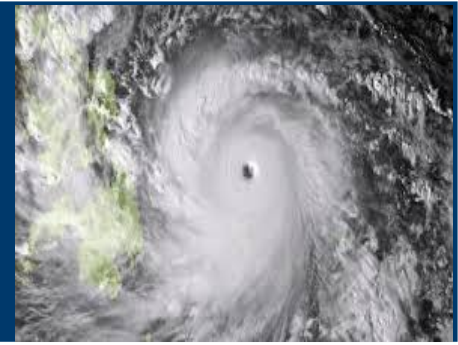




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Hurricane Sandy, Cyclone Phailin and Typhoon Haiyan



images are taken from wikipedia and bbc.co.uk

Typhoon Haiyan,
Prediction & Response
Can we do better?

Fred Branski,
President, WMO
Commission for Basic
Systems

AMS Washington
Forum
April 3, 2014

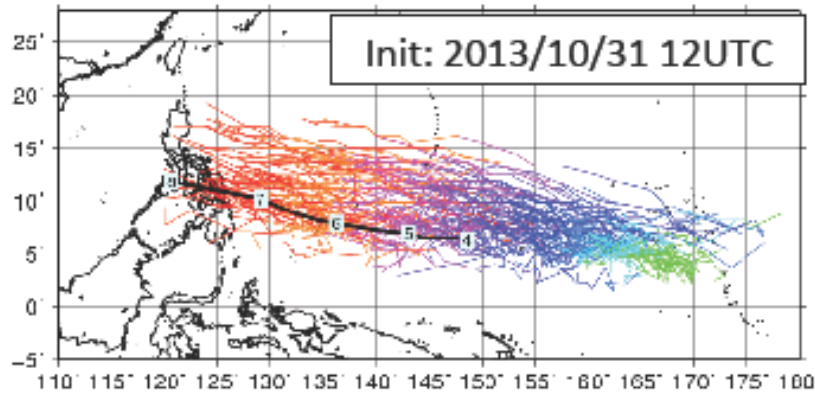
Prediction

- TIGGE makes it possible to produce a Multi-Center Grand Ensemble (MCGE)
- Although still primarily used for research the future goal is for enhanced use of ensemble prediction for operational purposes; Global Interactive Forecast System (GIFS)
- MCGE can provide forecasters additional information on forecast uncertainty and increase the level of confidence in the forecast.

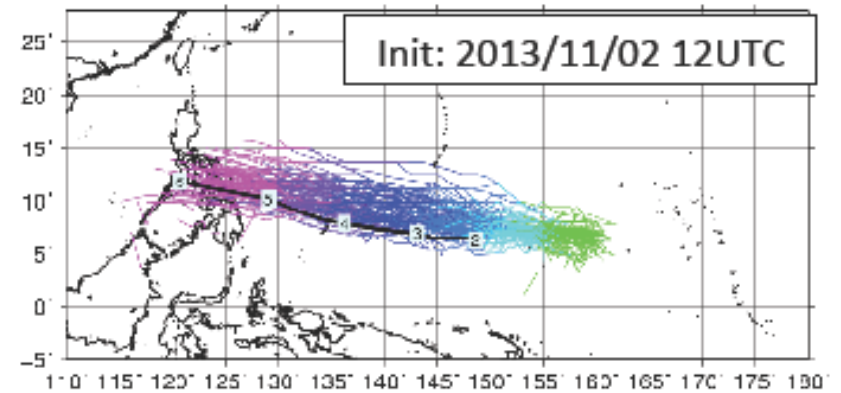


Typhoon Haiyan

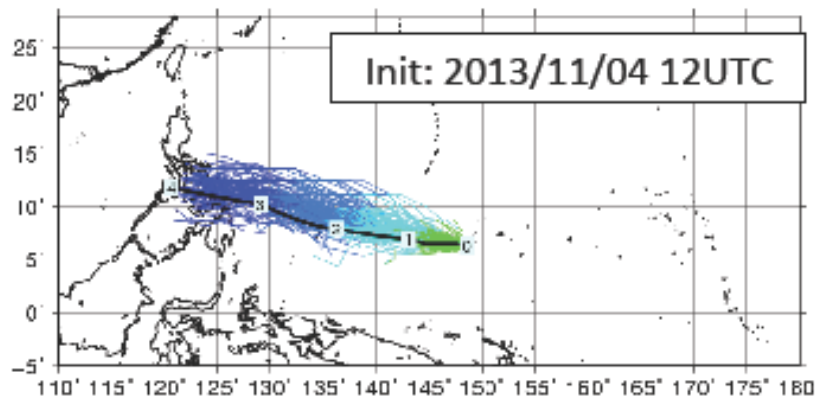
MCGE-4



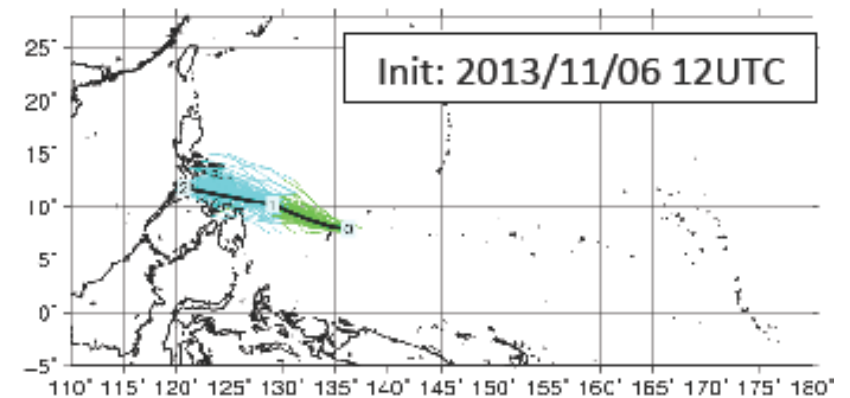
MCGE-4



MCGE-4

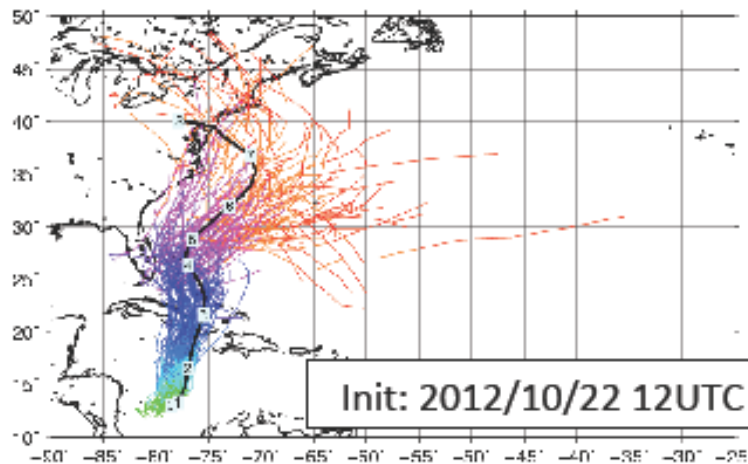


MCGE-4

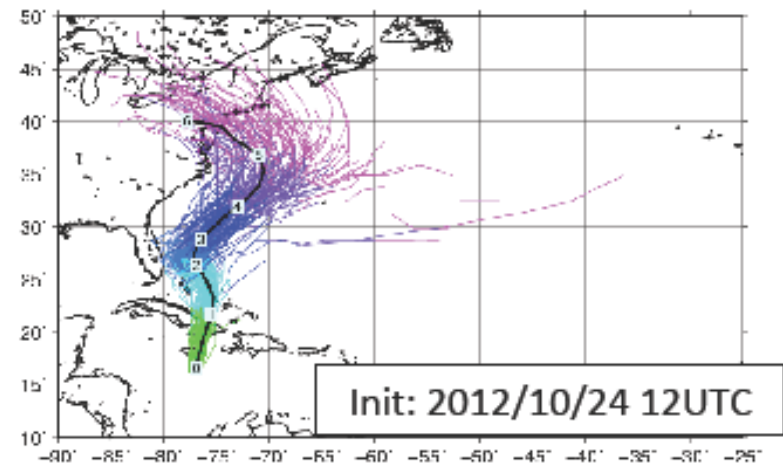


Hurricane Sandy

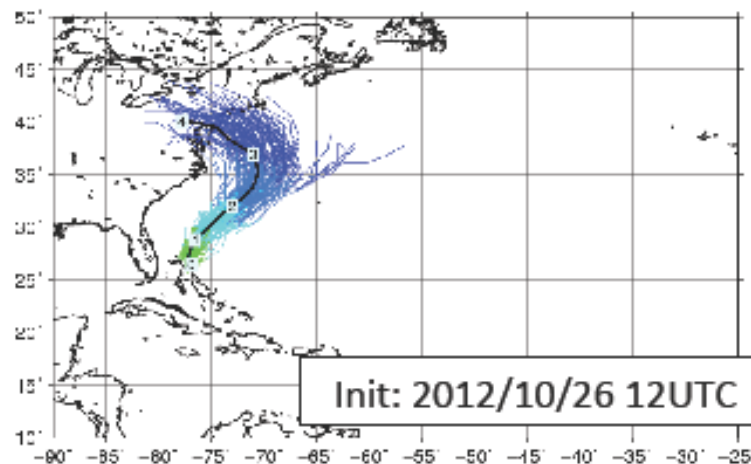
MCGE-4



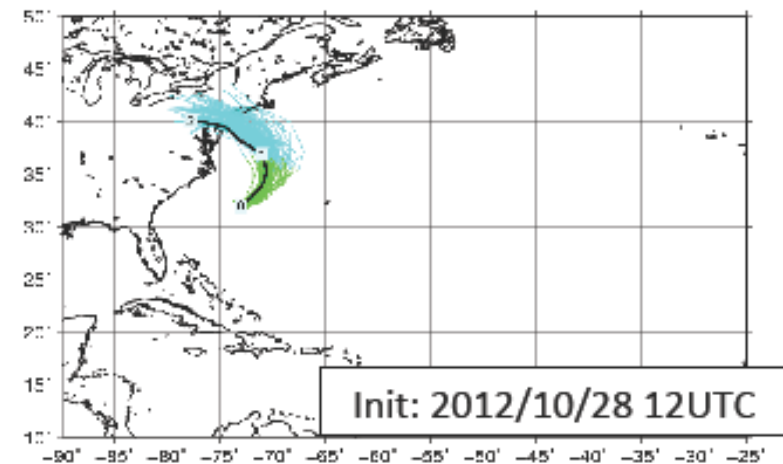
MCGE-4



MCGE-4



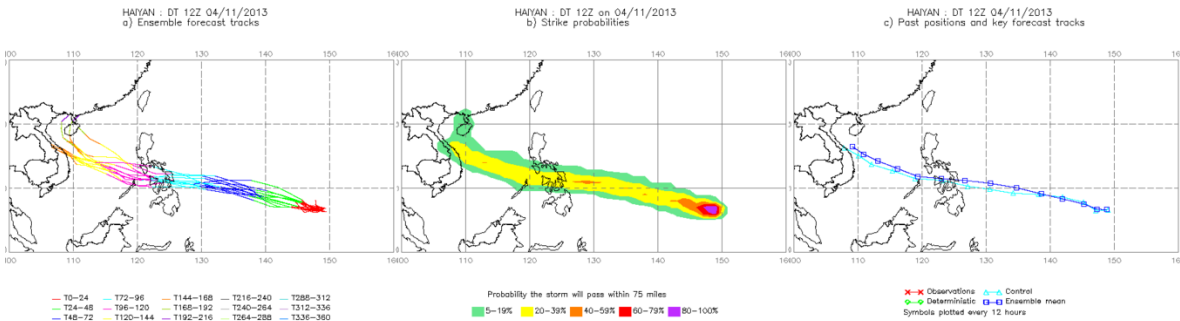
MCGE-4



Typhoon Haiyan

Landfall Philippines Fri 8 Nov 2013

Tropical cyclone products from the experimental MOGREPS 15-day ensemble

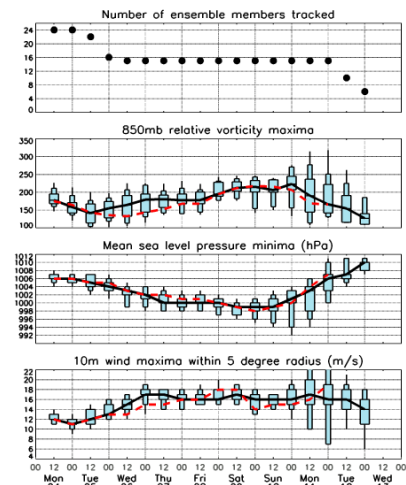


4-day forecast from 12UTC on 4 Nov

MOGREPS-15 EPS Meteogram

NWP HAIYAN 6.3°N 148.6°E

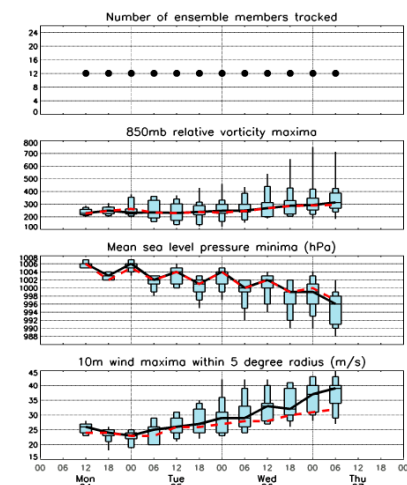
04 November 2013 12 UTC



MOGREPS-G storm-following meteogram

NWP HAIYAN 6.3°N 148.6°E

04 November 2013 12 UTC

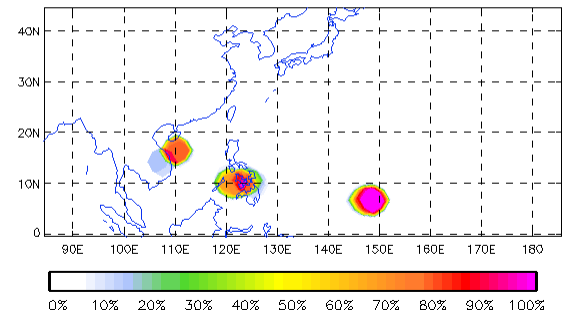


Tropical cyclone products from the experimental MOGREPS 15-day ensemble

Data time 2013110412

Tropical cyclone strike probability for 24hrs centred on T+00

(shows probability of a tropical cyclone passing within c.300km)

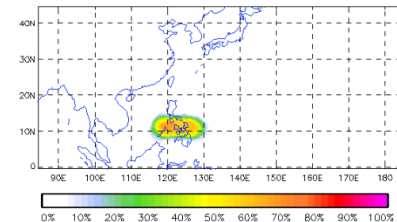


Tropical cyclone products from the experimental MOGREPS 15-day ensemble

Data time 2013110412

Tropical cyclone strike probability for 24hrs centred on T+096

(shows probability of a tropical cyclone passing within c.300km)



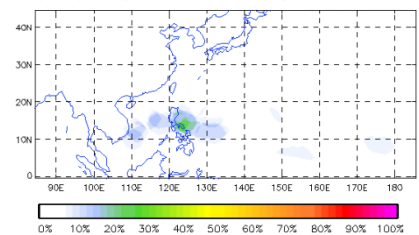
4-day forecast
from 12UTC on
4 Nov

Tropical cyclone products from the experimental MOGREPS 15-day ensemble

Data time 2013102812

Tropical cyclone strike probability for 24hrs centred on T+252

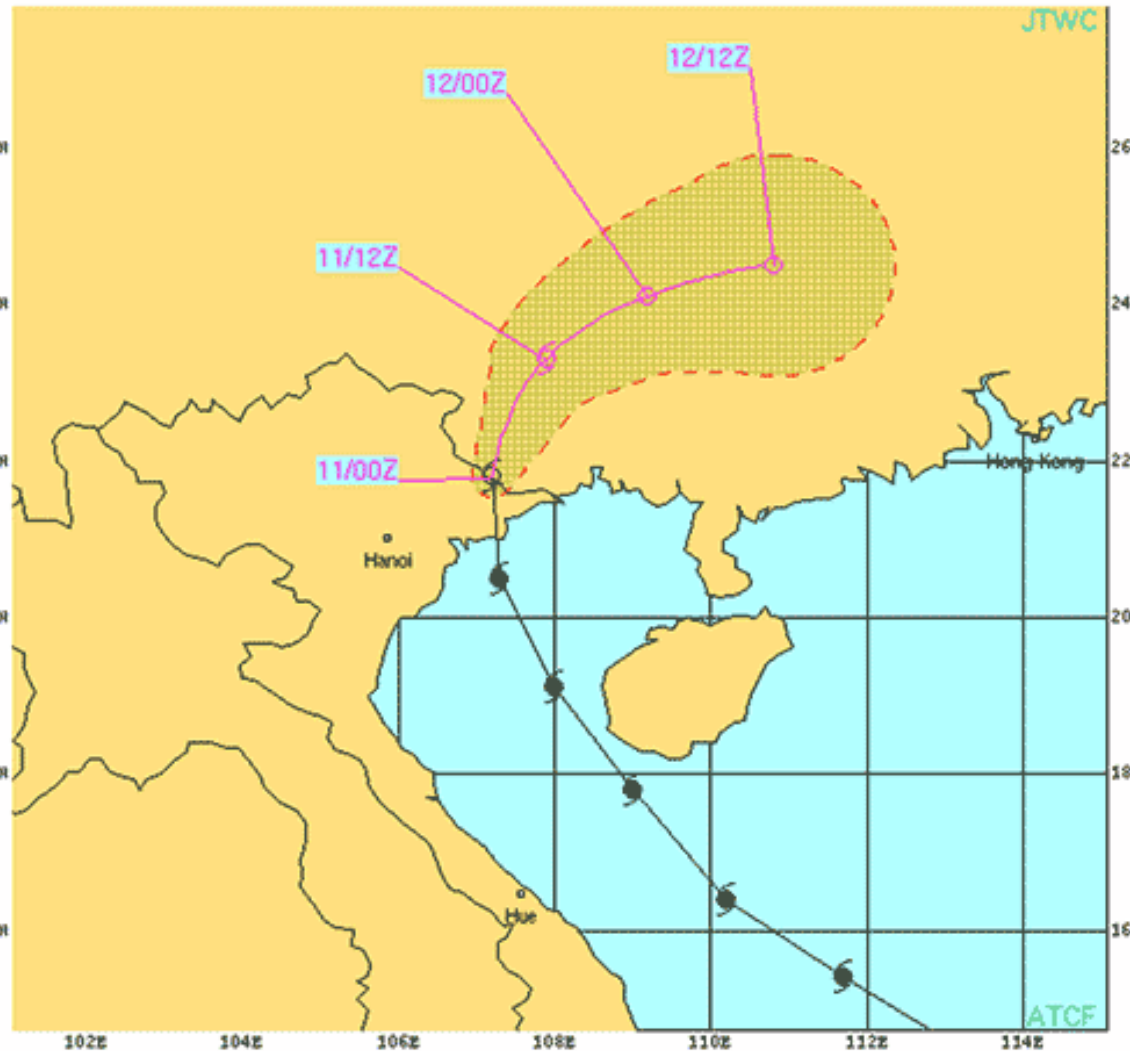
(shows probability of a tropical cyclone passing within c.300km)



11-day forecast
from 12UTC on
28 Oct

Typhoon Haiyan Storm Track - November 11, 2013

Source: [Joint Typhoon Warning Center](#)



Both SMEs and MCGE had a high degree of track predictability 4 days out, going into Philippines.

Track forecast post-Philippines was less accurate.

How did this affect response?
In both cases?

For example, the WFP only moved supplies once the impacts on the ground we're seen.

How high does confidence need to be?

Can we do Better?



Prediction Summary

- Brier Skill Scores of all TIGGE NWP centers are positive at least out to day 9, more skillful than climatology.
- For Hurricane Sandy, Typhoon Haiyan and Tropical Cyclone Phailan, MCGE Track prediction had high confidence out at least 5 days out.
- All SMEs are over confident, (forecasted probability is larger than observed frequency), especially for the high-probability range.
- Results from: WMO Typhoon Committee, 8th Integrated Workshop (8th IWS)/2nd Training and Research Coordination Macao, China December 02, 2013

Munehiko Yamaguchi^{1,2}, Frederic Vitart², Simon Lang², Linus Magnusson², Russell Elsberry³, Grant Elliot⁴, Masayuki Kyouda¹, Tetsuo Nakazawa⁵, Koji Kuroiwa⁵

1: Japan Meteorological Agency

2: European Centre for Medium-Range Weather Forecasts

3: U.S. Naval Postgraduate School

4: Bureau of Meteorology in Australia

5: World Meteorological Organization



Response

- The important issue isn't TC track or intensity, rather its the risk and impact associated with actual weather on the ground.
- The importance, perception and impact of forecast performance are perhaps different (or should be?) in the research context compared with an operational context.
- Actual impacts are caused by the "intensity" of the weather phenomena associated with a TC.
- Work is moving forward on verification of surface parameters for NWP
 - WBO CBS has a Task Team focusing on this area.
- What about impact-based forecasting and risk-based warning?
- A key role the WMO emergency response for Typhoon Haiyan played was to assist its Members and institutions in the communication of impacts and risks of the typhoon.
- How do we develop and include impacts based and risk mapped tropical cyclone forecasting and warning information into the tropical cyclone advisories provided by the Regional Specialized Meteorological Centres for tropical cyclones?



Additional

- THORPEX GIFS-TIGGE Working Group page:
<http://tigge.ecmwf.int/>
- TIGGE Cyclone Exchange page for track forecasts:
<http://www.cawcr.gov.au/projects/THORPEX/TC/>
- WMO Typhoon Committee Integrated workshop page:
<http://www.typhooncommittee.org/integrated-workshop/>
- Full Presentation - Ensemble Tropical Cyclone Activity Prediction using TIGGE data, Dr. Yamaguchi:
http://www.typhooncommittee.org/8IWS_2TRCG/docs/Keynotes/2.%20TRCG_Yamaguchi.pdf
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 - Peter Chen, WMO Data Processing and Forecasting System Department





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Thank you for your attention

Fred Branski
President, CBS