

# PALOMA BORQUE, PhD

Research Associate at McGill University

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## EDUCATION

<b>Ph.D. Meteorology</b>	McGill University, Canada	2016
Thesis: Turbulence and lifetime studies of shallow cumuli clouds using cloud radar observations.		
Supervisor: Prof. Pavlos Kollias		
<b>M.Sc. Meteorology</b>	McGill University, Canada	2011
Thesis: Scale analysis of the diurnal cycle of precipitation over Continental United States.		
Supervisor: Prof. Isztar Zawadzki		
<b>Lic. in Atmospheric Sciences</b> (M.S. Meteorology equivalent degree)	Universidad de Buenos Aires, Argentina	2008
Thesis: Study of the environment associated with the development of MCSs during a SALLJ event.		
Supervisors: Prof. Matilde Nicolini and Prof. Paola Salio		

## EMPLOYMENT EXPERIENCE

Research Associate	McGill University	2022 - Present
Supervisor: Prof. Pavlos Kollias		
Post Doctorate Research Associate	Pacific Northwest National Laboratory	2020 - 2022
Manager: Dr. Jason Tomlinson		
Postdoctoral Research Associate	University of Illinois at Urbana-Champaign	2016 - 2020
Supervisor: Prof. Stephen W. Nesbitt		

## COMPUTER SKILLS

Programming languages: Python, MATLAB, IDL, Fortran, and LaTeX.

Operating Systems: Mac OS, Linux, and Windows.

## LEADING ROLES AND EXPERIENCE IN FIELD CAMPAIGNS

Co-chair of the Aerosols & Clouds Session at the Artificial Intelligence for Earth System Predictability (AI4ES) workshop. A multi-lab initiative working with the Earth and Environmental Systems Science Division (EESD) of the Office of Biological and Environmental Research (BER) to develop a new paradigm for Earth system predictability focused on enabling artificial intelligence across field, lab, modeling, and analysis activities. [Oct-Dec 2021].

Liaison between the RELAMPAGO<sup>1</sup> and CACTI<sup>2</sup> field campaign. Córdoba, Argentina [Nov 2018 - Jan 2019].

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<sup>1</sup> Remote sensing of Electrification, Lightning, And Mesoscale/microscale Processes with Adaptive Ground Observations – [https://www.eol.ucar.edu/field\\_projects/relampago](https://www.eol.ucar.edu/field_projects/relampago)

<sup>2</sup> Clouds, Aerosols, and Complex Terrain Interactions experiment – <https://www.arm.gov/publications/programdocs/doi-sc-arm-17-004.pdf>

Radar Operator and co-lead scientist for the Colorado State University (CSU) C-band radar deployed for the RELAMPAGO field campaign. Córdoba, Argentina [Jan 2019].

Provided support and onboard guest flight scientist for the Gulfstream-159 (G-1) twin turboprop aircraft operations in the CACTI field campaign. Córdoba, Argentina [Nov - Dec 2018].

Liaison between the forecasters from the National Weather Center in Argentina and the RELAMPAGO forecasters during a 2-week dry run operational period in preparation for the RELAMPAGO field campaign. Buenos Aires, Argentina [Nov 2017].

Collaboration with Dr. Kneifel's research group in the investigation of microphysical processes in snow and ice clouds as detected by multi-frequency radar remote sensing techniques and evaluation with coincident airborne in-situ measurements. Institute for Geophysics and Meteorology, University of Cologne, Germany [Jun-Jul 2017].

Student Member of the American Meteorology Society Committee on Radar Meteorology [2013 – 2014].

Onboard flight scientist and data seat operator in the KWACEX<sup>3</sup> Florida, USA [May 2012].

Collaboration with Dr. Giangrande in the investigation of the lifecycle of shallow clouds as detected by scanning millimeter-wavelength radars. Brookhaven National Laboratory. Upton, NY, USA [Feb 2012].

Graduate student researcher and forecaster in the MC3E<sup>4</sup> Oklahoma, USA [Apr - Jun 2011].

Co-organizer with David Plummer of the Radar Meteorology Student Discussion at the 35th Conference on Radar Meteorology. Pittsburgh, PA, USA [Sep 2011].

Vice-president of Council of Atmospheric and Oceanic Sciences graduate student organization of the Department of Atmospheric and Oceanic Sciences, McGill University [2010].

Organizer of the Land-Sea Breeze Field Campaign in La Plata River, Buenos Aires, Argentina [Feb - Mar 2007].

Upper-air observations instructor in Formosa and Chaco, Argentina [Oct 2006] and in Santiago del Estero University, Argentina [Sep 2005]. Tasks also included data collection and consistency.

Participated in the SALLJEX<sup>5</sup> making upper-air observations at Chamental Station, Argentina [Feb 2003].

## ACTIVITIES AND ASSOCIATIONS

Proposal reviewer for National Science Foundation (NSF), and journal reviewer for Monthly Weather Review (MWR), Journal of the Atmospheric Sciences (JAS), Journal of Applied Meteorology and Climatology (JAMC), Journal of Geophysical Research (JGR), Atmospheric Measurement Techniques (AMT), and Revista del Centro Argentino de Meteorólogos (Meteorologica).

Member of the American Meteorological Society (AMS), American Geophysical Union (AGU), and Centro Argentino de Meteorólogos (CAM).

Member of the "Cloud Studies using Radars: Observations of low reflectivity targets including clouds and drizzle, millimeter wavelength radars and synergistic observations including LIDAR/Radar, multi wavelength and spectral based studies" subcommittee for the AMS 38th Conference on Radar Meteorology. Chicago, IL, USA [Aug 2017].

Member of the Spiros G. Geotis Student Prize committee for the AMS 38th Conference on Radar Meteorology, IL, USA [Aug 2017].

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<sup>3</sup> Key West Aerosols and Cloud Experiment

<sup>4</sup> Midlatitude Continental Convective Clouds Experiment

<sup>5</sup> South American Low Level Jet Experiment

## PUBLICATIONS

Kollias, P., Puidgomènech Treserras, B., Battaglia, A., **Borque**, P., & Tatarevic, A., 2022: Processing reflectivity and Doppler velocity from EarthCARE's cloud profiling radar: the C-FMR, C-CD and C-APC products, *EGUsphere* [preprint], <https://doi.org/10.5194/egusphere-2022-1284>

**Borque**, P., A. Varble & J. Hardin, 2022: Peak rain rate sensitivity to observed cloud condensation nuclei and turbulence in continental warm shallow clouds during CACTI. *J. Geophys. Res. Atmos.*, **127**, e2022JD036864. <https://doi.org/10.1029/2022JD036864>

Yabra, M.S., M. Nicolini, P. **Borque**, Y. Garcia Skabar & P. Salio, 2022: Observational study of the South American low-level jet during the SALLJEX. *Int. J. Climatol.*, **1–21**. <https://doi.org/10.1002/joc.7857>

Varble, A.C., S.W. Nesbitt, P. Salio, J.C. Hardin, N. Bharadwaj, P. **Borque**, P.J. DeMott, Z. Feng, T.C.J. Hill, J.N. Marquis, A. Matthews, F. Mei, R. Öktem, V. Castro, L. Goldberger, A. Hunzinger, K.R. Barry, S.M. Kreidenweis, G.M. McFarquhar, L.A. McMurdie, M. Pekour, H. Powers, D.M. Romps, C. Saulo, B. Schmid, J.M. Tomlinson, S.C. van den Heever, A. Zelenyuk, Z. Zhang & E.J. Zipser, 2021: Utilizing a Storm-Generating Hotspot to Study Convective Cloud Transitions: The CACTI Experiment. *BAMS*, **102(8)**, E1597-E1620, <https://doi.org/10.1175/BAMS-D-20-0030.1>

**Borque**, P., L. Vidal, M. Rugna, T.J. Lang, M.G. Nicora & S.W. Nesbitt 2020: Distinctive Signals in 1-min Observations of Overshooting Tops and Lightning Activity in a Severe Supercell Thunderstorm. *J. Geophys. Res. Atmos.*, **125**, <https://doi.org/10.1029/2020JD032856>

**Borque**, P., S.W. Nesbitt, R.J. Trapp, S. Lasher-Trapp & M. Oue, 2020: Observational Study of the Thermodynamics and Morphological Characteristics of a Midlatitude Continental Cold Pool Event. *Mon. Wea. Rev.*, **148**, 719–737, <https://doi.org/10.1175/MWR-D-19-0068.1>

**Borque**, P., K.J. Harnos, S.W. Nesbitt & G.M. McFarquhar, 2019: Improved Parameterization of Ice Particle Size Distributions Using Uncorrelated Mass Spectrum Parameters: Results from GCPEX. *J. Appl. Meteor. Climatol.*, **58**, 1657–1676, <https://doi.org/10.1175/JAMC-D-18-0203.1>

**Borque**, P., E.P. Luke, P. Kollias & F. Yang, 2018: Relationship between Turbulence and Drizzle in Continental and Marine Low Stratiform Clouds. *J. Atmos. Sci.*, **75**, 4139–4148, <https://doi.org/10.1175/JAS-D-18-0060.1>

Chase, R.J., J.A. Finlon, P. **Borque**, G.M. McFarquhar, S.W. Nesbitt, S. Tanelli, O.O. Sy, S.L. Durden & M.R. Poellot, 2018: Evaluation of triple-frequency radar retrieval of snowfall properties using coincident airborne in situ observations during OLYMPEx. *Geophys. Res. Lett.*, **45**, 5752–5760, <https://doi.org/10.1029/2018GL077997>

**Borque** P., E. Luke & P. Kollias, 2016: On the unified estimation of turbulence eddy dissipation rate using Doppler cloud radars and lidars, *J. Geophys. Res. Atmos.* **120**, 5972–5989, <https://doi.org/10.1002/2015JD024543>

Mechem, David. B., S.E. Giangrande, C.S. Wittman, P. **Borque**, T. Toto & P. Kollias, 2015: Insights from modeling and observational evaluation of a precipitating continental cumulus event observed during the MC3E field campaign. *J. Geophys. Res. Atmos.*, **120**, 1980–1995, <https://doi.org/10.1002/2014JD022255>

**Borque** P., P. Kollias & S. Giangrande, 2014: First Observations of Tracking Clouds Using Scanning ARM Cloud Radars. *J. Appl. Meteor. Climatol.*, **53**, 2732–2746, <https://doi.org/10.1175/JAMC-D-13-0182.1>

Kollias, P., I. Jo, P. **Borque**, A. Tatarevic, K. Lamer, N. Bharadwaj, K. Widener, K. Johnson & E. Clothiaux, 2014: Scanning ARM Cloud Radars. Part II: Data Quality Control and Processing. *J. Atmos. Oceanic Technol.*, **31**, 583–598, <https://doi.org/10.1175/JTECH-D-13-00045.1>

**Borque** P., P. Salio, M. Nicolini & Y. García Skabar, 2010: Environment Associated with Deep Moist Convection under SALLJ Conditions: A Case Study. *Wea. Forecasting*, **25**, 970–984, <https://doi.org/10.1175/2010WAF2222352.1>

## INVITED SEMINARS

“Improved Parametrization of Ice PSD Using Uncorrelated Mass Spectrum Parameters: Results from GCPEX”. Invited Seminar at the Aerospace Research Centre, National Research Council Canada, Ottawa, Canada [Nov 2022].

“Radar-based Cloud Type Classification and Multi-sensor Analysis of Processes Controlling Cloud Evolution”. Invited Virtual Seminar at the Department of Atmospheric Sciences, University of Washington, USA [Nov 2020].

“Brief Description of Weather Radars and their Applications in Atmospheric Science” (in Spanish). Invited Seminar at Faculty of Astronomical and Geophysical Science, National University of La Plata. Buenos Aires, Argentina [Jul 2019].

“Characteristics and Applications of Different Meteorological Radars in Atmospheric Sciences” (in Spanish). Invited Seminar at the Department of Oceanic and Atmospheric Sciences, University of Buenos Aires. Buenos Aires, Argentina [Apr 2019].

“The Importance of Field Campaigns in Atmospheric Sciences” (in Spanish). Invited Seminar at the Department of Oceanic and Atmospheric Sciences, University of Buenos Aires. Buenos Aires, Argentina [Jul 2017].

“Characterization of Ice and Snow In-Situ Properties Observed in The Olympic Mountain Experiment”. Invited Seminar at Cologne University. Cologne, Germany [Jun 2017].

“First Observations of Tracking Clouds Using Scanning ARM Cloud Radars”. Invited Seminar at the Department of Atmospheric Sciences, University of Illinois at Urbana-Champaign. Illinois, USA [Mar 2016].

“Preliminary Results on Cumulus Lifecycle during the Midlatitude Continental Convective Clouds Experiment (MC3E)”. Invited Seminar at Brookhaven National Laboratory. New York, USA [Feb 2012].

## SELECTED CONFERENCE PRESENTATIONS

**Borque** P., A.C. Varble & J.C. Hardin, 2021: Processes Affecting Drizzle Formation and Intensity in Continental Shallow Clouds. Virtual poster presentation at the American Geophysical Union Fall Meeting (AGU).

**Borque** P., A.C. Varble & J.C. Hardin, 2020: Cloud type statistics and shallow convective cloud processes over complex terrain in central Argentina. Virtual poster presentation at the American Geophysical Union Fall Meeting (AGU).

**Borque** P., A.C. Varble & J.C. Hardin, 2020: Processes Controlling the Evolution of Orographic Shallow Clouds during CACTI. Oral presentation at the AMS 19th Conference on Mountain Meteorology Virtual Meeting.

Nesbitt S.W., J. Mulholland, I. Singh, L.E.R. Zea, P. **Borque**, K.L. Rasmussen, R.S. Schumacher, A.K. Rowe, L.A. McMurdie, J. Marquis, P. Salio, M.D.L.M.A. Imaz, M. Cancelada, H. Bechis & A.C. Varble, 2019: Mesoscale Flows Leading to Convective Initiation, Upscale Growth, and Heavy Precipitation As Observed during RELAMPAGO-CACTI. Oral presentation at 18th Conference on Mesoscale Processes (AMS) Savannah, GA, USA.

**Borque** P., R.J. Chase, S.W. Nesbitt & G.M. McFarquhar, 2018: Characterization of Ice and Snow in-Situ Properties from GPM Field Campaigns. Poster presentation at 15th Conference on Cloud Physics (AMS) Vancouver, BC, Canada.

**Borque** P., J.A. Finlon, S.W. Nesbitt & G.M. McFarquhar, 2017: Characterization of Ice and Snow In-Situ Properties During the Main Weather Regimes Observed in The Olympic Mountain Experiment. American Geophysical Union Fall Meeting (AGU). Oral Presentation. New Orleans, LA, USA.

**Borque** P., S. Nesbitt, R.J. Trapp & S. Lasher-Trapp, 2017: Relationship Between Convective Systems and the Production and Maintenance of Associated Cold Pools. 38th Conference on Radar Meteorology (AMS). Oral Presentation. Chicago, IL, USA.

**Borque** P., E. Luke & P. Kollias, 2016: Relationship Between Turbulence and Drizzle in Continental and Marine Low Stratiform Clouds. American Geophysical Union Fall Meeting (AGU). Oral Presentation. San Francisco, CA, USA.

**Borque** P., P. Kollias & E. Luke, 2014: Comparison of Eddy Dissipation Rate Retrievals using Vertically Pointing ARM Cloud Radar Observations. 8th European Conference on Radar in Meteorology and Hydrology (ERAD). Oral Presentation. Garmisch-Partenkirchen, Germany.

**Borque** P. & P. Kollias, 2013: Kinematic Study of Layered Clouds using Scanning Cloud Radar Observations. 36th Conference on Radar Meteorology (AMS). Oral Presentation. Breckenridge, CO, USA.

**Borque** P., P. Kollias, K. North, S. Giangrande & S. Collis, 2012: First Look at a Cloud Identification and Tracking Algorithm-Cloud Lifecycle during MC3E. A case study. American Geophysical Union Fall Meeting (AGU). Poster Presentation. San Francisco, CA, USA.

**Borque** P., P. Kollias, K. North, S. Giangrande & S. Collis, 2012: Low-level Divergence Measurements During MC3E. 7th European Conference on Radar in Meteorology and Hydrology (ERAD). Poster Presentation. Toulouse, France.

**Borque** P., P. Kollias, S. Giangrande, E. Luke & K. North, 2011: Evolution of shallow cumulus clouds at the ARM SGP during the MC3E. American Geophysical Union Fall Meeting (AGU). Poster Presentation. San Francisco, CA, USA.

**Borque** P., I. Jo & P. Kollias, 2011: In-cloud horizontal wind profiles using the Scanning W-Band ARM Cloud Radar. 35th Conference on Radar Meteorology (AMS). Oral Presentation. Pittsburgh, PA, USA.

## ATTENDED COURSES AND SUMMER SCHOOLS

Trustworthy Artificial Intelligence for Environmental Science (TAI4ES) Summer School. Held virtually by the National Center for Atmospheric Research (NCAR) in conjunction with NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (AI2ES) [Jul 2021].

ITaRS (Initial Training for Atmospheric Remote Sensing) Summer School “Clouds and Precipitation: Observation and Processes”. Jülich, Germany [Sep 2014].

Short Course on Millimeter Wavelength Radars. 7th European Conference on Radar in Meteorology and Hydrology. Toulouse, France [Jun 2012].

Introduction to Radar in meteorology: Dual – Polarization and Doppler Weather Radar. 7th European Conference on Radar in Meteorology and Hydrology. Toulouse, France [Jun 2012].

Short Course on QPE, QPF and Hydrological Applications for students and experts. 6th European Conference on Radar in Meteorology and Hydrology. Sibiu, Romania [Sep 2010].

## SELECTED WORKSHOPS AND MEETINGS CONTRIBUTIONS

Presentation at the 2022 Aerosols, Clouds, Precipitation and Climate (ACPC) Virtual Workshop:

- **Borque** P.C., A.C. Varble & J.C. Hardin: Factors controlling continental warm rain rate intensity during CACTI field campaign.

Poster presentation at the 2021 ARM/ASR 2021 Virtual Joint Meeting:

- **Borque** P.C., A.C. Varble, J.C. Hardin, K. Johnson & S. Giangrande: Liquid Water Path, Turbulence, And Aerosol Effects on Warm Drizzle Formation and Intensity During CACTI.

Participation at the 2020 virtual NOAA/CPO/ESSM - DOE/ESSD Precipitation Processes and Predictability Workshop.

Participation at the 2020 virtual NASA ACCP Modeling & Assimilation Virtual Workshop: Confronting Future Models with Future Satellite Observations of Clouds and Aerosols.

Participation at the 2020 ASR/ARM Topical Workshop on Machine Learning and Statistical Methods for Observations, Modeling, and Observational Constraints on Modeling. Virtual workshop.

Oral presentation at the 2019 RELAMPAGO-CACTI Data Analysis Workshop, Buenos Aires, Argentina:

- **Borque**, P., L. Vidal, M. Rugna, T. Lang, and S. Nesbitt: Insights from high resolution cloud top cooling rates and lightning observations of a severe weather event during RELAMPAGO-CACTI

Oral presentation at the 2018 Science Team Meeting of the Atmospheric System Research (ASR), VA, USA:

- **Borque** P., and co-authors: RELAMPAGO Overview.

Oral presentation at the 2018 RELAMPAGO Team Meeting, CO, USA:

- **Borque** P. and P. Salio: Local Education and Outreach

Oral presentation at the 2017 Science Team Meeting of the Atmospheric System Research (ASR), VA, USA:

- **Borque** P., and co-authors: SACR Observations.

Oral presentation at the 2017 1st International Summer Snowfall Workshop, Cologne, Germany:

- **Borque** P., S.W. Nesbitt, J. Finlon & G.M. McFarquhar: Statistically representation of in-situ properties of ice and snow particles during The Olympic Mountain Experiment

Participation in the discussion about the next generation technologies and observing capabilities best suited to analyze physical characteristics of environments over a wide range of scales at the 2017 C-RITE Community Workshop on Developing Requirements for in Situ and Remote-Sensing Capabilities in Convective and Turbulent Environments at UCAR Center Green Campus & NCAR Foothills Laboratory, CO, USA.

Collaboration with peer scientists to assure data quality of analyses relevant for radar operations and science at the 2016 5th ARM Radar Workshop at Pacific Northwest National Laboratory, WA, USA.

Poster presentation at the 2016 NASA's Precipitation Measurement Missions (PMM) Science Team Meeting, TX, USA:

- **Borque** P., S. W. Nesbitt, and G. McFarquhar: Precipitation characterization from GPM field campaigns to better constrain spaceborne precipitation retrievals of snowfall.

Poster presentation at the 2016 Joint 8th International Precipitation Working Group (IPWG) and 5th International Workshop on Space-based Snowfall Measurement (IWSSM) Workshop, Bologna, Italy:

- **Borque** P., S. W. Nesbitt, and G. McFarquhar: Precipitation characterization from GPM field campaigns to better constrain spaceborne precipitation retrievals of snowfall.

Poster presentation at the 2011 2nd Science Team Meeting of the Atmospheric System Research (ASR), TX, USA:

- **Borque** P., P. Kollias, and S. Giangrande: Study of Cloud Lifetime Effects Using the SGP Heterogeneous Distributed Radar Network: Preliminary Considerations.

## TEACHING EXPERIENCE

Invited virtual class “Brief Introduction to Millimeter Wavelength Radars” (in Spanish) for “Remote Sensing of Earth System 2” (graduate level) at the Department of Oceanic and Atmospheric Sciences, University of Buenos Aires [Jul 2021].

Substitute lecturer for “ATOC 309: Weather Radars and Satellites” (undergraduate level), McGill University [2 weeks, winter semester 2014].

Graduate Teaching Assistant, McGill University 2009 - 2013: Current Weather Discussion (graduate level) and Natural Disasters, Science of Storms, and Introduction to Atmospheric Sciences (undergraduate level).

Graduate Teaching Assistant, University of Buenos Aires 2006 - 2008: Fluid Mechanics (graduate level) and Introduction to Dynamics of the Atmosphere (undergraduate level).