the Environment
2017 University of Bergen: Advanced Climate Dynamics Courses
2017 Beijing University: Climate, Weather, Pollution & Health Consequences
2016 Chicago University: Rossbypalooza