

Alain Protat

*Senior Principal Research Scientist, Radar Science Team Leader
Australian Bureau of Meteorology, Science and Innovation Group*

700 Collins Street, Docklands, VIC 3008, Australia @: alain.protat@bom.gov.au



Education and Training

- 1991 BS, University Paris Diderot, Physics
- 1993 MS, University Paris Diderot, Physics
- 1996 PhD in Atmospheric Physics, specialty Remote Sensing Applications in Meteorology, with honours.

Employment History:

- 2017 – now Senior Principal Research Scientist, Bureau of Meteorology, Melbourne, Australia.
- 2011 – 2017 Principal Research Scientist, Bureau of Meteorology, Melbourne, Australia.
- 1999 – 2011 Permanent research scientist at CNRS (French National Research Centre) at LATMOS, France.
- 1998 – 1999 Post-doctoral research scientist at CNRS (French National Research Centre) at CETP, France.
- 1996 – 1998 Post-doctoral research scientist at McGill University, Montreal, Canada.

Current work and responsibilities

At the Bureau of Meteorology, I work in the Science and Innovation Group, Research Program, where I lead the "Radar Science" Team. The core of my research is to use radars at different frequencies and on different platforms (ground, ship, aircraft, satellite) to better understand cloud and convection (storms) processes. This better understanding of clouds and convection is then exploited to evaluate and improve satellite products and the representation of clouds and convection in numerical weather prediction and climate models.

Current research activities:

- Investigation of aerosol – cloud – radiation – precipitation interaction processes responsible for the large shortwave radiation biases in climate models over the Southern Ocean.
- Analysis of statistical properties of precipitation and their variability across Australia
- Analysis of radar-derived properties of tropical convection to inform a new cumulus parameterization.
- Analysis of bushfire properties using radar observations
- Development of operational wind and hail nowcasting techniques for the operational radar network

Publication Record (as of 09/2023)

- 2 book chapter contributions, 188 peer-reviewed publications
- Google scholar indices: 5740 citations, h-index=44, i10-index=127
- Researchgate index: 43, citations: 5891.

Selected recent publications

Brook, J. P., A. Protat, C. K. Potvin, J. S. Soderholm, and H. McGowan, 2023: The effects of spatial interpolation on a novel, dual-Doppler 3D wind retrieval technique. *J Atmos. Oceanic. Technol.*, in press, 10/08.

Fiddes, S. L., A. Protat, M. D. Mallet, S. P. Alexander, and M. T. Woodhouse, 2022: Southern Ocean cloud and shortwave radiation biases in a nudged climate model simulation: does the model ever get it right? *Atmospheric Chemistry and Physics*, 22, 14603–14630.

- Protat, A.**, V. Louf, and M. Curtis, 2023: A novel Doppler unfolding technique based on optical flow. *J. Atmos. Oceanic Tech.*, in press, 09/08.
- Protat, A.**, V. Louf, J. Soderholm, J. Brook, and W. Ponsonby, 2022: Three-way radar calibration consistency check using ground-based and spaceborne radars. *Atmos. Meas. Tech.*, 15, 915–926.
- Mallet, M. D., S. P. Alexander, **A. Protat**, and S. L. Fiddes, 2023: Reducing Southern Ocean shortwave radiation errors in the ERA5 reanalysis with machine learning and 25 years of surface observations. *Artificial Intelligence for the Earth Systems*, 2, 1-18.
- Guyot, A., A. Protat, S. P. Alexander, A. R. Klekociuk, P. Kuma, and A. McDonald, 2022: Detection of supercooled liquid water clouds with ceilometers: Development and evaluation of deterministic and data-driven retrievals. *Atmos. Meas. Tech.*, 15, 3663–3681.
- Mace, G. G., **A. Protat**, S. Benson, and P. McGlynn. 2023: Inferring the Properties of Snow in Southern Ocean Shallow Convection and Frontal Systems using Dual Polarization C-Band Radar. *J. Appl. Meteorol. Clim.*, 62, 467-487.
- Lestari, S., **A. Protat**, V. Louf, A. King, C. Vincent, and D. Karoly, 2022: Sub-daily rain rate properties in Western Java analysed using C-band Doppler radar. *J. Appl. Meteor. Clim.*, 61, 1179-1199.
- Alexander, S., G. McFarquhar, R. Marchand, **A. Protat**, E. Vignon, G. G. Mace, and A. R. Klekociuk, 2021: Mixed-phase clouds and precipitation in Southern Ocean cyclones observed poleward of 64°S by ship-based cloud radar and lidar. *J. Geophys. Res.*, 126.
- Mace, G. G., **A. Protat**, and S. Benson, 2021: Mixed-Phase Clouds over the Southern Ocean as observed from satellite and surface based lidar and radar. *J. Geophys. Res. Atmos.*, 126, e2021JD034569. <https://doi.org/10.1029/2021JD034569>.
- McFarquhar, G. M., C. Bretherton, R. Marchand, **A. Protat**, et al., 2021: Observations of clouds, aerosols, precipitation, and surface radiation over the Southern Ocean: An overview of CAPRICORN, MARCUS, MICRE and SOCRATES. *Bulletin of the American Meteorological Society*, 1 - 92.
- Protat, A.** and I. McRobert, 2020: Three-dimensional wind profiles using a stabilized shipborne cloud radar in wind profiler mode. *Atmos. Meas. Tech.*, 13, 3609–3620, <https://doi.org/10.5194/amt-13-3609-2020>

International involvement:

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| 2021 – now | Member of the NASA INCUS science team (selected mission) |
| 2015 – now | Member of the NASA Global Precipitation mission (GPM) Ground Validation team |
| 2014 – now | Member of the international Southern Ocean Clouds, Radiation, Aerosol Transport Experimental Study (SOCRATES) steering committee (NSF funded). |
| 2015 – now | Co-PI of the U.S. DoE Atmospheric System Research (ASR) Macquarie Island Clouds and Radiation (MICRE) program. |
| 2016 – now | Co-PI of the U.S. DoE ASR Measurements of Aerosols, Radiation and Clouds over the Southern Oceans (MARCUS) program. |
| 2023 – now | Co-PI of the US ARM Mobile Facility Cape-K project |

National involvement:

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| 2020 – now | Co-leader of the Australian Antarctic Program Partnership (AAPP) Atmospheric Project |
| 2016 – now | Partner Investigator, ARC Centre of Excellence for Climate Extremes (CLEX) |

Staff, Students and Postdocs currently supervised

Radar Science Team members (10 currently), Marc Mallet (Post-Doc, University of Tasmania), Sonya Fiddes (Post-Doc, University of Tasmania), Jordan Brook (PhD, University of Queensland).