

Cristian Martinez-Villalobos

CONTACT INFORMATION

Universidad Adolfo Ibáñez
Faculty of Engineering and Science
Diagonal Las Torres 2640, Peñalolén
Región Metropolitana, Chile

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(h-index: 9)

RESEARCH INTERESTS

Precipitation statistics, extreme precipitation under global warming, tropical dynamics, air-sea coupling, El Niño Southern Oscillation, Coastal El Niño, inverse modeling, climate stochastic modeling, data-driven modeling, nonlinear processes, extratropical-tropical interactions, heat waves, global climate model evaluation, dry spells.

EMPLOYMENT

Universidad Adolfo Ibáñez, Faculty of Engineering and Science (Chile)

- Assistant Professor, Mar 2021-Current

Data Observatory Foundation (Chile)

- Researcher, Aug 2021-Current

Centro de Estudios Avanzados en Zonas Áridas (Chile)

Postdoctoral Researcher, Apr 2020-Feb 2021

- Mentor: Dr. Boris Dewitte. Co-mentor: Dr. René Garreaud

University of California, Los Angeles Dept. of Atmospheric and Oceanic Sciences (USA)

Postdoctoral Researcher, Nov 2016-Oct 2019

Staff Research Associate III, Dec 2019-Mar 2020

- Mentor: Dr. J. David Neelin

University of Wisconsin-Madison, Dept. of Atmospheric and Oceanic Sciences (USA)

Research Assistant, May 2011-Nov 2016

University of Wisconsin-Madison, Department of Physics (USA)

Teaching Assistant, August 2010-May 2011

Universidad Católica de Chile, Departamento de Física (Chile)

Teaching Assistant, August 2005-July 2009

EDUCATION

University of Wisconsin-Madison, Madison, Wisconsin 2010-2016

Ph.D., Atmospheric and Oceanic Sciences, May 2011-October 2016

- Dissertation Topic: “Deterministic and Stochastic Models of Tropical Climate Variability”
- Advisor: Dr. Daniel J. Vimont

Physics Graduate Student, August 2010-May 2011

Universidad Católica de Chile, Santiago, Chile 2003-2010

M.Sc., Physics, June 2010

- Dissertation Topic: “Uncertainties in the calculation of the tau lepton semi-hadronic decay, and a new perturbative expansion”
- Advisor: Dr. Marcelo Loewe, Co-advisor: Dr. Cristián Valenzuela

Licentiate, Physics, August 2007

- Dissertation Topic: “Thermal corrections to pion-pion scattering lengths in the linear sigma model”
- Advisor: Dr. Marcelo Loewe.

Licentiate Student, Astronomy, 2003-2006

PUBLICATIONS

Yangruixue Chen, Bo Liu, Yali Luo, Cristian Martinez-Villalobos, Guoyu Ren, Yong Sun, and Zhongshi Zhang: **The role of tropical cyclone in modulating moisture transport for precipitation over Henan province in North China: mean state and an extreme event.** In review.

Cristian Martinez-Villalobos, J. David Neelin, and Angeline G. Pendergrass, 2022: **Metrics for evaluating CMIP6 representation of daily precipitation probability distributions.** *J. Climate*, **35**, 5719-5743, 10.1175/JCLI-D-21-0617.1

L. Ruby Leung, William R. Boos, Jennifer L. Catto, Charlotte DeMott, Gill M. Martin, J. David Neelin, Travis A. O'Brien, Shaocheng Xie, Zhe Feng, Nicholas P. Klingaman, Yi-Hung Kuo, Robert W. Lee, Cristian Martinez-Villalobos, S. Vishnu, Matthew Priestley, Cheng Tao, and Yang Zhou, 2022: **Exploratory precipitation metrics: spatiotemporal characteristics, process-oriented, and phenomena-based.** *J. Climate*, **35**, 3659-3686, 10.1175/JCLI-D-21-0590.1

Sihan Zhang, Yangruixue Chen, Yali Luo, Bo Liu, Guoyu Ren, Tianjun Zhou, Cristian Martinez-Villalobos, and Meiyu Chang, 2022: **Revealing the circulation pattern most conducive to precipitation extremes in Henan Province of North China.** *Geophys. Res. Lett.* **49**, e2022GL098034, 10.1029/2022GL098034

Meiyu Chang, Bo Liu, Bin Wang, Cristian Martinez-Villalobos, Guoyu Ren and Tianjun Zhou, 2022: **Understanding future increases in precipitation extremes in global land monsoon regions.** *J. Climate*, **35**, 1839-1851, 10.1175/JCLI-D-21-0409.1

J. David Neelin, Cristian Martinez-Villalobos, Samuel N. Stechmann, Fiaz Ahmed, Gang Chen, Jesse M. Norris, Yi-Hung Kuo and Geert Lenderink, 2022: **Precipitation extremes and water vapor: Relationships in current climate and implications for climate change.** *Curr Clim Change Rep*, **8**, 17-33, <https://doi.org/10.1007/s40641-021-00177-z>

Cristian Martinez-Villalobos and J. David Neelin, 2021: **Climate models capture key features of extreme precipitation probabilities across regions.** *Environ. Res. Lett.*, **16**, 024017, 10.1088/1748-9326/abd351

Meiyu Chang, Bo Liu, Cristian Martinez-Villalobos, Guoyu Ren, Shangfeng Li and Tianjun Zhou, 2020: **Changes in extreme precipitation accumulations during the warm season over continental China.** *J. Climate*, **33**, 10799-10811, 10.1175/JCLI-D-20-0616.1

Cristian Martinez-Villalobos and J. David Neelin, 2019: **Why Do precipitation Intensities Tend to Follow Gamma Distributions?** *J. Atmos. Sci.*, **76**, 3611-3631, 10.1175/JAS-D-18-0343.1

Cristian Martinez-Villalobos, Matthew Newman, Daniel J. Vimont, Cécile Penland, and J. David Neelin, 2019: **Observed El Niño-La Niña Asymmetry in a Linear Model.** *Geophys. Res. Lett.*, **46**, 10.1029/2019GL082922

Erin E. Thomas, Daniel J. Vimont, Matthew Newman, Cécile Penland, and Cristian Martínez-Villalobos, 2018: **The Role of Stochastic Forcing in Generating ENSO Diversity.** *J. Climate*, **31**, 9125-9150, 10.1175/JCLI-D-17-0582.1

Cristian Martinez-Villalobos and J. David Neelin, 2018: **Shifts in Precipitation Accumulation Extremes during the Warm Season over the United States.** *Geophys. Res. Lett.*, **45**, 8586-8595, 10.1029/2018GL078465

Cristian Martinez-Villalobos, Daniel J. Vimont, Cécile Penland, Matthew Newman, and J. David Neelin, 2018: **Calculating State-Dependent Noise in a Linear Inverse Model Framework.** *J. Atmos. Sci.*, **75**, 479-496, 10.1175/JAS-D-17-0235.1

Cristian Martinez-Villalobos and Daniel J. Vimont, 2017: **An Analytical Framework for Understanding Tropical Meridional Modes.** *J. Climate*, **30**, 3303-3323, 10.1175/JCLI-D-16-0450.1

Cristian Martinez-Villalobos and Daniel J. Vimont, 2016: **The Role of the Mean State in Meridional Mode Structure and Growth.** *J. Climate*, **29**, 3907-3921, 10.1175/JCLI-D-15-0542.1

Goradz Cvetic, Marcelo Loewe, Cristian Martinez, and Cristián Valenzuela, 2010: **Modified contour-improved perturbation theory.** *Phys. Rev. D*, **82**(9), 093007. 10.1103/PhysRevD.82.093007

Marcelo Loewe and Cristian Martinez-Villalobos, 2008: **Thermal corrections to pi-pi scattering lengths in the linear sigma model.** *Phys. Rev. D*, **77**(10), 105006. 10.1103/PhysRevD.77.105006

AWARDS

Postdoctoral Fellowship Fondecyt 2020 (Apr 2020-Apr 2023). Grant #3200621: Dynamical Mechanisms of Coastal El Niño Events. Amount awarded: 81.334.000 Chilean Pesos (Total) (106,097 USD, Nov 30, 2020 exchange rate).
Fulbright-Conicyt Scholarship, 2010-2014. Funding PhD studies at the University of Wisconsin-Madison, Madison, WI, United States.

TEACHING EXPERIENCE

Universidad Adolfo Ibáñez, Facultad de Ingeniería y Ciencias (Mar 2021-present) (Assistant Professor)

Climate Change (undergraduate, 5th year), Climate Change (Diploma in Hydrology and Climate Change Impacts), Multivariable Calculus, Differential Equations

The Wisconsin Center for Academically Talented Youth. Accelerated Learning Program. (Jun-Jul 2014)

Physics of the Impossible

University of Wisconsin-Madison Department of Physics (Sep 2010-May 2011) (Teaching Assistant)

Physics 103: Introduction to physics at the non-calculus level

Physics 201: Calculus-based introduction to physics for engineering students

**Universidad Católica de Chile. Physics Department (Aug 2005-Jul 2009)
(Teaching Assistant)**

Statistical Mechanics, Quantum Physics I, Quantum Physics II, Electromagnetic Theory, Heat and Optics, Heat and Waves, Physics for Sciences, Electromagnetism, Contemporary Physics, Classical Mechanics Laboratory

**SELECTED
CONFERENCE
AND INVITED
TALKS**

Two types of Coastal El Niño events

Cristian Martinez-Villalobos, Boris Dewitte, René Garreaud, Leandra Loyola, Emilio Concha.

European Geosciences Union General Assembly 2022. Sesión: ENSO and Tropical Basins Interactions: Dynamics, Predictability and Modelling.

Vienna, Austria. **May 2022.**

13th International Conference on Southern Hemisphere Meteorology and Oceanography

Tropical Climate Variability: Dynamics, Teleconnections, and Impacts 3.

Christchurch, New Zealand (virtual meeting). **February 2022.**

Precipitation extremes probabilities: GCM evaluation, theory, and its implications under global warming

Séminaire CNRM

Centre National de Recherches Météorologiques (CNRM)

Toulouse, France. **May 2022.**

What sets the probability distribution of precipitation?

Cristian Martinez-Villalobos and J. David Neelin.

2018 American Geophysical Union Fall Meeting. Section: Nonlinear Geophysics. Session: Stochastic Modeling and Nonlinear Waves in Atmosphere, Ocean, Climate Dynamics, and Space Physics I. Washington D.C., United States. **December 2018.**

Stochastic Modeling in the Climate Sciences: Applications to modeling of precipitation distributions, and El Niño Southern Oscillation.

Colloquium Series, Department of Atmospheric and Oceanic Sciences.

University of Wisconsin-Madison.

Madison, Wisconsin, United States. **November 2018.**

Why do Precipitation Intensities Tend to Obey a Gamma Distribution?

Cristian Martinez-Villalobos and J. David Neelin.

2018 American Physical Society March Meeting. Session: Coalescence, Fragmentation, Mixing and Anomalous Diffusion.

Los Angeles, California, United States. **March 2018.**

Shifts in Precipitation Accumulation Distributions During the Warm Season over the United States.

Cristian Martinez-Villalobos and J. David Neelin.

2017 American Geophysical Union Fall Meeting. Section: Atmospheric Sciences. Session: Extreme Precipitation in Past, Present and Future Climates I. New Orleans, Louisiana, United States. **December 2017.**

An Analytical Framework for Understanding Tropical Meridional Modes.

Cristian Martinez-Villalobos and Daniel J. Vimont.

97th American Meteorological Society Meeting, 29th Conference on Climate Variability and Change. Seattle, Washington, United States. **January 2017.**

An analytical framework for understanding meridional mode dynamics.

Cristian Martinez-Villalobos and Daniel J. Vimont.

Meridional Mode Workshop.

Madison, Wisconsin, United States. **October 2016.**

An observational study of the South Pacific Meridional Mode.

Cristian Martinez-Villalobos and Daniel J. Vimont.

11th International Conference on Southern Hemisphere Meteorology and Oceanography. Santiago, Chile. **October 2015.**

How do Meridional Modes Structure and Growth Depend on Mean State

Asymmetry? Cristian Martinez-Villalobos and Daniel J. Vimont.

95th American Meteorological Society Meeting, 27th Conference on Climate Variability and Change. Phoenix, Arizona, United States. **January 2015.**

OTHER
PRESENTATIONS
(SELECTED)

* denotes presenter

The ENSO-induced South Pacific Meridional Mode

Boris Dewitte*, Emilio Concha, Diego Sepúlveda, Óscar Pizarro, Cristian Martinez-Villalobos, Marcel Ramos, and Aldo Montecinos.

European Geosciences Union General Assembly 2022. Session: ENSO and Tropical Basins Interactions: Dynamics, Predictability and Modelling.

Vienna, Austria. **May 2022.**

Changes in Extreme Precipitation Accumulations During the Warm Season Over Continental China.

Bo Liu*, Meiyu Chang, Cristian Martinez-Villalobos, Guoyu Ren, Shangfeng Li, Tianjun Zhou

Asia Oceania Geosciences Society 18th Annual Meeting. **August 2021.**

Metrics for Evaluating CMIP6 Simulation of Daily Precipitation Probability Distributions. (Poster)

Cristian Martinez-Villalobos*, J. David Neelin and Angeline G. Pendergrass

2020 American Geophysical Union Fall Meeting. **December 2020.**

Changes in probability of large precipitation events under global warming: Using theory to understand projections in the CMIP6 ensemble.

J. David Neelin* and Cristian Martinez-Villalobos

2020 American Geophysical Union Fall Meeting. **December 2020.**

ENSO Asymmetry in Amplitude and Duration in a Linear Model with State Dependent Noise.

Cristian Martinez-Villalobos, Daniel J. Vimont*, Matthew Newman, Cécile Penland and J. David Neelin.

100th American Meteorological Society Annual Meeting. Boston, Massachusetts, United States. **January 2020.**

Precipitation probability distributions in CMIP6 models: relationship to the thermodynamic environment and of daily to sub-daily timescales.

J. David Neelin*, Cristian Martinez-Villalobos, Yi-Hung Kuo, Fiaz Ahmed and Angeline G. Pendergrass.

2019 American Geophysical Union Fall Meeting. San Francisco, California, United States. **December 2019.**

Why daily precipitation intensities tend to follow Gamma distributions —theory and applications. (Poster)

Cristian Martinez-Villalobos*, J. David Neelin and Angeline G. Pendergrass

12th International Precipitation Conference. Irvine, California, United States. **June 2019.**

Controls on Deep-Convective Precipitation and the Dialogue with the Mesoscale

J. David Neelin*, Fiaz Ahmed, Kathleen A. Schiro, Yi-Hung Kuo and Cristian Martinez-Villalobos.

99th American Meteorological Society Meeting. Phoenix, Arizona, United States. **January 2019.**

The dialogue between fast-process diagnostics and stochastic process models for precipitation

J. David Neelin*, Yi-Hung Kuo, Fiaz Ahmed, Cristian Martinez-Villalobos, Xianan Jiang, Eric D. Maloney, Andrew Gettleman and Yi Ming.

2018 American Geophysical Union Fall Meeting. Washington D.C., United States. **December 2018.**

El Niño-La Niña Asymmetry in a Linear Inverse Model Framework. (Poster)

Cristian Martinez-Villalobos*, Matthew Newman, Cécile Penland, Daniel J. Vimont, and J. David Neelin.

IV International Conference on El Niño Southern Oscillation: ENSO in a Warmer Climate. Guayaquil, Ecuador. **October 2018.**

Stochastic Forcing Structures Conducive to Eastern and Central Pacific ENSO Characteristics.

Erin Thomas*, D.J. Vimont, M. Newman, and C. Martinez-Villalobos

97th American Meteorological Society Meeting. 29th Conference on Climate Variability and Change. Seattle, Washington, United States. **January 2017.**

How do Meridional Modes Structure and Growth Depend on Mean State Asymmetry? (Poster)

Cristian Martinez-Villalobos* and Daniel J. Vimont.

5th Annual AOSS Poster Reception. Department of Atmospheric and Oceanic Sciences. University of Wisconsin-Madison. April 2015.

95th American Meteorological Society Meeting. 14th Annual Student Conference. Phoenix, Arizona, United States, **January 2015.**

Thermal Corrections to pi-pi Scattering Lengths in the Linear Sigma Model.
Cristian Martinez-Villalobos* and Marcelo Loewe. Presenter: Cristian Martinez-Villalobos
XVI Chilean Symposium of Physics. Valparaíso, Chile. **November 2008.**

Thermal Corrections to pi-pi Scattering Lengths in the Linear Sigma Model. (Poster)
Cristian Martinez-Villalobos* and Marcelo Loewe.
VII Latin American Symposium on High Energy Physics. Bariloche, Argentina. **January 2009.**
Standard Model and Beyond in the LHC Era. Valparaíso, Chile. **January 2008.**

TRAVEL AWARDS

NASA JPL Center for Climatic Sciences Summer School. Aug 31-Sep 4, 2015. Keck Institute for Space Studies. Pasadena, California. Awarded by the organization.
Intensive Summer School for Computing in Environmental Sciences. May 27-Jun 12, 2015. University of Virginia. Charlottesville, Virginia. Awarded by the organization.
95th American Meteorological Society Meeting. Jan 3-Jan 8, 2015. Phoenix, Arizona. Awarded by the Atmospheric and Oceanic Sciences Department. University of Wisconsin-Madison.
31st Conference on Hurricanes and Tropical Meteorology. Mar 31-Apr 4, 2014. San Diego, California. American Meteorological Society Student Travel Grant.
Summer School on Mathematical Physics. Dec 7-Dec 11, 2009. Frutillar, Chile. Awarded by the organization.
5th Latin American School of High Energy Physics. Mar 15-Mar 28, 2009. Medellín, Colombia. Awarded by The European Organization for Nuclear Research (CERN).
58th Annual Lindau Nobel Laureate Meetings with Young Scientists. Jun 29-Jul 4, 2008. Lindau, Germany. Awarded by the Council for the Lindau Nobel Laureate Meetings.
Quantum Gravity in the Southern Cone IV. Punta del Este, Uruguay. Oct 22-Oct 25, 2006. Awarded by the Physics Department. Universidad Católica de Chile.

OTHER AWARDS

Winner of the Hivemind El Niño Prediction Market for October 2019 (£1000 prize).
Best Poster, 2018. Early Career Scientists Poster Competition. IV International Conference on El Niño Southern Oscillation.
Astronomy Department Tuition Scholarship (Matrícula de Honor), 2003. Universidad Católica de Chile. Given to the highest ranked applicant in the admission process to the Astronomy Major.

ADDITIONAL RESEARCH EXPERIENCES

Linear Inverse Modeling and Tropical Climate Stochastic Forcing. May 29-July 9, 2016. NOAA Physical Sciences Division. Boulder, Colorado. Hosts: Dr. Cécile Penland and Dr. Matthew Newman

PROFESSIONAL DEVELOPMENT

Diplomado en Aprendizaje y Enseñanza en Educación Superior (en curso)
Universidad Adolfo Ibáñez, Aug 2021-Dec 2022
Entrenamiento para el uso del DataCube
Universidad Adolfo Ibáñez, May 11-May 13, 2021
Extreme Science and Engineering Discovery Environment (XSEDE) Big Data Workshop
University of California, Los Angeles, April 2019
Intensive Summer School for Computing in Environmental Sciences. May 27-Jun 12, 2015. University of Virginia. Charlottesville, Virginia.

OPINION ARTICLES AND OUTREACH

September 16, 2022. Cristian Martinez-Villalobos. "Preservación de la capa de ozono: lecciones para enfrentar el cambio climático". Revista Qué Pasa shorturl.at/ehjuM. Reproducida en diversos medios regionales y digitales: Diario de Osorno, DiarioSostenible.cl, Diario Regional Aysén, Diario de Valdivia, DiarioDePuertoMontt, cienciaenchile.cl.

September 3, 2022. Charla de Divulgación sobre el Cambio Climático. Bar Truf. La Reina, Santiago, Chile.

June 8, 2022. Cristian Martinez-Villalobos. "Día Mundial de los Océanos: Chile, la quinta costa más larga del mundo". Reproducida en diversos medios regionales: [Revista Tour Innovación](#), El Líder (San Antonio), El Longino (Iquique), El Insular (Castro), [Diario Chiloé](#), [DiarioPalena.cl](#), [DiarioDePuertoMontt](#), [Diario Lago Ranco](#), [Diario de Valdivia](#), [Diario Río Bueno](#), [Portal Innova](#)

June 8, 2021. Cristian Martinez-Villalobos. "Día Mundial de los Océanos: Chile y su Riqueza Marina". Revista Qué Pasa <http://lt.cl/a7rj21>. El Mostrador [link](#)

LANGUAGES

Spanish. Native language.
English. Highly proficient.

MEMBERSHIPS

American Meteorological Society (**AMS**) Early Career Member.
American Geophysical Union (**AGU**) Early Career Member. Sections: i) Physics, Dynamics and Climate ii) Nonlinear Geophysics iii) Hydrology iv) Ocean Sciences v) Paleooceanography and Paleoclimatology.
European Geosciences Union (**EGU**) regular membership

SERVICE

Member of the Climate and Ocean – Variability, Predictability, and Change (CLIVAR) Pacific Region Panel (2022-2024). CLIVAR is a core project of the World Climate Research Programme <https://www.clivar.org/clivar-panels/pacific>

Reviewer for PNAS, Physical Review Letters, Environmental Research Letters(2), Journal of Climate(5), Geophysical Research Letters(4), Climate Dynamics(2), Journal of Hydrometeorology, Journal of Geophysical Research-Atmospheres(2), Monthly Weather Review, Chaos: An Interdisciplinary Journal of Nonlinear Science, Journal of Applied Meteorology and Climatology(2), Pure and Applied Geophysics, Physical Review Research.

Awards Judge Outstanding Student Paper, 2017 American Geophysical Union Fall Meeting.

Co-Chair ENSO Dynamics, Predictability, and Impacts Part II session, 29th Conference on Climate Variability and Change, 97th American Meteorological Society Meeting, 2017.