



(and links to test beds)

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NOAA Testbed USWRP Workshop

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THORPEX Background

(http://www.wmo.int/pages/prog/arep/wwrp/new/thorpex_new..html)

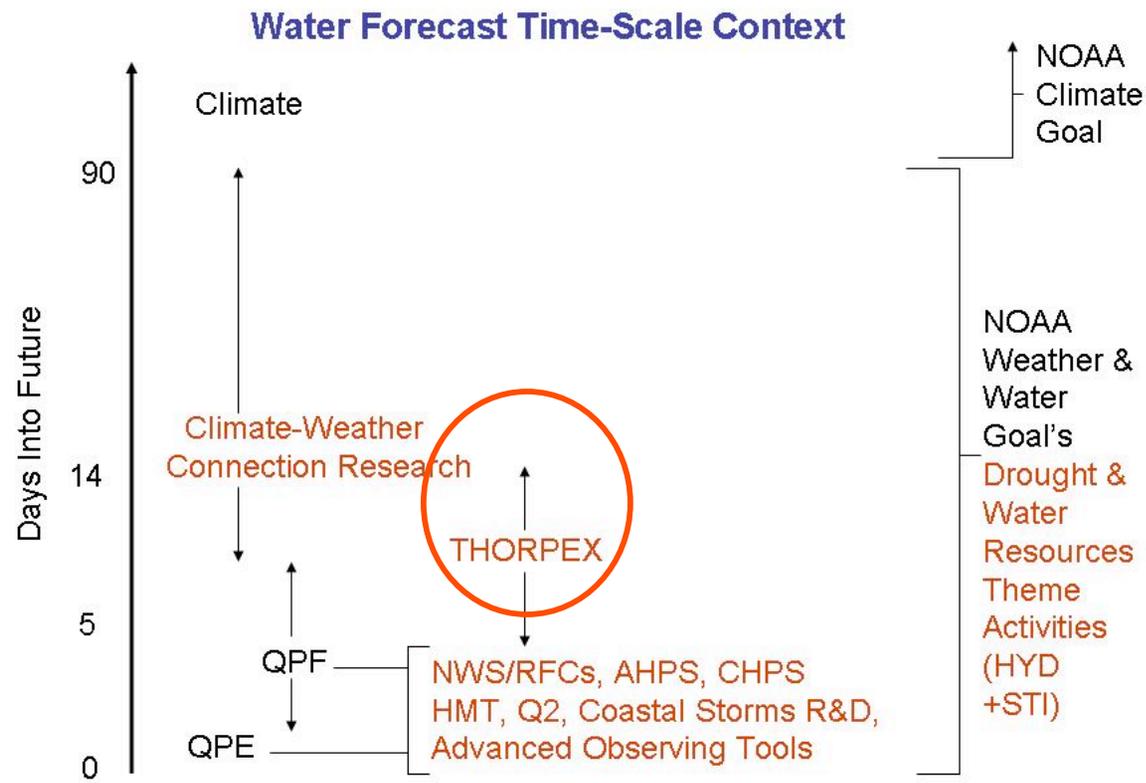
- **10-year International WMO program to accelerate improvements in global-scale forecasts of high impact weather out to 14 days**
- **Established 2004**
- **Research work based on ensemble modeling techniques and adaptive and targeted observations**
- **Modeling and forecast centers in all nations participating**

THORPEX Research Priorities

- Predictability and dynamical processes
- Data assimilation and observing strategies
- Societal and economic applications

Focus in NOAA has been on the first two, but through test beds, the third priority could be addressed.

THORPEX in the context of Weather & Water Theme Plan for Drought and Water Resources



All boundaries are approximate and overlapping

THORPEX International Projects with NOAA Involvement

- **THORPEX Interactive Grand Global Ensemble (TIGGE) – Ensemble data from 10 centers available in non-real time (From NCAR: <http://tigge.ucar.edu> . From ECMWF: <http://tigge-portal.ecmwf.int>)**
- **TIGGE is leading to a Global Interactive Forecasting System (GIFS) for real-time access to ensembles of ensembles**
- **THORPEX Pacific-Asian Regional Campaign (T-PARC) (2008-9) – Observational study of western Pacific TCs, ETs, and winter storms impacting the west coast of North America (heavy NSF and ONR investment)**
- **Year of Tropical Convection (YOTC) (2008-9) – A modeling study using existing data, including field campaign data to advance our understanding of the initiation of the MJO and the teleconnections with mid-latitude Rossby wave energetics**
- **Numerous regional field campaigns and modeling efforts among the European Community**

NOAA Initiated THORPEX Projects

(<http://www.emc.ncep.noaa.gov/gmb/ens/THORPEX.html>)

- **Winter T-PARC (2009) – Adaptive and targeting observation experiment in the north Pacific to improve ensemble forecasts of high impact winter storms on the North American West Coast**
 - Analysis links to HMT and DTC
- **North American Ensemble Forecasting System (NAEFS) – operational in 2007 with Canadian Meteorological Center and with Mexico as a user; first installment of GIFS**

(<http://www.emc.ncep.noaa.gov/gmb/ens/NAEFS.html>)

Internal NOAA THORPEX Activities

(<http://www.emc.ncep.noaa.gov/gmb/ens/THORPEX.html>)

- **Development and transition work (NCEP/EMC and ESRL cooperative effort) on:**
 - Adaptive observations
 - Ensemble DA/initial perturbations
 - Model related uncertainty
 - Statistical bias correction, downscaling (applications)
 - Weather-climate forecast interface for seamless products
- **THORPEX can:**
 - Underpin the National Unified Operational Prediction Capability (NUOPC)
 - Provide a connection to climate (subseasonal) – MJO and tropical forcing of mid-latitude weather and reforecasting for ensemble bias correction
 - Provide ensembles downscaled for short-term regional and local probabilistic forecasts and link to test beds

THORPEX & Relationship with NOAA Test Beds

- NOAA THORPEX: locus of expertise in ensemble prediction for NOAA
 - Mission: develop & transition to operations ensemble / probabilistic methods across all weather, water, and intra-seasonal forecast applications
 - Objective: accelerate increase in skill and utility of probabilistic high-impact weather forecasts
 - Focus areas
 - Observing systems
 - Data assimilation
 - Ensemble forecasting
 - Applications

THORPEX & Relationship with NOAA Test Beds (Candidates)

- Objective: accelerate infusion of research and development into NWS operations
- Areas of operations
 - JCSDA Data assimilation, esp. satellite data
 - JHT Tropical Cyclone forecasting
 - CTB Seasonal and Intra-Seasonal forecasting
 - HMT Hydro-meteorological forecasting
 - HWT Hazardous weather forecasting
 - AWT Aviation forecasting
 - HTB Hydrology Test Bed
 - DTC Infrastructure support for extramural research
 - OSSE (?) Observation impact, optimization of future observation systems

THORPEX – Proposed Test Bed Initiative (Objectives)

- **Start / invigorate two-way interactions by identifying**
 - User requirements (Test Beds)
 - R & D opportunities (THORPEX)
- **Enhance test-bed activities by leveraging THORPEX ensemble / probabilistic expertise**
- **Improve the transfer of THORPEX R&D into NOAA application areas**
- **Save resources by coordinated joint development efforts**

THORPEX – Proposed Test Bed Initiative (Proposed Approach)

- **Designate a THORPEX liaison for each Testbed**
 - Articulate THORPEX objectives/activities to Testbeds
 - Feed back user requirements into THORPEX R/D
- **Invite Testbed leads (or their designate) to annual NOAA THORPEX Workshop**
- **Jointly define probabilistic performance metrics**
- **Joint announcements between Testbeds & THORPEX**
 - Allow PIs to submit proposals to Testbeds & THORPEX
 - Joint evaluation by Testbed & THORPEX
 - Joint funding
 - Example – Probabilistic Tropical Cyclone forecasting
 - Proposal submitted under JHT / THORPEX

Example Linkage - HMT & THORPEX

(Tentatively beginning in FY2010)

- **Tentative new linking topics:**
 - Relative merits of dynamical downscaling (hi-res ensembles) vs. statistical (lower-res. ensembles calibrated with reforecasts)
 - Improved convective and microphysical parameterizations and their adaptation for addressing model-related uncertainties.
- **Thoughts on use of HMT resources:**
 - Increase internal research awards and possibly set up an external granting activity
 - Concentrate some resources on this question of dynamical vs. statistical downscaling.
 - Some sizeable percentage to external or cooperative institute grants, including societal impacts, applications; ... but need to find mechanism to facilitate R2O better than we have in past external grants.

Take Home Message

- THORPEX is THE global ensemble model development and probabilistic prediction activity in NOAA and underpins all other efforts at other model time a spatial scales.
- Will be valuable to link THORPEX with these other efforts, many of the efforts being components of test beds.