






## Spencer Koncius Clark

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### Education

**Princeton University**, Princeton, NJ

*Ph.D., Atmospheric and Oceanic Sciences*

Sept. 2019

Advisor: Yi Ming

**Princeton University**, Princeton, NJ

*M.A., Atmospheric and Oceanic Sciences*

Sept. 2016

**Cornell University**, Ithaca, NY


*B.S., Engineering Physics; Honors in Research; magna cum laude*


May 2014


Thesis Advisor: Natalie Mahowald

### Publications


#### Refereed


Narinesingh, V., Booth, J. F., **Clark, S. K.**, Ming, Y. (2020). "Atmospheric blocking in an aquaplanet and the impact of orography." Accepted for *Weather and Climate Dynamics*, 1(2), 293–311. 

**Clark, S. K.**, Ming, Y., and Adames, Á. F. (2020). "Monsoon low pressure system like variability in an idealized moist model." *Journal of Climate*, 33(6), 2051–2074. 

Adames, Á. F., Kim, D., **Clark, S. K.**, Ming, Y., and Inoue, K. (2019). "Scale analysis of moist thermodynamics in a simple model and the relationship between moisture modes and gravity waves." *Journal of the Atmospheric Sciences*, 79, 3863–3881. 

**Clark, S. K.**, Ming, Y., Held, I. M., and Philipps, P. J. (2018). "The Role of the Water Vapor Feedback in the ITCZ Response to Hemispherically Asymmetric Forcings." *Journal of Climate*, 31(9), 3659–3678. 

**Clark, S. K.**, Ward, D. S., and Mahowald, N. M. "Parameterization-based uncertainty in future lightning flash density." *Geophysical Research Letters*, 44(6), (2017), 2893–2901. 

**Clark, S. K.**, Ward, D. S., and Mahowald, N. M. "The sensitivity of global climate to the episodicity of fire aerosol emissions." *Journal of Geophysical Research: Atmospheres*, 120(22) (2015), 11589–11607. 

#### Ph.D. Thesis

**Clark, S. K.** "Controls on tropical mean state and intraseasonal precipitation variability in an idealized moist atmospheric model." Ph.D. Thesis. Program in Atmospheric and Oceanic Sciences, Princeton University (2019).

### Research Experience

**Vulcan Inc.**, Princeton, NJ

*Software Engineer for Climate Model Development*

Aug. 2019 - Present

**Princeton University, Program in Atmospheric and Oceanic Sciences**, Princeton, NJ

*Research Assistant*

Sept. 2014 - Aug. 2019

- Characterized the role of water vapor in the ITCZ response to hemispherically asymmetric perturbations.
- Demonstrated that South Asian monsoon low pressure systems can be simulated in an idealized moist GCM, and that the storms exhibit some properties consistent with moisture vortex instability theory, as well as some properties that deviate from it.
- Studied the sensitivity of equatorial wave variability in an idealized moist GCM to various forms of heating perturbations.

**Cornell University, Department of Earth and Atmospheric Sciences**, Ithaca, NY

*Research Assistant*

Jan. 2011 - Mar. 2017

- Characterized the episodicity of forest and grass fires and developed 7 new prescribed emissions cases to test the impact of fire episodicity on fire's aerosol direct and indirect radiative forcings.

- Implemented 8 GCM lightning parameterizations in CAM5, compared their results to LIS/OTD observations, and studied their future projections.

## Teaching Experience

**Princeton University, Princeton Environmental Institute**, Princeton, NJ

Modeling the Earth System (ENV367)

Fall 2017

*Assistant in Instruction*

- Adapted an existing compact Earth System Model [↗](#) for use as a teaching tool. Wrote comprehensive web-based documentation for the model [↗](#).
- Authored lab exercises to help students learn about the features and limitations of the model, and illustrate Earth system modeling concepts.

**Cornell University, Department of Applied and Engineering Physics**, Ithaca, NY

Mathematical Physics II (AEP 4220)

Spring 2014

*Grader*

- Held weekly office hours, wrote official solutions, and graded homework and exam problems.

## Software Development

**xarray**, A widely-used Python library providing N-dimensional labeled array data structures [↗](#)

*Contributor and Core Developer*

Feb. 2017 - Present

- Led an effort to add first-class support of non-standard calendar types frequently used in climate science.
- Responsible for taking part in carefully reviewing new contributions, fixing bugs, adding requested features, and answering user/developer questions.

**aospy**, A Python library for climate model data analysis and management [↗](#)

*Contributor and Core Developer*

Sept. 2015 - Present

- Migrated the internals of the project to use xarray (then xray).
- Added support for parallelizing computations, abstracted data-loading procedures, and enabled variables to be computed recursively.

**cftime**, A Python library providing datetime instances for non-standard calendars [↗](#)

*Contributor*

Feb. 2018 - Present

- Enabled exact numerical decoding and encoding of datetimes.
- Suggested strategy that led to speeding up fundamental operations, e.g. datetime construction and timedelta arithmetic, by 200 to 400x.

Contributor to other libraries in the scientific Python community, including **dask-jobqueue** [↗](#), **nc-time-axis** [↗](#). Primary author of **faceted** [↗](#) and **xdiff** [↗](#).



## General Technical Skills

- Experienced in writing HPC-friendly Fortran code for use in atmospheric models, e.g. NCAR's CAM5 and GFDL's Flexible-Modeling-System-based idealized moist model.
- Practiced in collaborative software engineering workflows involving version control with git, unit testing, and code review.
- Familiar configuring continuous integration services for automated testing of software projects, e.g. with Travis CI or Jenkins.
- Expert in leveraging PyData ecosystem tools, e.g. xarray, NumPy, pandas, and matplotlib, to draw insights from data.
- Experienced in analyzing terabyte-scale datasets in a high-performance computing context. Regular user of tools for distributed computing, e.g. packages in the dask ecosystem, as well as tools for building data processing pipelines, e.g. snakemake.

## Selected Honors and Awards

Arnold Guyot Teaching Award, <i>Princeton University Department of Geosciences</i>	2018
NDSEG Fellowship, <i>American Society for Engineering Education</i>	2016-2019
Dorothy and Fred Chau Award (Excellence in Undergraduate Research), <i>Cornell AEP</i>	May 2014
Rawlings Cornell Presidential Research Scholar, <i>Cornell</i>	2010-2014

## Professional Experiences

Participant, <i>Columbia AOSPy Workshop, founding meeting of the Pangeo Data initiative</i> 	Nov. 2016
Organizer, <i>Princeton AOS Workshop on Tropical Dynamics</i>	2016
Participant, <i>Dynamical Core Model Intercomparison Project Workshop</i> 	June 2016

## Service

Assistant mentor to NOAA Hollings Scholar Bridgette Befort (2017).

## Reviewing

Peer-reviewed manuscripts for *Nature*, *Nature Climate Change*, *Journal of Geophysical Research – Atmospheres*, and GFDL internal manuscript review.

## Presentations

**Clark, S. K.**, Ming, Y., Adames, Á. F. “An idealized framework for simulating monsoon low pressure systems and their potential sensitivity to the mean state.” AGU Fall Meeting 2018, Washington D.C., December 2018. Poster Presentation.

**Clark, S. K.**, Ming, Y. “Investigating synoptic-scale monsoonal disturbances in an idealized moist model.” AGU Fall Meeting 2017, New Orleans, LA, December 2017. Poster Presentation.

**Clark, S. K.**, Ming, Y., Held, I. M., and Philipps, P. J. “The role of water vapor in the ITCZ response to hemispherically asymmetric forcings.” Dynamics seminar series, Princeton University, Princeton, NJ, November 2017. Oral Presentation.

**Clark, S. K.**, Ming, Y., and Held, I. M. “The role of water vapor in the ITCZ response to hemispherically asymmetric forcings.” AGU Fall Meeting, San Francisco, CA, December 2016. Poster Presentation.

Hill, S. A., **Clark, S. K.** “The other 'aospy': automated climate data analysis and management.” AOSPy Workshop at Columbia University, New York, NY, November 2016. Oral Presentation.

**Clark, S. K.**, Ming, Y., and Held, I. M. “The role of water vapor in the ITCZ response to hemispherically asymmetric forcings.” WCRP Model Hierarchies Workshop, Princeton, NJ, November 2016. Poster Presentation.

**Clark, S. K.**, Ming, Y., and Held, I. M. “The role of water vapor in the ITCZ response to hemispherically asymmetric forcings.” Dynamical Core Model Intercomparison Project, Boulder, CO, June 2016. Poster Presentation.

**Clark, S. K.**, Ming, Y., and Held, I. M. “Climate Impacts of Inter-hemispherically Asymmetric Radiative Forcing.” AGU Fall Meeting, San Francisco, CA, December 2015. Poster Presentation.

**Clark, S. K.**, Ming, Y., and Held, I. M. “Climate Impacts of Inter-hemispherically Asymmetric Radiative Forcing.” Gordon Research Conference, Lewiston, ME, July 2015. Poster Presentation.

**Clark, S. K.**, Ward, D. S., and Mahowald, N. M. “The implementation and evaluation of five lightning parameterizations in a global climate model.” Cornell Applied and Engineering Physics Honors Thesis Presentation, Ithaca, NY, May 2014.

**Clark, S. K.**, Ward, D. S., and Mahowald, N. M. “The sensitivity of global climate to the episodicity of fire

aerosol emissions." SESSA Spring Research Symposium, Ithaca, NY, May 2013. Poster Presentation.

**Clark, S. K.**, Ward, D. S., and Mahowald, N. M. "Climate Model Responses to Increased Episodicity in Prescribed Fire Aerosol Emissions." CESM Workshop, Breckenridge, CO, June 2012. Poster Presentation.

**Clark, S. K.**, Ward, D. S., and Mahowald, N. M. "Climate Model Responses to Increased Episodicity in Prescribed Fire Aerosol Emissions." SESSA Spring Research Symposium, Ithaca, NY, May 2012. Poster Presentation.

## Activities

Varsity Tennis, Cornell University

Sept. 2010 - May 2014