Meteorological Observing Systems Special Interest Group

Newsletter Issue 49

Spring/Summer 2021

Contents

Front Cover Photo – © Campbell Scientific Inc

*(*But It's a Dry Heat… like a Furnace (campbellsci.com)*)*

QR – link to our RMetS webpage

You can also now find us on Twitter!

https://twitter.com/RMetS_MetObs

Introduction

Welcome everyone to the 49th edition of the Meteorological Observing Systems Special Interest Group newsletter.

Hope you find this edition of the Newsletter informative! Thanks!

Mark Dutton, Newsletter Editor

Group Website: Members are encouraged to regularly check the Group's pages on the RMetS website at https://www.rmets.org/special-interest-groups/meteorological-observing-system for details of meetings and booking information, including on-line registration for meetings. Whilst every effort is made to publicise meetings via the inserts in Weather magazine and the Newsletter the website is the quickest medium of communicating with you.

Have Your Say: This is your Group and your Officers are always happy to receive feedback about what is being done on your behalf. If you have any comments or suggestions on matters relating to the Group and our activities please do not hesitate to get in touch with any Officer. Contact details are shown on the last page of the Newsletter. Suggestions for future meetings and speakers are always very welcome.

Material for Publication: Written material must be in electronic format, preferably in MS Word or Excel, although PDF format can be accepted. Digital image format should be JPEG (preferable) TIFF or BITMAP. Short news items as email are preferred.

Publication deadlines *are 31st March for Spring Newsletters and 31st October for Autumn Newsletters.* Whilst every effort is taken to ensure accuracy, responsibility for the accuracy of material published and opinions expressed lies with individual authors. The Editor is always pleased to receive correspondence on published items which provides correction, clarification or additional detail. This may be included in future editions of the Newsletter.

New Committee Members

We are very pleased to announce two new members to the Meteorological Observing Systems Special Interest Group committee. Both from the UK Centre for Ecology & Hydrology. Steve is based in Wallingford and Katie is based in Lancaster. Welcome to you both!

Steve Turner, UK Centre for Ecology & Hydrology (Wallingford).

I am a hydrologist at UKCEH with a focus on hydrometric data management, analysis and interpretation, hydrological trends, and meteorological recording. The main part of my role is in the UK National River Flow Archive where we bring together river flow data from the devolved nations, quality control and disseminate it. I also run the Wallingford Meteorological Station, which has been a part of the Met Office UK Climatological Observation Network since 1962. As well as the daily site, we also have an automatic weather station, and are also conducting rain gauge undercatch trials.
Stephen Turner | UK Centre for Ecology & Hydrology (ceh.ac.uk)

Katie Muchan, UK Centre for Ecology & Hydrology (Lancaster).

I am a hydrologist at UKCEH, working primarily in the National River Flow Archive team, managing and analysing UK river flow data. From 2014 to 2019 I managed the Meteorological Station at UKCEH's Wallingford site, continuing the rainfall undercatch research which has been ongoing since the 1960s. The most recent work involved the installation of three OTT Pluvio gauges, with results of the field trial published in Hydrology Research in 2020. Since moving to UKCEH's Lancaster site in 2019 I have handed the site management to Steve Turner, but remain involved in the scientific research – expanding the field trial of raingauges to include wind speed measurements at each gauge height and the addition of Rain[e] gauges.
Katie Muchan | UK Centre for Ecology & Hydrology (ceh.ac.uk)

Forthcoming Meetings

Measuring Climate Change

20th October 2021
13:00 to 16:30

© Royal Meteorological Society

This will be a virtual event held jointly with the Royal Meteorological Society.

This meeting will review how climate is measured and how data is processed for climate modelling and to provide long datasets identifying long term changes.

Speakers will cover the measurement of several key essential climate variables. They will cover important issues such as how effects of changes in station exposure and changes in instrument types are assessed and accounted for. Speakers will also cover issues of how modern and historical proxy data sets are combined to create long time series.

The meeting is intended for a general audience.

Agenda

Time	Title	Speaker
13:00	Welcome	
13:05	Long Records - Site Changes	Prof P Jones FRMetS
13:35	Long Records - Instrument Changes	Dr S Burt FRMetS
14:05	Comfort Break	
14:35	Sea Surface Temperatures and Marine Air Temperatures	Dr E C Kent FRMetS
15:05	Satellite-Based Climate Data Records	Prof C Merchant
15:35	Matching Modern Records to Older Proxy Data	Prof T J Osborn FRMetS
16:05	Closing Remarks	

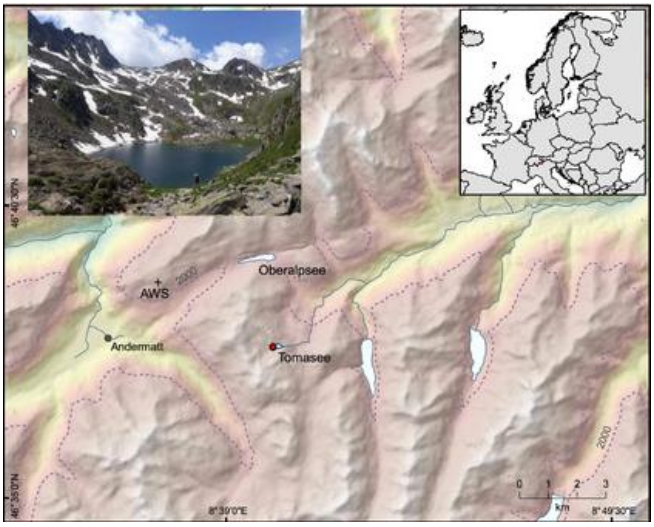
Free to attend. Non-members are welcome. Please register on the RMetS website: -

https://www.rmets.org/event/virtual-measuring-climate-change

Joining details will be sent in due course.

Measuring Changes in Snowpack SWE Continuously on a Landscape Scale Using Lake Water Pressure

Hamish D. Pritchard, Daniel Farinotti, and Steven Colwell



Abstract

The seasonal snowpack is a globally important water resource that is notoriously difficult to measure. Existing instruments make measurements of falling or accumulating snow water equivalent (SWE) that are susceptible to bias, and most represent only a point in the landscape. Furthermore, the global array of SWE sensors is too sparse and too poorly distributed adequately to constrain snow in weather and climate models. We present a new approach to monitoring snowpack SWE from time series of lake water pressure. We tested our method in the lowland Finnish Arctic and in an alpine valley and high-mountain cirque in Switzerland and found that we could measure changes in SWE and their uncertainty through snowfalls with little bias and with an uncertainty comparable to or better than that achievable by other instruments. More importantly, our method inherently senses change over the whole lake surface, an area in this study up to 10.95 km2, or 274 million times larger than the nearest pluviometer. This large scale makes our measurements directly comparable to the grid cells of weather and climate models. We find, for example, snowfall biases of up to 100% in operational forecast models AROME-Arctic and COSMO-1. Seasonally frozen lakes are widely distributed at high latitudes and are particularly common in mountain ranges, hence our new method is particularly well suited to the widespread, autonomous monitoring of snow-water resources in remote areas that are largely unmonitored today. This is potentially transformative in reducing uncertainty in regional precipitation and runoff in seasonally cold climates.

SIGNIFICANCE STATEMENT

This work demonstrates a new method for measuring the water supplied by snowfall on the landscape scale. We find that we can measure accurately and precisely the changing water content of a snowpack by monitoring water pressure in lakes. Monitoring water pressure is relatively simple, cheap, and robust, and pressure changes represent the whole lake surface, which can be an area of many square kilometers. This makes our measurements comparable in size to the grid cells used by weather models, removing one of the major sources of uncertainty when calibrating these models to conventional point measurements of snow. Our method could therefore lead to an improved understanding of regional precipitation and runoff in seasonally cold climates.

Full Article:

Measuring Changes in Snowpack SWE Continuously on a Landscape Scale Using Lake Water Pressure in: Journal of Hydrometeorology Volume 22 Issue 4 (2021) (ametsoc.org)

But It's a Dry Heat… like a Furnace

by Dirk Baker (Campbell Scientific)

In this article, I'll share my experience collaborating on a research project to record some extreme weather conditions that may even set a world record!

On August 16, 2020, the weather station located at Furnace Creek in Death Valley National Park (California, USA) recorded a temperature of 54.4 °C (130 °F). If confirmed, this would be a record high for an automated measurement in the western hemisphere, perhaps even the world. News of this, of course, got a lot of attention from both enthusiasts and skeptics. The National Weather Service (NWS) is conducting a rigorous test of the instrumentation involved, which will determine whether a new record has, indeed, been set.

Recommended for You: *These articles provide additional information:*

- Death Valley, California, may have recorded the hottest temperature in world history
- Did We Break the Planetary Temperature Record Sunday? Probably So!
- WMO will verify temperature of 54.4°C in California, USA

Shortly after that temperature was recorded, I got in touch with the personnel in the Las Vegas office of the NWS who oversee and maintain the Furnace Creek weather station to see how I—and Campbell Scientific—could be of assistance. Understandably, they ultimately chose to test the sensor in an independent lab rather than send it to us (the manufacturer). However, I also offered to collaborate with them and the National Park Service (NPS) on a short-term research project that would co-locate a high-accuracy temperature measurement next to their existing station for a few months.

Note: *This article does not express the opinions of the NWS, the NPS, or either agency's personnel, nor does it imply an endorsement of Campbell Scientific by either agency.*

And so, I found myself in Death Valley in early May 2021 installing a station at air temperatures that were already in excess of 38 °C (100 °F).

Some Details...

The August 16, 2020 temperature was recorded by a CR1000 Measurement and Control Datalogger with a CS215-L Digital Air Temperature and Relative Humidity Sensor that was mounted in a passive radiation shield. A passive radiation shield is simply a set of carefully designed plates that are stacked together. These plates are spaced apart and designed to prevent direct sunlight from impacting the temperature measurement while allowing air to flow through and past the sensor. Direct solar radiation on a sensor can cause a large upward bias in measurements—several degrees Celsius in some cases.

A passive radiation shield

At times of low or no wind, however, air can become trapped in a passive shield that also causes a bias—though not of the magnitude caused by solar radiation. An active, or aspirated, radiation shield addresses this issue by incorporating a fan to continuously move air past the sensor while also protecting it from solar radiation. This method is commonly considered the best for accurate air temperature measurements. Until recently, however, aspirated shields required a prohibitive amount of power to operate on remote, low-power weather stations.

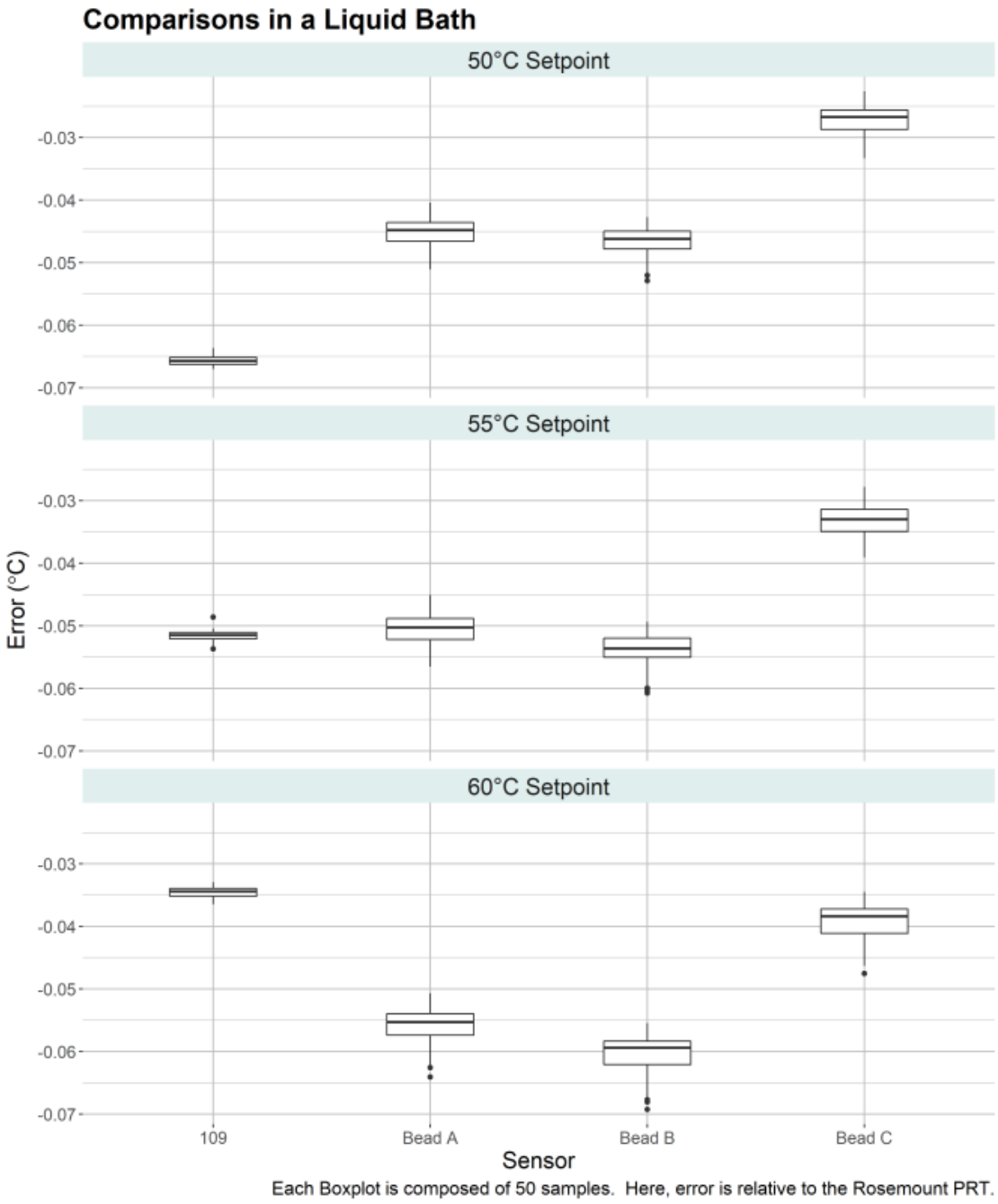
An aspirated radiation shield

The new station I installed includes two TS100SS Aspirated Radiation Shields and two passive 41303-5A 6-Plate Solar Radiation Shields. There is a HygroVUE™5 sensor (measuring temperature and relative humidity) in one of the aspirated shields and one of the passive shields. In the other aspirated shield, there are three independent thermistor beads. In the other passive shield, there is a 109 Temperature Probe. The thermistor beads are the same as those used in the 109.

Some of the key features of the TS100SS aspirated shield are that it is lower power and cost compared to others on the market. The shield incorporates an aerodynamic design to take advantage of winds when they occur. In addition, the duty cycle of the fan can be controlled to save power—for instance, reducing the fan speed at night.

Also included on this station are a ClimaVUE™50 Compact Digital Weather Sensor and a CS320 Digital Thermopile Pyranometer. A CR1000X Measurement and Control Datalogger was also installed next to the CR1000 for independent data collection. Data from the CS320 are used by the CR1000X to reduce the duty cycle of both TS100SS shields at night to save power.

Prior to installation, I tested the 109 sensor and triplicate thermistor beads in our liquid bath (Fluke 7040 High Precision Bath) using a Rosemount PRT as reference. This bath controls the temperature of actively circulated antifreeze so that we can have confidence that the sensors are exposed to the same conditions. The most recent calibration certificate of the Rosemount from an independent lab shows that its uncertainty is less than 0.01 °C over the range of approximately -40 to +230 °C. At 50, 55, and 60 °C, the 109 sensor and thermistor beads all performed very well. (See the figure below.) For instance, the maximum absolute difference relative to the reference across sensors and temperature set points was 0.07 °C.

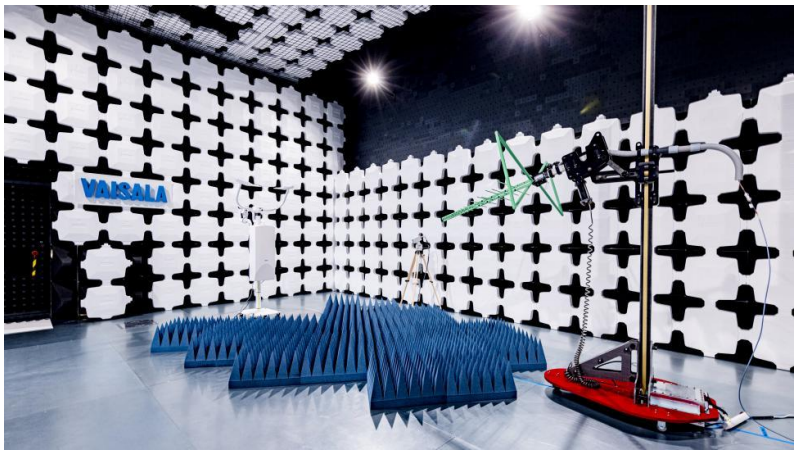


Pre-deployment temperature sensor testing against a high-accuracy reference Rosemount PRT

What's Next?

I will return to Death Valley in the fall of 2021 to take down the temporary station. In the meantime, I and my collaborators with the NWS and NPS will be watching with interest. I can't say that I unreservedly wish for a record temperature to be set this summer due to the other implications it would have in a warming climate. However, there will be a great deal of interesting data produced regardless of what conditions actually occur.

Vaisala opens new R&D and innovation centre in Finland



Vaisala, a global leader in weather, environmental, and industrial measurements, has opened a new R&D and innovation centre in Finland. The new centre is a unique arena for product development, including all levels from ideation to hardware and software design, development, and testing.
The new R&D centre is located on the same campus area as Vaisala's head office and production facilities in Vantaa, Finland. The new building houses about 300 experts, representing 67% of Vaisala's R&D personnel in total, working in various areas of research and development.

Significant investments in R&D
During the recent years, Vaisala has invested strongly in research and development. This has created a need for new facilities to accelerate growth. The number of R&D personnel has increased by some 45% during 2015-2020 (446 people in 2020).
"Vaisala is a global technology leader and this requires long-term commitment and investments in research and development. Last year, we invested 14% of our net sales in R&D," says Kai Öistämö, President and CEO at Vaisala.
"The need for accurate observations and reliable measurements is increasing due to several pressing societal and environmental challenges, such as climate change. We want to make sure that we have the best possible facilities for top-level product development supporting our long-term growth both now and in the future," says Öistämö.

Almost 40 custom-made laboratories
Top-level laboratories and custom-designed testing equipment play a key role in Vaisala's product development facilities. Vaisala's measurement solutions are used all over the world in the most demanding of conditions, and the technology needs to work reliably and accurately in places like hospitals and cars, inside hurricanes, or even in space.
There are 37 custom-made laboratories in the new R&D center. These include a spacious EMC lab for measuring electromagnetic compliance, rain tower for simulating natural rain, vibration & free fall laboratory, environmental chambers, where instruments can be tested in extreme temperatures and humidity conditions, and system testing laboratories, where software compatibility and quality is ensured.
Multifunctional space design enables agile product development
In addition to modern laboratories, another key requirement for the new R&D premises was multifunctional and flexible design of spaces. This enables experimental product development, agile project work, and fast prototyping.
Construction work of the 7,900 m2 building begun in January 2019, and employees have gradually started to work in the new premises during the spring 2021.

Committee Meeting Minutes

Royal Meteorological Society
Meteorological Observing Systems
Special Interest Group

Summer Committee Meeting

Monday 5th July 2021 at 13:00 via zoom

Minutes

1. Apologies and welcomes
    - Keri Nicoll and Stuart Goldstraw.
    - The committee welcomed Katie Muchan and Stephen Turner who have joined the committee.

2. Minutes of last meeting
    - The minutes were agreed.

3. Chair's Report
    - Congratulations Stephen Burt on getting his PhD which is titled "Combining instrumental data rescue techniques with meteorological metrology to develop applied historical climatological analyses" and also congratulate Keri Nicoll who has received the 2020 Atmospheric and Space Electricity Early Career Award at AGU's virtual Fall Meeting 2020.
    - Not much else to report, there has been one meeting of the meetings and conferences committee but as it was during the school half term holiday I was not able to attend.

4. Treasurer's Report
    - Our financial position remains healthy.
    - Membership is 54.
    - Our capital reserves are £4,924.44 (at 2021-06-30)
    - I have received £340.00 for membership fees for 2021.
    - We can pay reasonable expenses, if needed, to allow meeting organisers to invite speakers who otherwise may not attend. Funds could also be used for other purposes such as support for small projects that might otherwise not take place.

5. Newsletter Editor's Report
    - In 2020 we produced one newsletter (autumn/winter). Due to the current Covid-19 pandemic meetings had to be cancelled or put-on hold. This meant a reduction in articles and notifications. Also, committee members had to concentrate on individual concerns.
    - Autumn/Winter 2020 Newsletter (the last edition) covered –
        - Meeting - The weather, measur'd: 400 years of meteorological instrument technology.
        - SCIENTIFIC INSTRUMENTS SOCIETY: Research Grants 2021.
        - Make your own Met measurements - build a digital barometer for about £10.
        - PROPOSAL: A UK Climate Extremes Sub-Committee.
    - Spring/Summer 2021 Newsletter articles:
        - Any ideas welcome? Not received so far, any articles or information this year that could be included in the Newsletter.
        - Hoping to get something out before the end of July.
    - There followed a discussion on possible articles for the newsletter, the following were suggested
        - A biography of Katie Muchan and Stephen Turner to introduce themselves to the SIG **action KM and ST.**
        - Possible an article on new equipment from the manufacturers **action SBell an DB**
        - A summary of the paper on measuring snowfall by using frozen lakes as weighing scales **action SC.**

6. Committee membership/recruitment
    - It was felt that it would be good to have more Met Office membership on the committee so this will be investigated.

7. Future Meetings

(a) Joint meeting on measurement for climate science.
    - This is scheduled as an online meeting for the 20th October but it is currently not showing on the main society website so Mike will chase this up **action MB.**

(b) Joint meeting between the Worshipful Company of Scientific Instrument Makers (WCSIM), the Scientific Instrument Society (SIS) and our SIG.
    - Still planning for an in person meeting in 2022 possible at the end of April.

(c) Climate measurements in difficult places.
    - It is planned to hold this as an in person meeting in the autumn of 2022,

possible held at BAS.

- Several ideas o speakers were suggested and Steve Colwell and Stephen Burt will follow up on this after the meeting **action SC and SB.**

(d) Visit to Eskdalemuir.

- Possibly as a summer visit in 2022 and could also be the AGM. SIS (Scientific Instruments Society) are also considering this as an option so we could combine the two and also possible a visit to Lerwick met station for there planned 101 years celebration.

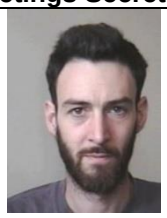
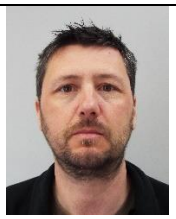
(e) Online talks suggested by Richard Griffith

- Richard has asked if it is possible for the SIG to organize any short online presentations similar to what the history group have done. Katie was asked if she would be able to do one on the rain gauge network that she looks after. This would probably be a half hour lunchtime meeting with time for questions at the end **action SC and KM.**

8. Any other Business
    - None.

9. Date and venue of the next committee meeting
    - Steve Colwell to setup a doodle poll for late September/early October to find an appropriate date and also have this as the online AGM **action SC.**

Group Officers

Chairman and Acting Meetings Secretary	Treasurer & Membership Secretary	Newsletter Editor
 **Steve Colwell** British Antarctic Survey Madingley Road Cambridge. CB3 0ET Tel: 01223 221483 src@bas.ac.uk	 **Mike Brettle** 94 Countrymans Way Shepshed Loughborough Leics. LE12 9RB mike.brettle@hotmail.com	 **Mark Dutton** EML 7 Jupiter Court Orion Business Park North Shields. NE29 7SE Tel: 07810448726 mark@emltd.net
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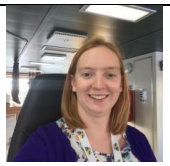
 **Stuart Goldstraw** Met Office (Details coming soon)	 **Katie Muchan** UK Centre for Ecology & Hydrology Lancaster Environment Centre Library Avenue, Bailrigg Lancaster. LA1 4AP Tel: 01524595872 katmuc@ceh.ac.uk	