

Kat J. Bormann, BEnvEng, PhD

NASA Postdoctoral Fellow

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Kat J. Bormann is a NASA Postdoctoral Fellow at the Jet Propulsion Laboratory/California Institute of Technology. Kat's areas of interest include snow hydrology, remote sensing of seasonal snow cover, snow cover variability, the spatial and temporal heterogeneity of snow properties (in particular snow density) and the representation of snow processes in models. Kat is currently acting as **Science Liaison to the compute team** for the Airborne Snow Observatory (ASO), a project which produces unique near-real time operational snow water equivalent maps for water resource managers along with invaluable snow retrievals for a new era in snow science.

Kat has been an integral component of ASO, with a) the reduction of product uncertainty through development and implementation of snow density bias-correction procedures, b) improved automation of post-processing and product deliverables **including fusion of Lidar and spectrometer data streams**, c) development, generation and delivery of tailored products for water resource managers throughout California and Colorado, d) working closely with our collaborators at USRA-ARS on model development, snow density algorithms and model improvements, e) undertaking outreach and user engagement activities with potential stakeholders in ASO including the National Water and Climate Center, Kings Basin Water Authority and the Los Angeles Department of Water and Power, f) participating in flight campaigns, and, g) organizing and undertaking multiple field campaigns for further evaluation of ASO products.

Education

- Oct 2013 NASA Postdoctoral Fellow, Jet Propulsion Laboratory/California Institute of Technology, US. Research topics:
- *Airborne Snow Observatory*
- *Spectral un-mixing for remote sensing and snow mapping*
- 2013 University of New South Wales – **PhD in Climate Science**, Australia
Thesis: *Snowpack characteristics and modelling in the marginal snowfields of southeast Australia*
- 2001 Monash University – Bachelor of Environmental Engineering (Hons I), Australia

Research Interests

Remote sensing of snow across multiple spatial scales and in complex terrain, climatic and short term variability in snow, snow hydrology and water resources, building operational tools and systems from complex data, spatial and temporal variability in snow properties in particular snow density and the statistical and physically-based modelling of snow density.

Positions overview

- 2013 – **NASA Postdoctoral Fellow**, Jet Propulsion Laboratory, California Institute of Technology, CA
- 2009 – 2013 **PhD Candidate/Research Associate**, University of New South Wales, AU
- 2008 – 2009 **Environmental Engineer**, Maunsell AECOM (now AECOM Australia), Sydney, AU
- 2006 – 2007 **Water Resources Consulting Engineer**, SMEC Australia, North Sydney, AU
- 2007 – 2009 **Civil & Environmental Consultant**, Terrane Civil Consulting Engineers, AU
- 2003 – 2007 **Civil & Environmental Consultant**, Henwood Consulting Engineers, AU

Honors & Awards

2014 **NASA Group Achievement Award** - Airborne Snow Observatory team
 2013 **NASA Postdoctoral Fellowship**, Jet Propulsion Laboratory (Pasadena, CA)
 2012 The **Silicon Graphics Prize** for high performance computing, UNSW Climate Change Research Centre
 2009 **Australian Postgraduate Award** Scholarship, UNSW (3 years)
 2009 **Top-up Scholarship** – Climate Change Research Centre, UNSW (3 years)
 2002 **Theiss Prize** for Civil Engineering Design, Monash University
 2000 CRC Catchment Hydrology **Student Vacation Scholarship, CSIRO**

Publications

Google Scholar h-index: 4 + i10-index: 3

Total citations 93 (since 2011 total citation 93)

https://www.researchgate.net/profile/Kat_Bormann/publications

Publications: https://drive.google.com/open?id=0ByRWZA08_Ch-b3hqSU5jbVN5d3c

In Preparation

Bormann, K.J., Painter, T.H, Marks, D., Hedrick, A., Winstral, A., Skiles, S.M., Deems, J.S. Using a snow density ensemble to characterize the uncertainty of snow water equivalent distributions from the Airborne Snow Observatory, Water Resources Research.

Bormann, K.J., Marks, D., McGurk, B., Hedrick, A., **Painter, T.H.** The Airborne Snow Observatory quantifies basin-scale snowpack water storage during a severe drought in California. Geophysical Research Letters.

Painter, T.H., **Bormann, K.J.**, Burgess, A.B., and Kaab.A, Impact of dust radiative forcing on heterogeneity of glacier mass balance across the Himalaya. Journal yet to be decided.

Rittger, K., **Bormann, K.J.**, Painter, T.H., Brodzik, M.J., Armstrong, R., Dozier, J. Fractional snow cover for Landsat OLI, MODIS, and VIIRS from spectral mixture analysis. Journal yet to be decided.

In Review

NA

Published

[6] Painter, T. H., Berisford, D. F., Boardman, J. W., **Bormann, K. J.**, Deems, J. S., Gehrke, F., Hedrick, A., et al. (2016) The Airborne Snow Observatory: fusion of imaging spectrometer and scanning lidar for snow albedo and snow water equivalent. *Remote Sensing of Environment* **184**, 139-152. doi:10.1016/j.rse.2016.06.018

[5] Evans, J. P., **Bormann, K.**, Katzfey, J., Dean, S. & Arritt, R. (2015) Regional climate model projections of the South Pacific Convergence Zone. *Clim Dyn* 1–13. doi:10.1007/s00382-015-2873-x

[4] **Bormann, K. J.**, Evans, J. P. & McCabe, M. F. (2014) Constraining snowmelt in a temperature-index model using simulated snow densities. *Journal of Hydrology* **517**, 652–667. doi:10.1016/j.jhydrol.2014.05.073

[3] Argüeso, D., Evans, J. P., Fita, L. & **Bormann, K. J.** (2013) Temperature response to future urbanization and climate change. *Clim Dyn* 1–17. doi:10.1007/s00382-013-1789-6

[2] **Bormann, K. J.**, Westra, S., Evans, J. P. & McCabe, M. F. (2013) Spatial and temporal variability in seasonal snow density. *Journal of Hydrology* **484**, 63–73. doi:10.1016/j.jhydrol.2013.01.032

[1] **Bormann, K. J.**, McCabe, M. F. & Evans, J. P. (2012) Satellite based observations for seasonal snow cover detection and characterisation in Australia. *Remote Sensing of Environment* **123**, 57–71. doi:10.1016/j.rse.2012.03.003

Conference Proceedings

Berisford, D. F., Hand, K. P., Skiles, S. M., Duffy, E. R., Richardson, M. L., **Bormann, K. J.** & Painter, T. H. (2016) Europa Landing Site Analog: LiDAR Surveys of Devil's Golf Course as a Pathological Case for the Surface Morphology of Europa. *Lunar and Planetary Science Conference*, Vol. 47, 2771. Retrieved from <http://adsabs.harvard.edu/abs/2016LPI....47.2771B>

Bormann, K. J., McCabe, M. F. & Evans, J. P. (2011) A new approach to snow detection in Australia using MODIS & Landsat TM. *34th International Symposium on Remote Sensing of Environment*. Presented at the International Symposium for Remote Sensing of the Environment (34th), 10-15 April, Sydney, Australia.

Hairsine, P. B., **Bormann, K.** & Brophy, J. (2001) Stock tracks and the delivery of pollutants to streams by overland flow. *Proceedings of the 3rd Australian Stream Management Conference*. Presented at the Third Australian Stream Management Conference, 27-29 August, Brisbane, Australia: CRC for Catchment Hydrology.

Selected Presentations

Dec 2015 Invited presentation: *Converting snow depth to SWE: the fusion of simulated data with remote sensing retrievals and the Airborne Snow Observatory*. AGU, San Francisco, CA, US

Invited presentation: *Constraining annual water balance estimates with basin scale observations from the Airborne Snow Observatory during the current Californian drought*. AGU, San Francisco, CA, US

May 2015 Invited presentation: *Fusing basin-scale airborne observations with simulations to quantify mountain snow water storage during a severe drought*. AGU/CGU Joint Assembly, Montreal, Canada

Dec 2014 Invited presentation: *How much water is in that snowpack? Understanding basin-wide snow water equivalent estimates from the Airborne Snow Observatory*. AGU, San Francisco, CA, US

Nov 2014 Poster: *VIIRSCAG: A fractional Snow Cover and Grain size product from Suomi-NPP VIIRS surface reflectance retrievals*. Second Suomi NPP Applications Workshop, Huntsville, AL, US

Jul 2014 Presentation: *Comparison of fractional snow detection algorithms for VIIRS retrievals*. International Satellite Snow Product Intercomparison and Evaluation Experiment (SnowPEX), NOAA Center for Weather and Climate Prediction, MD, US

Jun 2011 Presentation: *Comparison of simulated snow cover from WRF regional climate model with satellite-based and in-situ observations*. International Union of Geodesy and Geophysics (IUGG) General Assembly, Melbourne, AU.

Apr 2011 Presentation: *A new approach to snow detection in Australia using MODIS & Landsat TM*. 34th International symposium for Remote Sensing of Environment, Sydney, AU.

Professional Experience

Research

- 2013 – 2016 **NASA Postdoctoral Fellow** at the Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
- 2013 **Research associate** at the Climate Change Research Centre, Kensington, AU
Representation of the South Pacific Convergence Zone in regional and global climate models
- 2009 – 2013 **PhD Candidate** at the Climate Change Research Centre, Kensington, AU
Title: “*Snowpack characteristics and modelling in the marginal snowfields of southeast Australia*”.
- 2011 – 2012 **Research associate** at the Climate Change Research Centre, Kensington, NSW, AU. Research assistant on the NARClm Project involving regional climate modelling.
- Dec 2001 **Research Student**, CSIRO Land and Water Division, Canberra, ACT, AU
2000 **Student Vacation Scholar**, CSIRO Land and Water Division, Canberra, ACT, AU

Private

- 2008 – 2009 **Environmental Engineer**, Maunsell AECOM (now AECOM Australia), Sydney, AU
- 2006 – 2007 **Water Resources Consulting Engineer**, SMEC Australia, North Sydney, AU
- 2007 – 2009 **Civil & Environmental Consultant**, Terrane Civil Consulting Engineers, QLD, AU
- 2003 – 2007 **Civil & Environmental Consultant**, Henwood Consulting Engineers (now HCE Engineers), QLD, AU

Teaching

- 2014 – 2015 JPL Summer Intern student primary advisor
- 2010 – 2012 Water Resources Engineering CVEN 3501, University of New South Wales, AU
- 2010 – 2011 Design Practice B, CVEN4003, University of New South Wales, AU

Training

- Jan 2015 **Level One Avalanche Course**, American Institute for Avalanche Research and Education
- Dec 2014 **Ground Pilot School**, Wings by Werntz, CA
- Mar 2014 **Hypoxia Recognition and Recovery Training**, Van Nuys, CA

Programming/scripting Languages and Software

IDL, ENVI, [R], NCL, Fortran90, basic Python, basic Perl and PBS for high performance computing

Journal Reviews

Remote Sensing of Environment, Water Resources Research, Climatic Change, Hydrology, Climate Research, Journal of Hydrology, Hydrology and Earth System Sciences, The Cryosphere Discussions, Climate Dynamics

Proposal Reviews

NASA Earth and Space Science Fellowship (NESSF) Program – Earth Sciences program, Washington D.C., 2016

Professional Organizations

AGU (American Geophysical Union)

Scientific Collaborations

NSIDC National Snow and Ice Data Center (K. Rittger, M.J. Brodzik), Fractional Snow Cover monitoring

MU University of Melbourne (M. Kearney), Snow model evaluation for niche habitat identification

ARS-USDA Agricultural Research Service, U.S. Department of Agriculture (D.Marks, A.Hedrick)

References

Referee contact details are available on request