

Final report of the HIWeather kick-off workshop

The HIWeather kick-off workshop, held on 25-27 April 2016 at the Met Office headquarters in Exeter, UK, attracted 84 scientists from 21 countries around the world. It was opened by Dr. Andy Brown, Director of Science, on behalf of the UK Met Office and by Prof. Sarah Jones, Chair of the Scientific Steering Committee and Dr. Paolo Ruti, Head of the World Weather Research Programme, on behalf of WMO. The aim of the workshop was to review the status of the HIWeather project and to plan and progress the activities of the next few years in the context of available funding resources.

Prof. Virginia Murray of Public Health England (PHE) and the United Nations office for Disaster Reduction (UNISDR) launched the meeting with an inspirational presentation on the Sendai framework for disaster reduction. She pointed out the critical role that HIWeather will play in delivering the science capability for the early warning systems that will reduce the disaster toll of lives, livelihoods, health and wealth, emphasising the often long-term effects on health and well-being. She illustrated her talk with examples of research and warnings developed by PHE with the Met Office. She concluded by asking HIWeather to deliver on: Forecasting the things that matter, Defining warning language that people will respond to appropriately, Supporting the warning with relevant information for action, Using appropriate metrics to guide investment and Working in partnership to implement Sendai.

Prof. Brian Golding of the Met Office, one of the project co-chairs, introduced HIWeather, focussing on the science gaps that it will address, including scale interactions & error growth; hazard-specific processes; observations & data assimilation for coupled km-scale forecasting systems; representation of cloud and near surface processes; modelling of human impact, vulnerability & exposure; multi-media and multi-format risk products; use of language; and choice of evaluation metrics. He described how the research would be brought together in Forecast Demonstration Projects and how it would benefit policy making for future climates as well as emergency management of current hazards.

Dr. Paolo Ruti then led a round table discussion of representatives of European UK and UN funding bodies. In addition to existing research funding, new opportunities include the Global Challenge Fund and the Green Climate Fund. These funds are large and primarily focussed on delivering sustainable development, which might include capacity building in weather and climate information services. Research might form a part of a larger development project if it could be shown to be relevant to developing local weather forecasting capacity.

Parallel meetings were held on Wednesday afternoon. At Exeter University, the career of Prof. Alan Thorpe was celebrated with a forward look at new challenges in numerical weather prediction, sponsored by the Royal Meteorological Society Dynamical Meteorology Specialist Group. At the Met Office, David Johnston, Brian Mills and Beth Ebert introduced a programme of presentations and discussion on social and economic hazard impacts, communication of warnings, and hazard verification.

Thursday and Friday were taken up with group working sessions, interspersed with brief plenary feedback, to select, develop and prioritise activities from the HIWeather implementation plan that would fit with the funding framework outlined on Wednesday. Each group developed several proposals for joint papers, studies and workshops that are listed in the Meeting Outputs below. The meeting closed with summary comments from the task team leaders and co-chairs, and from Dr. Paolo Ruti on behalf of WMO.

Outputs of the meeting

The individual task teams came up with a wide variety of specific proposals for activities within or across the research themes, which were shared but not fully discussed at the final plenary. Initial working up of the proposal concepts will be by the nominated leads. Their execution within HIWeather will then depend on the commitment of participants in the relevant task teams. As a major cross-cutting activity, the first proposal will need to be considered by all task teams before its acceptance.

- a. HIWeather Multi-Hazard Early Warning System Demonstration Project (FDP):
Demonstrate / evaluate state-of-the-art end-to-end multi-hazard warning system based on km-scale coupled ensemble impact predictions & advanced communication methods in one or more developing countries in collaboration with existing SWFDP(s).
Leads: Peter Steinle, co-chairs, task team leads.
Objectives: Demonstrate benefits of advanced weather & coupled modelling; measure value chain & identify causes of biggest losses; build capacity through participation & training; transfer capability to academic, private & government institutes in the region; establish on-going capability that can be maintained locally.
Actions: Develop concept paper (2016)
 Identify participants and funding for trial FDP - possibly Lake Victoria (2017)
 Execute and evaluate trial FDP (2018-9)
 Execute and evaluate full FDP (2022-3)
- b. Review the state of wind hazard forecasting
Lead: George Craig
Objectives: Clarify the wind metrics that relate to impacts; describe the state-of-the-art in observing and predicting these metrics; identify processes that lead to high impacts; make recommendations for targeted work to address weaknesses in understanding, observing and prediction.
Actions: Identify participants (2016)
 Carry out review (2016-7)
 Document and publish (2017-8)
- c. Review current state of nowcasting & forecasting high impact weather
Leads: Sharan Majumdar and Jenny Sun
Objectives: Document current state of high impact weather nowcasting/forecasting with an emphasis on flood and high wind warnings; Identify gaps
Actions: Workshop leading to review article (2017)
- d. Intercomparison of km-scale DA & nowcast/forecast systems
Leads: Sharan Majumdar and Jenny Sun
Objectives: Demonstrate state-of-the-art of km-scale DA & nowcast/NWP systems for HIW warning with an emphasis on floods & high winds; Document status of NWP capability for nowcasting severe weather
Actions: Develop concept paper (2017);
 Identify interested participants, datasets & funds (2017)
- e. Using multi-scale prediction and uncertainty in decision making
Lead: tbd
Objective: User-oriented post-processing tools for decision making with an emphasis on impacts, uncertainty & risk
Actions: Workshop leading to a review article (2019)
- f. Intercomparison of impact models for a particular hazard against a common impact dataset; optimal combination of impact data

Leads : Martin Goeber, Joanne Robbins, Isabelle Ruin
Action: Develop concept paper (2016)

- g. Inventory, classification and Critical Review of impact models and their use by NHMS agencies
Leads: Brian Mills & HIVR task team
Action: Develop paper (end 2017)
- h. Research Demonstration Project (RDP) focused on the Value Chain
Leads: Jeff Lazo, Barb Brown, Brian Mills, Manfred Dorninger, Anna Scolobig, Mark Bevan
Actions: Concept paper (2016)
Scoping workshop (2017)
- i. Factors that affect warning-related decision-making including legal & institutional frameworks.
Leads: Anna Scolobig, Julia Chasco
Action: Concept paper (2016)
Framework intercomparison: PhD student (2019)
- j. Communication along the value chain in different cultures/contexts
Lead: Isabelle Ruin, Julia Chasco, Tom Kox
Action: Concept paper (2016)
- k. Probabilistic forecasting and evaluation of Tropical Cyclones
Leads: Helen Titley, Sharan Majumdar, Munehiko Yamaguchi, David Richardson, Barbara Brown, Linda Anderson-Berry
Objectives: Increase use of *probabilistic* ensemble forecast information in operational tropical cyclone forecasting; link to multi-scale modelling through, e.g., storm wind structure, precipitation (incl. orographic effects), storm surge and impact forecasting.
Actions: Review best practice in producing, evaluating & using probabilistic TC forecasts
Targeted HIWeather session at WMO/WWRP International Workshop on Tropical Cyclones. (2018)
- l. Unconventional data sources for impact modelling, evaluation & communication
Leads: David Johnston, Abi Beatson
Action: Literature review and synthesis: Abi Beatson, PhD student. (2019)

HIWeather will also be contributed to by national and regional research activities and by international RDPs and FDPs that build, demonstrate and evaluate the capabilities identified in the Implementation Plan.