

Dr. Melody Sandells

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Director of CORES Science and Engineering Limited. Research interests include snow and cryosphere physics, earth observation of snow and soil moisture, soil-snow-vegetation radiative transfer at optical, thermal and microwave wavelengths.

Education	1999-2002	PhD	Environmental Systems Science Centre, The University of Reading <i>Modelling the effect of vegetation on the seasonal snow cover</i>
	1994-1998	MSci (Physics, 2:1)	Imperial College of Science, Technology and Medicine, University of London Final project: <i>Building a spark chamber</i>

Career Outline 2015- *Director, CORES Science and Engineering Limited*
2013- 2015 *University of Reading. (Senior Research Fellow)*
2005-2013 *University of Reading. (Research Fellow).*
2004-2005 *Operational Research in Health Ltd. (Consultant)*
2002-2004 *Centre for Polar Observation and Modelling, University College
London. (Research Fellow)*

International Community Roles

- Elected Vice President International Commission on Snow and Ice Hydrology (2015-2019)
- Elected AGU Cryosphere Focus Group Secretary (2013-2015)
- Fellow of the Software Sustainability Institute (2013-)
- Lead organiser of MICROSNOW (Workshop on Microstructure in Snow Microwave Radiative Transfer), Reading, August 2014.
- Local organiser for Workshop on Results of the Snow Grain Size Intercomparison Workshop, including financial aspects, on behalf of the WSL Swiss Institute for Snow and Avalanche Research SLF, Davos, Switzerland, Reading, August 2014
- Co-organiser and chair for ESA Workshop on Novel Mission Concepts in Snow and Cryosphere Research, ESA-ESTEC, September 2014
- UK Substitute Representative for EU COST Action ES1404: *Cost Action on a European network for a harmonised monitoring of snow for the benefit of climate change scenarios, hydrology and Numerical Weather Prediction* (2014-2018)
- AGU Cryosphere Focus Group Outstanding Student Paper Awards Co-ordinator (2013)
- Convener and chair* at AGU Fall Meeting (2014*, 2013*, 2012*, 2010, 2008*)
- Convener of AGU Town Hall in Fall Meeting on Software and Research (2013)
- Successfully nominated and solicited support letters for Liz Morris to give prestigious AGU Fall Meeting Nye Lecture (2012)
- Judge for Outstanding Student Paper Award, AGU Fall Meeting (2012), EGU Assembly (2016)
- Member of ESA SMOS Level 2 Prototype Processor Expert Support Laboratory (2005-2007)
- Reviewer for 8 journals, National Science Foundation, Wiley/Blackwell Cryospheric Science Series. Technical Reviewer for IEEE International Geoscience and Remote Sensing Symposium (2009-2015)

Teaching Experience

- Principal PhD Supervisor of William Maslanka, jointly with Finnish Meteorological Institute (2013-) – *Microwave Extinction in Snow*
- PhD Co-supervisor of Tom Watts, jointly with Northumbria University and Environment Canada (2011-) – *Evaluation of snow remote sensing*.
- Designed and supervised MSc projects at Reading University (2009, 2010, 2012, 2013)
- Supervisor of SpIN Summer Intern (2013) and Year 10 work experience student (2010)
- Lectured for Centre for Earth Observation Instrumentation (CEOI) Training Workshop: Passive Microwave Remote Sensing (2012). Feedback from the CEOI director was that it was 'excellent in all respects'
- Lectured, organised and ran practical session at UK Polar Network Summer School (2011).
- Volunteer tutor for physics A-level student (2005-2006)

Departmental and Management Roles

- Member of PhD Committees for several students (2006-)
- Member of seminar organisation committee (2010-2012). Led negotiation of seminar series structure and management during departmental merger.
- Task leader for ESA Project on Advanced Data Assimilation (2012-2014)

Grants and Income

- 2015: PM – ESA Microstructural Origins of Microwave Scattering project. Wrote proposal.
- 2014: PI - MICROSNOW Workshop. Total income from ESA-DA projects, Micro-DICE (European Science Foundation), International Association of Cryospheric Sciences and Software Sustainability Institute
- 2013: PI - Joint UoR / FMI studentship
- 2012: Software Sustainability Institute Fellowship
- 2011: Co-I - ESA advanced data assimilation grant. Contribution: wrote snow component
- 2010: PI for NCEO Mission support travel grant
- 2007: Researcher Co-I – NERC grant for National Centre for Earth Observation Theme 4. Contribution: wrote substantial portion of snow and soil moisture section

Public Engagement and Impact

- Café Scientifique: The Science of Snow Crystals (Dec 2013), The Colour of Snow (May 2014)
- Media communication in The Times, The Observer and live interview on BBC Radio Berkshire (Jan 2013).
- NERC Planet Earth Online: Recorded audio diaries during fieldwork activities in 2011, an extract was included in 'Our best audiodiaries of 2011'
- Science, Technology, Engineering and Mathematics (STEM) Ambassador (2010-)
- FE college practical on satellite retrievals and snow energy balance (Mar 2013, 2014)
- Primary school talk on Earth Observation and Snow (Feb 2016)
- Primary school talk on polar materials (Nov 2011) and polar regions (Mar 2012, Jan 2014)
- Primary school talk on Space and Earth Observation (Jan 2014)
- Secondary school talk on Physics of Snow – designed props and practical (May 2011)
- Project judge for South East regional Big Bang Fair (2010).
- Science Slam Competitor, Reading (2014)

Memberships: Institute of Physics, International Glaciological Society, American Geophysical Union

Field Activities

- Measured snow properties to drive and test microwave emission models in Churchill, Canada (2011), Abisko, Sweden (2011), Sodankylä, Finland (2014).
- Designed and conducted 4-month field experiment on snow-vegetation interactions in Reynolds Creek Experimental Watershed, Idaho, USA, in collaboration with USDA (2001).
- Co-ordinated ground-based measurements of snow and airborne hyperspectral and microwave observations in Sodankylä, Finland (2012).
- NASA field experiment to collect snow crystals for ESEM analysis (1999)

Invited Presentations

- ECMWF H-SAF and HEPEX workshops on coupled hydrology (2014) *Current state of snow remote sensing observations, future direction and remaining challenges*
- AGU Fall Meeting (2012) *Better interpretation of snow remote sensing data with physics-based models*
- UK Climate and Cryosphere (CliC) Meeting, part of the World Climate Research Programme (2004) *Overview of UK Snow Research*
- AGU Fall Meeting (2001) *Modeling the Interaction of Radiation Between Vegetation and the Seasonal Snowcover.*

Selected Other Presentations:

- ESA Workshop on Novel Mission Concepts for Snow and Cryosphere Research (2014) *Challenges in simulation of snow grain size and implications for remote sensing of snow mass*
- AGU Chapman Conference on Remote Sensing of the Terrestrial Water Cycle (2012) *Can simpler models reproduce the temperature gradient of many-layered models for remote sensing of snow mass?*
- AGU Fall Meeting (2012) *Snow stratigraphic heterogeneity within ground-based passive microwave radiometer footprints: implications for emission modelling*
- University of Reading Internal seminars (2010, 2011, 2012)
- Northumbria University (2011) *Remote sensing of snow: the big picture*
- AGU Fall Meeting (2010) *Impact of small-scale microstructure variations on passive microwave brightness temperature*
- Edinburgh University (2010) *Abisko 2011 Spectroradiometer retrievals of snow grain size*
- Workshop on Cold Regions Hydrology (2010) *Inclusion of soil physics in a snow mass and energy balance model*
- National Centre for Earth Observation Conference (2010) *Towards greater accuracy in remotely sensed global snow mass*
- Durham University (2010) *Spectral Reflectance of Snow*
- British Hydrological Society 3rd International Symposium (2010) *Physics based modelling for remote sensing of snow*
- AGU Fall Meeting (2006) *Soil Moisture Retrieval Uncertainty From Soil and Vegetation Heterogeneity Over a Topographic Surface*
- EGU General Assembly (2006) *Simulation of internal snow properties and retention of liquid water*
- SMOS 6th Workshop (2006) *Accounting for wet snow in L-band passive microwave retrievals*
- International Symposium on Snow, Avalanches and Impact of the Forest Cover, Innsbruck (2000) *Modelling the influence of vegetation on the seasonal snowcover.*

Journal Publications:

Maslanka, W., Leppänen, L., Kontu, A., **Sandells, M.**, Lemmetyinen, J., Schneebeli, M., Proksch, M., Matzl, M., Hannula, H.-R., and Gurney, R.: Arctic Snow Microstructure Experiment for the development of snow emission modelling, *Geosci. Instrum. Method. Data Syst.*, 5, 85-94, 2016.

J. Pan **et al.**: Differences Between the HUT Snow Emission Model and MEMLS and Their Effects on Brightness Temperature Simulation, *IEEE Transactions on Geoscience and Remote Sensing*, vol. 54, no. 4, pp. 2001-2019, April 2016.

N. Rutter, **M. Sandells**, C. Derksen, P. Toose, A. Royer, B. Montpetit, A. Langois, J. Lemmetyinen and J. Pulliainen (2014). Snow stratigraphic heterogeneity within ground-based passive microwave radiometer footprints: implications for emission modeling. *J. Geophys. Res. Earth Surf.*, 119, 550–565, doi:10.1002/2013JF003017

M. Sandells, G. Flerchinger, R. Gurney and D. Marks (2012). Simulation of snow and soil water content as a basis for satellite retrievals. *Hydrology Research*. 43.5, 720-735.

I.J. Davenport, **M.J. Sandells** and R.J. Gurney (2012). The effects of variation in snow properties on passive microwave snow mass estimation. *Remote Sensing of Environment*. 118, 161-168.

Rutter, N., **et al.** (2009), Evaluation of forest snow processes models (SnowMIP2), *J. Geophys. Res.*, 114, D06111, doi:10.1029/2008JD011063

M. J. Sandells, I. J. Davenport and R. J. Gurney (2008). Passive L-band microwave soil moisture retrieval error arising from topography in otherwise uniform scenes. *Advances in Water Resources*, 31 1433-1443

I. J. Davenport, **M. J. Sandells** and R. J. Gurney (2008). The effects of scene heterogeneity on soil moisture retrieval from passive microwave data. *Advances in Water Resources*, 31 1494-1502

Tribbeck, M.J., Gurney, R.J., Morris, E.M. (2006). The Radiative Effect of a Fir Canopy on a Snowpack. *Journal of Hydrometeorology* 7, 880–895. doi:10.1175/JHM528.1

Tribbeck, M.J., Gurney, R.J., Morris, E.M., Pearson, D.W.C. (2004). A new Snow-SVAT to simulate the accumulation and ablation of seasonal snow cover beneath a forest canopy. *Journal of Glaciology* 50, 171–182. doi:10.3189/172756504781830187

Other Publications:

M. Sandells and D. Flocco: Introduction to the Physics of the Cryosphere. *IoP / Morgan-Claypool*. 109pp

Sandells, M., M. Hörhold and N. Rutter (2014), Understanding Snow Microstructure for Microwave Remote Sensing, *Eos Trans. AGU*, 95(47), 432.

M. Sandells (2014). Assessment report on new snow mass retrieval framework and on the different assimilation schemes. *ESA Technical Report*. 92pp.

A. Pawlik, A. Pope, **M. Sandells**, K. Iacovino, R. Wilson (2014). Software and research. *GeoQ*, 10, p22.

M. Sandells (2013). Existing snow data assimilation systems and recommendations. *ESA Technical Report*. 51pp.

M. Sandells and R. Hollingham (2011). Let it snow. *Blue Marble Magazine*, 2, 7-9.

I.J. Davenport, **M.J. Sandells**, R.J. Gurney (2010) The effects of variation in snow properties on snow mass estimation using the Chang algorithm, Proc. BHS 3rd Int. Symp., ISBN 1 903741 17 3

M. Sandells, G. Flerchinger, R. Gurney and D. Marks (2010). Physics-based modelling for remote sensing of snow, Proc. BHS 3rd Int. Symp., ISBN 1 903741 17 3