HIWeather

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Paolo Ruti and I have just returned from a week in Canmore in the Canadian Rockies discussing links between HIWeather and the WCRP Global Energy and Water EXchanges (GEWEX) programme at the GEWEX Extremes and Water on the Edge conference. The main areas of interaction were highlighted as: convection-permitting modelling, weather impacts, and communication methods. There are several projects in the GASS (Global Atmospheric System Studies) and GLASS (Global Land/Atmosphere System Study) panels (https://www.gewex.org/panels/) that are of relevance to our Predictability & Processes and Multi-Scale Forecasting task teams. The GASS panel is currently working on several new proposed projects (white papers for which are

Staff of the HIWeather International Coordination Office in Beijing

linked at the bottom of http://singh.sci.monash.edu/Pan-GASS/Agenda.shtml). Some of the GEWEX Regional Hydroclimate Projects (RHPs) are, or could be, linked with HIWeather, including HYMEX (Mediterranean), HYVIC (Lake Victoria), PANNEX (Pannonian Basin), Baltic Earth and the proposed ANDEX (Andes). On the final afternoon, we attended a workshop on the planned RISK-KAN (Knowledge Action Network on Emergent Risks and Extreme Events) which links together work in GEWEX, IRDR, Future Earth and, potentially, HIWeather. Earlier, in late March, I was in Nairobi representing the Met Office at a meeting on Forecast-based Financing (FbF) organised by the International Federation of Red Cross and Red Crescent Societies (IFRC) to discuss progress with FbF across Africa. Several African NMHSs were represented and I presented information on how the UK developed and uses Impact Based Forecasting. FbF is based on IFRC-sponsored research that has demonstrated that using impact forecasts to deliver aid before a disaster can substantially reduce the overall cost of aid – a good example of applying the HIWeather Value Chain. More information is available at http://media.ifrc.org/ifrc/forecast-based-financing-fbf/ and http://fbf.drk.de/. Argentina is hosting a WMO workshop on Impact Based Forecasting & Warning in September, to which members of the Evaluation and Communications task teams will contribute. Next month, I shall be in Geneva, joining members of the ICO: Prof. Qinghong Zhang, Liye Li and Haoyue Zhang, in a side meeting at the WMO Executive Council, and then in Paris for a planning meeting for the RISK-KAN.

Meanwhile, in April, David visited Beijing with Emily Campbell from the Communications Task Team for the **19th Scientific Committee Meeting of IRDR.** Integrated Research on Disaster Risk (IRDR) is a decade-long research programme co-sponsored by the International Council for Science (ICSU), the International Social Science Council (ISSC) and the United Nations Office for Disaster Risk Reduction (UNISDR) (http://www.irdrinternational.org/). It is a global, multi-disciplinary approach to dealing with the challenges brought by natural disasters, mitigating their impacts, and improving related policy-making mechanisms. IRDR International Programme Office is hosted by Institute of Remote Sensing and Digital Earth (RADI), Chinese Academy of Sciences. The key focus of the meeting was to shape the strategic direction for the remaining two years of the programme. Discussions focussed on how to best add value to the large array of outputs and activities over the last eight years. A parallel focus is directed towards the shape of any new programme post 2020. The sponsors are committed to continuing the effort and building on the legacy of the current programme but in a form that best meets future needs. Following this they attended the **2018 Asian Science and Technology Conference on Disaster Risk Reduction.** The Sendai Framework calls for the development and dissemination of science-based risk knowledge, methodologies and tools, science and technology work on DRR to support the four priority areas: understanding disaster risk; disaster risk governance; investing in DRR for resilience; and enhancing disaster preparedness for response and to build back better. This conference provided an opportunity to the science, research, academia community in Asia to continue the much-needed science-policy dialogue to ensure that implementation of disaster risk reduction

measures at all level are sound science and technology based. There were 6 thematic sessions: Progress on Science and Technology Roadmap for Disaster Risk Reduction in Asia; Progress on Understanding Risk in Asia (Sendai Priority 1); Progress on Strengthening Disaster Risk Governance in Asia (Sendai Priority 2); Progress on Investing in Disaster Risk Reduction for Resilience in Asia (Sendai Priority 3); Progress on Enhancing Preparedness for Response and Recovery (Sendai Priority 4); Regional Collaboration on Applications of Science and Technology in Preventing Future Risk. Finally David and Emily held discussions with Prof. Quinghong Zhang from Peking University, and Liye Li from CMA at the new ICO to discuss aspects of the ICO and future developments of the websites and possible collaboration on Citizen Science.

The SG held a teleconference in April at which we were joined by the new International Coordination Office (ICO) in Beijing for the first time. The ICO hopes to have its new web site running by early July and the handover should be complete by November. It was decided that a new logo is needed and this appears at the head of this Newsletter. We discussed the HIWeather workshop which will be held in Beijing from 20-22 November, and which we hope all HIWeather task team members will be able to attend as well as others who are associated with the work of HIWeather. As well as reviewing the achievements of the first three years, the workshop will be looking forwards towards a unifying theme for the work of the next period. To that end, the workshop sessions are being planned around the Value Chain concept, with emphasis on how advances in each stage of the warning process lead to better decisions at the end of the chain. Please put the dates in your diary and aim to be there.

Wishing you all every success in your HIWeather activities.

The Project

Steering Group
Co chairs: Brian Golding, UK and David Johnston, New Zealand
Processes & Predictability (PP) theme – lead: Michael Riemer, Germany; members: John Knox, Peter Knippertz, Andreas Schäfler, Juan Fang.
Multi-Scale coupled Forecasting (MSF) theme – lead: Jenny Sun, USA; members: Paul Joe, Peter Steinle, Sharan Majumdar, Jianjie Wang, Jim Dudhia, Krushna Chandra Gouda.
Human Impacts, Vulnerability & Risk (HIVR) theme – lead: Brian Mills, Canada; members: Joanne Robbins, Jeff Lazo, Michael Kunz, Isabelle Ruin, Melanie Gall.
Communication theme – co-leads: Andrea Taylor, UK, and Shannon Panchuk, Australia; members: Abi Beatson, Greg Carbin, Melanie Harrowsmith, Amber Silver, Rutger Dankers, Sally Potter, Thomas Kox, Claudia Adamo, Jose Galvez, Kiernan McGill, Linda Anderson-Berry, Tim Brown, Vankita Brown.
Evaluation theme - Beth Ebert, Australia; members: Julia Chasco, Barb Brown, Anna Scolobig, Manfred Dorninger, Martin Goeber, Helen Titley, Marion Mittermaier, Jing Chen, Chiara Marsigli.

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 will 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: A plan for setting up the ICO in the Chinese Academy of Meteorological Sciences, part of CMA the Chinese Meteorological Administration, was agreed during our visit in January. The ICO will take over organisation of Steering Group, Advisory Board and Task Team teleconferences, the newsletter and web site from the WWRP secretariat in Geneva. It is planned to formally open the ICO during the workshop in November.

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 up 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: The Steering Group meets quarterly, usually by teleconference. The next physical meeting will be at the Beijing workshop in November. Task teams meet by teleconference at intervals to suit their work. The Advisory Board has decided to increase the frequency of its meetings to quarterly by teleconference.

Relevant Scientific Meetings

29th Conference on Weather Analysis and Forecasting (WAF)/25th Conference on Numerical Weather Prediction (NWP), 4-8 June 2018, Denver, USA, https://www.ametsoc.org/ams/index.cfm/meetings-events/ams-meetings/29th-conference-on-weather-analysis-and-forecasting-waf-25th-conference-on-numerical-weather-prediction-nwp/. Abstract deadline extended to 19th February.

Royal Meteorological Society/NCAS Atmospheric Science Conference 2018: Weather, Climate & Air Quality, 3-4 July 2018, York University, UK . https://www.atmosphericscienceconference.uk/. Deadline for paper submissions 16th March 2018.

43rd Annual Natural Hazards Research and Applications Workshop, 8-11 July, Boulder, USA. https://hazards.colorado.edu/workshop/2018

10th International Conference on Urban Climate/14th Symposium on the Urban Environment, 6-10 August 2018, New York**.** https://www.ametsoc.org/ams/index.cfm/meetings-events/ams-meetings/10th-international-conference-on-urban-climate-14th-symposium-on-the-urban-environment/**.** Registration opens shortly.

EMS Annual Meeting: European Conference for Applied Meteorology and Climatology 2018 (EMS2018), 3–7 September 2018, Budapest, Hungary. Conference theme: Weather and climate: global change and local hazards. Abstract deadline 7th March 2018. https://meetingorganizer.copernicus.org/ems2018/sessionprogramme

International Conferences on Subseasonal to Decadal Prediction, 17-21 Sep 2018, NCAR, Boulder, USA. Abstracts deadline 16 March 2018. https://www.wcrp-climate.org/s2s-s2d-2018-home.

IDRiM (International Society for Integrated Disaster Risk Managament) 9th conference, 2-4 October 2018, Sydney, Australia. http://www.idrim.org/?p=1730

14th IEEE International eScience conference, 29 Oct – 1 Nov, Amsterdam. Session on Weather & Climate in the Digital Era. https://www.escience2018.com/373100#topmenu, select "Call for Abstracts on Weather & Climate in the Digital Era".

ISCRAM (The 2018 ISCRAM Asia-Pacific Conference is being hosted it in Wellington, New Zealand on the 4th-7th November 2018) Asia-Pacific Conference, 4-7 November, Wellington, New Zealand. Paper submissions deadline 15th June. http://www.confer.co.nz/iscramasiapacific2018/

HIWeather Workshop, Beijing, 20-22 November 2018. This will be our first meeting to include all of the HIWeather task teams since the kick-off meeting in Exeter in Spring 2016, so we are looking forward to bringing everyone together again, to hearing about successes and challenges in the intervening 30 months, and to planning new activities for the coming years.

9th International Workshop on Tropical Cyclones (IWTC-9), 3-7 December, Honolulu, USA. By invitation. https://www.wmo.int/pages/prog/arep/wwrp/IWTC-9.html

AGU Fall Meeting, 10-14 December, Washington DC, USA. Abstract submissions open mid-June. https://fallmeeting.agu.org/2018/welcome/

AMS Annual Meeting, 6-10 January 2019, Phoenix, USA. Abstract deadlines 1st August https://annual.ametsoc.org/index.cfm/2019/call-for-papers/

UNISDR Global Platform, 13-17 May 2019, Geneva, Switzerland.

IUGG General Assembly, 8-18 July, 2019, Montreal, Canada

HIWeather Research

a. **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 no later than December 2018.

b. **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
A draft was prepared ahead of the Conference on Predictability & Multi-Scale Prediction of High Impact Weather in October 2017. Lead and contributors have been assigned for each section. BAMS have accepted the proposal and submission is scheduled for September.

c. **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 discussion at the Conference on Predictability & Multi-Scale Prediction of High Impact Weather in October, it is proposed initially to compare the relative performance of nowcasting and NWP in NHMSs.

d. **UK Environmental Prediction (UKEP) project**
NERC/Met Office programme 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. See
https://www.metoffice.gov.uk/research/collaboration/ukenvironmentalprediction

e. **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

f. **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.

g. **Review & classification of impact modelling**
Leads: Brian Mills & HIVR task team
A review of impact modelling is being prepared aiming to have a draft for the workshop in November.

h. **Global Hazard Map**
Leads : Helen Titley and Joanne Robbins, UK Met Office
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. Performance is evaluated by comparing daily gridded precipitation forecasts against observations, and by assessing the ability of the multi-model precipitation summary layer to highlight events which cause community impacts as recorded in an impact database. The Global Hazard Map is currently being trialled with the Severe Weather Forecast Demonstration Projects (SWFDP).

i. **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. It is planned to prepare a paper on the concept. An outline structure has been circulated to potential contributors. **Any potential contributors who have not yet responded, please do so as soon as possible.**

j. **Probabilistic forecasting and evaluation of Tropical Cyclones**
Leads: Helen Titley, Munehiko Yamaguchi, Linus Magnusson
Ensemble forecasting of tropical cyclones 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. We aim to enhance collaboration amongst the research and operational community to

aid the development of new and innovative ways to display and verify ensemble probabilistic tropical cyclone forecasts including tracks, strike probability, genesis, intensity, and potential impacts. We will work with the operational TC forecasting community to gather their current and future user requirements and demonstrate the benefits of using ensemble forecasts, with a view to increasing the use of probabilistic information in tropical cyclone forecasting. Future plans include:

- Send out a questionnaire to all operational TC forecasting centres asking them about their use of ensemble forecasts including: examples where probabilistic forecasts have been successfully integrated in to operations, occasions where hurdles have prevented them from being fully utilised, and where further model or product development and/or user-oriented evaluation would help encourage their wider use.
- Quantify the current level of forecasting skill for TC intensity in global ensemble forecasts.
- Present results at the 9th International Workshop on Tropical Cyclones in December

k. Unconventional data sources for impact modelling, evaluation & communication
Lead: Abi Beatson
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:

- Real-time reporting and social data intelligence: Abi Beatson (JCDR, New Zealand)
- 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, Abi Beatson (New Zealand)

l. Mesoscale Verification Inter-comparison over Complex Terrain (MesoVICT).
Leads: Manfred Dorninger and Marion Mittermaier, Evaluation Team
The project continues to encourage investigation of spatial verification methods in complex terrain, including for ensemble forecasts and uncertain observations. A paper entitled, "Mesoscale Verification Inter-Comparison over Complex Terrain" has been submitted to *BAMS* and a special collection of articles related to MesoVICT is planned for *Monthly Weather Review* and *Weather & Forecasting*.

m. User-oriented metrics challenge.
Lead: JWGFVR and evaluation task team
A competition for evaluation metrics relevant to end users run by the Joint Working Group on Forecast Verification Research (see http://www.wmo.int/pages/prog/arep/wwrp/new/Forecast_Verification.html) was a great success with 17 entries from 11 countries. A selection of submissions are published in *Meteorologische Zeitschrift*. The JWGFVR plans to run another challenge in 2020.

n. 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 is in preparation under the title, "Communicating High Impact Weather: Improving warnings and decision making processes". The articles are now available online in early release.

o. Training Materials
Lead: Shannon Panchuk
Current plans are to link into the work of the WMO Expert Team on Impact-Based Forecasting & Warning and to NOAA in the USA.

p. Review of the role of trust, salience and beliefs on people's responses to weather warnings.
Lead: Sally Potter
Reviewing the role of influences on response to weather warnings, such as risk perceptions, trust, salience and beliefs. We aim to Review previous literature, Understand the variables on achieving an optimal behavioural response, Produce guidelines on how to best communicate weather information. Recent work in the Bushfire CRC is being picked up.

q. Communicating uncertainty
Lead: Sally Potter
Review and publish the implications of uncertainty in weather forecasts and warnings across the whole spectrum of HIWeather. Literature review underway. Once completed, materials and research will be summarised and guidelines developed for weather forecasters to communicate uncertainty better.

r. Post-event case studies
Lead: Shannon Panchuk

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.

s. Communication platform
Lead: Emily Campbell.
Outputs from HIWeather communication activities will be freely available on the HIWeather Communication Platform, including best practice guidelines and reviews. An early version was reviewed and some enhancements are under development with a soft launch expected shortly.

t. NAWDEX (North Atlantic Waveguide and Downstream Impacts Experiment):
Lead: George Craig and Processes & Predictability task team.
The field phase completed in October 2016 and acquired excellent data including the extratropical transition of Tropical Cyclone Karl, see http://nawdex.ethz.ch/news.html.

u. **HIGHWAY** (**Lake Victoria Basin Nowcasting project**)
The "HIGH impact Weather lAke sYstem" project falls under the UK's Department for International Development (DFID) WISER (Weather and Climate Information SERvices for Africa) 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. Meetings have been held in February and May with stakeholders, including local fishing communities. See https://www.metoffice.gov.uk/about-us/what/international/projects/wiser/highway and https://www.wmo.int/amcomet/sites/default/files/field/doc/events/highway_meeting_report_final.pdf

v. GCRF African Science for Weather Information and Forecasting Techniques (GCRF African SWIFT)
Lead: Doug Parker and Alan Blyth (University of Leeds / National Centre for Atmospheric Science).
A 4-year project, funded by UK's Global Challenge Research Fund (GCRF), to improve African forecasting capabilities on hourly to seasonal timescales, funding 80 scientists in 5 UK and 10 African institutions, with WMO as an advisory member. Work is organised in 3 Strands:
- **User engagement/forecast evaluation**: links user engagement with forecast accuracy evidence.
- **Physical science research**: disciplinary research to deliver quality-controlled weather predictions.
- **Knowledge exchange, training and documentation**: provide a legacy to project outcomes.
WMO/WWRP supported the planning of the project, and a strong collaboration with the recently-funded *Highway* project in the Lake Victoria Basin has been planned. GCRF African SWIFT aims to engage with and contribute to *HIWeather's* programme of work. Andrea Taylor, who is jointly leading GCRF African SWIFT's work on user engagement, is a member of the HIWeather Communication task team. See https://www.ncas.ac.uk/en/swift-project or contact NCASSwift@leeds.ac.uk

w. 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 WGNMFR
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 (Servicio Meteorológico Nacional, SMN) and Brazil's space agency (INPE) that governs Brazil's weather and climate prediction service (CPTEC). Extended Observing Period is 15 Aug 2018–30 Apr 2019; Intensive Observing Period is 1 Nov–15 Dec 2018. CACTI is a US Department of Energy (DOE) funded project to study orographic clouds and their representation in multi-scale models for 15 Aug 2018–31 Mar 2019, involving the AMF-1 cloud-aerosol-radiation observatory, the Mobile Aerosol Observing System (MAOS) and the CSAPR-2 precipitation radar. It will also bring intensive airborne observations during RELAMPAGO through deployment of the G-1 aircraft. See: https://drive.google.com/file/d/0B6Z5EcBIjxY2S1llakstc3o1cUU/view?usp=sharing

x. 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. See http://www.ium.cn/en/animationInfo.aspx

y. ICE-POP2018 (RDP/FDP alongside the Pyeongchang Winter Olympic Games in South Korea)

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

z. SCMREX (Southern China Monsoon Rainfall EXperiment)

During the presummer 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.

aa. 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.

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 with a view to building links.

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. Impacts work is largely carried out in the Natural Hazard Partnership (http://www.naturalhazardspartnership.org.uk/). The NERC/Met Office funded FfIR (Flooding from Intense Rainfall) project addresses several aspects of HIWeather, including new radar observations, km-scale data assimilation & coupling with rural & urban inundation models (http://www.met.reading.ac.uk/flooding/). Research Councils UK is funding two networks in its "Decision Making Under Uncertainty" theme.

The UK Natural Environment Research Council (NERC) and Department for International Development (DfID) fund four research projects through the Science for Humanitarian Emergencies And Resilience (http://www.nerc.ac.uk/research/funded/programmes/shear/) programme, targeting lower to middle income countries in sub-Saharan Africa and south Asia, focusing on co-production of knowledge using a multi-disciplinary and problem-centred approach. ForPAc (towards Forecast-based Preparedness Action: Probabilistic forecast information for defensible preparedness decision-making and action) focuses on flooding and drought in East Africa (primarily Kenya) promoting the use of risk information for preparedness action (http://gtr.rcuk.ac.uk/projects?ref=NE%2FP000568%2F1). LANDSLIP (Landslide Multi-Hazard Risk Assessment, Preparedness and Early Warning in South Asia: Integrating Meteorology, Landscape and Society), focuses on early warning of landslides in India (http://www.landslip.org/). FATHUM (Forecasts for AnTicipatory HUManitarian action) focuses on flooding in Africa (https://www.insis.ox.ac.uk/forecasts-anticipatory-humanitarian-action-fathum) and "Citizen science for landslide risk reduction and disaster resilience building in mountain regions", focuses on landslides in Nepal (http://gtr.rcuk.ac.uk/projects?ref=NE%2FP000207%2F1). See also SWIFT and HIGHWAY, above.

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
An Australian HIWeather community was established at the annual Australian Meteorological and Oceanographic Society (AMOS) meeting in February in Canberra. 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 to join this community.

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

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. These include a project to provide best practice recommendations on the optimal length, order and content of short warning messages for agencies that warn the public about a variety of hazards, including severe weather and flooding. The next HIWeather New Zealand workshop is planned for the NZ Hydrological Society & NZ Meteorological Society Joint Conference in December 2018, in Christchurch.

Argentine Contributions

The Alert.AR project will finish by May 2018. Remaining work includes deliverable reports and a final 2-day workshop with the forecasters: about the capabilities of the WRF 4km Model; and with Civil Protection, to work with the new warnings. A new Health & Heatwave Early Warning System (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 will be hosted in September.

Chinese Contributions

Recently, 4 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).
East Asian observations will be collected and processed, for research on convective scale data assimilation, to generate full observation datasets as well as regional atmospheric reanalysis system. The first generation of reanalysis datasets will span a decade and be at 3-km spatial resolution.

2) "*Research on Thunderstorm Electrification-discharge Processes and Lightning Effects*" (Weitao LYU).
This project is to develop a real-time three-dimensional lightning channel mapping system with high resolution, observe thunderstorm electrification-discharge processes collaboratively in Southern China, reveal relationship between multiple characteristics of lightning activities and thunderstorm structure, develop lightning forecasting and warning seamless operational demonstration platform in combination with artificial intelligence techniques, analyze effects of grounded objects on lightning striking process, multi-dimensional electromagnetic radiation features and coupling mechanism of lightning process, and establish platform for lightning damage and protection experimental research.

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).
The operational NWP model lacks cloud physics modules that take aerosol effects into account. The ultimate goal of this project is to conduct field campaigns on the properties of aerosol, cloud and precipitation, based on integrated ground-based, air- and space-borne observations, to elucidate the underlying mechanism how the aerosol affects radiation, cloud and precipitation. As such, this project will develop a series of mixed-phase cloud parameterization schemes, which will be then applied to conduct the application demonstration of QPF in Beijing-Tianjing-Hebei region. At the end of the day, TS score for the 24-h precipitation forecast under polluted conditions is expected to increase by 8%."

4) "*Development of Seamless Weather-Climate Model Dynamic Core on Unstructured Grid*" (Jian LI).
Establish a dynamical core to meet the needs of numerical weather prediction and climate simulation in hyperscale parallel computing environment in the future. This framework will accommodate to seamless weather-climate

numerical simulation and prediction with its higher and more flexible resolution configuration, more accurate numerical solutions, as well as better conservativeness and extensibility.

A five-year Project, named as "*Key Dynamic and Thermodynamic Processes and Prediction for the Evolution of Typhoon Intensity and Structure*" was founded by the Ministry of Science and Technology this spring. The project was lead by Prof. Zhemin Tan from Nanjing University. The goals are delivering forecast products of track, intensity and structure of typhoon 3-7 days in advance, developing the international collaborative and applied platform for the Northwest Pacific Ocean typhoon monitoring and forecasting, and providing service for natural disaster risk management. See: http://meso.nju.edu.cn/web/typhoon/

Related Activities

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 was published in the April 2017 issue of BAMS.

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/

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/

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/

European Disaster Risk Management Knowledge Centre
This 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)
Latest news is available at http://www.s2sprediction.net/static/news

PPP (Polar Prediction Project)
Latest news is available at http://www.polarprediction.net/news.html.

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 nearly 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.

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. A discussion, held at the Royal Society on 13-15 November 2017, among a wide range of natural and social scientists, agreed that the participants would work together with the broader research community to develop and apply solutions for interdisciplinary data integration; pursue this through data integration for major global challenges that can also act as exemplars of the power of its interdisciplinary potential; support, in parallel, the development of capacities to realise the potential of modern data resources across all the disciplines of science; and recognise that in many disciplines, foundational work needs to be undertaken to develop the specific vocabularies that are needed to enhance data discovery, use, interoperability and integration. The group will now work 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 http://www.codata.org/

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 and follow YESS on Facebook: www.facebook.com/yesscommunity, Twitter: twitter.com/YESSCommunity or LinkedIn: www.linkedin.com/company/yess-community.

New Journal: The Journal of International Crisis and Risk Communication Research is 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 publishes articles in a print version and open access online, which means that all content is freely available without charge to the user or institution. 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, wild fires, infectious disease outbreaks or similar threats. The Journal is published biannually. All submission details and the journal's first issue can be found at: www.jicrcr.com

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Wave Life Cycle and Role of Diabatic Heating, Mon Wea Rev, 146, 695-712

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WMO, 2017, Final Report of the JOINT MEETING OF THE COMMISSION FOR BASIC SYSTEMS OPEN PROGRAMME AREA GROUP ON PUBLIC WEATHER SERVICES DELIVERY (OPAG-PWSD) EXPERT TEAMS ON IMPACT OF MULTIHAZARD PREDICTION AND COMMUNICATION (ET/IMPACT) AND ON SERVICES AND PRODUCTS INNOVATION AND IMPROVEMENT (ET/SPII)