



# HIWeather

5<sup>th</sup> April 2017

2017 is shaping up to be a very busy year for HIWeather, with many of the projects identified at Exeter last year moving ahead rapidly. Some will come to fruition in 2017, including three reviews that should lead to publication in 2018. In the broader community, there will be many opportunities for HIWeather to raise the profile of its work and to develop partnerships with other players in this field. Pre-eminent amongst these will be the UNISDR Global Platform in Cancun in May when both governmental and non-governmental delegates from across the world will meet to take stock of progress in the two years since the signing of the Sendai Framework for Disaster Risk Reduction, and to agree steps towards delivering its key objectives.

The HIWeather Steering Group met by teleconference on 29<sup>th</sup> March to discuss arrangements for three meetings this year: the Steering Group meeting and Value Chain workshop alongside the International Verification Methods Workshop in Berlin in May, the WMO Early Warnings Symposium alongside the Global Platform in Cancun in May; and the Predictability and Prediction conference in Landshut in October. It was good to take part in the Communications task team teleconference the previous week, and I look forward to hearing more about what the other task teams are doing at the Steering Group meeting in Berlin. Information continues to be added to the WMO web site at <http://bit.ly/1RKapbc>, so I would encourage you to visit there from time to time.

I presented HIWeather to the inaugural annual conference of the UK Alliance for Disaster Research in London in January (<http://www.ukadr.org/>). This new grouping has enormous potential to bridge gaps between the many disciplines involved in disaster-related research in the UK. Also in January, David Johnston, Paolo Ruti and I attended the American Meteorological Society's Annual Meeting in Seattle, giving presentations on HIWeather in different sessions. We had some very useful discussions with US scientists and policymakers with particular reference to US plans for a co-ordinated response to the three post-THORPEX projects within a re-invigorated USWRP (Weather Research Programme) and the Weather Ready Nations initiative. Last week, I was in Telford UK for the annual Flood & Coast Conference run by the Environment Agency. I presented HIWeather as a global context for flood forecasting and warning in the UK, drawing on a recent Weather Ready Nation paper as an example of what HIWeather is aiming at.

Several HIWeather-linked conferences are coming up this year. Julia Keller will represent the HIWeather SG at EGU (23-28 April) with a poster and will be taking some of our HIWeather postcards (available on the web site at <http://bit.ly/1RKapbc>). This is followed by the International Verification Methods workshop in Berlin on 8 - 11 May, where we are holding a mini-workshop on 7<sup>th</sup> May to develop the value chain concept, discussed in Exeter last year. The Steering Group will also meet here, on 6<sup>th</sup> May, and I shall go on to Warsaw to present HIWeather to the EUMETNET Heads of Forecasting. Later in May, HIWeather will be a focus of the WMO Symposium on Early Warning Systems in Cancun prior to the UNISDR Global Platform on Disaster Risk Reduction. In August there is a session in the IAPSO-IAMAS-IAGA assembly in Cape Town devoted to High Impact Weather and Climate. Then we are organising a conference on Predictability and Prediction of High Impact Weather at Landshut in Southern Germany on 9-12 October. I hope to meet many of you at one or other of these conferences.

Wishing you all every success in your HIWeather activities

A handwritten signature in black ink, appearing to read 'Brian Golding', with a stylized flourish at the end.

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## **The Project**

### **Steering Group**

Co chairs: Brian Golding, UK and David Johnston, New Zealand

Processes & Predictability theme – lead: George Craig, Germany; members: Thomas Knox, Peter Knippertz, Jeff Keppert.

Multi-Scale Coupled Forecasting theme – lead: Jenny Sun, USA; members: Paul Joe, Peter Steinle, Sharan Majumdar, Jianjie Wang, Jim Dudhia.

Impacts, Vulnerability & Risk theme – lead: Brian Mills, Canada; members: Joanne Robbins, Jeff Lazo, Michael Kunz, Isabelle Ruin.

Communication theme – co-leads: Sally Potter, New Zealand and Shannon Panchuk, Australia; members: Abi Beatson, Greg Carbin, Melanie Harrowsmith, Amber Silver, Rutger Dankers, Andrea Taylor, Thomas Kox, Claudia Adamo, Jose Galvez, Jennifer Sprague-Hilderbrand, Kiernan McGill, Linda Anderson-Berry, Tim Brown.

Evaluation theme - Beth Ebert, Australia; members: Julia Chasco, Barb Brown, Anna Scolobig, Manfred Dorninger, Pertti Nurmi, Martin Goeber, Helen Titley, Marion Mittermaier, Jing Chen.

### **Advisory Group**

Dr. John Rees, British Geological Survey and Research Councils UK, representing funding agencies

Dr. Jan Polcher, Laboratoire de Meteorologie Dynamique of Centre National de la Recherche Scientifique, France, representing Climate Science

Dr. Jennifer Sprague-Hilderbrand, National Oceanic and Atmospheric Administration, USA, representing users

Prof. Virginia Murray, Public Health England and UNISDR, representing the UN family

Prof. Michael Reeder, Monash University, Australia, representing academia

**Funding.** The Trust Fund is able to provide only limited support for project meeting attendance at present. New contributions are needed to develop and facilitate the work of the project.

**International Coordination Office:** Discussions continue regarding the setting up of an ICO.

**Secretariat:** Julia Keller is providing valuable assistance within the WMO secretariat. Paolo Ruti provides the link to the World Weather Research Programme.

**Communication:** The HIWeather administrative web site can be reached at <http://bit.ly/1RKapbc>. It contains the Implementation Plan, Steering Group and Task team membership and HIWeather presentations. It is available for task teams to post meetings and progress. A communications web platform for the project has been set at Massey University, New Zealand and is currently being populated. I use Linked-In to post items of interest about HIWeather and copy my posts to Twitter using the hashtag #HIWeather.

**Meetings:** Steering Group meetings are held approximately quarterly, usually by teleconference. The next meeting will take place prior to the Verification workshop in Berlin in May. The task teams meet by teleconference at intervals to suit their work and progress.

### **Relevant Scientific Meetings**

Global Atmospheric Watch (GAW) Quadrennial Symposium, Geneva, 10-13 April. GAW is the WMO programme concerned with atmospheric composition. Brian Golding will contribute to discussions on coupled modelling. <https://www.wmo.int/pages/prog/arep/gaw/gaw2017symp.html>

European Geophysical Union General Assembly, Vienna, 23-28 April. Julia Keller will represent HIWeather with a poster in the session, Communicating and Mitigating Natural Risks. <http://www.egu2017.eu/>

UNISDR Global Platform, Cancun, 22 - 26 May 2017, preceded by WMO symposium on Multi-Hazard Early Warning Systems. Both co-chairs are attending the Symposium and the Global Platform. David Johnston will contribute to a panel discussion in the Symposium. Brian Golding will present a paper on HIWeather contributions to Urban severe weather warnings in a side meeting of the Symposium. <http://www.unisdr.org/conferences/2017/globalplatform/en>.

Seventh International Verification Methods Workshop (7IVMW), Berlin, 8-11 May 2017, <http://www.7thverificationworkshop.de/> preceded by a Tutorial on 3-6<sup>th</sup> May, HIWeather Steering Group meeting on 6<sup>th</sup> May and Value Chain Workshop on 7<sup>th</sup> May. The evaluation, human impacts and communication task teams will be well represented and Brian Golding will present a paper on HIWeather.

Models to Decisions (M2D) network Annual Conference, Exeter University, 11-14 July 2017. <http://blogs.exeter.ac.uk/models2decisions/>

Royal Meteorological Society Annual Conference “Weather and Climate Impacts: from research and services to application and policy”, Exeter University, 13-14 July 2017. <https://www.rmets.org/annual2017>

IAPSO - IAMAS – IAGA Joint Assembly, Cape Town, 27 August – 1 September 2017, including session on High-impact Weather and Climate Extremes of which Brian Golding is co-convenor. <http://iapso-iamas-iaga2017.com/>.

European Meteorological Society Annual Meeting, Dublin, 4 – 8 September 2017. Proposed session on impact forecasting and hazard impact modelling. <http://www.ems2017.eu/>

WMO Data Assimilation Symposium, Florianopolis, Brazil, 11 - 15 September, 2017, <http://www.cptec.inpe.br/das2017/>

International Conference on The Impact of Hazard, Risk and Disasters on Societies, Durham, UK, 19 - 22 Sep 2017. <https://www.dur.ac.uk/ihr/10th-anniversary/ihr10/>

Conference on Predictability and Prediction of High Impact Weather, Landshut, Germany, 9-12 October 2017 – first announcement to appear shortly

## **HIWeather Research**

- a. **HIWeather Multi-Hazard Early Warning System Demonstration Project (FDP):** Demonstrate / evaluate a state-of-the-art, end-to-end, multi-hazard warning system based on km-scale coupled ensemble impact predictions & advanced communication methods in one or more developing countries in collaboration with existing SWFDP(s).  
Leads: Peter Steinle, co-chairs, task team leads.  
Objectives: Demonstrate benefits of advanced weather & coupled modelling; measure value chain & identify causes of biggest losses; build capacity through participation & training; transfer capability to academic, private & government institutes in the region; establish on-going capability that can be maintained locally.  
Actions: Develop concept paper (early 2017)  
Identify participants and funding for trial FDP - possibly Lake Victoria (2017)  
Execute and evaluate trial FDP (2018-9)  
Execute and evaluate full FDP (2022-3)
- b. **Review the state of wind hazard forecasting**  
Lead: George Craig  
Objectives: Clarify the wind metrics that relate to impacts; describe the state-of-the-art in observing and predicting these metrics; identify processes that lead to high impacts; make recommendations for targeted work to address weaknesses in understanding, observing and prediction.  
Actions: Identify participants (2017)  
Carry out review (2017)  
Document and publish (2017-8)
- c. **Review current state of nowcasting & forecasting high impact weather**  
Leads: Sharan Majumdar and Jenny Sun  
Objectives: Document current state of high impact weather nowcasting/forecasting with an emphasis on flood and high wind warnings; Identify gaps  
Actions: Draft review (2017)  
Workshop (October 2017)  
Publication (2018)
- d. **Intercomparison of km-scale DA & nowcast/forecast systems**  
Leads: Sharan Majumdar and Jenny Sun  
Objectives: Demonstrate state-of-the-art of km-scale DA & nowcast/NWP systems for HIW warning with an emphasis on floods & high winds  
Actions: Develop concept paper (2017);  
Identify interested participants, datasets & funds (2017)
- e. **Intercomparison of impact models for a particular hazard against a common impact dataset; optimal combination of impact data**  
Leads : Martin Goeber, Joanne Robbins, Isabelle Ruin  
Action: Develop concept paper (2017)
- f. **Review & classification of impact modelling**  
Leads: Brian Mills & HIVR task team

Action: Develop paper (end 2017)

**g. Research Demonstration Project (RDP) focused on the Value Chain**

Leads: Jeff Lazo, Barb Brown, Brian Mills, Manfred Dorninger, Anna Scolobig, Mark Bevan

Actions: Concept paper (2016)

Scoping workshop (May 2017)

**h. Factors that affect warning-related decision-making including legal & institutional frameworks.**

Leads: Anna Scolobig, Julia Chasco

Action: Project funded, PhD student appointed

Framework intercomparison: PhD student (2019)

**i. Communication along the value chain in different cultures/contexts**

Lead: Isabelle Ruin, Julia Chasco, Tom Kox

Action: Concept paper (2017)

**j. Probabilistic forecasting and evaluation of Tropical Cyclones**

Leads: Helen Titley, Sharan Majumdar, Munehiko Yamaguchi, David Richardson, Barbara Brown, Linda Anderson-Berry

Objectives: Increase use of *probabilistic* ensemble forecast information in operational tropical cyclone forecasting; link to multi-scale modelling through, e.g., storm wind structure, precipitation (incl. orographic effects), storm surge and impact forecasting.

Actions: Review best practice in producing, evaluating & using probabilistic TC forecasts

Targeted HIWeather session at WMO/WWRP International Workshop on Tropical Cyclones. (2018)

**k. Unconventional data sources for impact modelling, evaluation & communication**

Leads: David Johnston, Abi Beatson

Action: Research network formed

Literature review and synthesis: Abi Beatson, PhD student. (2019)

**k. Mesoscale Verification Inter-comparison over Complex Terrain (MesoVICT).**

Lead: JWGFVR through Evaluation task team.

The project held a session at the 2016 EMS conference in Trieste followed by a 3-day workshop in Bologna to share initial findings ([https://www.arpae.it/dettaglio\\_evento.asp?idLivello=32&id=2415](https://www.arpae.it/dettaglio_evento.asp?idLivello=32&id=2415)). A session is planned for the 2017 EMS conference in Dublin.

**l. User-oriented metrics challenge.**

Lead: JWGFVR through Evaluation task team.

The JWGFVR organised a competition for innovative evaluation metrics that are relevant to end users. Seventeen entries from ten countries were received and the winning entry will be presented at the Berlin workshop.

**m. Review of approaches to communicating high impact weather.**

Lead: Andrea Taylor, Communication task team.

Twenty-four abstracts were submitted in response to the Call for Papers for the special issue of the International Journal of Disaster Risk Reduction under the provisional title, "Communicating High Impact Weather: Improving warnings and decision making processes". The deadline for submission is the end of July.

**n. NAWDEX (North Atlantic Waveguide and Downstream Impacts Experiment):**

Lead: Processes & Predictability task team.

The field phase is complete and acquired some good data including the extratropical transition of Tropical Cyclone Karl. Further information can be found at <http://nawdex.ethz.ch/news.html>. Flight data are currently being curated ready for release to the analysis and modeling groups.

**o. HIGHWAY (Lake Victoria Basin Nowcasting project)**

Discussions are taking place between the prospective funder and the WMO with a view to agreeing a project plan.

## **National Programmes**

### **US Contributions**

A joint committee is formulating a US response to the three post-THORPEX projects. The US has a wide range of relevant work underway including the Hydrometeorology Testbed (HMT), focusing on rainfall and flood forecasting, and the Hazardous Weather Testbed, focusing on tornado, wind and hail forecasting. CAPS is running 3-km CONUS-domain cycled EnKF data assimilation, including radar data, for selected

periods and discussing coupling with hydrology/river stream models for HMT. The National Weather Service FACETS project (<http://www.nssl.noaa.gov/projects/facets/>) is closely aligned with several aspects of HIWeather. The related Weather Ready Nations initiative is particularly relevant and Dr. Jennifer Sprague-Hilderbrand has recently joined the Advisory Group and Communications task team with a view to building links. The NCAR Societal Impacts Program at the Research Applications Laboratory is closely aligned with HIWeather and contributes strongly to the evaluation theme (<http://www.ral.ucar.edu/research/sip/>).

### **UK Contributions**

A summary of Met Office contributions to HIWeather has been prepared, which it is planned to extend to include NCAS, and potentially other UK partners. Key areas of work include unconventional data sources, km-scale data assimilation and ensemble prediction, km-scale coupled modelling for the UK, hazard impact modelling and risk communication. The impacts work is largely carried out with partners in the Natural Hazard Partnership (<http://www.naturalhazardpartnership.org.uk/>). The NERC/Met Office funded FfIR (Flooding from Intense Rainfall) project is addressing several aspects of HIWeather, including new radar observations, km-scale data assimilation and coupling with rural & urban inundation models (<http://www.met.reading.ac.uk/flooding/>). The Met Office/NERC UKEP project to develop a coupled km-scale atmosphere, ocean, land surface hydrology prediction system has started phase 2, having successfully demonstrated sensitivity to coupling in short range forecasts. Research Councils UK has funded two new networks in its “Decision Making Under Uncertainty” theme. One of them “Models to Decisions (M2D)” will hold its first annual conference in July.

### **German Contributions**

W2W (Waves to Weather) is a Collaborative Research Center delivering the underpinning science needed to identify the limits of predictability in different weather situations so as to pave the way towards a new generation of weather forecasting systems. See <http://w2w.meteo.physik.uni-muenchen.de/>. The research programme is listed under the headings of Upscale Error Growth, Cloud-Scale Uncertainties and Predictability of local Weather. WEXICOM (Weather warnings: from EXtreme event Information to COMunication and action) is an interdisciplinary collaborative research project aimed at facilitating transparent and effective communication of risks and uncertainties for individual user groups. See <http://www.geo.fu-berlin.de/en/met/wexicom/index.html>.

### **Australian Contributions**

The Australian Bureau of Meteorology is running a project to evaluate and inter-compare different fire spread simulators driven by weather input. Results from this project will assist in developing routine predictive services for wildfire behaviour. An Australian HIWeather network has been formed.

### **New Zealand Contributions**

Colleagues of David Johnston and Sally Potter at Massey University and GNS Science are developing a portfolio of HIWeather related projects in the Communications theme. Also, a New Zealand HIWeather network has been formed, linking a range of organisations.

## **Related Projects**

### **VORTEX-SE (Verification of the Origins of Rotation in Tornadoes Experiment – SouthEast)**

A research program to understand how environmental factors characteristic of the southeastern United States affect the formation, intensity, structure, and path of tornadoes. It will also determine the best methods for communicating forecast uncertainty related to these events to the public, and evaluate public response. See <http://www.nssl.noaa.gov/projects/vortexse/>

### **PECAN (Plains Elevated Convection At Night)**

A large field project that focused on night-time convection in the Central USA. It was conducted across northern Oklahoma, central Kansas and south-central Nebraska from 1 June to 15 July 2015. A description of the field programme and preliminary results is in BAMS early online release at <http://journals.ametsoc.org/doi/abs/10.1175/BAMS-D-15-00257.1>. See also <http://www.nssl.noaa.gov/projects/pecan/>

### **RELAMPAGO-CACTI (Remote sensing of Electrification, Lightning, And Meso-scale/micro-scale Processes with Adaptive Ground Observations - Cloud Aerosols and Complex Terrain Interactions)**

Funding for major US components of the RELAMPAGO field programme to study the huge thunderstorms of the La Plata Basin in Argentina has been secured. The extended observing period will be from August 2018 to April 2019 with the Intensive Observing Period in November/December 2018. The US DOE is also funding a study of Cloud Aerosols and Complex Terrain Interactions, looking at orographic clouds and their

representation in models in the same area and time period. The two projects will share airborne resources. More information is available at <https://publish.illinois.edu/relampago/>. Observations will feed into the Argentine Weather Service ALERT.AR programme to improve severe weather warnings.

### **SURF (Study of Urban Rainfall and Fog/Haze)**

The Institute of Urban Meteorology is carrying out the SURF field experiment to study urban pollution and extreme precipitation in Beijing. A RDP proposal is being prepared for submission to WWRP.

**ICE-POP2018 (RDP/FDP alongside the Pyeongchang Winter Olympic Games in South Korea)** The objectives of the RDP/FDP are similar to SNOW-V10 and FROST-2014, but with stronger emphasis on high-resolution data assimilation and modelling. (<http://www.wmo.int/pages/prog/arep/wwrp/new/RDP-FDP.html>).

**I-REACT** – EU Horizon2020 3-year project on Improving Resilience to Emergencies through Advanced Cyber Technologies (I-REACT) involving a consortium of 20 partners will integrate existing systems and assets to facilitate early planning of weather-related disaster risk reduction activities. I-REACT will cooperate with the European Flood Awareness System (EFAS), European Forest Fire Information System (EFFIS), European Global Navigation Satellite System (E-GNSS), Copernicus, etc. See <http://www.i-react.eu/>

**ANYWHERE** – EU Horizon2020 project aimed at producing a Europe-wide early warning system for weather-related hazards. <http://www.anywhere-h2020.eu/>

### **Aristotle**

Aristotle will deliver multi-hazard capability to the Emergency Response Coordination Centre (ERCC) of EU DG ECHO, which is responsible for the coordination of human aid upon request of the government of a country affected by natural (and other) hazards. It has been designed to offer a flexible and scalable scientific network including 24/7 services that can provide new hazard related services to the ERCC and to create a pool of experts in the field of Hydro-Meteorology and Geophysics of Europe that can support the ERCC with regard to situation assessments in crisis situations worldwide. A website is being built at <http://aristotle.ingv.it/>

**European Disaster Risk Management Knowledge Centre** – The new centre will work at the science-policy interface to help EU Member States respond to emergencies, prevent and reduce the impact of disasters. See <http://drmkc.jrc.ec.europa.eu/>, <https://ec.europa.eu/jrc/en/news/new-knowledge-centre-help-eu-minimise-risk-disasters>

### **S2S (Sub-seasonal-to-Seasonal Prediction):**

The Extreme Weather sub-project, which has direct links to HIWeather, held a teleconference in January. See <http://www.s2sprediction.net/static/news> for news, including the latest S2S newsletter for download.

### **PPP (Polar Prediction Project):**

Latest news is available at <http://www.polarprediction.net/news.html>.