

A post-THORPEX project

Prepared by a subgroup of ICSC

Introduction

WWRP THORPEX is a ten-year research programme with a focus on accelerating improvements in the forecasting of high-impact weather 1 to 14 days ahead. The THORPEX programme is due to finish at the end of 2014 and so now is the time to consider what might follow THORPEX. Before the THORPEX International Core Steering Committee (ICSC) meeting in October 2012, a consultation exercise was carried out to gather views on possible THORPEX follow-on programmes. Strong support was given to the proposal of establishing “a new 10 year programme ... jointly, where appropriate, with the WCRP with a focus on improving the predictability of high impact weather from hours to a season (seamless prediction) and within the framework of a changing climate”.

At the recent WMO EC meeting (EC-64, June/July 2012), approval was given for the launch of two new WWRP projects that developed out of THORPEX: the sub-seasonal to seasonal (S2S) and polar prediction (PPP) projects. These two projects, with their own trust funds, are seen as part of the THORPEX follow on programme. The S2S project, in particular, is a key to defining the link to WCRP. For the post-THORPEX era an important question must be “what is missing, will make a difference and is worth investing in and should be promoted within the WWRP?” A common theme of many of the responses to the ICSC consultation was that there was a need for continued research focused on high-impact weather and to consider shorter time and space scales. Although high-impact weather plays an important role in S2S and PPP, those projects will not cover many of the issues related to improving predictions of high-impact weather on the hours-to-weeks timescales.

It is proposed the current THORPEX working groups will form the basis of two expert teams under WWRP, the DAOS team and the Predictability and Ensembles team (combining elements from the current PDP and GIFS-TIGGE groups). Together with other WWRP expert teams, they would provide scientific expertise to several limited-term projects. Such projects would include, Forecasting Demonstration and Research and Development projects (FDPs and RDPs), and THORPEX follow-on projects, including the S2S and PPP projects.

The aim of this document is to consider a possible new high-impact weather project based on some elements of the THORPEX programme that, without a new international collaborative project, either would not get done, or would get done too slowly.

Priorities for a new project

As a way to consider the priorities for a new project, we consider: a) threats and opportunities; b) elements of THORPEX that need to be continued; c) new requirements/ drivers.

Some threats and opportunities:

- Continued erosion of observing network
- New observations (satellite and in-situ)
- Impact of a changing climate on NWP prediction
- Increasing supercomputer capacity and the related requirements of scalability
- Convective scale resolution for global models and regional ensemble prediction systems
- New opportunities for linking research to user needs through the SWFDP

Elements of THORPEX that need to be continued and developed further:

- Further research on adaptive observing systems (e.g. satellite data)
- Better exploitation of ensembles for forecasting
- Continued exploitation of recently obtained datasets (e.g. T-PARC, TIGGE, YOTC, HyMeX)
- Research into the limits of predictability as a function of impacts and required lead time
- Accurate short-range (<~2-day) forecasts for decision-making
- Maintain and strengthen involvement of the academic community

New requirements and drivers beyond the scope of THORPEX:

- Focus on shorter time (<1 day) and spatial (convective) scales
- More skilful convective-scale forecasts which need to be better exploited
- Data assimilation at the convective scale
- Improved forecasting of weather extremes
- Coupling with downstream models, e.g., hydrology, storm surge, energy
- Predicting not only the weather but its impact as well (e.g., increased vulnerability; flood forecasting)

Project Scope

A possible project on High Impact Weather should include the following elements:

- 1) Basic research on the limits of predictability of high impact weather
- 2) Field campaigns, with a focus on understanding predictability
- 3) A focus on the observing system, ensuring a sustainable network that is fit for purpose.
- 4) Scientific exchange – particularly between operational centres and universities.
- 5) Forecasting the impacts of weather to address the requirements of users

The project should focus on improving predictive skill in the time range hours to weeks, focusing on the prediction of high-impact weather in the context of a changing climate. It is recognised that mesoscale predictability is different from synoptic scale predictability but the project should consider both, as global models will all be at mesoscale resolution (~10km grid-length) in 5 years time

Ensembles are a valuable tool for forecasting risks of high-impact weather events, and need to be better exploited. That includes the development of probabilistic forecast

products. The TIGGE database of global ensemble predictions, and the higher resolution limited-area TIGGE-LAM data are both invaluable resources to underpin this effort. The project should promote the wider use of the TIGGE and TIGGE-LAM databases by the research community.

The project should include experiments on observing system optimization, including the use of adaptive observations and the exploitation of new observations. The observing network needs to be fit for purpose on multiple scales, from local nowcasting (0 to 6h) through to global predictive capability. There still remains a question as to the value of targeting of observations for mid-latitude systems.

In addition to weather prediction, the project should include assessment of the impacts of weather on hydrology, flooding, storm surges, travel hazards, energy generation, etc. National Met Services need more accurate and finer scale forecasts, especially up to 2 days ahead, to predict the potential impacts of weather and to allow time for civil contingency planning and emergency response.

Time line

In order to allow a structured plan for the proposed project there are a number of opportunities to present a draft proposal to the community for consideration to assist in defining a project, and then to confirm whether to proceed with it.

- 1) A “Town Hall” meeting is planned for the AMS Annual Meeting in Austin, Texas in January 2013 under the sponsorship of the US THORPEX Executive Committee (USTEC), organized by the US THORPEX Science Steering Committee (USTSSC), which will debate the future of THORPEX and give feedback as a report.
- 2) There will be a workshop in Karlsruhe or Offenbach in February or March 2013, with 30-40 invitees, to discuss a project plan. At this meeting the decision will be made whether to continue to a full proposal, to complement the S2S and PPP projects. Invitees will include potential project leads, and a prospective WMO project consultant.
- 3) If the decision is to proceed, a project consultant will be employed to help develop a draft science & implementation plan. The plan will need to be drafted before the ICSC-11 meeting in July 2013.
- 4) The plan will be considered at the joint ICSC and WWRP JSC meeting in July.
- 5) Approval of the project will then be considered at the CAS meeting in November 2013.