

Steven M. Cavallo

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EDUCATION

- *Ph.D.*, Atmospheric Sciences
University of Washington, Seattle, WA, 2009
Advisor: Dr. Gregory J. Hakim
- *M.S.*, Atmospheric Sciences
University of Washington, Seattle, WA, 2006
Advisor: Dr. Gregory J. Hakim
- *B.S., Summa Cum Laude*, Meteorology
Florida State University, Tallahassee, FL, May 2003
Minors: Mathematics, Physics, Computer Science
Advisors: Dr. Albert Barcilon, Dr. Phillip Cunningham

PROFESSIONAL EXPERIENCE

- **Assistant Professor** **November 2011-Present**
University of Oklahoma, School of Meteorology
Affiliate faculty, Center for Analysis and Prediction of Storms (CAPS)
Fellow of the Cooperative Institute for Mesoscale Meteorological Studies (CIMMS)
- **Postdoctoral Fellow** **June 2009-October 2011**
National Center for Atmospheric Research, MMM Division
National Science Foundation Office of Polar Programs
Postdoctoral advisor: Dr. Chris Snyder
Arctic vortex dynamics, data assimilation, real-time numerical modeling with Advanced Hurricane WRF (AHW) model, model development.
- **Graduate Research Assistant** **Fall 2003-June 2009**
Department of Atmospheric Sciences, University of Washington
Model physics and interactions, vortex dynamics, and Arctic climate.
Operated mesoscale numerical models for real data and idealized experiments.
Developed and implemented a real-time modeling system and web page.
- **Academic Tutor** **Fall 2006-June 2009**
Student-Athlete Academic Services, University of Washington
Tutored regularly for beginning and advanced atmospheric science, mathematics, physics, and geography classes for individuals and large groups.
- **Teaching Assistant** **Spring 2005**
Department of Atmospheric Sciences, University of Washington
Introduction to Weather
Led quiz sections, set up and performed lab demonstrations, collaborated daily in a group environment, created exams and homework sets.

COMPUTER EXPERIENCE

Numerical Models: Model for the Prediction Across Scales (MPAS), Weather and Research Forecasting (WRF), Community Atmospheric Model (CAM), Advanced Hurricane WRF (AHW), Rapid Radiative Transfer Model (RRTM)

Programming Languages: Fortran 77/90, C, HTML, LaTeX, Python

High performance computing: Maintained a Xeon64 hex core 2.6 GHz CPU consisting of 10 computing nodes and 240 processors for my research group

Software and Operating Systems: Matlab, NCL, GEMPAK, IVE, GARP, Unix, Linux, Adobe Illustrator, MS Word, MS Excel, MS Powerpoint

**AWARDS,
HONORS,
MEMBERSHIPS,
AND
ACTIVITIES**

- Recipient of **Office of Naval Research** Young Investigator Award, 2016
- Recipient: National Science Foundation/**NSF** Postdoctoral Fellowship in Polar Regions Research (2010-2011), American Meteorological Society/**AMS** Atmosphere, Oceans, and Fluid Dynamics student presentation award (2009), **AMS** Father James B. Macelwane Award (2004), **AMS** Graduate Fellowship (2003-2004), **AMS** Undergraduate Scholarship (2002)
- **NSF** panelist in Antarctic Ocean and Atmospheric Sciences, Arctic Natural Sciences
- Associate Editor, **Monthly Weather Review**
- Invited author for **Worldbook Encyclopedia** definition of *Polar Vortex*
- Invited author for **American Meteorological Society** definition of *Polar Vortex*
- Invited speaker, **ETH** Institute for Atmospheric and Climate Science, Zurich, Switzerland, May 2016
- Invited speaker, Joint **ECMWF/WWRP** workshop: Model Uncertainty, Reading, United Kingdom, April 2016
- Invited participant, **World Meteorological Organization US THORPEX** Science Legacy Planning, Silver Spring, Maryland, USA
- Science committee, 17th **Cyclone Workshop**, 25-30 Oct. 2015, Pacific Grove, CA
- Invited speaker: International Symposium on Earth-Science Challenges, October 2013, Kyoto University, Kyoto, Japan
- Invited speaker: The Weather-Climate Intersection: Advances and Challenges, **NCAR ASP** Summer Colloquium, June 2012, Boulder, Colorado, USA
- Invited participant: **Climate Science Day on Capitol Hill**, February 2012, Washington D.C., USA; sponsored by **NCAR**.
- Invited speaker: Institute for Pure and Applied Mathematics (**IPAM**), March 2010, UCLA, USA
- Invited speaker: **IGERT** Joint Program in Applied Mathematics and the Earth and Environmental Sciences, February 2009, Columbia University, USA
- Member of American Meteorological Society, American Geophysical Union
- Reviewer for NSF proposals (mail reviews), *Monthly Weather Review*, *Weather and Forecasting*, *Journal of Atmospheric Science*, *Quarterly Journal of Royal Meteorological Society*, *Journal of Geophysical Research*, *Journal of Climate*, *Climate Dynamics*, *International Journal of Remote Sensing*, *Atmospheric Research*, *Journal of Applied Meteorology and Climatology*
- Student Athletes Choice Tutoring Award 2008
- Oceanographic field experiment forecaster, International Polar Year (IPY) NSF Freshwater Initiative (2006-2008), Davis Strait
- Outreach volunteer, Pacific Science Center, Seattle, WA
- Phi Kappa Phi, Phi Sigma Theta, Golden Key National Honors Societies, National Society for Collegiate Scholars, Chi Epsilon Pi Meteorological Honors Society

INTERESTS

Vortex dynamics, mesoscale numerical weather prediction, climate modeling, regional climate modeling, ensemble modeling and data assimilation, data and statistical analysis, atmospheric physics, synoptic meteorology, climate, climate change, renewable energy generation, planetary boundary layer processes, science communication

Grants awarded and/or active

Cavallo, S. M., (PI, 100% credit), *Polar predictability and dynamics through multi-scale atmospheric vortices*, Sponsored by U.S. Department of Defense, **Office of Naval Research/ONR**, Federal, \$526,637. (Award notification: March 3, 2016).

Cavallo, S. M., (PI, 60% credit), Turner, D. D., (Co-PI, 40% credit), *Sensitivity of the midlatitude waveguide to the dynamics and observations of Arctic tropopause-based vortices*, Sponsored by **National Science Foundation/NSF**, Federal, \$298,112. (August 1, 2015 - July 31, 2018).

Cavallo, S. M., (PI, 100% OU credit), Skamarock, W. S. (Co-PI, 36% total credit), *Multi-scale Predictability with a New Coupled Non-hydrostatic global model over the Arctic*, Sponsored by U.S. Department of Defense, **Office of Naval Research/ONR**, Federal, \$358,463. (May 1, 2015 - April 30, 2017).

Cavallo, S. M., (PI, 50% credit), Turner, D. D., (Co-PI, 50% credit), *Collaborative Research: Integrated Characterization of Energy, Clouds, Atmospheric State, and Precipitation at Summit (ICECAPS)*, Sponsored by **National Science Foundation/NSF**, Federal, \$251,134. (15 August 2013 - 31 July 2018).

Cavallo, S. M., (PI, 50% credit), Turner, D. D., (Co-PI, 50% credit), *Collaborative Research: Characterizing the Roles of Atmospheric Structure and Clouds on the Radiation and Precipitation Budgets at Summit, Greenland*, Sponsored by **National Science Foundation/NSF**, Federal, \$140,409. (1 October 2013 - 30 September 2016).

Cavallo, S. M., (Co-PI, 50% credit), Parsons, D. B., (PI, 50% credit), *Improved characterization and prediction of Antarctic weather and climate through utilization of the CONCORDIASI data set*, Sponsored by the **National Science Foundation/NSF**, Federal, \$273,473. (September 2012 - May 2016).

Cavallo, S. M., (PI, 100% OU credit), Skamarock, W. S. (Co-PI, 36% total credit), *Multi-scale Predictability with a New Coupled Non-hydrostatic Global Model over the Arctic*, Sponsored by U.S. Department of Defense, **Office of Naval Research/ONR**, Federal, \$453,625. (February 1, 2012 - January 31, 2016).

Cavallo, S. M., (PI, 100% credit), Lusk, D., (Co-PI, 0% credit), *Predictability of mid-latitude cyclones in relation to tropopause-based vortices over the Arctic, and sensitivity to reductions in sea ice* (Student: Dylan Lusk), Sponsored by **NASA - Headquarters**, Federal, \$30,000. (September 1, 2013 - August 31, 2015).

Refereed articles in journals

- Cavallo, S. M.** and G. J. Hakim, 2009: Potential vorticity diagnosis of a tropopause polar cyclone. *Mon. Wea. Rev.*, **137** (4), 1358–1371.
- Cavallo, S. M.** and G. J. Hakim, 2010: The composite structure of tropopause polar cyclones from a mesoscale model. *Mon. Wea. Rev.*, **138** (10), 3840–3857, doi:10.1175/2010MWR3371.1.
- Cavallo, S. M.**, J. Dudhia, and C. Snyder, 2011: A multilayer upper-boundary condition for longwave radiative flux to correct temperature biases in a mesoscale model. *Mon. Wea. Rev.*, **139** (6), 1952–1959.
- Cavallo, S. M.** and G. J. Hakim, 2012: Radiative impact on tropopause polar vortices over the arctic. *Mon. Wea. Rev.*, **140** (5), 1683–1702.
- Cavallo, S. M.**, R. T. Torn, C. Snyder, C. Davis, W. Wang, and J. Done, 2013: Evaluation of the Advanced Hurricane WRF data assimilation system for the 2009 Atlantic hurricane season. *Mon. Wea. Rev.*, **141** (2), 523–541.
- Cavallo, S. M.** and G. J. Hakim, 2013: The physical mechanisms of tropopause polar cyclone intensity change. *J. Atmos. Sci.*, **70**, 3359–3373.
- Cohen, A. E., **S. M. Cavallo**, M. C. Coniglio, and H. E. Brooks, 2015: A review of planetary boundary layer parameterization schemes and their sensitivity in simulating a southeast US cold season severe weather environment. *Wea. Forecasting*, **30**, 591–612, doi:http://dx.doi.org/10.1175/WAF-D-14-00105.1.
- Lusk, D. and **S. M. Cavallo**, 2016: Changes in the Arctic atmosphere in response to reductions in sea ice. *Mon. Wea. Rev.*, Submitted.
- Cavallo, S. M.**, J. Berner, and C. Snyder, 2016: Diagnosing model error from time-averaged tendencies in the weather research and forecasting model. *Mon. Wea. Rev.*, **144** (2), 759–779.
- Cohen, A. E., **S. M. Cavallo**, M. C. Coniglio, and H. E. Brooks, 2016b: Evaluation of multiple planetary boundary layer parameterization 1 schemes in southeast United States cold season severe thunderstorm environments. *Wea. Forecasting*, In Review.
- Cohen, A. E., **S. M. Cavallo**, M. C. Coniglio, and H. E. Brooks, 2016a: Southeast United States cold season severe thunderstorm environments. *Wea. Forecasting*, In Review.
- Row, M. P., **S. M. Cavallo**, D. D. Turner, and A. Solomon, 2016: Synoptic and local influences on a summertime, long-lived, mixed-phase cloud event over Summit, Greenland: A modeling perspective. *Mon. Wea. Rev.*, In Review.
- Parsons, D. B., **S. M. Cavallo**, et al., 2016: THORPEX research and the science of prediction. *Bull. Amer. Meteor. Soc.*, In Press.

Articles in collections

- Cavallo, S. M.**, 2016: O-O-Oklahoma, Where the (Arctic) Wind Comes Sweepin' Down the Plain. *Our Arctic Nation*, U.S. Department of State's Official Arctic Twitter account, Washington, D.C., accessed: 2016-08-02 at <https://medium.com/our-arctic-nation/week-27-oklahoma-9821a6f2a317#.fe83v3159>.
- Cavallo, S. M.**, 2016: Polar vortex. *World Book Encyclopedia*, M. DuRoss, Ed., Scott Fetzer Company, Chicago, IL.
- Cavallo, S. M.**, et al., 2016: Polar vortex. *Glossary of Meteorology*, American Meteorological Society, Boston, MA, available online at http://glossary.ametsoc.org/wiki/Polar_vortex.

Refereed articles in preparation

- Lusk, D. and **S. M. Cavallo**, 2016: Changes in the Arctic atmosphere in response to reductions in sea ice. *Mon. Wea. Rev.*, Submitted.
- Riedel, C. and **S. M. Cavallo**, 2016a: The development of a mesoscale cycling ensemble prediction system in the Southern Hemisphere. *Mon. Wea. Rev.*, In preparation.
- Russell, J., **S. M. Cavallo**, and D. Parsons, 2016: Observations of antarctic flow regimes and their representation in the Antarctic Mesoscale Prediction System. *Mon. Wea. Rev.*, In preparation.
- Riedel, C. and **S. M. Cavallo**, 2016b: Reducing model bias in the Antarctic during polar sunrise using a cycling mesoscale ensemble prediction system. *Mon. Wea. Rev.*, In preparation.
- Cavallo, S. M.**, 2016: Tropopause polar vortices over the arctic. *Bull. Amer. Meteor. Soc.*, In preparation.
- Cavallo, S. M.**, 2017a: Atmospheric sensitivity of tropopause polar vortices to surface boundary conditions. *Mon. Wea. Rev.*, In preparation.
- Cavallo, S. M.**, 2017b: Diagnosing systematic numerical weather prediction model bias over the Antarctic from short-term forecast tendencies. *Mon. Wea. Rev.*, In preparation.

Proceedings or Conference Presentations

- Cavallo, S. M.**, 2004: Sub-synoptic structure in late stages of baroclinic wave life-cycles. *3rd Annual Student Conference*, Seattle, WA, American Meteorological Society.
- Cavallo, S. M.** and G. J. Hakim, 2005: Life cycles of tropopause polar vortices. *15th Conference on Atmospheric and Oceanic Fluid Dynamics*, Cambridge, MA, American Meteorological Society.
- Cavallo, S. M.** and G. J. Hakim, 2006: Analysis of the potential vorticity budget of a tropopause polar cyclone. *Thirteenth Extratropical Cyclone Workshop*, Pacific Grove, CA.
- Cavallo, S. M.**, 2006: Life-cycles of tropopause polar vortices. M.S. thesis, Department of Atmospheric Sciences, University of Washington.
- Cavallo, S. M.** and G. J. Hakim, 2007: Life cycles of tropopause polar vortices. *16th Conference on Atmospheric and Oceanic Fluid Dynamics*, Santa Fe, NM, American Meteorological Society.
- Cavallo, S. M.**, 2009: The structure and maintenance of tropopause polar vortices over the Arctic. Ph.D. thesis, University of Washington.
- Cavallo, S. M.**, 2011: Tropopause-based vortices over the Arctic. *Invited colloquium*, Norman, OK, University of Oklahoma.
- Cavallo, S. M.**, 2012a: Arctic weather or climate? Tropopause polar vortices, sea ice, and midlatitude cyclogenesis. *Invited seminar, The Weather-Climate Intersection: Advances and Challenges*, Boulder, CO, National Center for Atmospheric Research Advanced Study Program.
- Cavallo, S. M.**, 2012b: Coherent vortices over the arctic: Their role in the predictability of our weather and what may change with reductions in Arctic sea ice. *Invited colloquium*, Marietta, GA, Southern Polytechnic State University.
- Cavallo, S. M.** and W. S. Skamarock, 2012: Extended range prediction over the Arctic with the Model for the Prediction Across Scales. *DRI Meeting for Seasonal Prediction*, Monterey, CA, Naval Research Lab.
- Cavallo, S. M.** and W. S. Skamarock, 2013: Extended range prediction over the Arctic with the Model for the Prediction Across Scales. *DRI Meeting for Seasonal Prediction*, Monterey, CA, Naval Research Lab.
- Cavallo, S. M.**, 2013: Feedbacks between sea ice, surface cyclones, and tropopause-based vortices over the Arctic. *19th Conference on Atmospheric and Oceanic Fluid Dynamics*, Newport, RI, American Meteorological Society.

- Szapiro, N. and **S. M. Cavallo**, 2013: Simulation of an Arctic summer cyclone using MPAS. *International Symposium on Earth-Science Challenges: The 3rd Summit between the University of Oklahoma and Kyoto University*, Kyoto, Japan.
- Cavallo, S. M.** and D. Lusk, 2013: Understanding changes in the arctic atmosphere to reductions in sea ice. *International Symposium on Earth-Science Challenges: The 3rd Summit between the University of Oklahoma and Kyoto University*, Kyoto, Japan.
- Lusk, D. and **S. M. Cavallo**, 2013: A WRF model simulation of changes in the characteristics of tropopause polar vortices due to sea ice loss. *International Symposium on Earth-Science Challenges: The 3rd Summit between the University of Oklahoma and Kyoto University*, Kyoto, Japan.
- Szapiro, N. and **S. M. Cavallo**, 2014: Arctic tropopause in MPAS-A, WRF, and GFS. *The World Weather Open Science Conference (WWOSC). The weather. What's the outlook?*, Montreal, Canada.
- Russell, J., D. Parsons, and **S. M. Cavallo**, 2014: Concordiasi dropsondes: Improved characterization of errors in the Antarctic Mesoscale Prediction System. *The World Weather Open Science Conference (WWOSC). The weather. What's the outlook?*, Montreal, Canada.
- Riedel, C., M. Elliott, and **S. M. Cavallo**, 2014: Ensemble data assimilation in a mesoscale model during Concordiasi (2010). *The World Weather Open Science Conference (WWOSC). The weather. What's the outlook?*, Montreal, Canada.
- Elliott, M., **S. M. Cavallo**, and D. Parsons, 2014: Ensemble data assimilation in the Antarctic Mesoscale Prediction System (AMPS) during Concordiasi (2010). *26th Conference on Weather Analysis and Forecasting/22nd Conference on Numerical Weather Prediction*, Chicago, IL, American Meteorological Society.
- Cavallo, S. M.** and W. S. Skamarock, 2014: Extended range prediction over the Arctic with the Model for the Prediction Across Scales. *DRI Meeting for Seasonal Prediction*, Monterey, CA, Naval Research Lab.
- Cavallo, S. M.** and M. A. Shapiro, 2014: A multi-scale perspective of Arctic to tropical interactions for a high impact event over Europe. *The World Weather Open Science Conference (WWOSC). The weather. What's the outlook?*, Montreal, Canada.
- Halbert, K., M. Elliott, and **S. M. Cavallo**, 2014: Operational and research comparisons of a global variable resolution model to a limited area model. *The World Weather Open Science Conference (WWOSC). The weather. What's the outlook?*, Montreal, Canada.
- Lusk, D., M. Elliott, and **S. M. Cavallo**, 2014: WRF simulation of changes to characteristics of tropopause polar vortices due to sea ice loss. *The World Weather Open Science Conference (WWOSC). The weather. What's the outlook?*, Montreal, Canada.

- Szapiro, N. and **S. M. Cavallo**, 2015a: Associating Arctic sea ice variability and tropopause polar vortices. *International Symposium on Earth-Science Challenges: The 4th Summit between the University of Oklahoma and Kyoto University*, Norman, OK.
- Riedel, C. and **S. M. Cavallo**, 2015a: Atmospheric analysis uncertainties over the antarctic region using an EnKF method with the AMPS model. *27th Conference on Weather Analysis and Forecasting/23rd Conference on Numerical Weather*, Chicago, IL, American Meteorological Society.
- Cavallo, S. M.**, 2015b: Connecting polar regions processes with midlatitude weather. *Invited colloquium*, Norman, OK, University of Oklahoma.
- Cavallo, S. M.**, J. Berner, and C. Snyder, 2015: Diagnosing systematic numerical weather prediction model bias from thermodynamic tendencies in short-term forecasts. *27th Conference on Weather Analysis and Forecasting/23rd Conference on Numerical Weather*, Chicago, IL, American Meteorological Society.
- Wachowicz, L. and **S. M. Cavallo**, 2015: An evaluation of applying ensemble data assimilation to an Antarctic mesoscale model. *14th Annual Student Conference*, Atlanta, GA, American Meteorological Society.
- Cavallo, S. M.** and W. S. Skamarock, 2015: Extended range prediction over the Arctic with the Model for the Prediction Across Scales. *DRI Meeting for Seasonal Prediction*, Monterey, CA, Naval Research Lab.
- Szapiro, N. and **S. M. Cavallo**, 2015b: Object and process verification in MPAS-A of tropopause polar vortices. *27th Conference on Weather Analysis and Forecasting/23rd Conference on Numerical Weather*, Chicago, IL, American Meteorological Society.
- Szapiro, N. and **S. M. Cavallo**, 2015c: On mechanisms for the formation, maintenance, and decay of tropopause polar vortices. *17th Cyclone Workshop*, Pacific Grove, CA.
- Cavallo, S. M.**, 2015a: Polar cyclone concepts within the threefold tropopause framework. *17th Cyclone Workshop*, Pacific Grove, CA.
- Skamarock, W. S., **S. M. Cavallo**, A. Clark, and L. Wicker, 2015: Real-time evaluation of extended guidance produced by a global convection-permitting model. *27th Conference on Weather Analysis and Forecasting/23rd Conference on Numerical Weather*, Chicago, IL, American Meteorological Society.
- Lusk, D. and **S. M. Cavallo**, 2015a: Relationships between tropopause polar vortices and the arctic oscillation in the ERA-Interim Reanalysis data. *International Symposium on Earth-Science Challenges: The 4th Summit between the University of Oklahoma and Kyoto University*, Norman, OK.
- Lusk, D. and **S. M. Cavallo**, 2015b: Relationships between tropopause polar vortices and the Arctic Oscillation in the ERA-interim reanalysis data. *17th Cyclone Workshop*, Pacific Grove, CA.

- Riedel, C. and **S. M. Cavallo**, 2015b: Sensitivities in cyclone forecasts for the antarctic region using an EnKF method with the AMPS model. *17th Cyclone Workshop*, Pacific Grove, CA.
- Cavallo, S. M.**, 2016e: Arctic precursors to high impact midlatitude weather. *Invited colloquium*, Madison, WI, University of Wisconsin Madison.
- Cavallo, S. M.**, 2016b: Diagnosing systematic numerical weather prediction model bias over the Antarctic from short-term forecast tendencies. *Invited lecture*, Zurich, Switzerland, Federal Office of Meteorology and Climatology/MeteoSwiss.
- Cavallo, S. M.**, 2016d: Diagnosing systematic numerical weather prediction model bias over the Antarctic from short-term forecast tendencies. *Invited seminar*, Reading, UK, European Center for Medium Range Forecasting (ECMWF).
- Riedel, C. and **S. M. Cavallo**, 2016: Ensemble data assimilation in the Antarctic Mesoscale Prediction System (AMPS) over the Southern Hemisphere. *Second University of Oklahoma-Nanjing University Symposium on Weather and Climate Research*, Nanjing, China, University of Nanjing.
- Riedel, C. and **S. M. Cavallo**, 2016: Evaluation of the spread-skill relationship on a busted forecast using an MPAS pseudo-ensemble. *17th WRF Users' Workshop*, Boulder, CO, National Center for Atmospheric Research.
- Cavallo, S. M.** and W. S. Skamarock, 2016: Extended range prediction over the Arctic with the Model for the Prediction Across Scales. *DRI Meeting for Seasonal Prediction*, Monterey, CA, Naval Research Lab.
- Skamarock, W. S., L. J. Wicker, A. J. Clark, and **S. M. Cavallo**, 2016: Extended-range severe weather guidance using a global convection-permitting model (invited presentation). *96th American Meteorological Society Annual Meeting*, New Orleans, LA, American Meteorological Society.
- Cavallo, S. M.**, 2016b: Global influences from polar born processes: Tropopause-based vortices over the arctic. *Invited colloquium*, Zurich, Switzerland, Swiss Federal Institute of Technology in Zurich (ETH).
- Edwards-Opperman, J., D. D. Turner, and **S. M. Cavallo**, 2016: Large-scale influences on the occurrence and maintenance of mixed phase clouds over the Greenland ice sheet. *96th American Meteorological Society Annual Meeting*, New Orleans, LA, American Meteorological Society.
- Cavallo, S. M.**, 2016c: Linking arctic to lower latitude processes through resilient tropopause-based vortices. *Invited colloquium*, Fort Collins, CO, Colorado State University.
- Cavallo, S. M.**, 2016a: Processes surrounding a multiscale feature from polar regions to lower latitudes. *Second University of Oklahoma-Nanjing University Symposium on Weather and Climate Research*, Nanjing, China, University of Nanjing.