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January 2020

Recent months have highlighted the challenges faced by communities across the world in building resilience to weather-related hazards in a changing climate. Warning systems are a critical component of resilience and the work of HIWeather becomes increasingly important as climate change accelerates. As we enter a new year, we celebrate HIWeather's achievements to date and look forward to the new challenges we set ourselves at the HIWeather Steering Group meeting last October, conscious of the important role HIWeather plays in a research landscape that has many players, few of which can command HIWeather's breadth of scientific input from its task teams or HIWeather's global influence through the WMO membership.

The citizen science initiative is making good progress and is on track to provide guidance to WMO members later this year. The publishers have accepted our proposed outline and writing team for a book based on the Five Valleys of Death concept following excellent reviews. We are still working on the end-to-end case studies concept, which was circulated in late December. Current thinking is that this should be an ambitious initiative, aiming to pull together material from reviews of historical disasters so as to provide an integrated evidence base for research towards the ideal future warning system.

In October, I joined the COST Damocles meeting in Tallinn, Estonia to discuss compound risks. This European project is doing some interesting work in identifying and classifying the nature of both compound hazards and compound impacts. While much of the work was focused on multiple flooding hazards, there were some very interesting examples of pre-conditioning, especially in agriculture: e.g. Loss of crop due to a wet Winter followed by a cold Spring. From a warning point of view, I was particularly impressed by the Red Cross example of the Dzud in Mongolia, which kills livestock when a dry summer is followed by a cold winter – the stock being malnourished after the drought and unable to forage through the snow for winter feed. The warning system is initiated following a dry summer and uses a seasonal forecast for the following winter to decide whether the Red Cross should intervene with grants to enable especially vulnerable families to purchase fodder.

In December I took part in a Symposium on Impact Based Forecast and Warning Services, held at the Met Office in Exeter and organised by the Public Weather Services Delivery programme of WMO. Following a very fruitful two days of presentations and discussions, the participants were charged with preparing an update of the 2015 WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services. HIWeather is contributing significantly to this exercise, which is planned for completion in July.

I recently spent a hectic week in Boston at the AMS Centenary Annual Meeting. It was great to catch up with so many HIWeather task team members there and to meet with Jen Sprague from the HIWeather Advisory Group to discuss increased US involvement. The growth of cross-disciplinary symposia at AMS has been spectacular and it is no longer possible to go to all of the sessions on Societal Applications. I heard results from some excellent research being carried out in the context of the NWS FACETS project, which I hope HIWeather can connect with more closely.

Looking forward, we are starting to plan for a HIWeather workshop in October, probably in Beijing, and I invite you to get involved in one of the new initiatives in citizen science or in end-to-end case studies, or to link your own project to HIWeather through our endorsement scheme advertised on the HIWeather home page at <http://hiweather.net>.



Brian Golding

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### CALLS AND REQUESTS

**HIWeather Endorsement:** The Steering Group (SG) of the High Impact Weather (HIWeather) Project provides endorsement for projects, programs and initiatives that plan to contribute to the goals of HIWeather as outlined in the HIWeather Implementation Plan. Projects seeking endorsement through HIWeather may either be funded or in the process of seeking funding. (More [http://hiweather.net/news/show/c\\_id/145/n\\_id/315.html](http://hiweather.net/news/show/c_id/145/n_id/315.html))

**General Call:** We would like to invite those who use Twitter to communicate about HIWeather relevant topics to add their Twitter name to the database that Emily Campbell has compiled:

[https://docs.google.com/spreadsheets/d/1Aw1B2FjW66T\\_yoLCWSb6KzvDZR\\_e2wTBqYOsFFYRU5M/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1Aw1B2FjW66T_yoLCWSb6KzvDZR_e2wTBqYOsFFYRU5M/edit?usp=sharing)

**Request:** Anyone interested in joining the Social Media cross-cutting project, or find out more, is requested to email Sara Harrison at [s.harrison@massey.ac.nz](mailto:s.harrison@massey.ac.nz)

### AWARDS AND DISTINCTIONS

American Meteorological Society Fellow: **Jenny Sun** (NCAR)

Science New Zealand Early Career Research Award 2019: **Sally Potter** (GNS Science)

PhD Completions: **Philippe Weyrich** (ETH Zürich)

### ACTIVITIES

- **Workshop on “Warm Conveyor Belts – a challenge to forecasting”** hosted by ECMWF, 10-12 March 2020.  
From 10 to 12 March 2020 the ECMWF is hosting a workshop on “Warm Conveyor Belts – a challenge to forecasting” (<https://events.ecmwf.int/event/165/overview>). In advance of the workshop the NAWDEX community is discussing latest results from the campaign data analysis and other campaign-related studies
- **34<sup>th</sup> Conference on Hurricanes and Tropical Meteorology**, 10-15 May 2020, New Orleans LA  
<https://annual.ametsoc.org/index.cfm/2020/>
- **Disaster Ethnic Conference**, 18-20 May 2020. Copenhagen Centre for Disaster Research, Denmark.  
Conference Website: <https://events.ruc.dk/disasterethics/home.html>
- **AOGS 2020**, 28 June to 4 July, Hongcheon Korea.  
Author registration deadline: 21 Apr 2020  
Website: <http://www.asiaoceania.org/aogs2020/public.asp?page=home.html>
- **FESSTVal Summer School**: 13-24 July 2020, Meteorological Observatory Lindenberg MOL\_RAO, Germany  
The preparations for the field campaign are ongoing. Data collected during the pre-campaign in summer 2019 is being evaluated to define the best scanning strategies for the Doppler Lidars. Locations to set up the dense measurement network of the APOLLO (“Autonomous cold POoL LOGger”) stations are searched, and schools that are going to participate within the Citizen Science project are being acquired. The campaign will take place from June-August at the Meteorological Observatory Lindenberg – Richard-Aßmann-Observatory (MOL-RAO) of the German Weather Service (DWD) near Berlin, and is initiated by the Hans-Ertel-Center for Weather Research (HErZ). More details can be found at [www.fesstval.de](http://www.fesstval.de)

P&P	Review the state of wind hazard forecasting
	NAWDEX (North Atlantic Waveguide and Downstream Impacts Experiment)
	Multi-scale, multi-leadtime predictability of high-impact weather
	RELAMPAGO-CACTI (Remote sensing of Electrification, Lightning, And Meso-scale/micro-scale Processes with Adaptive Ground Observations - Cloud Aerosols and Complex Terrain Interactions)
	SCMREX (Southern China Monsoon Rainfall EXperiment)
	PRECIP (Prediction of Rainfall Extremes Campaign in the Pacific)

## REVIEW THE STATE OF WIND HAZARD FORECASTING

Lead: John Knox

Identify wind metrics that relate to impacts; describe the state-of-the-art in observing and predicting them; identify processes that lead to high impacts; make recommendations for targeted work to address weaknesses in understanding, observing and prediction. The writing team is working to a target of completion in 2020.

## NAWDEX (NORTH ATLANTIC WAVEGUIDE AND DOWNSTREAM IMPACTS EXPERIMENT)

Lead: Andreas Schäfler

ECMWF workshop on "Observational campaign for better weather forecasts":

In June 2019 ECMWF organized a workshop aimed to increase the interactions between observation campaigns and numerical weather prediction (NWP) centres. The workshop involved contributions from NWP centres, past and future campaigns and operational activities that provide "special" observations. From the HIWeather community, for example the NAWDEX and FESSTVal campaigns were represented. The workshop led to great discussions how to increase the interactions, and how NWP centres can help to motivate future campaigns.

Read more about the workshop here: <https://www.ecmwf.int/en/about/media-centre/news/2019/experts-explore-how-observational-campaigns-can-improve-weather>

## MULTI-SCALE, MULTI-LEADTIME PREDICTABILITY OF HIGH-IMPACT WEATHER

Leads: Shira Raveh-Rubin, Linus Magnusson, Michael Riemer

Objectives: Assess the predictability of different ingredients to HIW events as a function of leadtime and identify the physical processes that limit predictability (see *Di Muzio et al, 2019* for tropical-cyclone-like Mediterranean cyclones). In collaboration with the Multiscale Forecasting theme, assess the role of assimilating high-resolution data to capture the mesoscale dynamics and improve short-term prediction. Starting with high-impact weather related to dry intrusions (*Catto and Ravel-Rubin, 2019; Ravel-Rubin and Catto, 2019*), develop general recommendations how to assess this insight for other types of high-impact weather.

Linus Magnusson has finalized his report: ECMWF Severe Event Catalogue for Evaluation of Multi-scale Prediction of Extreme Weather, which can be found here:

<https://www.ecmwf.int/en/elibrary/19230-ecmwf-severe-event-catalogue-evaluation-multi-scale-prediction-extreme-weather>

## RELAMPAGO-CACTI

Remote sensing of Electrification, Lightning, And Meso-scale/micro-scale Processes with Adaptive Ground Observations - Cloud Aerosols and Complex Terrain Interactions

Linked to HIWeather through the Working Group on Nowcasting and Mesoscale Research (WGNMR)

RELAMPAGO is funded by the US National Science Foundation to observe convective storms that produce high impact weather in the lee of the Andes in Argentina. It also involves contributions from NASA, NOAA, Argentina (MINyCT), Brazil (CNPq and FAPESP), Chile (CONICYT), universities across the region, Argentina's national meteorological service (SMN) and Brazil's space agency (INPE). Observations during the main observing period, Nov-

## SCMREX (SOUTHERN CHINA MONSOON RAINFALL EXPERIMENT)

Lead: Yali Luo

During the pre-summer rainy season (April–June), southern China often experiences frequent occurrences of extreme rainfall, leading to severe flooding. The China Meteorological Administration (CMA) initiated a nationally coordinated research project, SCMREX, endorsed by WMO, as a WWRP RDP, consisting of four major components: field campaign, database management, studies on physical mechanisms of heavy rainfall events, and convection-permitting numerical experiments including impact of data assimilation, evaluation/improvement of model physics, and ensemble prediction. Pilot field campaigns were carried out in 2013–15. See <https://journals.ametsoc.org/doi/abs/10.1175/BAMS-D-15-00235.1>, which describes i) the scientific objectives, pilot field campaigns, & data sharing of SCMREX; ii) provides an overview of heavy rainfall events during SCMREX-2014; and iii) presents examples of preliminary research results and explains future research opportunities.

The fourth WMO Monsoon Heavy Rainfall Workshop (MHR-4) was held in Shenzhen, China on April 2019 to discuss recent advances in analysis, NWP studies and development of techniques for observing/forecasting monsoon heavy rainfall, and to review the progress of SCMREX. Above discussion has been summarized as a paper: *Science and Prediction of Monsoon Heavy Rainfall*. The accessible link is: <https://www.sciencedirect.com/science/article/pii/S2095927319305468?dgcid=author>

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## PRECIP

Lead: Rob Rogers

The U.S. NSF has recently funded a project entitled **Prediction of Rainfall Extremes Campaign in the Pacific (PRECIP)**, led by Michael Bell and Kristen Rasmussen (Colorado State University), which seeks to improve the fundamental understanding and predictability of the processes that produce extreme precipitation through an ingredients-based physical framework. Research observations will be collected during four event types that meet a global definition of ‘extreme’ rainfall across the spectrum of rainfall intensity and duration: (1) deep convective cores, (2) wide convective cores, (3) broad stratiform regions, and (4) tropical cyclones (TCs; termed “typhoons” in the West Pacific).

PRECIP will be conducted in collaboration with the Taiwan-area Atmospheric and Hydrological Observation and Prediction Experiment (TAHOPE) and Japanese Tropical cyclones-Pacific Asian Research Campaign for Improvement of Intensity estimations/forecasts (T-PARCII). The extreme rainfall and typhoon reconnaissance effort during the period leading up to the 2020 Tokyo Olympics will provide a focal point for an education and outreach effort promoting the positive role of international science collaboration to address global problems such as extreme weather.

MSF	MOUNTAOM (RDP alongside the 2022 Winter Olympic Games in Beijing)
	Review the current state of nowcasting & forecasting high impact weather
	Intercomparison of km-scale DA & nowcast/forecast systems
	SURF (Study of Urban Rainfall and fog/haze)
	ICE-POP2018 (RDP/FDP alongside the Pyeongchang Winter Olympic Games in South Korea)
	UK Environmental Prediction (UKEP) project

## MOUNTAOM (RDP ALONGSIDE THE 2022 WINTER OLYMPIC GAMES IN BEIJING)

China will be hosting the 2022 Winter Olympic Games in the mountains to the northwest of Beijing. A research activity is underway in the Chinese Meteorological Administration to develop capability in forecasting the relevant weather parameters in this area. The project has six research themes. It is planned to mount an annual field programme, the first of which was held in winter 2017. LES modelling experiments are being conducted with nested grids from 1km down to 37m. The project has an International Advisory Committee, the chair of which is Prof Joe Fernando.

## REVIEW THE 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

The writing team is completing final revisions and it is planned to submit to BAMS in 2020.

## INTERCOMPARISON OF KM-SCALE DA & NOWCAST/FORECAST SYSTEMS

Lead: 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

Following discussions with Brian Golding, Prof. Sarah Dance, a new member of DAOS, has offered to lead a discussion within DAOS on the best way of accelerating research into multi-scale data assimilation for convection-permitting models.

## SURF (STUDY OF URBAN RAINFALL AND FOG/HAZE)

Lead: Miao Shiguang (CMA/IUM).

Linked to HIWeather through GURME and the MSF task team

The Institute of Urban Meteorology is carrying out the SURF field experiment to study urban pollution and extreme precipitation in Beijing. 2017 was the third season of field data collection. Case study results were presented in the Conference on Predictability & Multi-Scale Prediction of High Impact Weather in October 2017.

## ICE-POP2018 (RDP/FDP ALONGSIDE THE PYEONGCHANG WINTER OLYMPIC GAMES IN SOUTH KOREA)

Led by KMA and linked to HIWeather through the WGNMR and MSF task team the IOP period is complete. See <http://www.wmo.int/pages/prog/arep/wwrp/new/RDP-FDP.html> for details.

## UK ENVIRONMENTAL PREDICTION (UKEP) PROJECT

Lead: Huw Lewis

The [UK Environmental Prediction](#) initiative is a national collaboration led by the Met Office, [Centre for Ecology & Hydrology](#), [National Oceanography Centre](#) and [Plymouth Marine Laboratory](#). It develops and evaluates the UK's first fully coupled regional prediction system at kilometre scale, encompassing atmosphere, ocean, wave, land surface, and biogeochemistry model components and their interactions. The aim of the initiative is to enable multi-disciplinary research on Earth system processes at high resolution and to improve future operational applications. One of the exciting aspects of working with coupled systems, illustrated during a workshop held in June 2019, is the need to join together and share different perspectives and expertise from across weather and climate, marine and hydrological

science disciplines. For further information on the UK Environmental Prediction collaboration, contact [huw.lewis@metoffice.gov.uk](mailto:huw.lewis@metoffice.gov.uk) or visit <https://www.metoffice.gov.uk/research/approach/collaboration/ukenvironmentalprediction>.

HIVR	Formal (statistical) impact model intercomparison
	Impact data collection
	Review & classification of impact modelling

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## FORMAL (STATISTICAL) IMPACT MODEL INTERCOMPARISON

Lead: Martin Goeber with input from HIVR and Evaluation task teams

Develop Masters student module to examine simple and physically-based impact models

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## IMPACT DATA COLLECTION

Leads: Joanne Robbins and Rainer Kaltenberger

A review paper is being prepared on how met services collect and use impact data.

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## REVIEW & CLASSIFICATION OF IMPACT MODELLING

Leads: Brian Mills & HIVR task team

The scope of the review is being prepared.



COMM	Unconventional data sources for impact modelling, evaluation & communication
	Review of approaches to communicating high impact weather.
	Training Materials
	Review of the role of trust, salience and beliefs on people's responses to weather warnings
	Communicating uncertainty
	Post-event case studies
	Communication platform
	HIGHWAY (Lake Victoria Basin Nowcasting project)
	GCRF African Science for Weather Information and Forecasting Techniques (GCRF African SWIFT)

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## UNCONVENTIONAL DATA SOURCES FOR IMPACT MODELLING, EVALUATION & COMMUNICATION

Leads: Sara Harrison and Amber Silver

An unconventional data research network has been formed. Several activities are underway to investigate tools for gathering social media data from the public, and on the use of weather warnings by the public using data from social media. Activities include:

- Twitter data analysis: Hywel Williams (U. Exeter, UK)
- Use and interpretation of warnings on social media by the public: Amber Silver (U. at Albany, US), Shannon Panchuk (BoM, Australia)
- Citizen science: Lisa McLaren (JCDR, New Zealand)
- Role of social media for impact models & warnings: Sara Harrison, Sally Potter (New Zealand)

If anyone is interested in being involved in this network, please email Sara Harrison ([s.harrison@massey.ac.nz](mailto:s.harrison@massey.ac.nz)).

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## REVIEW OF APPROACHES TO COMMUNICATING HIGH IMPACT WEATHER.

Lead: Andrea Taylor, Communication task team.

A special issue of the *International Journal of Disaster Risk Reduction* under the title, "Communicating High Impact Weather: Improving warnings and decision making processes" is available at

<https://www.sciencedirect.com/journal/international-journal-of-disaster-risk-reduction/vol/30/part/PA>.

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## TRAINING MATERIALS

Lead: Andrea Taylor, Communication task team

Current plans are to continue to seek existing training resources about impact-based forecasts and warnings from meteorological agencies. Please email Andrea ([A.L.Taylor@leeds.ac.uk](mailto:A.L.Taylor@leeds.ac.uk)) if you have any resources that could be shared globally.

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## COMMUNICATING UNCERTAINTY

Lead: Sally Potter

Review and publish the implications of uncertainty in weather forecasts and warnings across the whole spectrum of HIWeather. A recent publication on communicating model uncertainty, associated with HIWeather, has been published: <https://www.sciencedirect.com/science/article/pii/S2212420918306630?via%3Dihub>

Additionally, a study is underway in New Zealand to understand the public's perceptions of visual uncertainty in severe weather outlook maps that are produced by NZ's MetService, by Mary Anne Thompson, Sally Potter, and Emma Hudson-Doyle.

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## POST-EVENT CASE STUDIES

Lead: Brian Golding

HIW case studies of the forecast value chain will be reviewed. Tropical Idai in March 2019 will be the first case studied. An index of previous WMO surveys of weather service severe weather warnings has been prepared by Juyeon Bae and will be used by this and other activities as a starting point. Linus Magnusson has assembled discussions of severe weather events from the ECMWF newsletters 2014 - 2019.

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## COMMUNICATION PLATFORM

Lead: Emily Campbell, Communication Task Team.

Outputs from HIWeather communication activities will be freely available on the HIWeather Communication Platform, including best practice guidelines and reviews. The Platform is now live, at <http://hiweathercomms.net/>. Additionally, the HIWeather twitter is also now available to follow at [https://twitter.com/WMO\\_HIWeather](https://twitter.com/WMO_HIWeather). Content on the Communication Platform will mainly be populated through the newsletter and task team meeting minutes.

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## INFLUENCE OF TRUST, SALIENCE AND BELIEFS ON WARNING RESPONSE

Lead: Amisha Mehta, Communication Task Team

Amisha recently joined the Communication Task Team to lead a review into the influence of trust, salience and beliefs on warning response. She is planning on putting together a project plan by June 2020. Anyone interested in being part of this activity is encouraged to contact Amisha at [a.mehta@qut.edu.au](mailto:a.mehta@qut.edu.au).

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## HIGHWAY (LAKE VICTORIA BASIN NOWCASTING PROJECT)

HIWeather link: Andrea Taylor

The "HIGH impact Weather lAke sYstem" project falls in the UKAid WISER programme and runs from October 2017 to March 2020. The expected outcome of HIGHWAY is increased access to and use of co-designed and sustainable early warning systems to inform regional, national, sub-national and community level planning and decision-making in the East African region and to improve resilience and reduce the loss of life and damage to property supporting sustainable economic development in the East African region. In Spring 2019 the international partners participating in HIGHWAY supported an Enhanced Observing Period field campaign over Lake Victoria Basin, coordinated by NCAR. This has collected surface station observations, radar and forecasting reports from both National Meteorological Services and private networks. In parallel, work has been progressing on interpreting lightning observations over the Lake. All the observations collated will be used to understand the meteorology of Lake Victoria and its surrounding region. To complement the aims of HIGHWAY and its field campaign and additionally aligning with the aims of the GCRF African-SWIFT project, the HyVic-Pilot flight campaign was conducted in January 2019. The NERC/Met Office FAAM aircraft was deployed over Lake Victoria and successfully completed two flights across the lake. The flights sampled the diurnal shift in the land-lake and lake-land breezes, as well as the humidity at lower levels over the lake which contributes to night time thunderstorms. See <https://www.metoffice.gov.uk/about-us/what/international/projects/wiser/highway>.

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## GCRF AFRICAN SCIENCE FOR WEATHER INFORMATION AND FORECASTING TECHNIQUES (AFRICAN SWIFT)

Link: Andrea Taylor (Communication TT)

A 4-year Global Challenges Research Fund (GCRF) project to improve African hourly to seasonal forecasting capabilities, funding 80 scientists in 5 UK and 10 African institutions, with WMO as an advisory member. During 23 April-6 May, a team of African SWIFT researchers and operational forecasters is meeting in Nairobi, Kenya to conduct a weather forecasting testbed. Hosted by SWIFT partners, the Kenya Meteorological Agency (KMD), the testbed brings together researchers and operational forecasters from across West and East Africa, to engage in the developmental testing of forecasting systems in a quasi-operational environment. The SWIFT testbed will evaluate the NWC SAF Nowcasting software, to determine how the tools can be adapted to African weather systems, and so advance forecasting techniques in Africa. They will also test and evaluate **convection permitting ensemble (CP ensemble)** forecasts, designed by SWIFT partners at the UK Met Office specifically for the Testbed, to provide measures of confidence in the accuracy of forecasts of storms. During the testbed, the Nairobi teams are engaging directly with African forecast user groups at a **Stakeholder Workshop** that is running concurrently with the testbed. See <https://africanswift.org/>

During the last twelve months the African SWIFT project has been exploring potential user demand for impact based forecasting in three West African countries (Ghana, Senegal, and Nigeria), through a series of national workshops. The workshops have shown strong support for this approach amongst decisions makers in climate sensitive sectors, who expressed a need for forecast information focussing on the consequences of severe weather. This has been echoed in workshop discussions with decision makers in Kenya. At the recent African SWIFT Science

meeting and summer school, Andy Hartley (Met Office) provided an introduction to IBF to attendees from NMS and early career scientists.

EVAL	Evaluating the effectiveness of impact-based, extreme weather warnings and behavioural recommendations.
	Warning response
	Global Hazard Map
	Weather Information Value Chain
	Probabilistic forecasting and evaluation of Tropical Cyclones
	Fire weather evaluation
	Mesoscale Verification Inter-comparison over Complex Terrain (MesoVICT)
	Societal and Economic Research Applications (SERA) Workshop
	Value Chain review by WWRP SERA Working Group
	Verification Challenge
Method(s) to measure avoided losses due to improved warnings	

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## EVALUATING THE EFFECTIVENESS OF IMPACT-BASED, EXTREME WEATHER WARNINGS AND BEHAVIOURAL RECOMMENDATIONS.

Leads: Philippe Weyrich, Anna Scolobig & Anthony Patt, ETH Zurich

A survey of expected responses to impact-based and non-impact-based warnings amongst Swiss people was carried out. Overall, the results support the conclusion that impact information coupled with behavioural recommendations in warning messages, promote more effective decisions than standard warnings.

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## WARNING RESPONSE

Leads: Anna Scolobig and Philippe Weyrich

Collecting real-time storm warning and response data from an app from a private company; still waiting for a type3 warning to occur to test the response to impact-based and non-impact-based warnings.

Running serious (simulation) games to understand how social media communication and searching are used in warning. A flood simulation game was run in May 2019 at a training course for professionals in disaster risk reduction held at the University of Geneva.

Looking at people's behaviour as measured by post-event surveys, comparing 10 years ago and now.

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## GLOBAL HAZARD MAP

Leads : Helen Titley and Joanne Robbins

The Global Hazard Map (GHM) summarises the risk of high-impact weather across the globe over the coming week using forecasts from the Met Office and ECMWF global ensembles. It includes forecast layers for tropical cyclones (strike probability and tracks), 24-hour precipitation accumulation, maximum wind gust in a 24-hour period, 24-hour snowfall accumulation, as well as severe heat waves and cold waves. We are working with the University of Exeter to investigate if social media data could be used to evaluate the ability of GHM to identify events which cause community impacts.

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## WEATHER INFORMATION VALUE CHAIN

Lead: Brian Golding

Workshops, in Berlin in May and Melbourne in August 2017, explored the Weather Information Value Chain as a process for understanding the end-to-end flow of information and value from weather to community benefit, including: what constitutes "value"; what an end-to-end user-driven value chain looks like; how value is added/subtracted as information flows along the chain; ways to measure value; using the value chain to guide investment. A panel discussion at the AMS Washington Forum in March 2019 discussed the importance of routine measurement of the value of weather services. A paper on the value chain was published as part of the Global Assessment Report on Disaster Risk Reduction 2019.

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## PROBABILISTIC FORECASTING AND EVALUATION OF TROPICAL CYCLONES

Leads: Helen Titley, Munehiko Yamaguchi, Linus Magnusson

Ensemble forecasting of tropical cyclones (TCs) is vital in capturing the situation-dependent uncertainty in the track and intensity forecasts for existing storms, and in providing probabilistic information about tropical cyclone genesis, but there is huge potential to increase the pull through of ensemble-based uncertainty and probabilistic data in to operational TC forecasts and warnings. A questionnaire for operational TC forecasters aimed to report a baseline on the current use of ensembles at global operational TC forecast centers to the 9th International Workshop on Tropical Cyclones (IWTC-9), and help shape future research and development in order to maximise the pull through of the benefits of ensemble forecasts in to operational tropical cyclone forecasts and warnings. The results were presented at the 9th International Workshop on Tropical Cyclones (IWTC-9) in Hawaii in December 2018, and a series of recommendations put forward to IWTC. A paper describing the questionnaire results was published in an IWTC-9 special issue of the journal Tropical Cyclone Research and Review in September 2019. (<http://tcrr.typhoon.org.cn/EN/10.6057/2019TCRR03.05>).

Additional work relevant to this HIWeather activity includes the following:

- A. A Met Office evaluation of multi-model ensemble tropical cyclone strike probability forecasts across all global basins has been submitted for publication.
- B. At the Japan Meteorological Agency (JMA), multi-model ensemble forecasts have been pulled through in to operational TC track forecasts for the 2019 typhoon season, in a great example of successfully transitioning ensemble-based products from research into operations.
- C. A new study is underway to investigate ensemble-based predictability of flooding in TCs using the Global Flood Awareness System (GloFAS).

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## FIRE WEATHER EVALUATION

Lead: Amanda Anderson

This project at NCAR is evaluating coupled fire-weather modelling. Currently looking at the forecast sensitivity to fuel moisture, terrain and ignition location, and benefit of spotting capability in the model. A likelihood map for spotting will be evaluated when ready. The assessment is also exploring how the sensitivity information can be conveyed to the user.

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## MESOSCALE VERIFICATION INTER-COMPARISON OVER COMPLEX TERRAIN (MESOVICT)

Leads: Manfred Dorninger and Marion Mittermaier

The project encouraged investigation of spatial verification methods in complex terrain, including for ensemble forecasts and uncertain observations. The final workshop was held in July 2019 in Vienna (<https://mesovict.univie.ac.at/>). A special collection of articles related to MesoVICT is being published in *Monthly Weather Review* and *Weather & Forecasting*.

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## SOCIETAL AND ECONOMIC RESEARCH APPLICATIONS (SERA) WORKSHOP

Link: Martin Goeber

This workshop will be held in Berlin in 2020 or 2021, hosted by DWD's Hans Ertel Centre. It will have SERA themes similar to the NCAR's earlier WAS\*IS (Weather and Society\*Integrated Studies) workshops. The format will include a tutorial for students from weather services, etc., followed by a scientific conference.

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## VALUE CHAIN REVIEW BY WWRP SERA WORKING GROUP

Link: Martin Goeber

This review will provide an overview and meta-analysis, based on the literature, of how the value chain is applied in different fields.

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## VERIFICATION CHALLENGE

Leads: JWGFVR and Evaluation task team

A second competition for evaluation metrics using non-traditional observations (e.g. sensor networks, social media, citizen science, impact data, etc.) was launched at the European Meteorological Society Conference in September 2019, run by the Joint Working Group on Forecast Verification Research (JWGFVR) The contest is aimed to encourage the development and demonstration of verification approaches targeted to use new and non-traditional observations. New verification metrics and visualisations are encouraged.

The challenge is open to individuals and teams. Entries are due 15 February 2020. The winner will receive an all-expense paid attendance and keynote talk at 8th International Verification Methods Workshop to be held in Brazil in June 2020. The challenge supports the WWRP's HIWeather, Sub-seasonal to Seasonal Prediction (S2S), and Polar Prediction (PPP) projects.

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## METHOD(S) TO MEASURE AVOIDED LOSSES DUE TO IMPROVED WARNINGS

Leads: Masa Haraguchi and Michael Kunz

This study will do a literature search leading to a review paper. It will focus on heatwave and tropical cyclones, connecting to loss data from disaster reports from the World Bank.

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## NATIONAL PROGRAMMES

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### US CONTRIBUTIONS

A joint committee is formulating a US response to the three post-THORPEX projects and will shortly complete an inventory of existing relevant work. Prof. Michael Morgan leads this activity for HIWeather. 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 is a member of the HIWeather Advisory Group.

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### UK CONTRIBUTIONS

Relevant areas of work include unconventional data sources, km-scale data assimilation and ensemble prediction, km-scale coupled modelling, hazard impact modelling and risk communication. The Met Office recently completed implementation of its new hourly lagged convection-permitting ensemble. Trial results showed a substantial gain in performance (<https://www.metoffice.gov.uk/research/news/2019/mogreps-uk-hourly-cycling-updates>). Impacts work is largely carried out in the Natural Hazard Partnership (<http://www.naturalhazardpartnership.org.uk/>). The recently completed NERC/Met Office Flooding from Intense Rainfall project delivered new radar capability, advances in km-scale data assimilation & coupling with inundation models (<http://www.met.reading.ac.uk/flooding/>). UKRI funds two networks in its "Decision Making Under Uncertainty" theme. NERC/UKAid fund four research projects through the Science for Humanitarian Emergencies And Resilience (SHEAR) programme focusing on co-production of knowledge using a multi-disciplinary and problem-centred approach in sub-Saharan Africa and south Asia (<http://www.nerc.ac.uk/research/funded/programmes/shear/>). See also SWIFT and HIGHWAY, above. The UKRI Global Challenges Research Fund Urban Disaster Risk Hub, which is endorsed by HIWeather, is developing its plans for building resilience to natural hazards in Kathmandu, Nairobi, Istanbul and Quito (<https://www.de.ed.ac.uk/project/gcrf-urban-disaster-risk-hub>).

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### 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. The second

4-year phase has started July 2019. Results of the project are available in a QJRMS and an AMS journal special collection and on the W2W website (<https://www.wavestoweather.de/>).

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>.

Developed pre-operational impact forecasts in partnership with the fire brigade; Collecting citizen science measurements as part of a field experiment, to be used in forecast verification. (Martin Goeber, DWD).

Associated with Waves to Weather, a new PhD project has started to investigate the impact of the new Aeolus space-borne Doppler lidar on tropical waves and precipitation. Through its measurements of winds in cloud free regions Aeolus is closing an important gap in the global observing system and thus it is expected to substantially improve analysis fields and subsequently predictions of synoptic- to planetary-scale wave phenomena in the Tropics. The work will be conducted in close collaboration with the German Weather Service (DWD) and the European Centre for Medium-Range Weather Forecasts (ECMWF), which both are currently running data impact experiments with the new data.

In addition, Waves to Weather scientists are going to participate in an international field campaign on the Cape Verde islands in summer 2020, called ASKOS (<http://askos.space.noa.gr>). This project is built around planned calibration/validation aircraft measurements conducted during the same period. Cape Verde during boreal summer is ideal for a study of tropical wave phenomena. The midlevel African easterly jet allows for the formation of synoptic-scale African easterly waves (AEWs) that typically reach their maximum intensity close to the coast of West Africa. AEWs interact with convection and its mesoscale organization through modifications in humidity, temperature and vertical wind shear, and often serve as initial disturbances for tropical cyclogenesis. In addition, the tropical atmosphere sustains different types of planetary waves that frequently interact with the monsoon and AEWs. To support our research in this area, we plan frequent radiosonde ascents from Cape Verde to complement the measurements from space and aircraft.

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## AUSTRALIAN CONTRIBUTIONS

An Australian HIWeather community was established at the annual Australian Meteorological and Oceanographic Society (AMOS) meeting. The goal is to foster collaboration within Australia of physical and social scientists, forecasters, and users of forecasts of high impact weather. Anyone who is interested can contact [HIWeather@bom.gov.au](mailto:HIWeather@bom.gov.au) to join this community.

The Bureau of Meteorology and Geoscience Australia are conducting a small project on **impact prediction**, currently looking at impacts of wind on infrastructure. Partners include forecasters and State Emergency Services. High resolution ensemble NWP is coupled to a wind damage function to derive probabilistic spatial maps of damage severity, using East Coast Lows as demonstration events.

Future Warning Services (FWS) framework: In February 2018 the Australian Fire and Emergency Services Authority Council (AFAC) Warning Group commissioned social research to build a sound evidence base for a national three-level warning framework for all hazards. The Australian Bureau of Meteorology has embarked on a three-year Public Services Transformation to improve the impact and value of our services. This includes new and enhanced impact-based warning services that provides warnings that are clear, accurate, location specific, relevant and contextual. We are developing a framework to guide the preparation of a product roadmap that systematically prioritises the future development of services. People can get a copy of the PST business case by emailing [public-services@bom.gov.au](mailto:public-services@bom.gov.au).

The 'Reducing Illness and Lives Lost from Heatwaves' (RILLH) is a multi-agency collaboration between the Australian Bureau of Meteorology (BOM), Australian Bureau of Statistics (ABS), Department of Health (DOH), and Geoscience Australia (GA). The RILLH is a data-integration partnership project and asks three questions; 'who is most at risk?', 'where are they?', and 'how can services to vulnerable groups be improved through heat-health warnings and targeted interventions?'. This project seeks to answer these questions by mapping vulnerability against Excess Heat Factor (EHF), the scale used to define heatwave intensity by the Bureau of Meteorology and many Australian States and Territories. Through the utilisation and analysis of health and health service data, weather observations, neighbourhood community and environmental characteristics, the project is building a national 'map' of heat health vulnerability which will be underpinned by a Heat Vulnerability Index. It is anticipated that the core methodology of multi-agency collaboration and integration of data used in this project can be applied to other natural hazards as well. The results will support emergency response and planning in the immediate term and will inform and shape spatially target intervention strategies including impact forecast warning systems, social registries and community outreach, social media targeting, and urban planning. For more information contact Shannon Panchuk ([shannon.panchuk@bom.gov.au](mailto:shannon.panchuk@bom.gov.au))

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## NEW ZEALAND CONTRIBUTIONS

Within New Zealand, Resilience to Nature's Challenges (<https://resiliencechallenge.nz/>), is a five-year Government-funded research programme that has recently started (1 July 2019). The Weather & Wildfire theme, co-lead by Richard Turner (NIWA) and Sally Potter (GNS Science), is aiming to improve our understanding of extreme weather and wildfire impacts on communities and infrastructure, and co-design mitigation solutions (including improving impact-based warnings) with key stakeholders. We are using three scenarios – an ex-tropical cyclone, severe winter storm, and wildfire on a rural-urban interface. The programme has been aligned to support the goals of the WMO HIWeather programme. The Weather & Wildfire theme is linked to other themes within the programme, that will also contribute to HIWeather, notably the Resilience in Practice Model, co-lead by Julia Becker (Massey University) and the Urban theme co-lead by David Johnston (Massey University).

Sally Potter has completed a report that guides New Zealand stakeholders on how to write effective short warning messages, such as for social media and Emergency Mobile Alerts (available for free from [https://shop.gns.cri.nz/sr\\_2018-002-pdf/](https://shop.gns.cri.nz/sr_2018-002-pdf/)).

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## ARGENTINE CONTRIBUTIONS

The Alert.AR project finished in May 2018, having delivered a new warning system. A Health & Heatwave Early Warning System ([https://www.smn.gob.ar/smn\\_alertas/olas\\_de\\_calor](https://www.smn.gob.ar/smn_alertas/olas_de_calor)) was inaugurated this summer as a result of a joint research between the National Ministry of Health and the National Meteorological Service of Argentina. The warning system is based on mortality data and climatological information from the last 40 years for 57 cities of Argentina. A WMO regional workshop on Impact-Based Forecasting & Warning is being hosted in September.

SMN is developing a new Early Warning Service in partnership with emergency managers and citizens. A training day/workshop with all the provincial directors of emergency agencies and their technical teams will be held in June to inform them about how the new EWS will work well in advance of its launch. An event in July in conjunction with the National Secretariat of Science and Technology will include a workshop with all technical scientific bodies that "depend" on the information of warnings and forecasts to issue other types of warnings, announcements or bulletins so they will be able to adjust their own systems. (Julia Chasco, SMN)

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## EUROPEAN CONTRIBUTIONS

Joint initiative towards a International Fujita scale to assess tornado and wind damage (with European Severe Storms Lab) is still growing. Recently, there was a poster presentation at EMS Annual Meeting in Copenhagen, 9-13.9.2019. Information and first IF-scale draft document (v 0.1) can be found at <https://www.essl.org/cms/international-fujita-scale/>, there is also an internal forum for experts to discuss case studies and further refinements, experts who are working in this field are welcome to join our initiative. Next face-to-face meeting of the IF-Scale steering committee is planned along with the ESSL Tornado and Windstorm Damage Assessment Workshop in August 2020 in Wr. Neustadt, Austria. <https://www.essl.org/cms/upcoming-events/workshop-damage-assessment/>. Spread the message!

The EUMETNET EMMA/Meteoalarm PM carried out a survey on implementation of impact-oriented warnings among Meteoalarm members in Europe in August 2018 – May 2019. 79 questions covered topics from warning format, production process of warnings, dissemination of warnings, verification of warnings, warning strategy, crowdsourcing and cross-border collaboration 32/37 of European NMHSs replied, making it a valuable dataset for potential initiatives on the regional / global scale in the field of IoW. Preliminary results were presented an input for the EUMETNET EMMA/Meteoalarm Workshop on Impact-oriented Warnings, 25<sup>th</sup> and 26<sup>th</sup> June 2019 in Vienna. Final results were presented at the EMS Annual Meeting in Copenhagen, 9-13.9.2019. Publication of results is planned for 2020.

European Weather Observer –ZAMG and ESSL are in contact with a number of European NMHSs to work on and refine a pan-European, standardized set of human-assessed (hydro, meteo, geo) crowdsourcing reporting parameters and enable exchange through a standardized API. In 2018 a first set of reporting parameters was defined by DHMZ, FMI, KNMI, ESSL, ZAMG and other ESSL collaborators (i.e. European spotter groups). Our common proposal is, that European NMHSs shall act as national data hubs for weather- and impact observations enabling exchange of data between NMHS level and European level. Currently a consortium of participating NMHSs is formed. A standardized API between all partners will enable real time data exchange using the MQTT protocol. NMHSs are invited to provide API to subnational collaborators (e.g. spotter groups, emergency authorities). The API can be easily implemented in existing web pages and apps, e.g. <https://wettermelden.at>. Recently a presentation was held at EMS Annual Meeting in Copenhagen, 9-13.9.2019. <https://meetingorganizer.copernicus.org/EMS2019/EMS2019-887-2.pdf>.

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## CHINESE CONTRIBUTIONS

Recently, four projects lead by researchers from Chinese Academy of Meteorological Sciences (CAMS) have been approved as *National Key Technology Research and Development Plan*:

- 1) “Development of High Resolution Data Assimilation Techniques and East Asia Atmospheric Reanalysis Datasets” (Xudong LIANG). The aim is for a 3km grid, decade long reanalysis for East Asia.
- 2) “Research on Thunderstorm Electrification-discharge Processes and Lightning Effects” (Weitao LYU). This project will include basic observational and theoretical approaches to understanding lightning and will use AI approaches to develop a lightning forecasting and warning platform.
- 3) “Aerosol-Convective Cloud Interaction Mechanism and Its Model Application Demonstration over Beijing-Tianjin-Hebei Region” (Jianping GUO [https://www.researchgate.net/profile/Jianping\\_Guo6](https://www.researchgate.net/profile/Jianping_Guo6)). This project aims to improve 24-hour precipitation scores in the Beijing-Tianjing-Hebei region by developing improved mixed-phase parametrization scheme that incorporate aerosol effects. The parametrizations will be developed on the basis of field campaigns.
- 4) “Development of Seamless Weather-Climate Model Dynamic Core on Unstructured Grid” (Jian LI). The aim is to develop a core that gives more accurate solutions and is suitable for future supercomputing architectures.

A five-year Project, named as “Key Dynamic and Thermodynamic Processes and Prediction for the Evolution of Typhoon Intensity and Structure” of the Ministry of Science and Technology is led by Prof. Zhemin Tan from Nanjing University and aims to deliver forecast products of track, intensity and structure of typhoon 3-7 days in advance, see: <http://meso.nju.edu.cn/web/typhoon/>.

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## RELATED ACTIVITIES

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### GHHIN (GLOBAL HEAT HEALTH INFORMATION NETWORK).

A professional network of academics, government representative at all levels, professional organisations, international organisations, donor organisations, private sector and non-governmental organisations eager to share and engage in issues around heat and health. See <http://www.ghhin.org/>

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### I-REACT

EU Horizon2020 project on Improving Resilience to Emergencies through Advanced Cyber Technologies (I-REACT), involving 20 partners, will integrate existing systems to facilitate early planning of weather-related disaster risk reduction activities. I-REACT will co-operate 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/>

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### ANYWHERE

An EU Innovation action designed to bridge the gap between R&D in forecasting and warning high impact weather and climate so as to enhance response by emergency managers and first responders across Europe <http://www.anywhere-h2020.eu/>. Work packages include translating weather forecasts into impact forecasts, developing a platform for communicating information to emergency managers. The project is working on 5 pilot sites: Ligurian Sea, Catalonia, Finland/Norway, Swiss Alps. It is a partnership of operational authorities, R&D institutes and private sector businesses. The project catalogue contains a large collection of forecasting algorithms, many developed in previous EU actions. Mostly they concern prediction of the hazard, but a few also deal with the impact. See <http://anywhere-h2020.eu/catalogue/>

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### ARISTOTLE



Aristotle will deliver multi-hazard capability to the EU Emergency Response Coordination Centre (ERCC), which is responsible for the coordination of human aid upon request of the government of a country affected by natural (and other) hazards. It offers a scalable scientific network including new hazard related services and a pool of experts in the field of Hydro-Meteorology and Geophysics that can support ERCC in crisis situations worldwide. See <http://aristotle.ingv.it/>

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## EUROPEAN DISASTER RISK MANAGEMENT KNOWLEDGE CENTRE

This 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>

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## S2S (SUB-SEASONAL-TO-SEASONAL PREDICTION)

Latest news is available at <http://www.s2sprediction.net/static/news>

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## PPP (POLAR PREDICTION PROJECT)

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

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## TIGGE (THORPEX INTERACTIVE GRAND GLOBAL ENSEMBLE) AND TIGGE-LAM (-LIMITED AREA MODEL)

The TIGGE dataset (<https://www.ecmwf.int/en/research/projects/tigge>) is one of the major achievements of THORPEX. It now contains over 10 years of global data. On a smaller scale, the TIGGE-LAM dataset provides 5 years of multi-model ensemble data at mesoscale resolution for limited areas. These datasets have been used to investigate a variety of atmospheric processes and there is scope for more use in the context of HIWeather. Opportunities may be driven by analysis of weather phenomena or weather variable thresholds associated with high impact. Within the S2S project, activities related to specific weather phenomena are brought together at <http://s2sprediction.net/> under topic wiki pages. There may be opportunities to do something similar for phenomena relevant to HIWeather. If you are interested, please contact John Methven at Reading University.

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## CODATA: THE COMMITTEE ON DATA OF ICSU

CODATA exists to promote global collaboration to improve the availability and usability of data for all areas of research. CODATA supports the principle that data produced by research and susceptible to be used for research should be as open as possible and as closed as necessary. CODATA works also to advance the interoperability and the usability of such data: research data should be *intelligently open* or *FAIR*. The group is working with relevant domain experts to develop proposals for major cross-disciplinary data integration projects to advance solutions for three important global challenges in **infectious disease**, **sustainable cities**, and **disaster risk reduction**. See [www.codata.org/task-groups/linked-open-data-for-global-disaster-risk-research](http://www.codata.org/task-groups/linked-open-data-for-global-disaster-risk-research)

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## THE YOUNG EARTH SYSTEM SCIENTISTS (YESS) COMMUNITY

The YESS Community is an international multidisciplinary Early Career Researcher (ECR) network with more than 1000 members from over 80 countries. The network aims on bringing together early career scientists, both from natural and social sciences, who are working in a field of Earth system science. YESS is a bottom-up initiative and fully relies on the engagement and activities of its active members. YESS works closely with WWRP, GAW and WCRP to get ECRs involved and to provide them with a collective voice. YESS invites interested HIWeather master students, Ph.D. students and postdocs (within 5 years after their last degree) to join and engage in the community. See [www.yess-community.org](http://www.yess-community.org) and follow YESS on Facebook: [www.facebook.com/yesscommunity](http://www.facebook.com/yesscommunity), Twitter: [twitter.com/YESSCommunity](https://twitter.com/YESSCommunity) or LinkedIn: [www.linkedin.com/company/yess-community](http://www.linkedin.com/company/yess-community).

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## JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH

open access journal dedicated to human and mediated communication issues associated with crises, risks, and emergencies around the world. It is supported by an international [editorial board](#) comprised of top risk and crisis communication scholars. The Journal invites manuscripts of a philosophical, theoretical, methodological, critical, applied, pedagogical or empirical nature. Its scope includes community or regionally based events and risks, such as hurricanes, floods, wildfires, infectious disease outbreaks or similar threats. See [www.jicrcr.com](http://www.jicrcr.com)

## THE PROJECT

### STEERING GROUP AND TASK TEAMS

**Co-chairs:** Brian Golding, UK, [brian.golding@metoffice.gov.uk](mailto:brian.golding@metoffice.gov.uk) and David Johnston, New Zealand, [D.M.Johnston@massey.ac.nz](mailto:D.M.Johnston@massey.ac.nz)

**ICO:** Qinghong Zhang, Liye Li, China, [hiwico@cma.gov.cn](mailto:hiwico@cma.gov.cn).

**Processes & Predictability (P&P) theme** – lead: Michael Riemer, Germany, [mriemer@uni-mainz.de](mailto:mriemer@uni-mainz.de).

**Members:** John Knox, Peter Knippertz, Andreas Schäfler, Juan Fang, Shira Rabeh-Rubin, Linus Magnusson, Deanna Hence, Yali Luo, Linda Schlemmer, Robert Rogers

**Multi-Scale coupled Forecasting (MSF) theme** – lead: Jenny Sun, USA, [sunj@ucar.edu](mailto:sunj@ucar.edu).

**Members:** Paul Joe, Peter Steinle, Sharan Majumdar, Jianjie Wang, Jim Dudhia, Krushna Chandra Gouda, Nusrat Yussouf.

**Human Impacts, Vulnerability & Risk (HIVR) theme** – lead: Brian Mills, Canada, [bmills@uwaterloo.ca](mailto:bmills@uwaterloo.ca).

**Members:** Joanne Robbins, Michael Kunz, Isabelle Ruin, Melanie Gall.

**Communication theme** – co-leads: Andrea Taylor, UK, [a.l.taylor@leeds.ac.uk](mailto:a.l.taylor@leeds.ac.uk) & Sally Potter, New Zealand <mailto:s.potter@gns.cri.nz>

**Members:** Sara Harrison, Brenda Mackie, Shannon Panchuk, Julie Demuth, Amber Silver, Thomas Kox, Linda Anderson-Berry, Bob Goldhammer, Philippe Weyrich, Emily Campbell, Lisa McLaren, Amisha Mehta.

**Evaluation theme** – lead: Beth Ebert, Australia, [beth.ebert@bom.gov.au](mailto:beth.ebert@bom.gov.au)

**Members:** Amanda Anderson, Barb Brown, Julia Chasco, Martin Goeber, Masa Haraguchi, Rainer Kaltenberger, Chiara Marsigli, Marion Mittermaier, Anna Scolobig, Helen Titley

**Link to SURF project:** Xudong Liang, [liangxd@cma.gov.cn](mailto:liangxd@cma.gov.cn)

### ADVISORY BOARD

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

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

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

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

Michael Reeder, Monash University, Australia, representing academia

**Funding.** The Trust Fund can support HIWeather conference attendance by delegates from developing countries. New contributions are needed to develop and facilitate the work of the project.

**International Coordination Office:** The ICO is hosted by Chinese Academy of Meteorological Sciences, and responsible for the organisation of Steering Group, Advisory Board and Task Team teleconferences and maintenance of HIWeather web site: <http://hiweather.net/Index>.

**Secretariat:** Paolo Ruti and Hugo Remaury provide the link to the World Weather Research Programme.

**Communication:** The HIWeather web site can be reached at <http://hiweather.net/Index>. 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 up at Massey University, New Zealand and has recently become live at <http://hiweathercomms.net/>. It is currently being updated. A HIWeather twitter account is also now available to follow at [https://twitter.com/WMO\\_HIWeather](https://twitter.com/WMO_HIWeather).

**Meetings:** The Steering Group meets quarterly, usually by teleconference. The latest physical annual SG meeting has been held on 14-16 October in Geneva, with attendance of WWRD, Co-chairs, Task team leaders, and ICO. Task teams meet by teleconference at intervals to suit their work. The Advisory Board aims to meet at least once a year by teleconference.

## RELEVANT PUBLICATIONS

- Bachmann, Keil, Craig, Weissmann and Welzbacher, 2020, Predictability of Deep Convection in Idealized and Operational Forecasts: Effects of Radar Data Assimilation, Orography, and Synoptic Weather Regime. *Mon. Wea. Rev.* DOI: 10.1175/MWR-D-19-0045.1
- Boukabara, Krasopolsky, Stewart, Maddy, Shahroudi and Hoffman, 2019, Leveraging modern artificial intelligence for remote sensing and NWP. *BAMS*. DOI:10.1175/BAMS-D-18-0324.1
- Bremnes, 2020, Ensemble Postprocessing Using Quantile Function Regression Based on Neural Networks and Bernstein Polynomials. *Mon. Wea. Rev.* DOI: 10.1175/MWR-D-19-0227.1
- Chen, Yu, Wen, Zhang, Yin, Wu and Yao, 2019, Pre-evacuation Time Estimation Based Emergency Evacuation Simulation in Urban Residential Communities. *Int. J. Env. Res. & Pub. Health*, doi:10.3390/ijerph16234599
- Duan, Wan, Huang, Zhao, Yu, Wang, Zhao, Feng, Tang, Chen, Lu, Wang, Liang, Wu, Cui, Xu and Chan, 2019, Landfalling Tropical Cyclone Research Project (LTCRP) in China. *BAMS* DOI:10.1175/BAMS-D-18-0241.1
- Flack, Gray and Plant, 2019, A simple ensemble approach for robust process-based sensitivity analysis of case studies in convection-permitting models. *Quart J Roy Meteorol. S.* DOI: 10.1002/qj.3606
- Frogner, Andrae, Bojarova, Callado, Escriba, Feddersen, Hally, Kauhanen, Randriamampianina, Singleton, Smet, van der Veen and Vignes, 2019, HarmonEPS—The HARMONIE Ensemble Prediction System. *Wea For.* DOI: 10.1175/WAF-D-19-0030.1
- Gallo, Kalb, Gotway, Fisher, Roberts, Jirak, Clark, Alexander and Jensen, 2019, Initial development and testing of a convection-allowing model scorecard. *BAMS* DOI:10.1175/BAMS-D-18-0218.1
- Hirt, Rasp, Blahak and Craig, 2019, Stochastic Parameterization of Processes Leading to Convective Initiation in Kilometer-Scale Models. *Mon Wea Rev*, 3917. DOI: 10.1175/MWR-D-19-0060.1
- Karaye, Horney, Retchless and Ross, 2019, Determinants of Hurricane Evacuation from a Large Representative Sample of the U.S. Gulf Coast. *Int. J. Env. Res. & Pub. Health*, 16, 4268. doi:10.3390/ijerph16214268
- McGovern, Lagerquist, Gagne, Jergensen, Elmore, Homeyer and Smith, 2019, Making the Black Box more Transparent: Understanding the physical implications of machine learning. *BAMS*, 2175. DOI:10.1175/BAMS-D-18-0195.1
- Wang, Xia, Li and Wang, 2019, A Bibliometric Analysis of Crowdsourcing in the Field of Public Health. *Int. J. Env. Res. & Pub. Health*, 16, 3825. doi:10.3390/ijerph16203825
- Wang, Gao, Skinner, Knopfmeier, Jones, Creager, Heiselman and Wicker, 2019, Test of a Weather-Adaptive Dual-Resolution Hybrid Warn-on-Forecast Analysis and Forecast System for Several Severe Weather Events. *Wea For.* DOI: 10.1175/WAF-D-19-0071.1
- Zhang, Li, Ebert, Golding, Johnston, Mills, Panchuk, Potter, Riemer, Sun, Taylor, Jones, Ruti and Keller, 2019, Increasing the value of weather warnings. *Sci Bull.* doi: 10.1016/j.scib.2019.04.003

