



World Meteorological Organization

Weather • Climate • Water

# World Weather Open Science Conference (WWOSC)

16 - 21 August 2014  
Montreal, Canada



# The World Weather Open Science Conference



**THE WORLD WEATHER  
OPEN SCIENCE CONFERENCE**

The weather: what's the outlook?  
16 to 21 August 2014  
**WELCOME**

**WWOSC 2014**  
MONTRÉAL, CANADA

**CONFÉRENCE SCIENTIFIQUE  
PUBLIQUE MONDIALE SUR  
LA MÉTÉOROLOGIE**

La météo : quel avenir?  
16 au 21 août 2014  
**BIENVENUE**

Co-organized by / Co-organisée par :

 **WMO OMM**  **ICSU**  
International Council for Science

 Environment Canada  Environnement Canada

 National Research Council Canada  Conseil national de recherches Canada



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# Who attended WWOSC?



- Over 1000 participants: experts from over 50 countries in meteorology, application developments, social science as well as users.
- An A-list of heads and scientists from National Meteorological and Hydrological Services and academia:
- Secretariat and members of World Weather Research Program Committees + representatives from other WMO programs
- Early Career Scientists with support from WMO and National Science Foundation (US)
  - » Imbedded special program which included being rapporteurs or co-chairs for a number of sessions, Lounge in exhibit hall for mentorship discussions with senior scientists, Young scientist award, ...





# What happened at WWOSC?



WWOSC 2014  
MONTRÉAL, CANADA

- Unfolded over 5 intense days from 8:30 to 6pm (7pm) with
  - Two plenary presentations each day on science and user perspectives for the future
  - 12 concurrent sessions and panels ( over 700 presentations, 10 panels)
  - Posters (over 300 posters presented in alternation)
  - Exhibit hall
  - Many gathering friendly spaces



- Opening ceremony on evening of August 16 with federal and WMO representatives and a special keynote scientific address
- “5 à 7” on the Terrasse of the Palais des Congrès in lieu of banquet





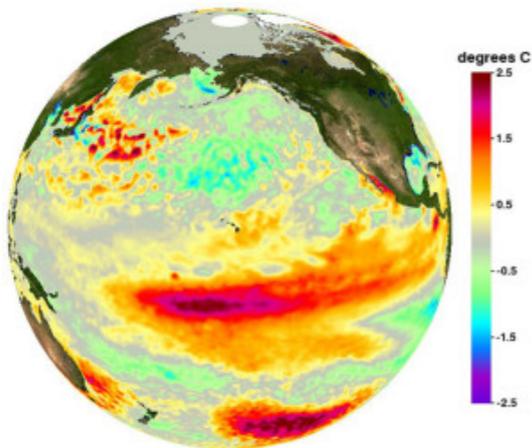
# What was achieved?

- Shape the thinking of an entire scientific community: the status of scientific advances and concerted identification of challenges

- **User's perspectives**
- **Seamless prediction**
- **Urban weather and environmental prediction**



## Sub-seasonal to Seasonal



## High Impact Weather



## A ten years vision

## Polar Prediction





# User's perspectives

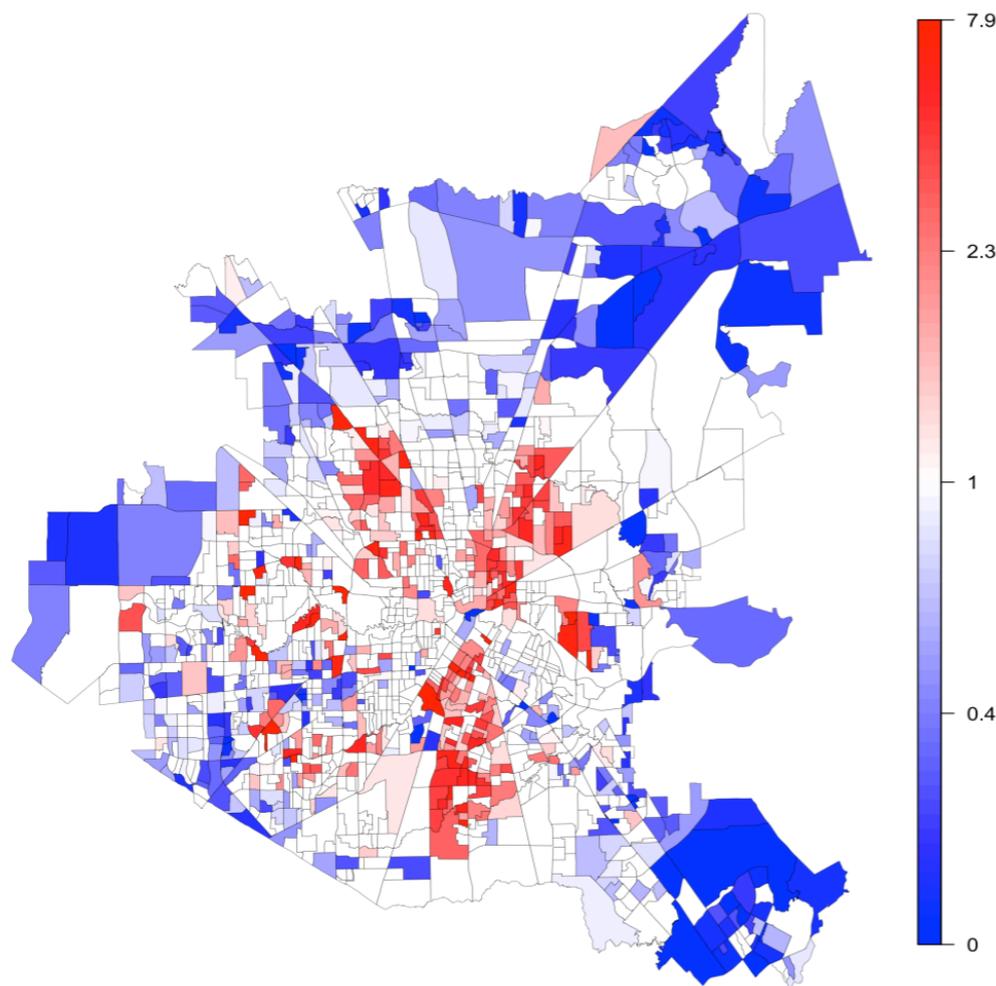
- “....we're talking about the intersection of nature & society, & at that intersection it's not just physical science but the science of how to get people to listen, respond & act”
- No it's NOT getting people to do anything – **Provide people with what they say they need**





# Renovate your information

- From minutes to weeks
- From district to neighborhood
- From weather information to environmental and impact ones



Projected increase in heat stress nights is a concern for public health, as daily minimum temperatures show significant associations with heat-related mortality

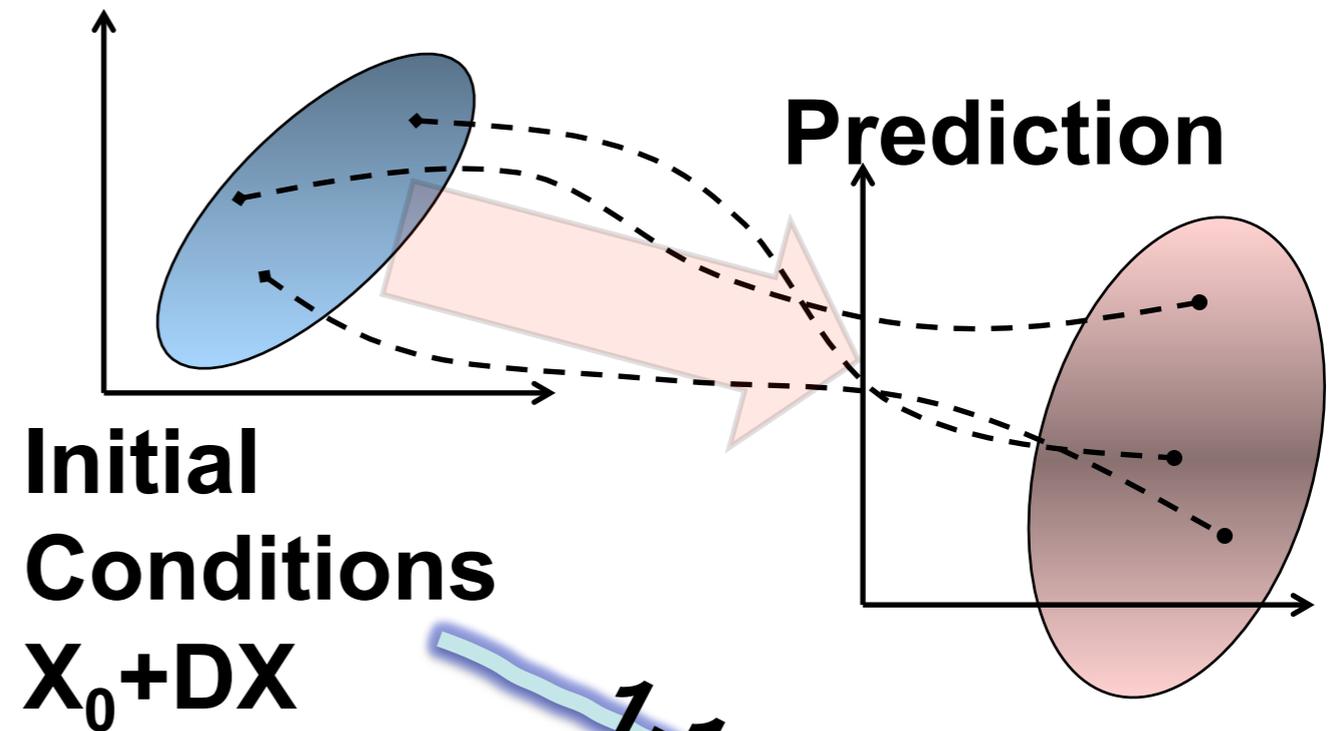
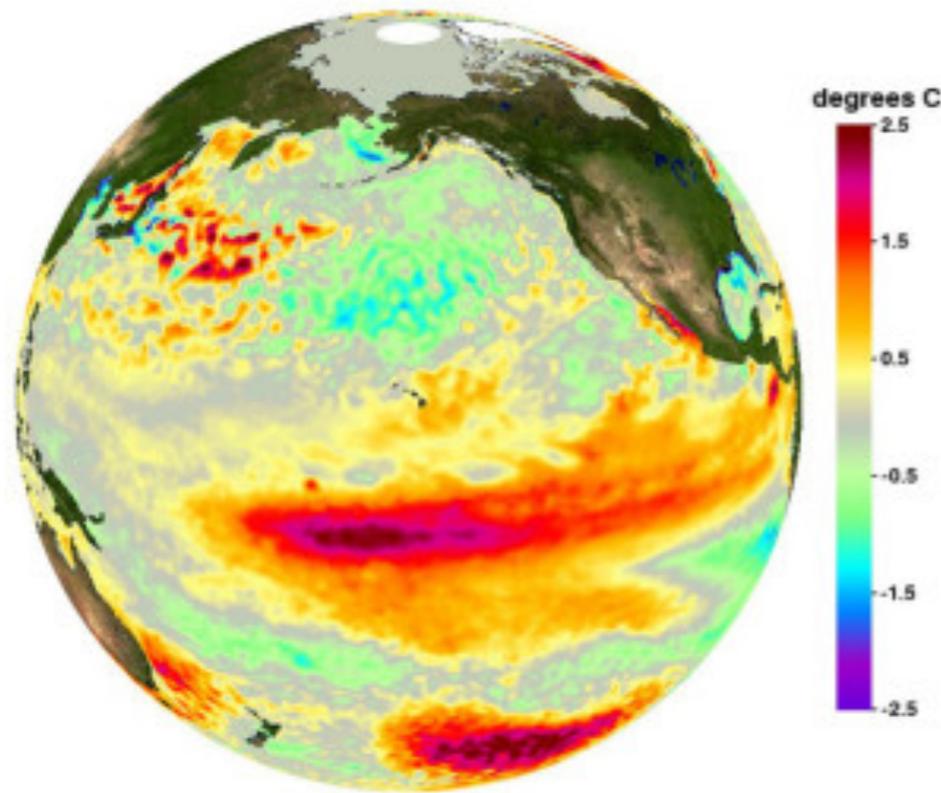
Heaton et al. (*Spatial & Spatio-Temporal Epidemiology*)





# Seamless prediction: from weather to climate

- Global coupled modelling on all timescales



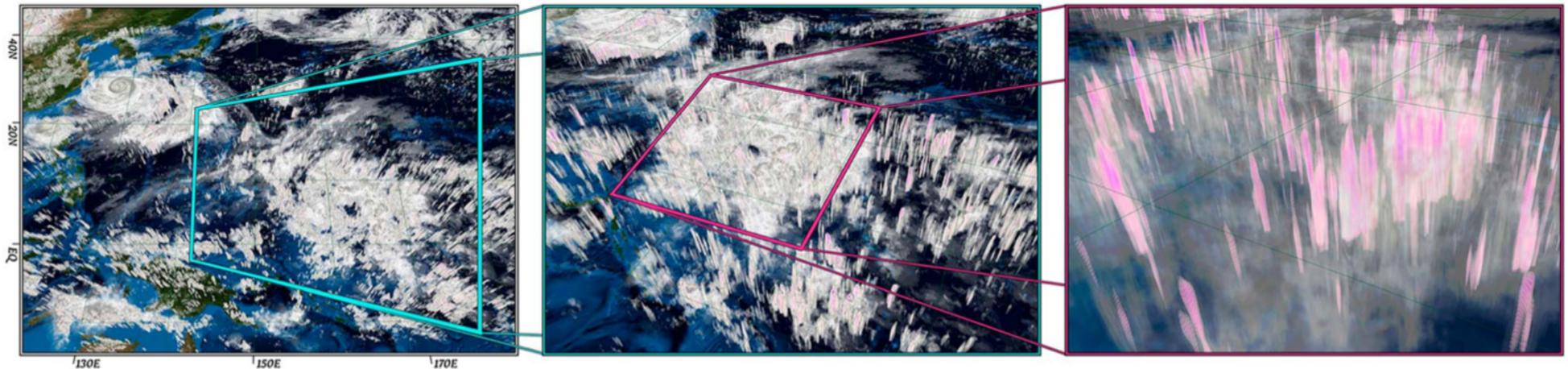
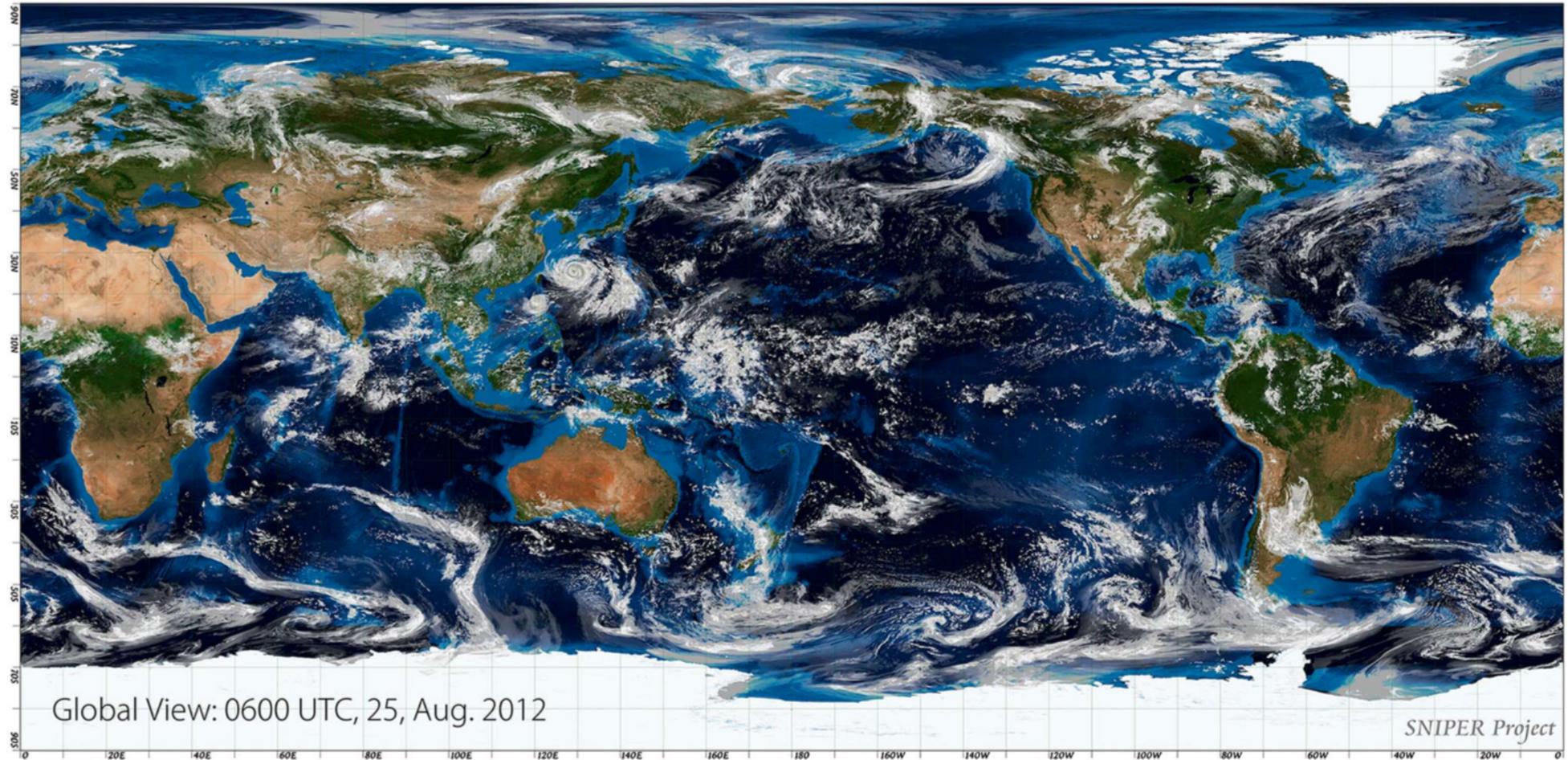
1-14 days  
1-12 months  
Years-decades





# Seamless prediction: a glimpse of the future

12 hr  
global  
simulation  
·  
Horizontal  
resolution  
870 m.

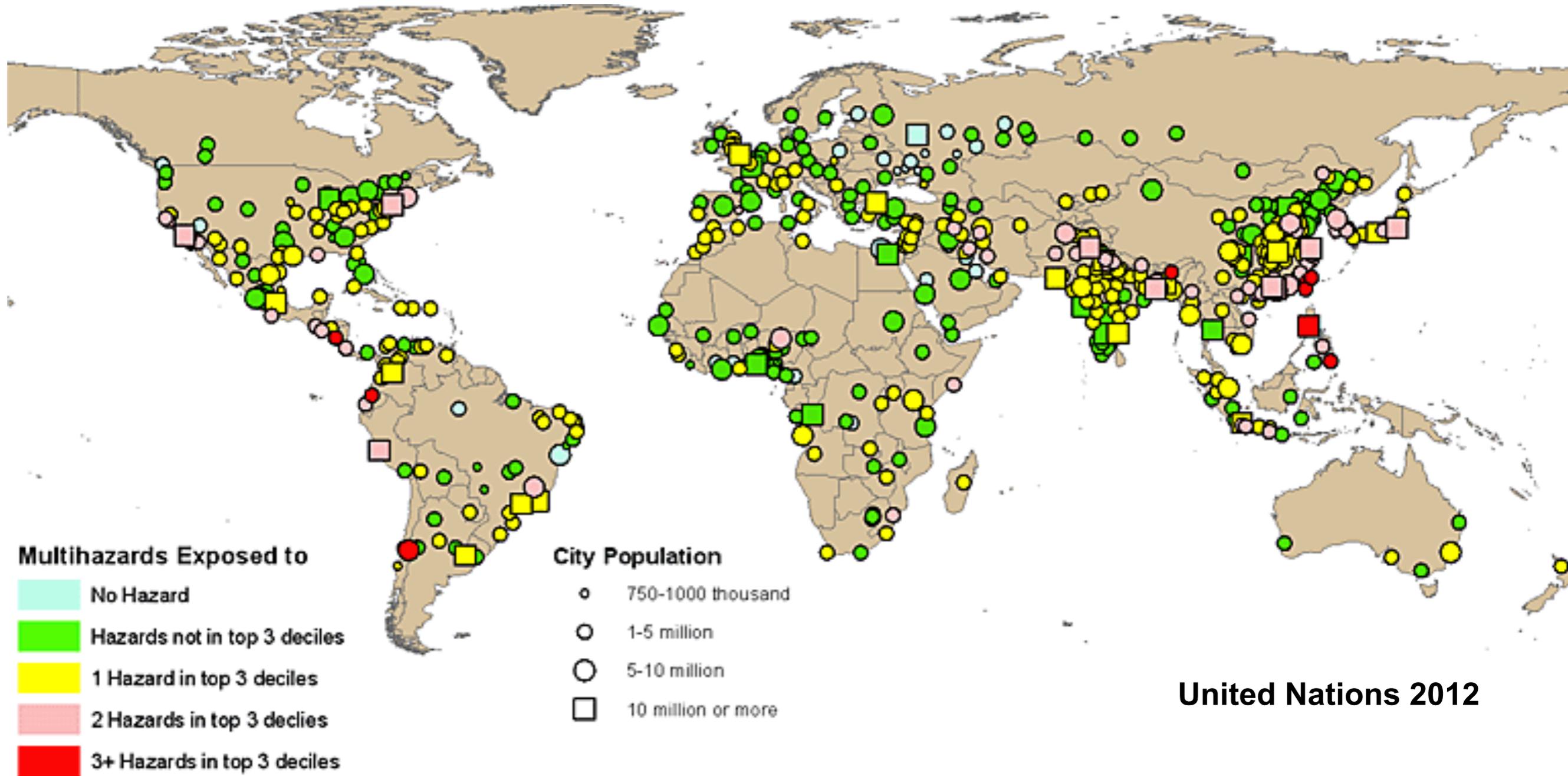


Miyamoto et al, 2013





# Urban agglomerations at risk of multiple natural hazards (2025)





# Urban challenges

- 50% global population (70% by 2050)
- 70% global carbon emissions
- 90% of GDP
- huge built infrastructure
- microclimates
- extensive water & food footprints
- massive mitigation co-benefits
- funding





# What happens now?

WWOSC 2014  
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- Availability of all presentations and videos on WMO website ([www.wmo.int/wwrp](http://www.wmo.int/wwrp))
- Implementation of decisions
  - GURME (GAW urban research meteorology and environment program) now operating across GAW and WWRP
- Peer-review publication of white papers
  - Transcription of vision for each area addressed by the conference
  - 15 out of a possible 28 already drafted
  - Publication by anniversary of WWOSC (summer 2015)
- WMO Congress
  - Summary of WWOSC and white papers to input in WMO strategic planning at Congress May 25 to June 12, 2015





# WWOSC Book

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NUMBER	TITLE	LEAD AUTHOR
1	Introduction	Gilbert Brunet
2	A SERA perspective	Brian Mills
<b>Observations and Data Assimilation</b>		
3	Observations for global to convective scale models	Rogers Saunders
4	Data assimilation methodology, diagnostic tools and reanalyses	Mark Buehner
5	THORPEX field campaigns	Patrick Harr
<b>Predictability and Processes</b>		
6	Dynamics and predictability of middle latitude weather systems and their higher and lower latitude interactions	Sue Gray
7	Numerical methods of the atmosphere and ocean	Jean Cote
8	Clouds and radiation	Graeme Stephens
9	Land-Atmosphere interactions and water cycle	Paul Dirmeyer
10	Cryosphere-ocean-atmosphere, coupling and interaction	Stephen Belcher
11	Challenges for sub-gridscale parametrizations in atmospheric models	Andy Brown
12	Stochastic forcing, Ensemble prediction systems and TIGGE	Richard Swinbank
13	Integrated Meteorology Chemistry Models: Challenges, gaps, needs and future directions	Veronique Bouchet
14	Continental convective systems	David Parsons
15	Tropical cyclones and tropical convection	Johnny Chan
16	Organized convection and the Year of Tropical Convection (YOTC)	Mitch Moncrieff
<b>Numerical Prediction of the Earth System</b>		
17	Environmental Prediction Systems: Global, tropical and medium-range aspects	Florence Rabyer
18	Regional Environmental Prediction Systems	Stephan Belair
19	Urban scale environmental prediction systems	Greg Carmichael
20	Polar Prediction Project (PPP)	Thomas Jung
21	Subseasonal to Seasonal (S2S) Prediction Project	Frederic Vitart
22	Numerical prediction of the earth system: Cross-cutting research on verification techniques	Beth Ebert
<b>Weather-related Hazards and Impacts</b>		
23	Development of applications in the forecasting process	Paul Joei
24	Improved understanding of and techniques for decision making	Ken Myline
25	Conclusions	Gilbert Brunet





# Thanks



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- Alan Thorpe
- Michel Beland
- Deon Terreblanche
- Gilbert Brunet
- Jean Langlais
- Tetsuo Nakasawa
- Sylvie Castonguay
- Laurier Forget
- Julia Keller
- Brian Mills (taking the picture)
- Sarah Jones
- Sylvie Couture
- Jim Abraham
- Sophie Cousineau
- Veronique Bouchet





# Structure of the WWOSC



- **140 Science Program Sessions with 58 Conveners**
  - Observations and Data Assimilation
  - Predictability and Dynamical/Physical/Chemical Processes
  - Interactions between Sub-Systems
  - Numerical Prediction of the Earth system: putting it all together
  - Weather-related Hazards and Impacts
  - Polar Prediction Project
  - Subseasonal to Seasonal Prediction Project
- **26 User Applications Science Program Sessions**
  - Cross-cutting and Other Topics
  - Disaster Risk Reduction and Management
  - Government Organization and Functions
  - The Goods and Services Economy
  - Joint Panel and UAS session on the Future of the Weather Enterprise
  - Special UAS session

Number of  
participants

....

Exhibitors ....





# Weather Science Highlight

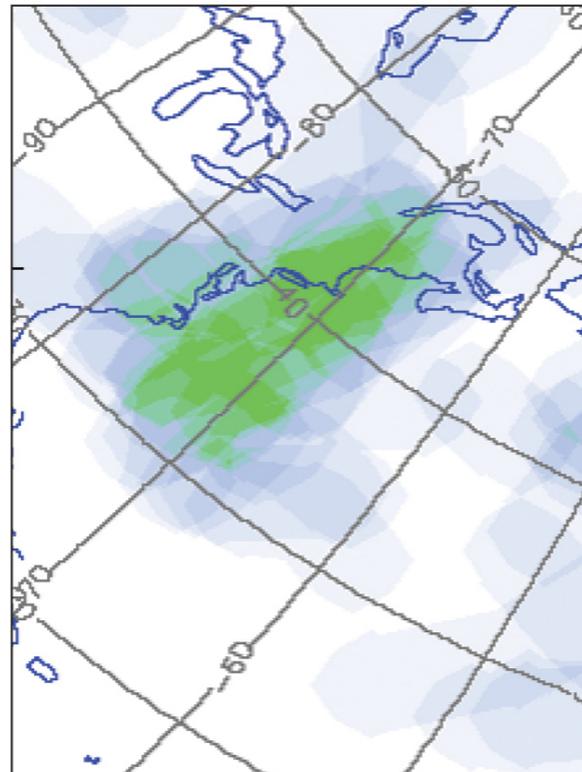


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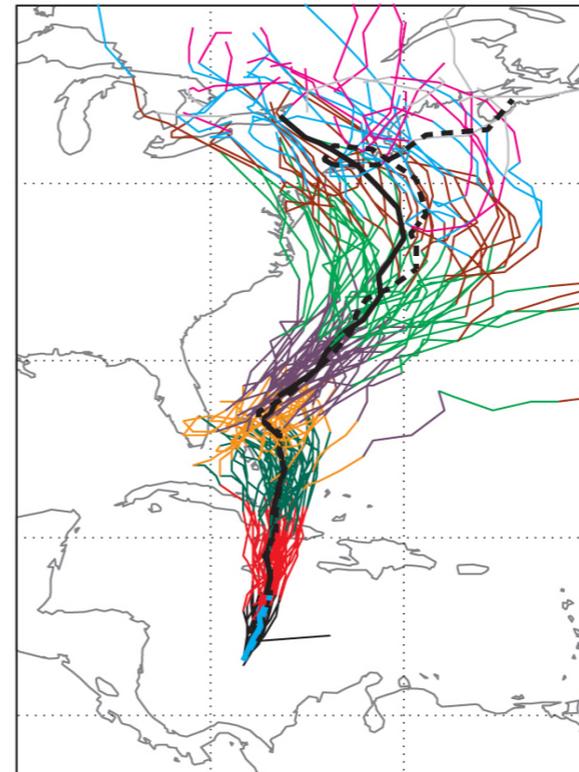
## Superstorm Sandy

Extension of  
medium range  
forecast for  
weather  
extreme events

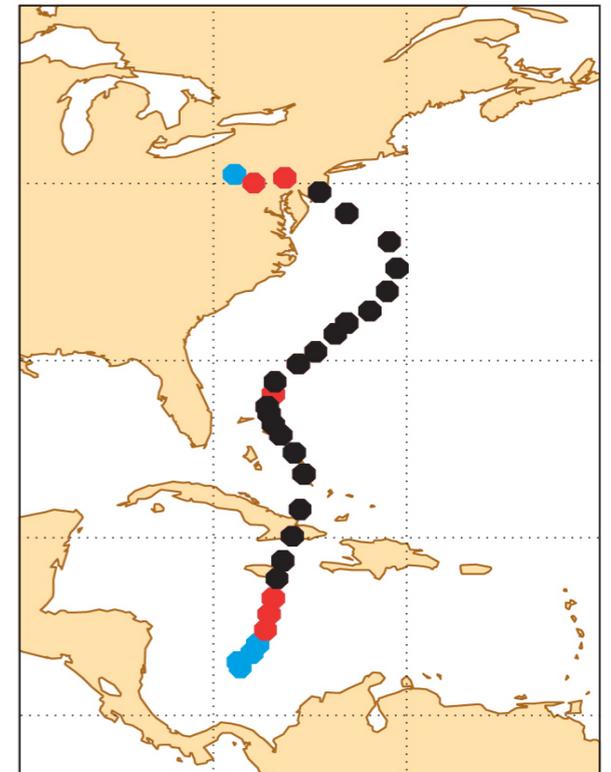
Probability of a wind storm  
9.5 days before landfall



Track forecasts  
6.5 days before landfall



Observed track of Sandy



Two days before Sandy formed (9.5 days before landfall in New Jersey) there was already a significant probability (25%) of a severe wind storm affecting the North-Eastern USA.

By the courtesy of A Thorpe ECMWF





# User-Application Highlight



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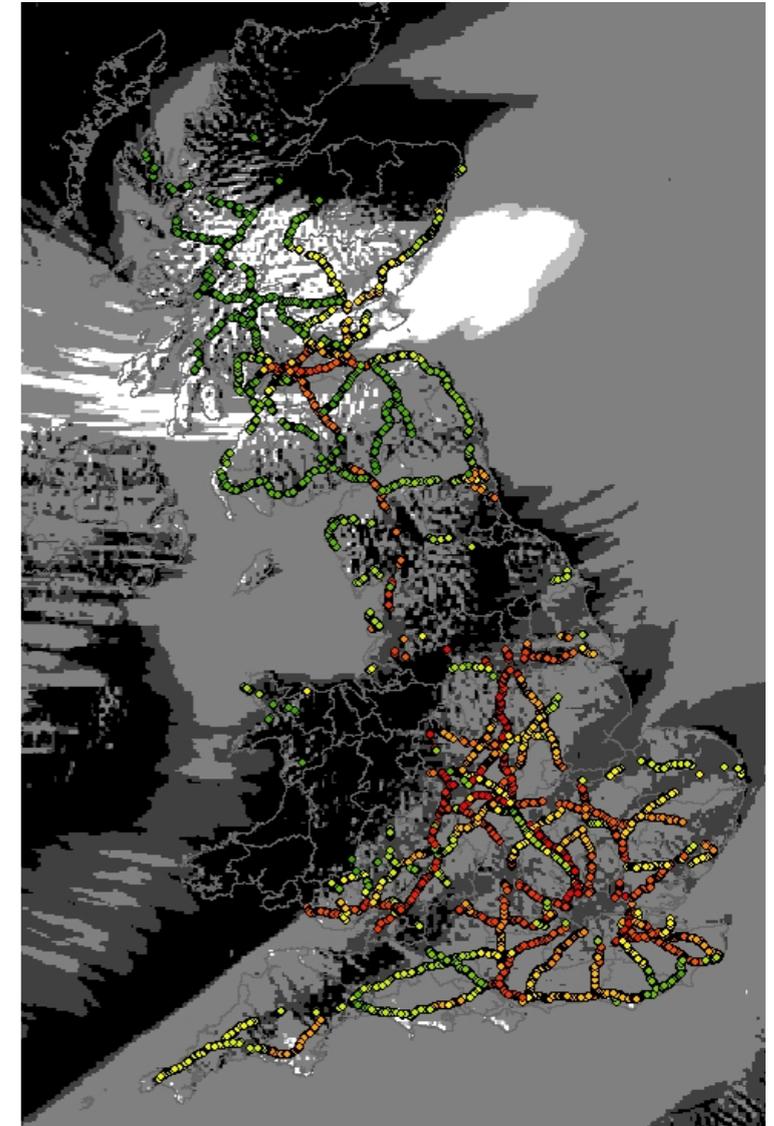


Wind gust speed  
at 1000 GMT on 3  
January 2012

Weighted wind gust  
based on vehicle  
overturning thresholds

Risk of major disruption  
on major roads

2 deaths. Road and rail  
disruption Fallen trees,  
power cuts and  
building damage



By the courtesy of J Slingo MetOffice

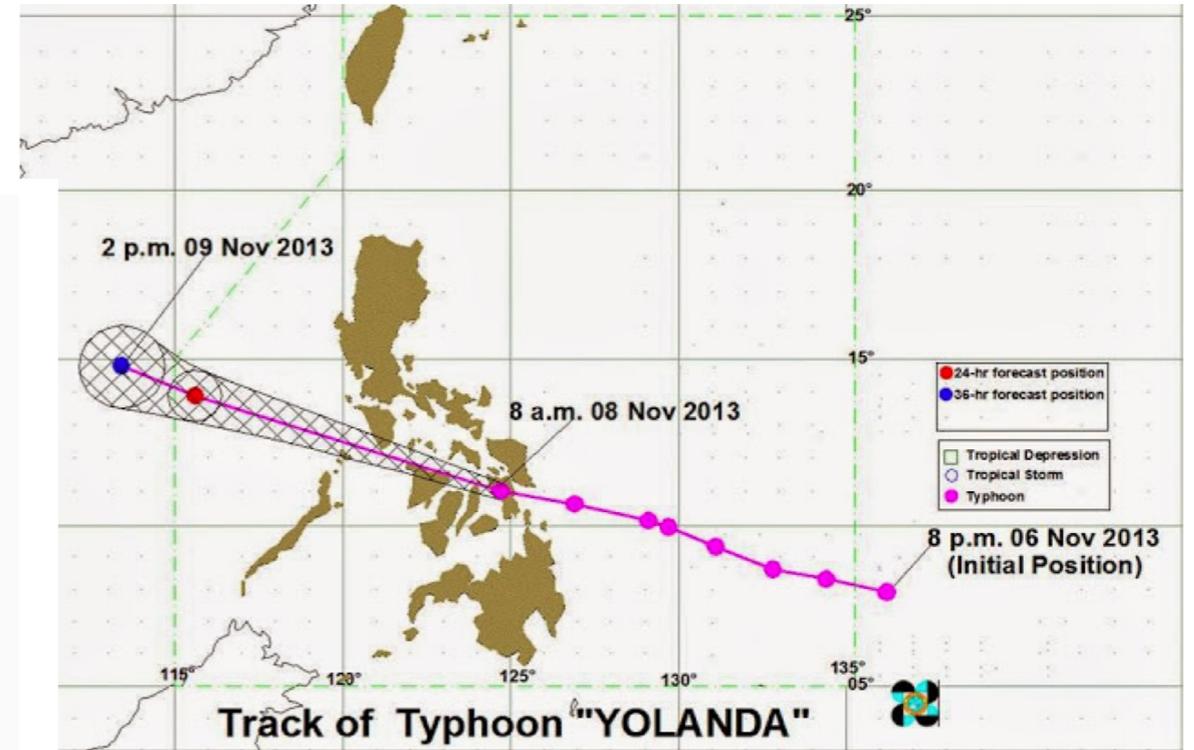
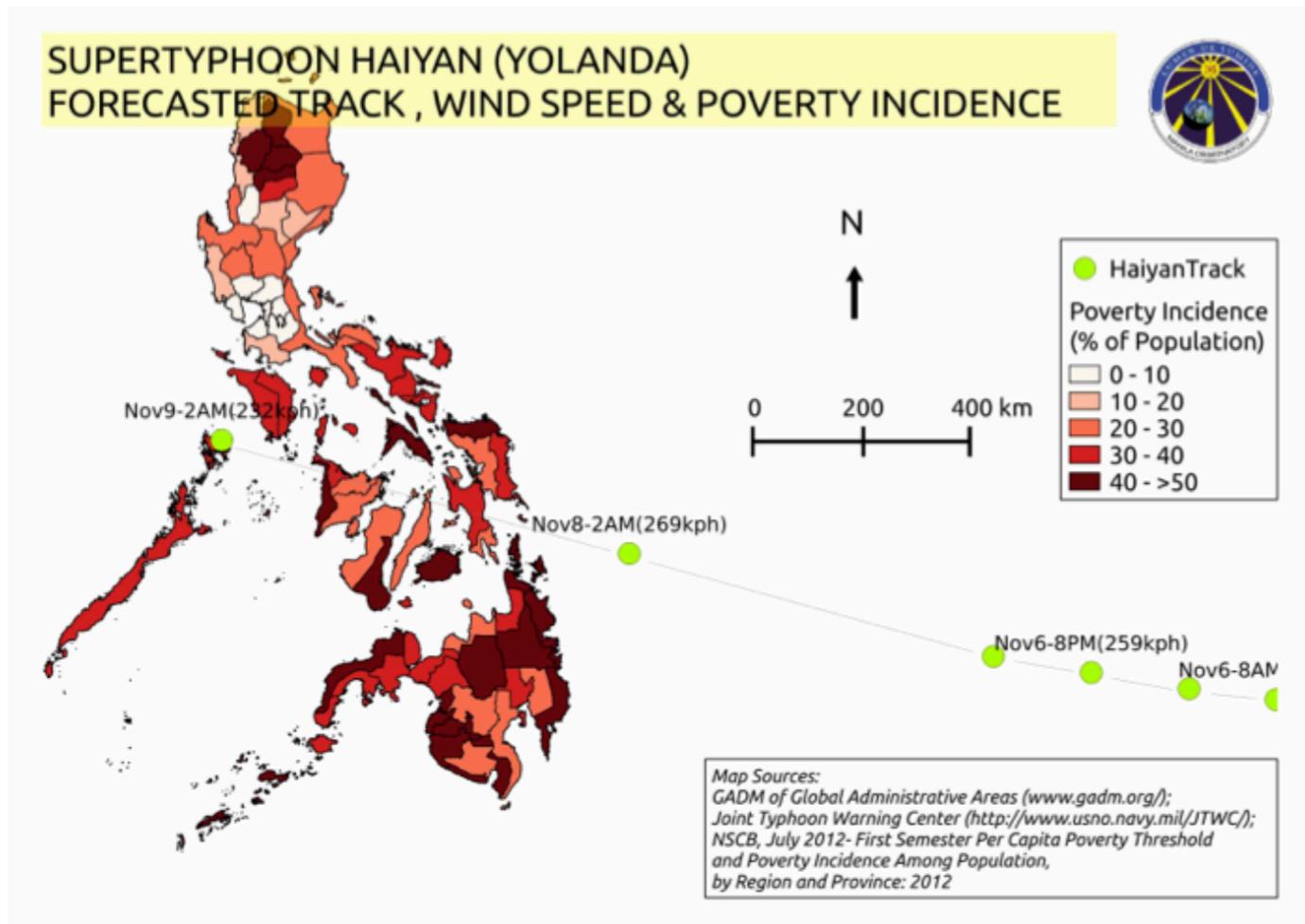




# User-Application Highlight



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A different perspective of a high-impact weather event

Figure 1. TY Yolanda track, wind speed and poverty incidence in the Philippines indicating vulnerable provinces. Image courtesy of the Manila Observatory with GADM, NSCB and JTWC data

By the courtesy of E Porio, Manila Un.



# Major Outcomes



- Media coverage (any numbers ????? Ask to Sylvie)
- 19 White papers covering topics from weather science to socio-economic applications → WMO book
- Inputs for the next WWRP implementation plan
- Videos of town-hall presentations on-line – WMO vimeo
- All presentations will be hosted by WMO web site
- Inputs from Chairs of IOC, SPC, UPC, LOC, Media... ??????





# Next Steps / Future Directions



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- Modeling the Earth/Environment System
  - Integrate all environmental components into operational forecasts
  - Developing new coupled assimilation systems: methods and numerical tools
  - Ensuring earth/environment observations
- Towards a seamless world
  - A unified framework for earth system predictions: from hours to decades
  - Better understanding of time and space scale interactions
  - Preparing for future computing architectures
- A three tiers approach: stakeholders-science-customers
  - Involving stakeholders, socio-economic experts in developing new forecast products
  - Strengthening the role of weather science for disaster risk reduction
  - Defining a sustainable business-model for public and private sectors

