

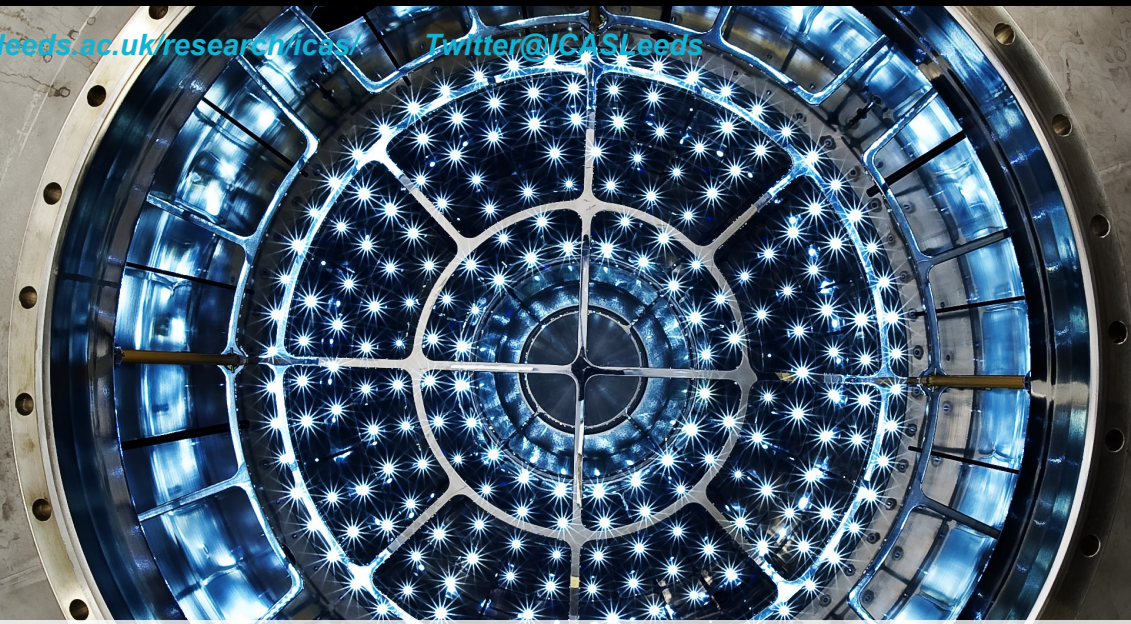


# ICAS Newsletter

Issue 7  
June 2016

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## Institute for Climate and Atmospheric Science

SCHOOL OF EARTH AND ENVIRONMENT

### LAUNCH OF THE PRIESTLEY CENTRE

The launch of the Priestley Centre was held on Tuesday 14 June.

The Priestley Centre is one of the University's flagship strategic investments, with more than £6 million being dedicated to the Centre over the next five years.

The Centre aims to bring together world-leading expertise in all the key strands of climate change research, helping deliver research which underpins robust and timely climate solutions. Piers Forster, the Centre's Director and ICAS Professor of Physical Climate Change introduced the Priestley Centre, drawing parallels with Joseph Priestley, a clergyman and chemist whose work in Leeds on CO<sub>2</sub> won him the Royal Society Copley medal.

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Photo: CERN. CLOUD experiment at CERN

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# PRIESTLEY CENTRE LAUNCH

Continued from front page

“I think new ideas come from challenging orthodoxy and breaking down barriers between disciplines. We therefore wanted to take the name and inspiration of our Centre from Joseph Priestley,” said Professor Forster, emphasising the interdisciplinary theme. “Priestley was the world’s first and also one of the greatest atmospheric scientists. But he was much more than that, he was a free thinker who made many important contributions across the sciences and humanities.”

Vice Chancellor Sir Alan Langlands introduced the Centre with facts about Leeds’s achievements in climate research. “The University of Leeds has over 150 experts working in climate and climate related research. We are first in the world for atmospheric science, publishing between 2010 and 2015 40 papers in Nature & Science. We receive £100 million in research income and five authors from Leeds contributed to the most recent IPCC report. We benefit from the goodwill of British research councils funding of £20million for NERC’s Centre for Polar Observation and Modelling, ESRC’s Centre for Climate Change Economics and Policy and the Centre for Industrial Energy, Materials and Products, part of the Research Council’s energy programme. The university’s Met Office academic partnership is a key development for the UK, bringing together modelling and local and national high powered computing.



**Joeri Rogelj being presented with his certificate as international prize winner by Sir Alan Langlands. University of Leeds.**

“The Priestley Centre aims to promote interdisciplinary research at the same time as considering its impact on nature and society. It will maximise research income by enabling new collaborations. The focus will be on four areas: improving prediction of future climate; understanding risk to develop a resilient world; enabling low carbon solutions and addressing the social, political and economic dimensions of climate change, with huge educational dividends for students.”

The launch saw Piers Sellers OBE give a video message of support to those attending and discussing his time at Leeds, where he gained a PhD in Biometeorology in the School of Geography in 1981.

In honour of Dr Sellers’ work as a renowned climate scientist and in raising public awareness of climate change, the Priestley Centre has created two annual [Piers Sellers Prizes](#) in his name to recognise outstanding research in the field. Deputy Director of the Priestley Centre, John Plane, Professor of Atmospheric Chemistry, introduced the awards.

The Piers Sellers Prize for ‘World leading contribution to solution-focused climate research’ was awarded to Dr Joeri Rogelj, a research scholar at the International Institute for Applied Systems Analysis (IIASA), Austria.

Dr Rogelj’s research examines workable mitigation solutions and the effects of staying below different global temperature targets. He was



# PRIESTLEY CENTRE LAUNCH

the only researcher before the United Nations climate conference in Paris in December 2015 to be actively publishing on how to limit global temperature rise to 1.5°C. His work played a central role in forming the evidence base behind the [Paris Agreement](#).

The second prize, for 'Exceptional PhD Research', is designed to reward and encourage current University of Leeds PhD students undertaking excellent research to better understand or address climate change. It went to [Kate Scott](#) from the Sustainability Research Institute, School of Earth and Environment, who published six papers during her PhD. Scott's research seeks to understand how environmental policies, consumption-side measures and industrial policies can be used to best effect in mitigating climate change. Her research has been integrated into assessments of evidence by the Committee on Climate Change (an independent body that reports to Parliament on progress made in reducing greenhouse gas emissions) and has been presented to various Government departments.

Kate said: "I'm excited to be the first winner of the Piers Sellers prize for a PhD student and I'm very proud to have been nominated by my supervisors, not only based on my publications but also on the policy impact and for the solutions that came out of my PhD.

"There's real momentum to take that forward and further pursue that through – for example, a fellowship through the University – and build on the strengths and the networks that I've gained doing a PhD here at Leeds."

The awards presented by Sir Alan Langland were followed by the signing of the Memorandum of Understanding between the Center for International Climate and Environmental Research – Oslo, (CICERO) and the University of Leeds.

The Director of CICERO, Kristin Halvorsen, talked about how "the partnership links the decade of research collaboration with Leeds

and has produced many publications, in particular with Ken Carslaw, Piers Forster and Julia Steinberger."

Following Kristin's talk, there were four talks representing just a small part of the research that the Priestley Centre brings together.

[Andy Shepherd](#), director of the [Centre for Polar Observation and Modelling](#), described research on "Earth's ice from space", an overview of how satellites have enhanced understanding and highlight changes in inaccessible areas. The Centre's work focusses on, in particular, the Cryosat satellite, which is the first to travel over Antarctic and has led to improvements of models, changes on ice and global sea depth and in the sea ice thickness in the Arctic.

[Lindsay Stringer](#), Professor of Environment & Development of the Sustainability Research Institute, School of Earth and Environment presented her research on "Triple-wins adaptation". Her research focusses on [the links between livelihoods and environment](#), science, policy and environmental governance, and the practical and policy mechanisms that can advance sustainable development.

Next to present his research, entitled "Climate smart cities and low carbon development" was Professor of Environmental Policy and Associate Pro-Vice-Chancellor (Interdisciplinary Research) [Andy Gouldson](#). He works on environmental and climate policy

and in related areas such as energy and development policy, with particular interest in cities and climate change, and has worked extensively on low carbon development for cities in Europe, Asia, South America and Africa.

Finally Wändi Bruine de Bruin, Professor of Behavioural Decision Making and Deputy Director of the Priestley Centre presented her research "Developing effective communications about climate change".

The launch was followed by a celebration with food and drink and then a public Climate Question Time debate addressing the question, 'Are there achievable solutions for limiting climate impacts at 1.5°C level?'

**Piers Forster signing the Memorandum of Understanding between University of Leeds and CICERO. University of Leeds.**



# SUCCESS AND CONGRATULATIONS

## DOMINICK SPRACKLEN APPOINTED TO PROFESSOR OF BIOSPHERE-ATMOSPHERE INTERACTIONS



Dominick completed his PhD on global aerosol modelling in ICAS in 2006 before going on to a position at Harvard University. He then returned to a NERC Advanced Fellowship in Leeds. He continues to pursue his research on global aerosol and climate, but has also diversified to cover a wide range of important problems related to how the biosphere and atmosphere interact.

In 2014 he published ground-breaking research, published in *Nature*, showing that rainfall over tropical forests is strongly affected by deforestation.

In 2015 he was awarded the Philip Leverhulme Prize. Dominick also makes many contributions beyond research, such as co-founding the Leeds Ecosystem, Atmosphere and Forest (LEAF) Centre and the Leeds Forest Observatory to enhance teaching and learning. He was also a co-founder of the United Bank of Carbon, a not-for-profit collaboration between businesses and environmental scientists at the

University of Leeds, which protects and restores forests in partnership with local communities.

## ANJA SCHMIDT WINS THE GEOLOGICAL SOCIETY WILLIAM SMITH FUND

Anja Schmidt wins The Geological Society William Smith Fund, presented at President's Day 2016 at Burlington House on 8 June by president of the Geological Society of London (below photo).

Anja is an Academic Research Fellow in ICAS since February 2013. She combines expertise in atmospheric science and volcanology to advance the current understanding of volcanic impacts and hazards. In particular, she investigates the impact of volcanism on atmospheric chemistry, climate, air quality, human health, ecosystems and aviation using a wide range of atmospheric models and volcanological datasets. She also applies atmospheric chemistry and aerosol modelling skills to non-volcanic topics in atmospheric and climate sciences.



*The [Geological Society of London](#), founded 1807, is a learned and professional body, of over 12,000 Earth scientists with a remit to investigate, interpret, discuss, inform and advise on the nature and processes of the Earth, their practical importance to humanity, and, in the interests of the public, to promote professional excellence.*

## RESEARCH EXPERIENCE PLACEMENT

The Doctoral Training Partnership have awarded Phil Rosenberg, Jim McQuaid and Kirsty Pringle one of the Research Experience Placements. Andrew Tolmie will be here over the summer working on a project titled Characterisation and Deployment of a New Environmental Particulate Matter Detector.

# SUCCESS AND CONGRATULATIONS

## THEO WILSON HAS BEEN AWARDED A BRITISH SCIENCE ASSOCIATION MEDIA FELLOWSHIP

Theo will be working at The Mirror for 3 weeks, 20<sup>th</sup> June – 8<sup>th</sup> July. The aim of the fellowship is to give scientists the opportunity to work in the media to learn more about science communication and how journalists go about deciding which science stories to report on.

Every year up to ten Media Fellows are mentored by professional journalists and learn how the media operates and reports on science, how to communicate with the media and to engage the wider public with science through the media.

After their media placement Fellows attend the British Science Festival in September, which provides an opportunity to gain valuable experience working alongside a range of media organisations from all over the UK in our dedicated Press Centre. The Festival also offers

**The 2016 Media fellows taken at British Science Association headquarters in London. British Science Association**



opportunities to learn from a wide range of public engagement activities and network with academics, journalists and science communicators.

Theo will be covering the British Science Festival for The Mirror in September. When he's finished his placement he plans to then disseminate what he learnt to colleagues in ICAS.

See <http://www.britishsociety.org/media-fellows>.

## INTRODUCING PETAL - THE PETABYTE ENVIRONMENTAL TAPE ARCHIVE AND LIBRARY

PETAL is a robotic tape library purchased by the School of Earth and Environment (SEE) to store large volumes of data from observations and model simulations. PETAL is available to all SEE staff and can be used to archive and store any data that is required for research, teaching or fieldwork.

PETAL is an active archive where data is moved seamlessly between disk and tape by the archiving software, providing access to volumes of data much larger than the disk cache. The online capacity of the library is 2.3 Petabytes and the disk cache is 0.5 Terabytes. PETAL is mainly designed to act as a long-term archive but can also serve near-online disk datasets. Completed tapes which haven't been recently accessed are stored outside the library, providing an essentially infinite offline capacity.

Multiple levels of redundancy and security exist and the data are automatically encrypted using AES-256, making the data unreadable from outside sources. Multiple copies of the data can also be produced for extra redundancy of sensitive information.

PETAL costs approximately £ 100/TB of storage. The service has an initial 10 year lifespan, with the possibility to extend the lifetime of the storage.

For more information about visit <http://www.petal.leeds.ac.uk> (only visible from within leeds.ac.uk). The website monitors all aspects of the tape library and each storage allocation has a restricted access web page that displays information about their usage of the tape library.

# POLAR PREDICTION SCHOOL

## POLAR PREDICTION SCHOOL

Prof Ian Brooks spent two weeks in April as an invited lecturer on a Polar Prediction School for graduate students and early career researchers. The school is a joint initiative from the World Weather Research Programme (WWRP), World Climate Research Programme (WCRP), and Bolin Centre for Climate Research.

Polar regions are experiencing rapid changes to their climate; this is opening up new possibilities for businesses such as tourism, shipping, and oil and gas extraction. At the same time it brings new risks to these delicate environments. Effective weather and climate prediction is essential to managing these risks. The complexity of the polar environmental systems, and very limited measurements in these remote regions, make them very challenging environments to provide accurate forecasts for any time scale from days to decades.

The school was based at the Abisko Scientific Research Station in northern Sweden – an appropriately

### Polar prediction School. Lina Broman



**Radiosonde. Ian Brooks**

Arctic environment. It brought in 28 PhD students and early career researchers from all over the world and a wide range of disciplines for nine days of lectures and practical exercises on the theme of polar prediction. Organised by Jonny Day (Reading University) and Gunilla Svensson (Stockholm University), the invited lecturers included James Screen (Exeter University), Helge Gossling and Thomas Jung (AWI), Cecilia Bitz (University of Washington), Don Perovich (CRREL), Erik Kolstad (University

Bergen), Jen Kay (Colorado University), and Matthew Chevallier (Meteo France)

Ian lectured on measurement of the Arctic atmosphere and surface exchange processes with associated practical exercises based around measurements of near-surface wind and temperature profiles and the surface energy budget made from a micro-meteorology mast erected on the frozen surface of Lake Torneträsk. Radiosondes were released each day, with 1 day of intensive measurements where radiosondes were released every 3 hours for 24 hours to study the diurnal cycle of boundary layer structure. All the observations were drawn together on the final day to study the full range of processes governing the surface energy balance over the previous week. Other lectures and exercises covered chaotic systems and predictability, operational ocean prediction, modelling polar boundary layer processes, ensemble climate prediction, sea ice processes, and polar lows.



## LEEDS FOREST OBSERVATORY

Last month, Leeds Ecosystem, Atmosphere and Forest (LEAF) Co-Director Dominick Spracklen and Co-ordinator Cat Scott spoke to Made in Leeds about the Leeds Forest Observatory (LFO) being established in Leeds this summer (at 7 mins in the clip here: <http://www.madeinleeds.tv/player/?playercat=76643&vid=pa5b10p0>).

LEAF researchers from across the University are working with Leeds City Council to establish an observatory, which will allow students and staff from the university to contribute to the collection of long-term environmental measurements and study the role of forests in the provision of ecosystem services.

The LFO will be located in Middleton Park, South Leeds, home to the second largest remaining area of ancient woodland in West Yorkshire. A specific 1 hectare patch of forest will be chosen for the LFO, allowing students and staff to return to the same area year on year to build up a picture of the environmental conditions, and any changes to them.

The LFO will contribute to the delivery of research-led teaching by providing opportunities for students from the university to become more deeply involved in scientific work and facilitating high-quality training in monitoring, analysing and reporting environmental data. More widely, the LFO will help address key questions in environmental research, enhancing our understanding of the role of forests in mitigating climate change, improving air quality and maintaining biodiversity.



Establishment of the LFO has been made possible due to funding from the University of Leeds Footsteps Fund, the United Bank of Carbon and the School of Earth and Environment Teaching Enhancement Fund.



Dominick Spracklen being filmed by Made in Leeds, Cat Scott.

Supported by donations to the  
**FOOTSTEPS FUND**  
by alumni and friends of the University of Leeds

# THE PHD EXPERIENCE BLOG

The PhD Experience Blog is a new feature of the ICAS Newsletter. The aim is to provide an opportunity for PhD students to describe their experiences of doing a PhD in ICAS. Our students take part in all kinds of interesting activities, from field work to visits to research partners.

## EXPLORING MY FIELD SITE IN VIETNAM BY POSTGRADUATE STUDENT SUZANNE STAS

“Are you doing a PhD in tropical forest ecology in Leeds?” People often ask me this with questioning faces. Indeed, it means that I am connected to the University of Leeds, but my field site is in Vietnam.

Therefore I went last month with my supervisor Dominick Spracklen on a two-week scoping trip to Vietnam. The aim of our trip was to meet local partners and organizations, visit my field site and to understand the logistics for my upcoming fieldwork.

My research takes place in the Khe Nuoc Trong forest in Quang Binh Province. The forest is protected for the important watershed services it provides, but illegal logging is frequently occurring and threatens the forest and its valuable ecosystem services.

A new method to finance conservation of the world's forests is to create a value for the carbon stored within trees and vegetation. Individuals or companies that want to reduce their carbon footprint can purchase carbon "credits", with the money used to protect forests. Before this can happen, we need a better understanding of the amount of carbon stored within forests and how this is altered when forests are logged.

During my PhD, I will study the



Camping in the forest, Suzanne Stas.

impacts of forest degradation and regrowth on the carbon storage and sequestration in the Khe Nuoc Trong forest.

The first few days we met people from several environmental research institutes, NGO's and a local university, to get a better understanding of what forestry and carbon-related work has already been done in this region. Geared up with leech socks and a GPS, we then went on a three-day trip to the forest. As it was the end of the rainy season, the water levels were quite high and we had to cross the river many times. After a five hour hike we reached our camp site: a spot uphill where we built a quick forest camp, put up our hammocks and took a shower in the river. The next day we further explored the forest to get a better impression where the logging takes place, how the forest looks like and where we want to establish our sample plots. The following day we hiked back to the village and took the night train to Hanoi.

This trip has provided us all the necessary information to plan my research and fieldwork for next year.

This work is funded by the World Land Trust. To find out more about their conservation work in the Khe Nuoc Trong forest visit <http://www.worldlandtrust.org/>

[news/2014/09/khe-nuoc-trong-forest-project-officially-launches-vietnam](http://www.worldlandtrust.org/news/2014/09/khe-nuoc-trong-forest-project-officially-launches-vietnam).



Suzanne Stas



## THE PHD EXPERIENCE BLOG



Above: Crossing the river, sometimes up till belly height. Below: Camping in the forest. Suzanne Stas.



# OUTREACH

## PINT OF SCIENCE

A new series of public engagement events has come to Leeds, set up by School of Earth & Environment Postgraduate students including ICAS's Oliver Halliday. The first evening was on the subject of meteorology with speakers Dr Jim McQuaid, Dr Ryan Neely III and Dr Cathryn Birch.

**Dr Ryan Neely** (Lecturer: Observational Atmospheric Science) gave a talk entitled *Goldilocks and the Greenland Ice Sheet*. Ryan said "Melting of the world's major ice sheets significantly affects human and environmental conditions by contributing to sea-level rise. In July 2012, an historically rare surface melt event was observed across the Greenland ice sheet. The cloud conditions, being "juuusssst right", played a key part in this melting event. The clouds were just thin enough to allow sunshine to penetrate through them and just thick enough to act as a blanket and trap heat from the ground. This combination pushed temperatures above freezing for the first time in 150 years."

**Dr Cathryn Birch** (University Academic Fellow) discussed *The floods of December 2015: climate change or just bad weather?* Cathryn said "Storms Desmond and Eva passed over northern England on 5th and 26th December 2015. With between 2 and 4 times the average rainfall, these storms contributed to one of the wettest Decembers on record. The period was exceptional and record-breaking but what was the cause? This talk gave an overview of the weather situation associated with storms Desmond and Eva and discussed the potential role of El Nino and climate change in the severity of the storms."

**Dr Jim McQuaid** (Associate Professor of Atmospheric Composition) asked the question *How to Weigh a Cloud*. He said "It has been calculated that at any

instant there are 12,900 cubic kilometres of water floating around the sky in the form of clouds, equivalent to around 10 million million tonnes of water. High in the atmosphere it's all about ice crystals whereas lower down water flips between a vapour and liquid droplets which we see as clouds. But, just how much does a typical fluffy cloud weigh? In this talk we will examine a number of ideas, some more crazy than others, culminating in the first ever time someone has actually weighed a cloud!"

The Pint of Science festival aims to deliver interesting and relevant talks on the latest science research in an accessible format to the public – all in the pub! It aims to provide a platform which allows people to discuss research with the people who carry it out - no prior knowledge of the subject is required. It is run mainly by volunteers and was established by a community of postgraduate and postdoctoral researchers in 2012. The main festival takes place annually over three days in May simultaneously in

pubs across the world. Pint of Science is a non-profit organisation.

### History

In 2012 Dr Michael Motskin and Dr Praveen Paul were two research scientists who started and organised an event called 'Meet the Researchers'. It brought people affected by Parkinson's, Alzheimer's, motor neurone disease and multiple sclerosis into their labs to show them the kind of research they do. It was inspirational for both visitors and researchers. They thought if people want to come into labs to meet scientists, why not bring the scientists out to the people? And so Pint of Science was born. In May 2013 they held the first Pint of Science festival and it quickly took off around the world. <https://pintofscience.co.uk>

## I'M A SCIENTIST, GET ME OUT OF HERE

**PINT OF SCIENCE**  
REAL SCIENTISTS IN PUBS NEAR YOU  
23-25 MAY 2016  
EVENTS FROM 7PM

Event	Location	Topic
<b>BEAUTIFUL MIND</b>	MIDNIGHT BELL, 101 WATER LANE, LEEDS, LS11 5QN	23 MAY: NO PAIN, NO MEMORY GAIN 24 MAY: MIND TO MOTION: HUMANS AND ROBOTS 25 MAY: FOOD FOR THOUGHT
<b>ATOMS TO GALAXIES</b>	O'NEILL'S, 26 GREAT GEORGE STREET, LEEDS, LS1 3DL	23 MAY: PHYSICS FOR FUTURE COMPUTERS 24 MAY: SPACE WEATHER AND THE BIRTH OF THE SOLAR SYSTEM 25 MAY: LIFE ON THE EDGE
<b>PLANET EARTH</b>	MR FOLEY'S, 159 THE HEADROW, LEEDS, LS1 5RG	23 MAY: METEOROLOGY 24 MAY: DYNAMIC EARTH 25 MAY: CLIMATE: PAST, PRESENT AND FUTURE

FOR TICKETS VISIT [PINTOFSCIENCE.CO.UK](http://PINTOFSCIENCE.CO.UK) @PINTOFSCIENCE #PINT16

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# OUTREACH

Catherine Scott, a postdoc in ICAS, recently took part in an outreach competition called “I’m a Scientist, Get Me out of Here”: <http://imascientist.org.uk/> in which school children from around the UK can ask scientists questions about their work, or about science in general.

The students then vote for their favourite scientist, and one scientist gets (cruelly!) evicted each day.

The competition is run in different zones, and she won the Climate Change Zone: <http://climatem16.imascientist.org.uk/2016/03/18/and-the-winner-is/>.

Cat said “I couldn’t have imagined how much I would enjoy taking part in “I’m a Scientist, Get Me Out of Here” – the children asked some great questions and it was reassuring to see how aware they were of the need to protect the environment. In fact they were pretty annoyed with us grown ups for having messed it up!”

The prize is £500, which she plans to spend on school outreach activities.

**Drawing by Cat Scott to explain her research to school children “Developing a framework to test the sensitivity of atmospheric composition simulated by Earth System Models (ESMs) to changing climate and emissions”.**



# FEATURED PAPERS

## CERN CLOUD PROJECT DISCOVERS A NEW WAY THAT PARTICLES FORM IN THE ATMOSPHERE

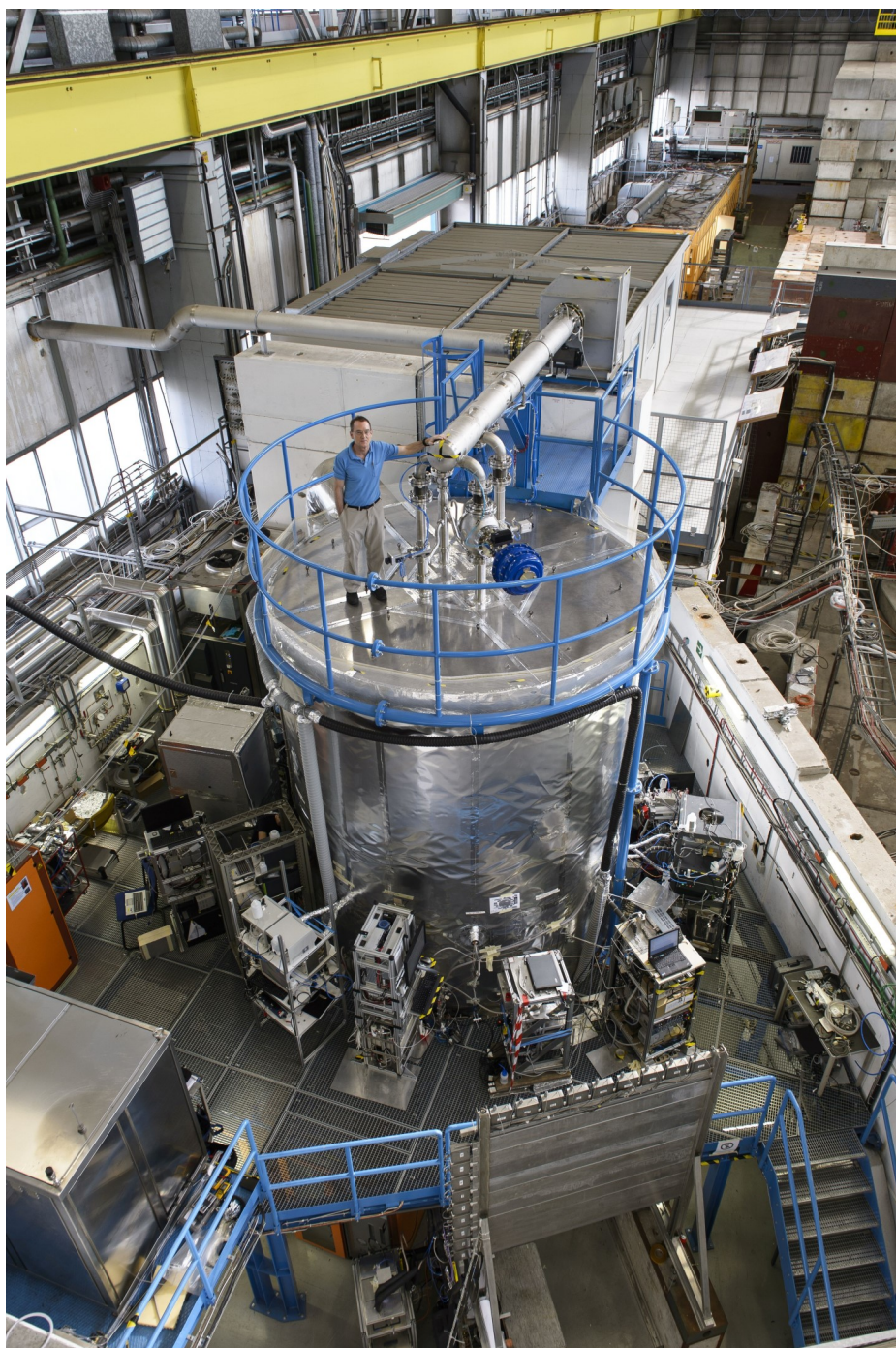
Two studies published in *Nature* this month outline exciting breakthroughs in our understanding of how aerosol particles are formed in the atmosphere, and overturn the long held belief that sulphur-containing molecules are needed to form new particles.

The research comes from the EU-funded CLOUD consortium which includes ICAS's Professor Ken Carslaw and PhD student Kamalika Sengupta.

**Professor Carslaw said “The CERN CLOUD experiment is uniquely capable of measuring how individual clusters of molecules form and grow into particles that eventually affect clouds and climate. We have shown that particles can form just from the organic molecules emitted by natural vegetation. This means that sulphur-containing pollutants are not needed.”**

We know that mankind's sulphur dioxide emissions from coal burning form small aerosol particles in the atmosphere, which in turn grow to act as cloud seeds. This in turn has made clouds brighter and more reflective, which has had a cooling effect on the Earth since the industrial revolution. This cooling effect is potentially nearly as large as the warming effect from carbon dioxide but it is also very uncertain, one of the largest uncertainties in climate science.

Previous work has suggested that man-made sulphur-containing gases were nearly always involved in particle formation, suggesting that the



pre-industrial atmosphere would often have been very clean with few cloud seeds compared to today. This is what most climate models also assume and thus they typically model large changes in particles since pre-industrial times, which produce correspondingly large increases in cloud brightness and a large cooling effect.

Piers Forster, Director of the University's new Priestley Centre for Climate said

“This work is something of a game changer as it revises what happens in pristine pre-industrial

environments. It shows that organic molecules can form and grow particles independently of sulphur. This has been measured in laboratory studies at CERN and also observed in clean air on the Jungfrau<sup>1</sup>. These results mean that there may well have been more cloud seeds available in the past than we thought, potentially lessening their increase over the last century. When these new results are worked through into our simulations we may find a smaller aerosol-cloud cooling effect over the last century.

“If the change in the aerosol-cloud effect is significant it is good news for

## FEATURED PAPERS

climate change. Firstly, it may mean that the Earth is less sensitive to greenhouse gas changes than we previously thought. Secondly, it may mean that cleaning up sulphur dioxide emissions may not lead to such a large drop in cloud reflectance and corresponding warming that some feared might happen. There is still a lot of research that needs doing to test these theories though.”

Professor Carslaw added that “It’s going to be very challenging to observe such natural aerosol formation in today’s polluted atmosphere. But hopefully these results will encourage scientists to understand the natural atmosphere, which is so important to our understanding of how human activities affect the climate”.

The CLOUD Marie Curie Initial Training Network is a multi-site network of 8 Ph.D. students and 2 post-docs at 9 partner institutions across Europe. The network investigates various aspects of the interactions of cosmic rays with

aerosols and clouds, which bears on the possibility of a “solar indirect” contribution to climate change. Besides the individual research of the Ph.D. students and post-docs at their hosting institutions, the major focus of the network is common experiments on aerosol nucleation carried out at CERN. These experiments are conducted at an aerosol chamber that is exposed to a CERN elementary particle beam where the effects of cosmic rays on aerosol and cloud formation can be efficiently simulated.

1) A brief CLOUD tour, available at:

<https://cds.cern.ch/record/2154271>

2) A description of the Nature results, which includes animations:

<https://cds.cern.ch/record/2155289>

Kirkby, J. et al. Ion-induced nucleation of pure biogenic particles. Nature, doi 10.1038/nature17953 (2016).

Tröstl, J. et al. The role of low-volatility organic compounds in initial particle growth in the atmosphere.

Nature, doi 10.1038/nature18271 (2016).

**Opposite page photo: CERN - CLOUD experiment at CERN**

**This page photo: CERN - Jasper Kirkby and The CLOUD experiment in October 2013**



# ICAS WINS THREE OUT OF FOUR IN SCHOOL OF EARTH & ENVIRONMENT POSTGRADUATE RESEARCHER PUBLICATIONS PRIZE 2015/16

Congratulations to ICAS PhD students Leighton Regayre, Ed Butt and Rory Fitzpatrick on being awarded School 2015/16 Postgraduate Researcher Publication Prizes, plus Susanne Lorenz and Stephen Turnock for their commended papers.

This event is now in its 6<sup>th</sup> year and the committee continues to be impressed with the quality of the nominations. A high number of nominations were received and it is encouraging to have so many researchers taking part and making such a great contribution to the success of the School.

Details of the winning papers and their authors can be found below.

A prize giving event was held in the school on Monday 20 June followed by a reception.

## The Prizewinners

**Leighton Regayre - Regayre, L. A., Pringle, K. J., Lee, L. A., Rap, A., Browse, J., Mann, G. W., Reddington, C. L., Carslaw, K. S., Booth, B. B. B., and Woodhouse, M. T., 2015: The Climatic Importance of Uncertainties in Regional Aerosol–Cloud Radiative Forcings over Recent Decades. *J. Climate*, 28, pp6589–6607. doi: <http://dx.doi.org/10.1175/JCLI-D-15-0127.1>**

Leighton describes the research: “This research has significantly advanced understanding of the role of atmospheric particles (aerosols) on climate phenomena such as the Asian Summer Monsoon, Arctic warming and the frequency of tropical storms. In this publication I identified the parameters in our global model GLOMAP that are the largest sources of uncertainty, with regard to the amount of solar radiation reflected back into space by clouds. The sources of uncertainty differ between regions. Modelling groups can now reduce the uncertainty in their global climate

models by improving the representation of the specific parameters I’ve identified. As a result more accurate representations of climate phenomena are expected.

“Crucially I’ve shown that aerosol uncertainty is more important at the regional scale than the global scale and as such has the potential to be an important source of uncertainty beyond the coming decades. By highlighting the importance of aerosol uncertainty at the regional scale this research has the potential to transform climate modeller’s perceptions about the role of aerosols in future climates.

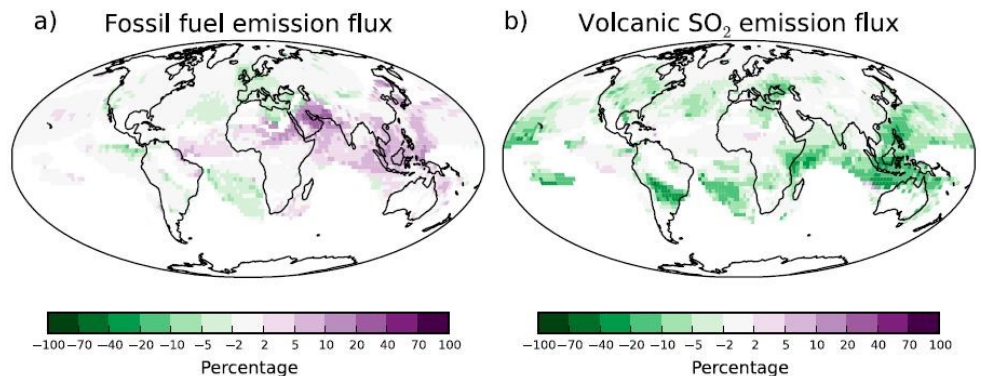
To conduct this research I’ve made use of cutting-edge statistical techniques and at the same time drawn upon substantial computational resources. The results I’ve presented in this paper would not be obtainable without this combination of statistical expertise and high-performance computing. As such I’ve elevated the standard for analysing sources of uncertainty in global climate models.”

**Ed Butt - Butt, E. W., Rap, A., Schmidt, A., Scott, C. E., Pringle, K. J., Reddington, C. L., Richards, N. A. D., Woodhouse, M. T., Ramirez-Villegas, J., Yang, H., Vakkari, V., Stone, E. A., Rupakheti, M., S. Praveen, P., G.**

**van Zyl, P., P. Beukes, J., Josipovic, M., Mitchell, E. J. S., Sallu, S. M., Forster, P. M., and Spracklen, D. V.: The impact of residential combustion emissions on atmospheric aerosol, human health, and climate, *Atmos. Chem. Phys.*, 16, 873-905, doi:10.5194/acp-16-873-2016, 2016**

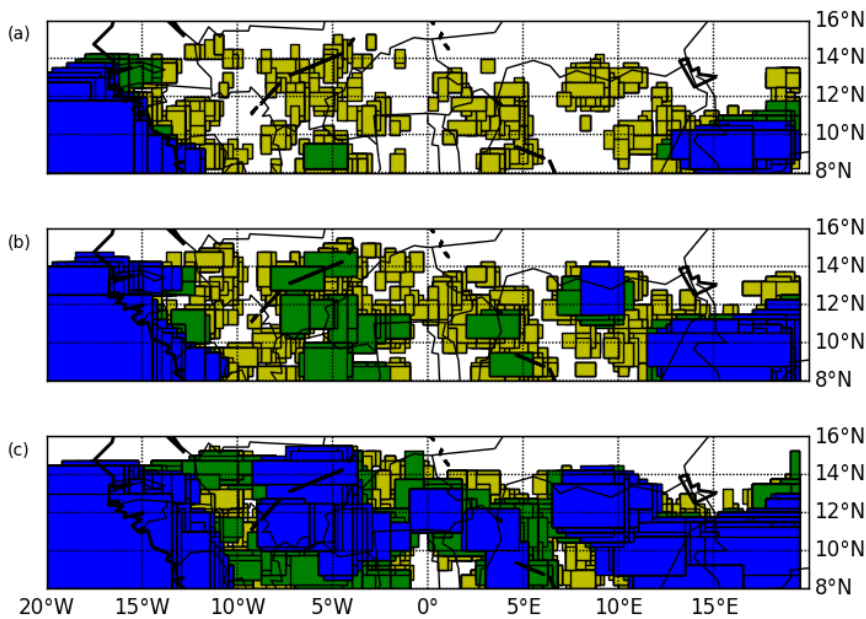
Ed outlines the findings in his paper: “Three billion people rely on the combustion of solid fuels for their basic energy requirements. Combustion of these fuels usually occurs in open fires or simple cookstoves with poor combustion efficiency resulting in large emissions of smoke to the atmosphere. This paper reports the first detailed study of the contribution of particulate emissions from residential solid fuel combustion to ambient air quality and the impacts on human health and climate. A global atmospheric aerosol model was used to simulate particulate matter concentrations and to calculate the contribution from residential solid fuel emissions.

“The study finds that these emissions account for up to half of particulate matter over large regions of East Asia, South Asia, and Eastern Europe where combustion of these fuels is very common. At the global



**Fig. 6 Percentage contributions to cloud albedo effect (CAE) forcing variance for (a) fossil fuel emission flux in May and (b) continuously degassing and sporadically erupting volcanic SO<sub>2</sub> emission flux in June. Purple shading is used to indicate that increasing the parameter amplifies CAE forcing (positive or negative) within individual model grid boxes, and green shading indicates that increasing the parameter suppresses CAE forcing.**

# ICAS WINS THREE OUT OF FOUR IN SCHOOL OF EARTH & ENVIRONMENT POSTGRADUATE RESEARCHER PUBLICATIONS PRIZE 2015/16



**Figure 6 from Rory Fitzpatrick's paper showing the level of spatial agreement of onset dates across West Africa.**

"This paper questions that consensus. Through creation of a novel concept (local onset regions), this paper finds non-arbitrary regions over West Africa over which local onset variability is homogenous. The work also provides the first analysis of a local onset trigger across West Africa.

"The impact of this paper is expected to be great. For the first time, regions have been provided over which local onset inter-annual variability is consistent and can be assessed using a representative time series of onset dates. This allows for local onset triggers to be discovered and provides relevant information for dependent stakeholders.

"The paper is currently unique with its sole focus on local onsets. The method presented is novel and has the potential for use in other areas of research (such as the spatial homogeneity of high impact weather over West Africa).

scale, residential solid fuel emissions were estimated to cause 308 000 (113 300–497 000) premature mortalities each year due to cardiopulmonary disease and lung cancer.

"Comparison of the model against observed particulate matter concentrations suggests residential emissions may be underestimated. Accounting for this underestimate increased estimated global mortality due to residential emissions by 60% to 517 000 (192 000–827 000) each year. The climate impact of residential emissions was sensitive to assumptions on the chemical composition and the size distribution of the emissions, but was small overall. The paper demonstrates that reducing particulate emissions from residential combustion would have substantial benefits for human health through improved ambient air quality."

Rory gives us a summary of his publication: "Accurate prediction of the local West African Monsoon onset is vital for local and regional stakeholders across West Africa. Currently, there is a dearth in research into what causes agronomic onset over the region limiting predictive potential. Previous publications have suggested that local precipitation and by proxy local agronomic onset is too spatially noisy to be properly assessed.

**Rory Fitzpatrick - Fitzpatrick, R. G. J., D. J. Parker, J. H. Marsham, P. Knippertz, and C. L. Bain (in press), On what scale can we predict the agronomic onset of the West African Monsoon?, Mon. Weather Rev.**



**Woman cooking on solid fuel stove in Malawi. Natalie Suckall.**

# LAUNCH OF THE CENTRE OF EXCELLENCE FOR MODELLING THE ATMOSPHERE AND CLIMATE (CEMAC)

Around 70 scientists and external partners gathered together on Tuesday 21st June 2016 for the Launch of our new Centre of Excellence for Modelling the Atmosphere and Climate (CEMAC). CEMAC is a major new initiative within the Institute for Climate and Atmospheric Science (ICAS) and the School of Earth and Environment at the University of Leeds.

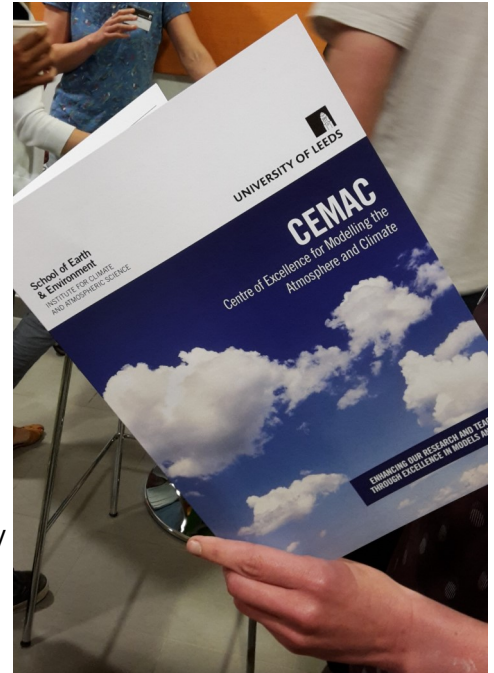


**CEMAC Director Dr Steve Arnold and Dr Kirsty Pringle at the launch. Cat Scott.**

CEMAC aims to be the UK's leading Centre of excellence in atmospheric and climate modelling and complex data exploitation. CEMAC has been established to substantially enhance the institute's research, teaching, impact and outreach capabilities, related to computer modelling, data analysis and visualisation. Its vision is to provide technical and scientific expertise to support a broad and ambitious range of modelling and visualisation activities, rivalling the best international examples of how model and data support and strategy is organised in computing-intensive research institutions.

ICAS Director, Prof Ken Carslaw and CEMAC Director, Dr Steve Arnold welcomed everyone to Leeds and gave an introduction to the Centre.

Dr Steve Arnold said that "Our vision is to capitalise on untapped potential in our advance computing and modelling, to enable development of our most ambitious science, leading to substantially increased impacts of our research".



A number of speakers outlined the grand challenges CEMAC aims to address in terms of weather (Dr John Marsham), atmospheric composition (Prof Dominick Spracklen) and climate science (Dr Amanda Maycock). Dr Jon Petch from the Met Office discussed the academic partnership between Leeds and the Met Office and how the contribution from CEMAC in terms of joint model and joint technical development will be critical in the future.



**Attendees of the CEMAC launch enjoy drinks to celebrate. Cat Scott.**



# LAUNCH OF THE CENTRE OF EXCELLENCE FOR MODELLING THE ATMOSPHERE AND CLIMATE (CEMAC)

Prof Alan Haywood introduced the University new tape archive facility (PETAL) and Dr George Holmes gave a perspective on how CEMAC will provide a massive contribution to research-based teaching in terms of visualisation and computing for education. Dr Anna Hogg and Dr Juliane Schwendike then outlined example case studies on the potential use data visualisation tools within CEMAC.

The CEMAC launch was closed by Dr Alan Real (Director of Research Computing, University of Leeds).

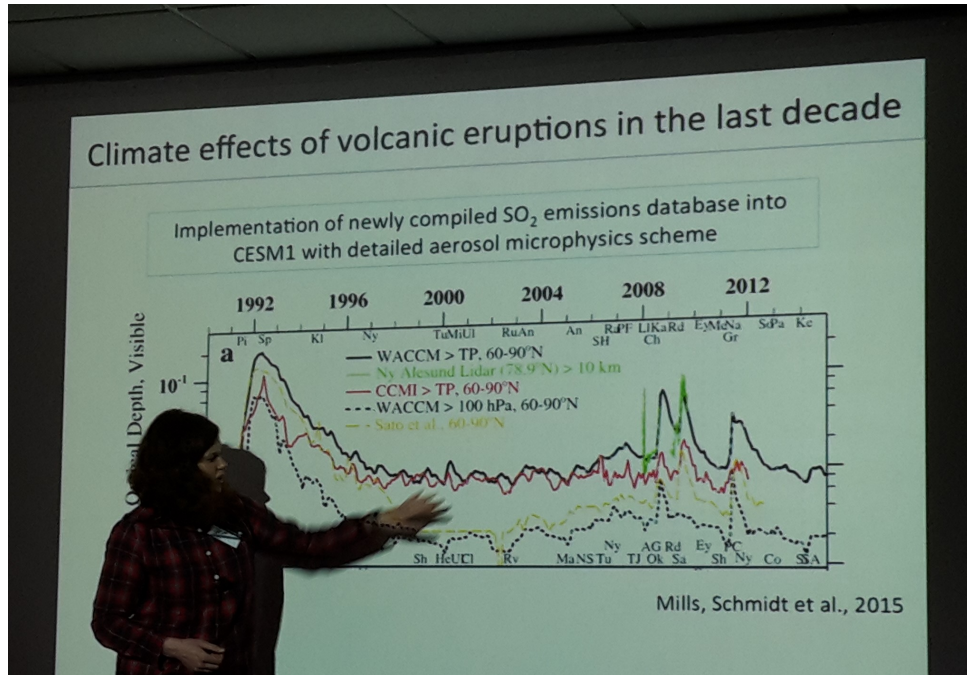
For more information regarding CEMAC and its activities, visit [cemac.leeds.ac.uk](http://cemac.leeds.ac.uk) or contact [cemac@leeds.ac.uk](mailto:cemac@leeds.ac.uk).

Photos top to bottom:

Amanda Maycock the Climate science Grand challenges CEMAC will address. Cat Scott.

PETAL—Active Archive was introduced by Prof Alan Haywood (read more on page 5).

Dominick Spracklen presents the Challenges in atmospheric composition CEMAC will investigate. Cat Scott.

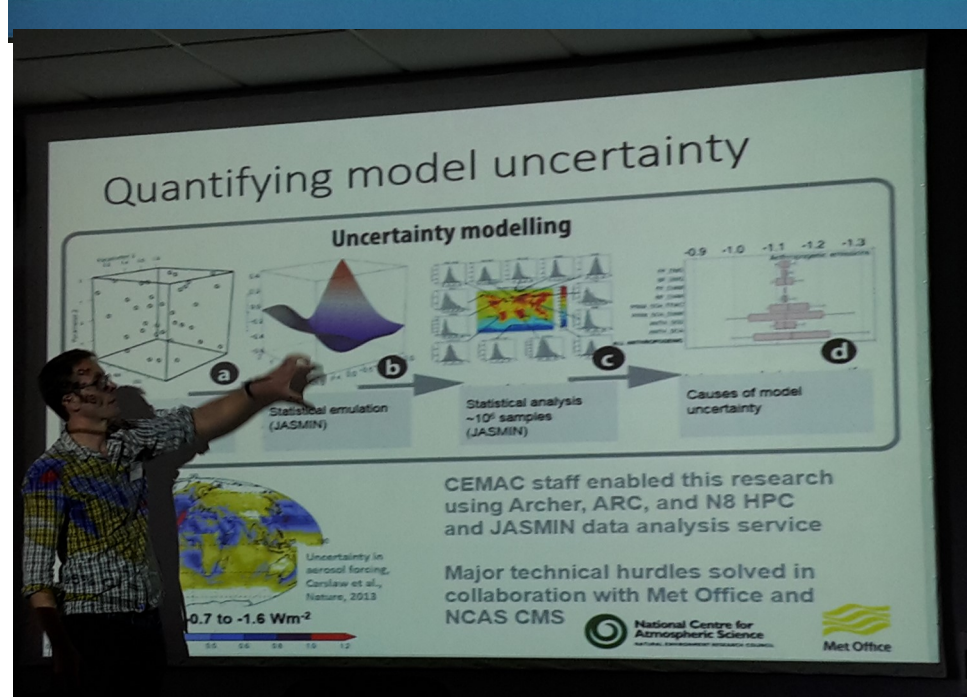


PETAL – Active Archive

SPECTRA

QSTAR TECHNOLOGIES

ACTIVE Archive



# FEATURED PERSON: ANJA SCHMIDT

I am an Academic Research Fellow in Volcanic Impacts and Hazards.

## What do you like the most about ICAS?

The diversity of research undertaken in ICAS is to my mind pretty unique and inspiring. It's also a very social and fun workplace to be in.

## Why did you choose this career and how did you get here?

Being a researcher means you learn something new (almost) every day. Volcanoes have fascinated me since childhood – yet I went to university to study geology only after completing an apprenticeship in IT and realising that I really did want to work on volcanic eruptions.

## What scientific achievement are you most proud of?

Winning the George Walker Award for Volcanology because George was the supervisor and post-doc advisor of two of my best collaborators who are both very famous volcanologists and who have had a huge influence on my career and supported me in carving out my own area of research.

## What does a typical working day involve for you?

Dealing with emails, meeting my students and colleagues, running/analysing model simulations, writing papers/grant applications, teaching, and hovering above an active volcanic vent in a helicopter (admittedly not as often as dealing with emails).

## What's the most interesting aspect of your job right now?

Right now I am working on relatively small-magnitude volcanic eruptions. The role of these eruptions in changing cloud properties and affecting climate becomes more and more recognised, so it's an interesting and exciting time for me.

## What's the most challenging aspect of your job?

On most days I attempt to solve problems I didn't know I had the day before – at times this can be frustrating but once you make some progress you get a real sense of achievement.

## How do you decompress outside work?

I am a keen wildlife photographer so you may find me in a hide at a local nature reserve. I also go running, and on rainy days I hone my Pro Evolution Soccer skills.

## What bit of information about you is likely to surprise your colleagues?

I practice mindfulness meditation.

