

# Cristian Martinez-Villalobos

## CONTACT INFORMATION

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

*E-mail:* cristian.martinez.v@uai.cl  
*Website:* cristianmartinezvillalobos.com  
*Google Scholar:* shorturl.at/AKORS  
(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

Boris Dewitte, Emilio Concha, Diego Sepúlveda, Óscar Pizarro, Cristian Martinez-Villalobos, Dacha Gushchina, Marcel Ramos, and Aldo Montecinos: **The ENSO-induced South Pacific Meridional Mode**. In review

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, 5<sup>th</sup> 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.**

13<sup>th</sup> 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.

97<sup>th</sup> American Meteorological Society Meeting. 29<sup>th</sup> 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.

11<sup>th</sup> 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.

95<sup>th</sup> American Meteorological Society Meeting. 27<sup>th</sup> 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 18<sup>th</sup> 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.

100<sup>th</sup> 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

12<sup>th</sup> 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.

99<sup>th</sup> 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

97<sup>th</sup> American Meteorological Society Meeting. 29<sup>th</sup> 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.

5<sup>th</sup> Annual AOSS Poster Reception. Department of Atmospheric and Oceanic Sciences. University of Wisconsin-Madison. April 2015.  
95<sup>th</sup> American Meteorological Society Meeting. 14<sup>th</sup> 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.  
**95<sup>th</sup> American Meteorological Society Meeting.** Jan 3-Jan 8, 2015. Phoenix, Arizona. Awarded by the Atmospheric and Oceanic Sciences Department. University of Wisconsin-Madison.  
**31<sup>st</sup> 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.  
**5<sup>th</sup> Latin American School of High Energy Physics.** Mar 15-Mar 28, 2009. Medellín, Colombia. Awarded by The European Organization for Nuclear Research (CERN).  
**58<sup>th</sup> 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 <https://tinyurl.com/aaw67wha>

Reproducida en diversos medios regionales y digitales: msn.com, 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.

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

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