

# Rebecca Adams-Selin

Atmospheric and Environmental Research  
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Dr. Adams-Selin's research interests include convective gravity waves, microphysical impacts on convection, and hail modeling and prediction. She has conducted original work interpreting observations to determine gravity wave presence, simulating gravity waves observed in conjunction with bow echo development, and connecting a specific type of wave to new bowing development (Adams-Selin and Johnson 2010, 2013), and has an ongoing NSF grant to examine gravity wave impacts on the environment in advance of MCSs observed in idealized simulations and with PECAN field campaign data (Adams-Selin and Schumacher 2017, 2018a, b; Adams-Selin 2020a, b).

Dr. Adams-Selin has led the development effort for HAILCAST over the past five years, directly transitioning feedback from HWT testing into model improvements (Adams-Selin et al. 2019; Adams-Selin and Ziegler 2016). She was responsible for implementation of the HAILCAST hail model into the High-Resolution Rapid Refresh (HRRR) model as well as the Air Force Weather Agency's Mesoscale Ensemble Prediction System. For seven years she also led the effort to transition microphysical research into the operational models and ensembles of the 557<sup>th</sup> Weather Wing (formerly the Air Force Weather Agency) as part of the SEMS II and SEMS III contracts. In addition to HAILCAST, this effort included microphysical ensemble perturbations resulting in improvements in QPF (Adams-Selin et al. 2013 WF, MWR; Adams-Selin 2013a,b), development and implementation of an aircraft icing algorithm to distinguish between glaze and rime icing (Adams-Selin and McCormick 2013; Adams-Selin 2013c), and incorporation of ensemble perturbations of CCN and cloud droplet concentrations into MEPS (Adams-Selin 2013d).

## Education

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Ph.D., Atmospheric Science	Colorado State University	2012
M.S., Atmospheric Science	Colorado State University	2007
B.S., Atmospheric Science, Mathematics	Creighton University	2005 with honors, summa cum laude

## Professional Experience

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Senior Staff Scientist II Lead, Microphysics and Convection Research Group	Atmospheric and Environmental Research	2019-present
Senior Staff Scientist	Atmospheric and Environmental Research	2017-present
Staff Scientist II	Atmospheric and Environmental Research	2014-2017
Staff Scientist I	Atmospheric and Environmental Research	2011-2014
Senior Research Associate	Atmospheric and Environmental Research	2009-2011
Visiting Scientist	University Corporation of Atmospheric Research Air Force Weather Agency	2007-2009

## Grants

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Collaborative Research: Impact of Convectively-Generated Gravity Waves on Mesoscale Convective Systems

Source: National Science Foundation

Appointment: Principal Investigator

Dates Covered: 11/01/2016 – 04/30/2020

Improving Hail Forecasts Through Operational Implementation of the HAILCAST Hail Model

Source: National Oceanic and Atmospheric Administration

Appointment: Principal Investigator

Dates Covered: 10/01/2018 – 09/30/2020

PREEVENTS Track 2: Collaborative Research: Improving High-Impact Hail Event Forecasts by Linking Hail Environments and Modeled Hailstorm Processes

Source: National Science Foundation

Appointment: Principal Investigator

Dates Covered: 08/01/2019 – 07/31/2022

## Refereed Publications

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**Adams-Selin, R.**, 2020a: Impact of convectively generated low-frequency gravity waves on evolution of a Mesoscale Convective System. *J. Atmos. Sci.*, accepted pending revisions.

**Adams-Selin, R.**, 2020b: Sensitivity of MCS low-frequency gravity waves to microphysical variations. *J. Atmos. Sci.*, submitted.

**Adams-Selin, R.**, A. Clark, C. Melick, S. Dembek, I. Jirak, and C. Ziegler, 2019: Verification of WRF-HAILCAST during the 2014-2016 NOAA/Hazardous Weather Testbed Spring Forecasting Experiments. *Wea. Forecasting*, 34, 61-79.

Haghi, K., B. Geerts, H. Chipilski, A. Johnson, S. Degelia, D. Imy, D. Parsons, **R. Adams-Selin**, D. Turner, and X. Wang, 2019: Bore-ing into nocturnal convection. *Bull. Amer. Meteor. Soc.*, 100, 1103–1121.

Hegarty, J., J. Lewis, E. McGrath-Spangler, J. Henderson, et al., 2018: Analysis of the planetary boundary layer height during DISCOVER-AQ Baltimore - Washington, DC with lidar and high-resolution WRF modeling. *J. Appl. Meteor. Climatol.*, 57, 2679–2696.

Alvarado, M. J., E. Winijkul, **R. Adams-Selin**, E. Hunt, C. Brodowski, C. R. Lonsdale, et al., 2018: Sources of black carbon deposition to the Himalayan glaciers in current and future climates. *Journal of Geophysical Research: Atmospheres*, 123, 7482–7505.

Clark, A., I. Jirak, S. Dembek, G. Creager, et al., 2018: The Community Leveraged Unified Ensemble (CLUE) in the 2016 NOAA/Hazardous Weather Testbed Spring Forecasting Experiment. *Bull. Amer. Meteor. Soc.*, 99, 1433–1448.

Gallo, B., A. Clark, I. Jirak, J. Kain, et al., 2017: Breaking new ground in severe weather prediction: The 2015 NOAA/Hazardous Weather Testbed Spring Forecasting Experiment. *Wea. Forecasting*, 32, 1541-1568.

- Adams-Selin, R.** and C. Ziegler, 2016: Forecasting hail using a one-dimensional hail growth model within WRF. *Mon. Wea. Rev.*, 144, 4919-4939.
- Adams-Selin, R.**, S. van den Heever, and R. Johnson, 2013: Impact of graupel parameterization schemes on idealized bow echo simulations. *Mon. Wea. Rev.*, 141, 1241-1262.
- Adams-Selin, R.**, S. van den Heever, and R. Johnson, 2013: Sensitivity of bow echo simulation to microphysical parameterizations. *Wea. Forecasting*, 28, 1188-1209.
- Adams-Selin, R.**, and R. Johnson, 2013: Examination of gravity waves associated with the 13 March 2003 bow echo. *Mon. Wea. Rev.*, 141, 3735-3756.
- Adams-Selin, R.**, and R. Johnson, 2010: Mesoscale surface pressure and temperature features associated with bow echoes. *Mon. Wea. Rev.*, 138, 212-227.

#### **Selected Non-Refereed Publications (*Internally Refereed Only*)**

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- Adams-Selin, R.**, and E. Hildebrand, 2017: Quantitative evaluation and comparison of Multi-sensor Advection Diffusion nowCast (MADCast) and World-Wide Merged Cloud Analysis (WWMCA) cloud analysis and forecasting systems. 557<sup>th</sup> Weather Wing Technical Report, SEMSD.33902, 19 pp.
- J. Hegarty, **R. Adams-Selin**, M. Alvarado, 2016: Source apportionment of fine particulate matter at Big Bend National Park: PMF analysis of Big Bend National Park IMPROVE aerosol data. Final Report, TCEQ Contract No. 582-15-50414, 64 pp.
- J. Hegarty, **R. Adams-Selin**, T. Nehr Korn, 2015: High resolution meteorological simulations of DISCOVER-AQ Houston. Final Report, TCEQ Contract No. 582-15-50414, 53 pp.
- Adams-Selin, R.**, 2014: In-line 1D WRF hail diagnostic. Air Force Weather Agency Technical Report, SEMSD.21495, 6 pp.
- Adams-Selin, R.**, and E. Hunt, 2014: Improved dust source regions. Air Force Weather Agency Technical Report, SEMSD.22032, 11 pp.
- Adams-Selin, R.**, 2013a: Evaluation of effect of hail/graupel modifications in WRF on convective QPF. Air Force Weather Agency Technical Report, SEMSD.18443, 10 pp.
- Adams-Selin, R.**, 2013b: Quantitative evaluation of microphysical perturbations within WRF-ARW. Air Force Weather Agency Technical Report, SEMSD.18444, 21 pp.
- Adams-Selin, R.**, 2013c: Use of WRF-ARW microphysics schemes to distinguish between aircraft icing types. Air Force Weather Agency Technical Report, SEMSD.18441, 10 pp.
- Adams-Selin, R.**, 2013d: Evaluation of perturbations in cloud condensation nuclei and cloud droplet concentrations for use in the Mesoscale Ensemble Prediction System. Air Force Weather Agency Technical Report, SEMSD.18442, 10 pp.
- Adams-Selin, R.**, 2013e: Quantitative evaluation of boundary layer and vertical resolution perturbations within WRF-ARW. Air Force Weather Agency Technical Report, SEMSD.18445, 14 pp.
- Adams-Selin, R.**, 2013f: Use of MISR, MODIS, and AERONET aerosol optical depth data for evaluation of WRF-Chem dust forecasts. Air Force Weather Agency Technical Report, SEMSD.18542, 15 pp.

**Adams-Selin, R.**, 2013g: Verification of AFWA and traditional GOCART WRF-Chem dust emission schemes. Air Force Weather Agency Technical Report, SEMSD.18543, 7 pp.

### **Selected Recent Conference Presentations**

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\*Denotes advised student    ^Denotes invited presentation

**Adams-Selin, R.**, C. Kalb, P. Skinner, and T. Jensen, 2020: Comparison of Object-Based and Grid-Based Verification of Warn-on-Forecast System HAILCAST Forecasts. *30th Conf. Wea. Analysis Forecasting/26th Conf. Num. Wea. Prediction*, Amer. Meteor. Soc., Boston, MA, 2B.2.

**Adams-Selin, R.**, 2020: Comparison of one-dimensional pseudo-Lagrangian and three-dimensional fully Lagrangian trajectories when forecasting hail size. *30th Conf. Wea. Analysis Forecasting/26th Conf. Num. Wea. Prediction*, Amer. Meteor. Soc., Boston, MA, 165.

Calkins, C., and **R. Adams-Selin**, 2020: Use of WRF-HAILCAST to produce a dynamically downscaled hail climatology. *30th Conf. Wea. Analysis Forecasting/26th Conf. Num. Wea. Prediction*, Amer. Meteor. Soc., Boston, MA, 163.

**Adams-Selin, R.**, and A. J. Heymsfield, 2019: Sensitivity of hail trajectories to embryo location, size, and density. *18th Conf. on Mesoscale Processes*, Amer. Meteor. Soc., Savannah, GA, 31.

**Adams-Selin, R.**, and R. S. Schumacher, 2019: Lifecycle and impacts of MCS convectively generated low-frequency gravity waves. *Special Symposium on Mesoscale Meteorological Extremes, 99th AMS Annual Meeting*, Phoenix, AZ, 379.

Groff\*, F., R. Schumacher, and **R. Adams-Selin**, 2019: Analysis of convectively generated gravity waves in the 14-15 July 2015 Mesoscale Convective System during PECAN. *Special Symposium on Mesoscale Meteorological Extremes, 99th AMS Annual Meeting*, Phoenix, AZ, 380.

**Adams-Selin, R.**, and R. S. Schumacher, 2018: Low-frequency gravity wave generation during Mesoscale Convective System Lifecycles within varying environments. *29th Conf. Severe Local Storms*, Amer. Meteor. Soc., Stowe, VT, 6B.3.

**Adams-Selin, R.**, A. Clark, C. Melick, S. Dembek, I. Jirak, and C. Ziegler, 2018: Evaluation of HAILCAST during NOAA/Hazardous Weather Testbed Spring Forecasting Experiments using multiple verification metrics. *29th Conf. Wea. Analysis Forecasting/25th Conf. Num. Wea. Prediction*, Amer. Meteor. Soc., Denver, CO, 11.

**Adams-Selin, R.**, and R. Schumacher, 2018: MCS evolution in response to convectively-generated low-frequency gravity waves. *29th Conf. Wea. Analysis Forecasting/25th Conf. Num. Wea. Prediction*, Amer. Meteor. Soc., Denver, CO, 10A.2.

Groff\*, F., R. Schumacher, and **R. Adams-Selin**, 2018: Analysis of convectively generated gravity waves in the 14-15 July 2015 Mesoscale Convective System during PECAN. *Special Symposium on Plains Elevated convection at Night (PECAN), 98th AMS Annual Meeting*, Austin, TX, 837.

- Adams-Selin, R.**, and R. Schumacher, 2017: Impacts of convectively-generated deep tropospheric gravity waves on surrounding environments of MCSs. *17<sup>th</sup> Conf. Mesoscale Processes*, San Diego, CA, 11.2.
- Adams-Selin<sup>^</sup>, R.**, 2017: Development, application, and evaluation of a one-dimensional hail growth model within WRF. *2<sup>nd</sup> European Hail Workshop*, Bern, Switzerland.
- Adams-Selin<sup>^</sup>, R.**, 2017: Development, application, and evaluation of a one-dimensional hail growth model. *MeteoSwiss*, Zurich, Switzerland.
- Adams-Selin, R.**, A. Clark, C. Melick, S. Dembek, and C. Ziegler, 2017: Application and evaluation of WRF-HAILCAST hail size forecasts during NOAA/Hazardous Weather Testbed Spring Forecasting Experiments. *28<sup>th</sup> Conf. Wea. Analysis Forecasting/24<sup>th</sup> Conf. Num. Wea. Prediction*, Seattle, WA, 7A.6.
- Adams-Selin, R.**, and A. Clark, 2015: WRF-HAILCAST hail forecasting system improvements. *27<sup>th</sup> Conf. Wea. Analysis and Forecasting/23<sup>rd</sup> Conf. Num. Wea. Prediction*, Chicago, IL, 3B.5.
- Adams-Selin, R.**, C. Ziegler, and A. Clark, 2014: Forecasting hail using a one-dimensional hail growth model inline within WRF. *27<sup>th</sup> Conf. Severe Local Storms*, Madison, WI, 11B.2.
- Hunt, E., **R. Adams-Selin**, J. Sartan, G. Creighton, E. Kuchera, J. Keane, and S. Jones, 2014: The Spring 2014 Mesoscale Ensemble Prediction System "Dust Offensive". *AGU Fall Meeting*, San Francisco, CA, A41F-3130.
- Adams-Selin, R.**, and R. Johnson, 2013: Effects of convectively-generated gravity waves on bow echo evolution. *15<sup>th</sup> Conf. Mesoscale Processes*, Portland, OR, 2.2.
- McCormick, J., and **R. Adams-Selin**, 2013: Statistical verifications for an ensemble-based icing forecasting algorithm. *15<sup>th</sup> Conf. Mesoscale Processes*, Portland, OR, 2.
- Adams-Selin, R.**, and J. McCormick, 2013: Using WRF-ARW to distinguish between glaze and rime icing at the Air Force Weather Agency. *16<sup>th</sup> Conf. on Aviation, Range, and Aerospace Meteorology*, Austin, TX, 2.3.

### University and Community Service

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Associate Editor	Monthly Weather Review	2018-present
Chair	AMS Committee on Weather and Forecasting	2018-present
Affiliate Faculty	Colorado State University	2017-2019
	Co-Advisor and Thesis Committee Member, Faith Groff	
Member	National Earth System Prediction Capability Physics Interoperability Group	2017-present
Committee Member	AMS Committee on Weather and Forecasting	2011-present
Chair	AMS Conf. on Weather Analysis and Forecasting/ Numerical Weather Prediction	2016
Co-chair	AMS Symposium on Aerosol-Cloud-Climate Interactions: Impacts of Aerosols on Storm Dynamics, Cloud Physics, and Precipitation	2014
Program committee member	AMS Conf. on Weather Analysis and Forecasting/ Numerical Weather Prediction	2012, 2014, 2015, 2017, 2019

**Honors**

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Invited Participant	NOAA/NSSL Hazardous Weather Testbed Spring Forecasting Experiment	2011, 2014-2019
Small Team of the Year	Air Quality and Atmospheric Composition Team Atmospheric and Environmental Research	2016
Best Student Oral Presentation	AMS Conf. Mesoscale Processes	2011
3 <sup>rd</sup> Student Oral Presentation	AMS Conf. on Weather Analysis and Forecasting/ Numerical Weather Prediction	2011
Fellowship	American Meteorological Society	2005-2006