

# Ju-Mee Ryoo, Ph.D

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<https://jmryoo.github.io/>

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## Education

### **Johns Hopkins University, USA**

Ph.D. in Earth and Planetary Sciences (advisor: Prof. Darryn W. Waugh)

M.A. in Earth and Planetary Sciences

### **Yonsei University, South Korea**

M.S. in Atmospheric Sciences

B.S. in Mathematics, Atmospheric Sciences (double major)

## Work experience

### **NASA Ames Research Center**

-Met Support team for ORACLES

PIs: Dr. Lennard Pfister, Dr. Rei Ueyama (Jan 2017 - present)

-Alpha Jet Atmospheric eXperiment (AJAX),

PI: Dr. Laura Iraci (Sept 2014-present)

### **San José State University**

- Teaching faculty (Dynamic meteorology, Fall semester 2018, part-time)

- Research Scientist (part-time)

PI: Prof. Sen Chiao (Jan 2017 - present)

**University of California, Berkeley**, PI: Prof. Inez Fung (2012-Aug 2014)

**California Institute of Technology, Jet Propulsion Laboratory**,

PIs: Dr. Duane Waliser and Dr. Eric Fetzer (Aug 2009 -2011)

## Research Interest

### • **Atmospheric dynamics and modeling in various scales**

- Understanding of the extreme weather (e.g. Atmospheric Rivers) events using models and data analysis, Synoptic Meteorology
- Climate variability, large-scale climate dynamics and hydrological cycle (e.g. ENSO)
- Source of atmospheric moisture and water vapor/trace gas transport mechanism
- The role of regional scale wind (e.g. Petaluma gap wind, CA) on the regional precipitation and air quality

### • **Atmospheric composition**

- Investigation of Transpacific ozone/aerosol transport using models and measurements
- Urban outflow of CO<sub>2</sub> and CH<sub>4</sub>, and its impact on the human health and air quality
- Influence of wild Fire on local regions of CA

## Research & Teaching experience

**Part-time Teaching faculty** San José State University (Fall 2018)

Teaching Meteorology major course (dynamic Meteorology)

**Research Assistant** Johns Hopkins University (2005-2009)

Working on NASA-NSF project (Advisor: Prof. Darryn W. Waugh)

**Research Assistant** Yonsei University (2001- 2003)

National Research Laboratory of Mesoscale Dynamics (Advisor: Prof. Hye-Yeong Chun)

**Teaching Assistant** Yonsei University (2001)

Teaching assistant on C+ computer language programming

### **Other Activities**

- Serve as a mentor for Center for Applied Atmospheric Research and Education (CAARE) summer internship program at NASA Ames led by Prof. Sen Chiao at SJSU (2016-2017: informally served as a secondary mentor (for Dr. Laura Iraci's interns), 2017-2018: serve as a primary mentor).
- Volunteering as a graduate student for West Baltimore Elementary School Science subject (Kids Grow) tutoring, Baltimore, MD (2006-2007)
- Participating in the *Intense Rain Observation Program during Jang-ma* (hurricane in Asia) held in Haenam and Heuksando: Performing Direct Rawinsonde Observation (e.g. wind, temperature, etc.) with other researchers from Meteorological Research Institute, Heuksando, South Korea (July 2002)

## Awards & Honors

**NASA Ames Contractor Council, Certificate of Excellence award as a ORACLES participant** (2017)

**Best poster award** at the Chapman conference (titled as 'Atmospheric water vapor and its role on the climate') in convection session (2008)

**NASA-NSF Research Project** (2005-2009)

**Johns Hopkins University, Gillman Fellowship** (2004-2005)

**BK 21(Brain Korea 21 Century) Scholarship** (2002)

**Honor student Scholarship** provided by the Astronomy and Atmospheric Sciences Alumni Association (1999-2000)

## Published & on-going Journal Publications

**Ryoo, J.-M.**, S. Chiao, J. R. Spackman, L. T. Iraci, R. B. Pierce, F. M. Ralph, J. E. Marrero, E. L. Yates, W. Gore, A. Martin, R. M. Dole, **2018**: The Impact of a Coastal Barrier Jet on Precipitation in Northern California during Atmospheric Rivers: A Case Study using Measurements and Models, *prepared for review in J. Hydrometeorology*.

Langford, A.O., R. J. Alvarez II. G/ Kirgis, C.J. Senff, D. Caputi, S.A. Conley, I. C. Faloona, L. T. Iraci, J.E. Marrero, M. E. McNamara, **J.-M. Ryoo**, and E.L. Yates, **2018**: Lidar and aircraft profiling of ozone above the central San Joaquin Valley during the California Baseline Ozone Transport Study (CABOTS), *in review at Atmos. Meas. Tech.*

**Ryoo, J.-M.**, L. T. Iraci, T. Tanaka, J. E. Marrero, E. L. Yates, I. Fung, Anna M. Michalak, Jovan Tadić, and W. Gore, T. Paul Bui, J. M. Dean-Day, C. S. Chang **2018**: Quantification of CO<sub>2</sub> and CH<sub>4</sub> emissions

over Sacramento, California based on divergence theorem using aircraft measurement. *In review at Atmos. Meas. Tech.* (published in *Atmos. Meas. Tech. Discuss.*, <https://doi.org/10.5194/amt-2018-254>)

Ira Leifer, C. Melton, M. L. Fischer, M. Fladeland, J. Frash, W. Gore, L. T. Iraci, J. E. Marrero, **J.-M. Ryoo**, T. Tanaka, and E. L. Yates: Atmospheric characterization through fused mobile airborne and surface in situ surveys: methane emissions quantification from a producing oil field. *Atmos. Meas. Tech.*, 11, 1-17, **2018**, <https://doi.org/10.5194/amt-11-1-2018>.

**Ryoo, J.-M.**, I. Fung, J. R. Ehleringer, B. B Stephens, **2018**: Holliday CO<sub>2</sub>: Inference from the Salt Lake City data, in preparation.

Yates, E. L., M. S. Johnson, L. T. Iraci, **J.-M. Ryoo**, B. J. Johnson, M. A. Ives, T. LeBlanc, M. S. Gustin, T. Tanaka, W. Gore, **2017**: Western US tropospheric ozone: An assessment of vertical, seasonal and spatial variations over California and Nevada, *J. of Geophys. Res.: Atmos.*, 122. <https://doi.org/10.1002/2016JD026266>

Tadić, J., A. Michalak, L. Iraci, V. Ilić, S., Biraud, D. Feldman, B. Thaopaul, M. S. Johnson, M. Loewensterin, S. Jeong, M. Fischer, E. Yates, **J.-M. Ryoo**, **2017**: Elliptic cylinder airborne sampling and geostatistical mass balance approach for quantifying local greenhouse gas emissions, *Environ. Sci. Tech.*, 51 (17), 10012-10021, DOI: 10.1021/acs.est.7b03100

**Ryoo, J.-M.**, M. S. Johnson, E. L. Yates, L. T. Iraci, R. B. Pierce, T. Tanaka, W. Gore, **2017**: Investigating sources of ozone over California using AJAX airborne measurements and models: assessing the long-range transport, *Atmos. Environ.*, **155**, 53-67, <http://dx.doi.org/10.1016/j.atmosenv.2017.02.008>

**Ryoo, J.-M.**, D. E. Waliser, D. W. Waugh, S. Wong, E. J. Fetzer, I. Fung, **2015**: Classification of atmospheric river events on the U.S. west coast using a trajectory model., *J. Geophys. Res. Atmos.*, **120**, doi:10.1002/2014JD022023.

**Ryoo, J.-M.**, Y. Kaspi, D. W. Waugh, G. N. Kiladis, D. E. Waliser, E. J. Fetzer, J. Kim, **2013**: Impact of Rossby Wave Breaking on U.S. West Coast Winter Precipitation during ENSO Events. *J. Climate*, **26**, 6360–6382, doi: <http://dx.doi.org/10.1175/JCLI-D-12-00297.1>

Kim, J., D. E. Waliser, P. J. Neiman, B. Guan, **J.-M. Ryoo**, and G. A. Wick, **2013**: Effects of atmospheric river landfalls on the cold season precipitation in California. *Clim. Dyn.*, **40**, 465–474, doi:10.1007/s00382-012-1322-3.

**Ryoo, J.-M.**, D. E. Waliser, and E. J. Fetzer, S. Wong, **2011**: Trajectory analysis on the origin of air mass and moisture associated with Atmospheric Rivers over the west coast of the United States, *Atmos. Chem. Phys. Discuss.*, 11, 11109–11142, doi:10.5194/acpd-11-11109-2011

**Ryoo, J.-M.**, **2009**: Control of tropical tropospheric humidity and transport: Measurement, theory, and Trajectory Model, *Ph.D. thesis*.

**Ryoo, J.-M.**, T. Igusa, and D. W. Waugh, **2009**: PDFs of Tropical Tropospheric Humidity:

Measurements and Theory, *J. Climate*, 22, 3357-3373.

**Ryoo, J.-M.**, D. W. Waugh, and A. Gettelman, **2008**: Variability of subtropical upper tropospheric humidity, *Atmos. Chem. Phys.*, 8, 1041-1067.

H.-Y. Chun, and **J.-M. Ryoo**, **2005**: A Case Study of Dynamical Linkage Between the Troposphere and Stratosphere Associated with Stratospheric Major Sudden Warmings in 1979 and 1984, *Journal of Korean Meteorological Society*, **41**, 3, 415-430.

**Ryoo, J.-M.** and H.-Y. Chun, **2005**: Stratospheric Major Sudden Warmings Revealed in NCEP Reanalysis Data for 41 years (1958-1999), *J. Korean. Meteorol. Soc.*, 41, 2, 173-190.

## Selected Conference Proceedings

**Ryoo, J.-M.**, L. T. Iraci, J. E. Marrero, E. L. Yates, W. J. Gore, C. L. Parworth, Variability of Ozone over California during CABOTS 2016: Assessing the Role of Long-Range Transport and Local Emission using Airborne Measurements and Models, accepted to AMS January 2019.

**Ryoo, J.-M.**, S. Chiao, J. R. Spackman, L. T. Iraci, R. B. Pierce, F. M. Ralph, E. L. Yates, J. E. Marrero, W. Gore, A. Martin, R. M. Dole, 2017: The impact of Coastal Barrier Jet on Precipitation in Northern California during Atmospheric Rivers: A Case Study using measurements and models. Meteorology and Climate – Modelling for Air Quality (MAC-MAQ), Sept. 13-15th, 2017, U.C. Davis, CA.

**Ryoo, J.-M.**, L. T. Iraci, T. Tanaka, J. E. Marrero, E. L. Yates, W. Gore, I. Fung, 2016: New Approach to characterize CO<sub>2</sub> and CH<sub>4</sub> emission over Sacramento in California using an airborne aircraft measurement, the American Geological Union fall meeting, A14A-06, oral presentation, December 12-16, 2016, San Francisco, CA.

**Ryoo, J.-M.**, L. T. Iraci, W. J. Gore, E. L. Yates, J. E. Marrero, J. R. Spackman, R. M. Dole, F. M. Ralph, 2016: Capturing Atmospheric Rivers: Alpha Jet Atmospheric eXperiment (AJAX) Flights in support of CalWater/El Nino Rapid Response 2016, International Atmospheric River Conference (IARC), oral presentation, Aug. 8-11, 2016, Scripps Institution of Oceanography, La Jolla, CA.

**Ryoo, J.-M.**, D. E. Waliser, D. W. Waugh, S. Wong, E. J. Fetzer, I. Fung, 2016: Classification of atmospheric river events on the U.S. West Coast using a trajectory model, International Atmospheric River Conference (IARC), poster presentation, Aug. 8-11, 2016, Scripps Institution of Oceanography, La Jolla, CA

**Ryoo, J.-M.**, M. S. Johnson, L. T. Iraci, E. L. Yates, R. B. Pierce, T. Tanaka, W. Gore, 2015: Investigating ozone sources in California using AJAX airborne measurements and models: implications for stratospheric intrusion and long range transport, the American Geological Union fall meeting, A51B-0026, December 14-18, San Francisco, CA.

**Ryoo, J.-M.**, M. S. Johnson, L. T. Iraci, E. L. Yates, R. B. Pierce, T. Tanaka, W. Gore, 2015: Investigating ozone sources in California using AJAX airborne measurements and models: implications

for stratospheric intrusion and long range transport, Transboundary Ozone Pollution Conference, March 31-April 2, Yosemite, CA

**Ryoo, J.-M.**, D. E. Waliser, D. W. Waugh, S. Wong, E. J. Fetzer, I. Fung, 2014: Classification of atmospheric river events on the U.S. west coast using a trajectory model., the American Geological Union, fall meeting, San Francisco, CA.

**Ryoo, J.-M.**, I. Fung, J. R. Ehleringer, B. B Stephens, 2013: Holliday CO<sub>2</sub>: Inference from the Salt Lake City data, the American Geological Union, fall meeting, San Francisco, CA.

Kim, J., B. Guan, **J.-M. Ryoo**, D. Waliser, E. Fetzer, P. Neiman, G. Wick, and N. Molotch, 2012: Impacts of Atmospheric River landfalls on the cold season hydrology in California. 24th Conf. on Climate Variability and Change, 22-26 January 2012, New Orleans, Louisiana.

**Ryoo, J.-M.**, D. E. Waliser, and E. J. Fetzer, D. W. Waugh, G. N. Kiladis, Y. Kaspi, and J.-W. Kim, 2011: Impact of Rossby wave breakings on the precipitation over Pacific-North America during YOTC, *American Geophysical Union, fall meeting*, San Francisco, CA, December 5-9, 2011.

Kim, J., B. Guan, **J.-M. Ryoo**, D. Waliser, E. Fetzer, P. Neiman, G. Wick, and N. Molotch, 2011: Impacts of Atmospheric River landfalls on the cold season hydrology in California. C15-T85A, 2011 CLIVAR conference, 24-28 October 2011, Denver, CO.

**Ryoo, J.-M.**, D. E. Waliser, and E. J. Fetzer, J.-W. Kim, T. Schneider, G. N. Kiladis, 2011: Trajectory study of storm tracks and the midwinter precipitation characteristics over the west coast of the United States. *Atmospheric and Oceanic Fluid Dynamics*, Spokane, WA, June 13-17, 2011.

**Ryoo, J.-M.**, D. E. Waliser, E. J. Fetzer, T. Schneider, Y. Kaspi, D. W. Waugh, G. N. Kiladis, J.-W. Kim, 2011: Impact of Potential Vorticity intrusions on the Precipitation and Atmospheric Rivers over Pacific-North America during YOTC. *CalWater Science Workshop*, Scripps Institution of Oceanography, La Jolla, CA, June 8-10, 2011.

**Ryoo, J.-M.**, D. E. Waliser, E. J. Fetzer, T. Schneider, D. W. Waugh, Y. Kaspi, G. N. Kiladis, J.-W. Kim, 2011: A Lagrangian Trajectory Model of Atmospheric Rivers over Pacific – North America during YOTC. YOTC International Science Symposium, Beijing, China, May 16-19, 2011.

**Ryoo, J.-M.**, J.-W. Kim, E. J. Fetzer, D. E. Waliser, 2010: A study of storm tracks and the cold season precipitation characteristics in California using trajectory model. *American Geophysical Union, fall meeting*, San Francisco, CA, December, 2010.

Kim, Jinwon, D.E. Waliser, B. Guan, N.P. Molotch, **J.-M. Ryoo**, E. Fetzer, and P.J. Neiman, 2010: The impact of atmospheric rivers on the cold season hydrology in California. December 13-17, San Francisco, CA. 2010 Fall meeting, Suppl., Abstract A51F-03.

**Ryoo, J.-M.**, D. E. Waliser, E. J. Fetzer, 2010: Trajectory study on the origin of moisture associated with Atmospheric Rivers events in the west coast of United States. *Invited talk to NOAA*, Boulder, CO, November, 2010.

**Ryoo, J.-M.**, D. E. Waliser, E. J. Fetzer, 2010: Trajectory study on the cold season precipitation characteristics in west coast of United States. *Climate Diagnostic and Prediction Workshop*, North Carolina, October, 2010.

**Ryoo, J.-M.**, J.-W. Kim, E. Fetzer, D. E. Waliser, 2010: *CalWater workshop*, San Diego, CA, October, 2010.

**Ryoo, J.-M.**, D.W. Waugh, and T. Igusa, 2008: Comparison of tropospheric humidity from AIRS, MLS, and statistical and trajectory models, *a Joint NASA/NOAA Atmospheric Sounding Science Team Meeting* with focus on the AIRS/CrIMSS/IASI instruments, Greenbelt, MD, 14-17 October, 2008.

**Ryoo, J.-M.**, T. Igusa, and D.W. Waugh, 2008: PDFs of Tropical Tropospheric Humidity with Generalized Statistical Model, *AGU Chapman Conference on Atmospheric Water Vapor and Its Role in Climate*, Kailua-Kona, Hawaii, 20-24 October, 2008.

**Ryoo, J.-M.**, D.W. Waugh, and T. Igusa 2008: PDFs of Tropical Tropospheric Humidity: Measurement and Theory, *EOS Aura Science Team Meeting*, Columbia, MD, 27-30 October, 2008.

**Ryoo, J.-M.** and D.W. Waugh, 2008: Upper Tropospheric Transport and Humidity, *Burgers-Center for Environmental and Fluid Mechanics (CEAFM) Spring Symposium*, University of Maryland, MD, May, 2008.

**Ryoo, J.-M.** and D.W. Waugh, 2007: Controls on subtropical upper tropospheric humidity, *16th Conference of Atmospheric and Oceanic Fluid Dynamics*, Santa Fe, NM, 25-29 June, 2007.

**Ryoo, J.-M.** and H.-Y. Chun, 2002: Analysis of Stratospheric Major Sudden Warming using NCEP-NCAR Reanalysis data, *International Symposium on Stratospheric Variations and Climate*, Fukuoka, Japan, Nov, 2002.

## Computer skills

- **Programing Language:** IDL (expert), Python, MATLAB, R, Gnuplot, Fortran 77/90, web (HTML), NCAR Graphics,
- **Technologies:** Unix/Linux, LaTeX, MS Office Suite, Web development (IT support for Meteorological data forecasting)
- **Data analysis:** Large datasets (reanalysis: NCEP/NCAR, MERRA2, ECMWF, NARR) analysis, satellite data processing, in-situ observational data (airborne data, tower, radiosonde)
- **Models:** Trajectory model (NASA GSFC trajectory model, WRF-STILT, NOAA HYSPLIT), Regional model (WRF, WRF-chem)

## Professional Affiliations

American Geophysical Union	(2005-present)
American Meteorological Society	(2005-present)
Korean Atmospheric Scientists in America	(2005-present)