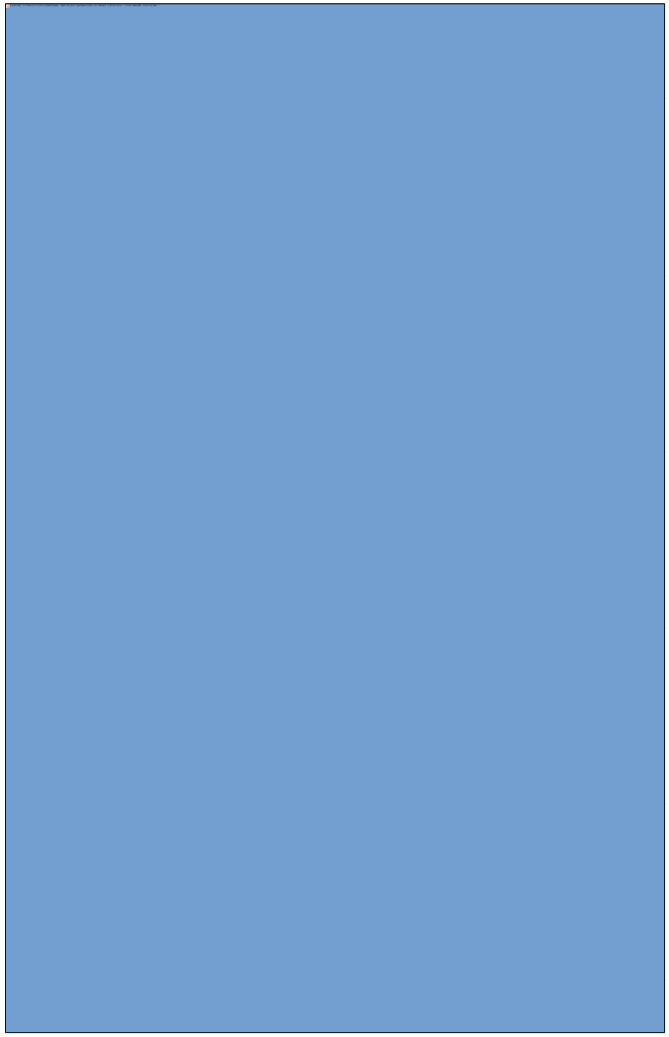
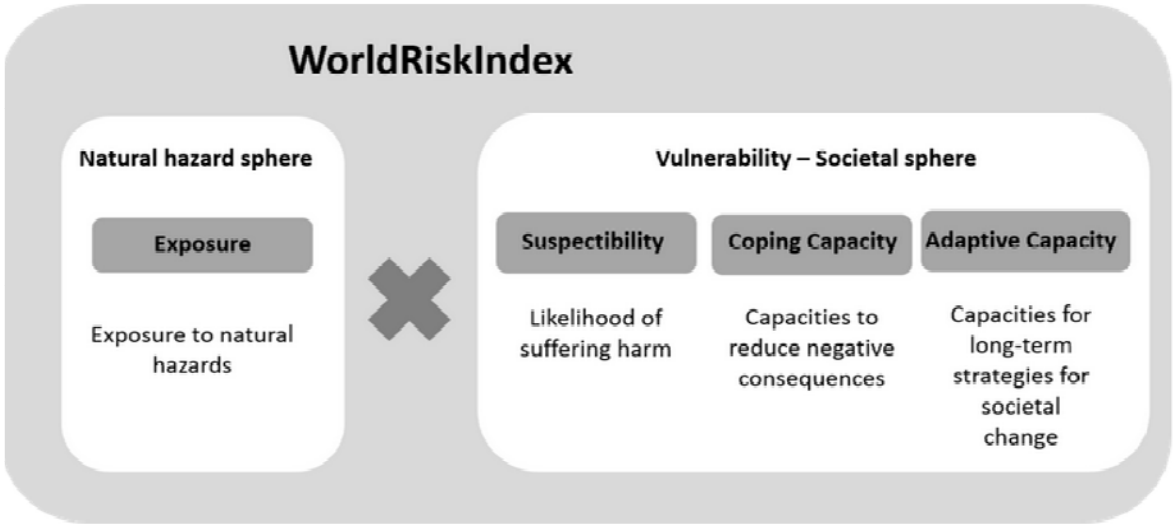
e-Science in Disaster Management:
The Philippine Experience

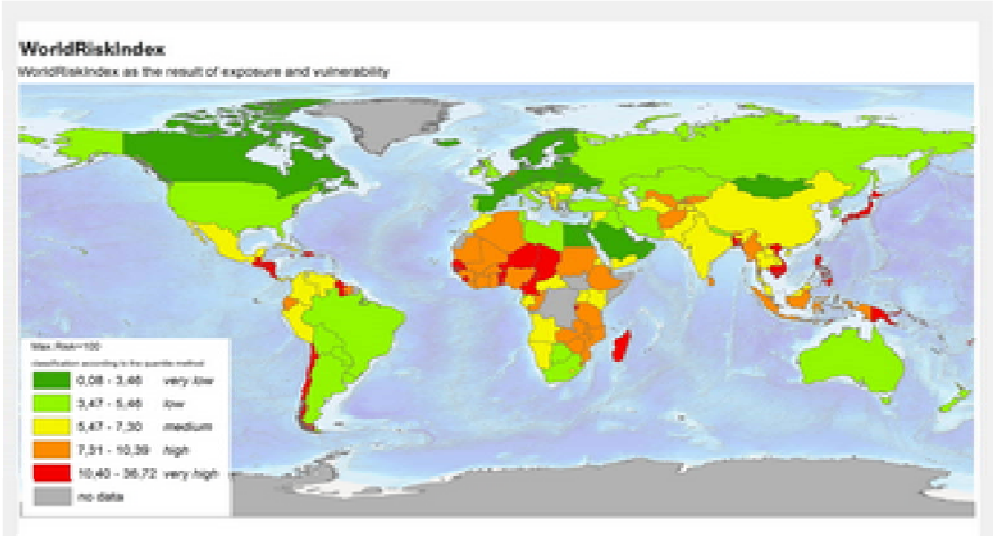
ISGC 2017

Academia Sinica, Taipei, Taiwan
8 March 2016

2016 UN World Hazard Risk Index



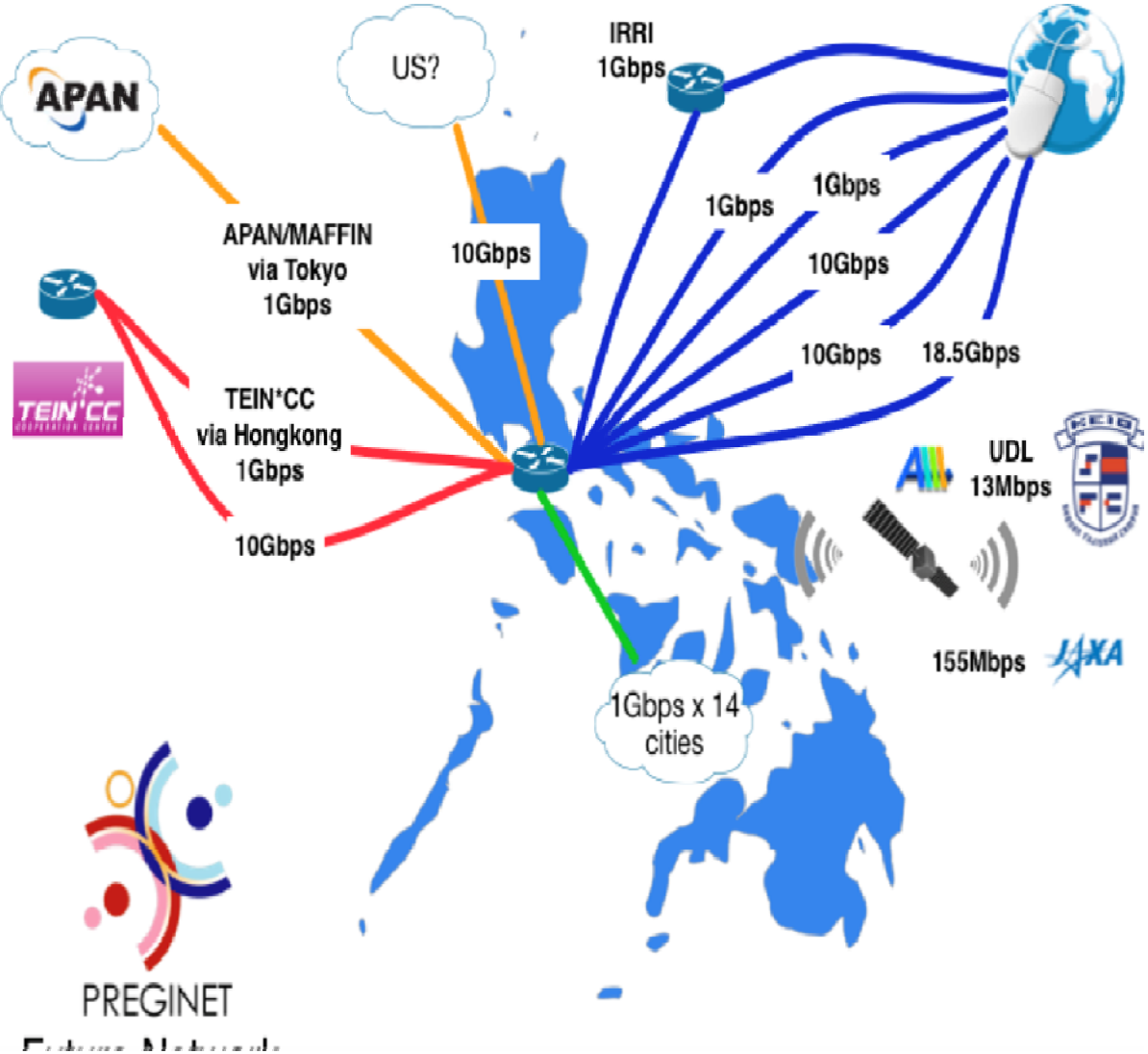




Philippine Typhoon tracks

Evolution of e-Science in PH

- **The Philippine Research, Education and Government Information Network (PREGINET)**
  - Enhanced network connectivity among local academic and research institutes
  - Facilitate formation of user-communities in scientific areas
  - Connected to International RENs
  - APAN (since 2004)
  - TEIN (since 2006)



Evolution of e-Science in PH

- **Philippine e-Science Grid (PSciGrid)**
- Started in 2008 with a $300K grant
- Launched to the public in July 2010 (ASTI, UP, ADMU)
- Grid Applications:
- Meteorology (HRM, GrADS)
- Bioinformatics
- 16 Nodes/128 cores and 9TB of storage grew to 50 nodes by 2010
- Participated in EuAsia grid project, PRAGMA, and EGI-Inspire

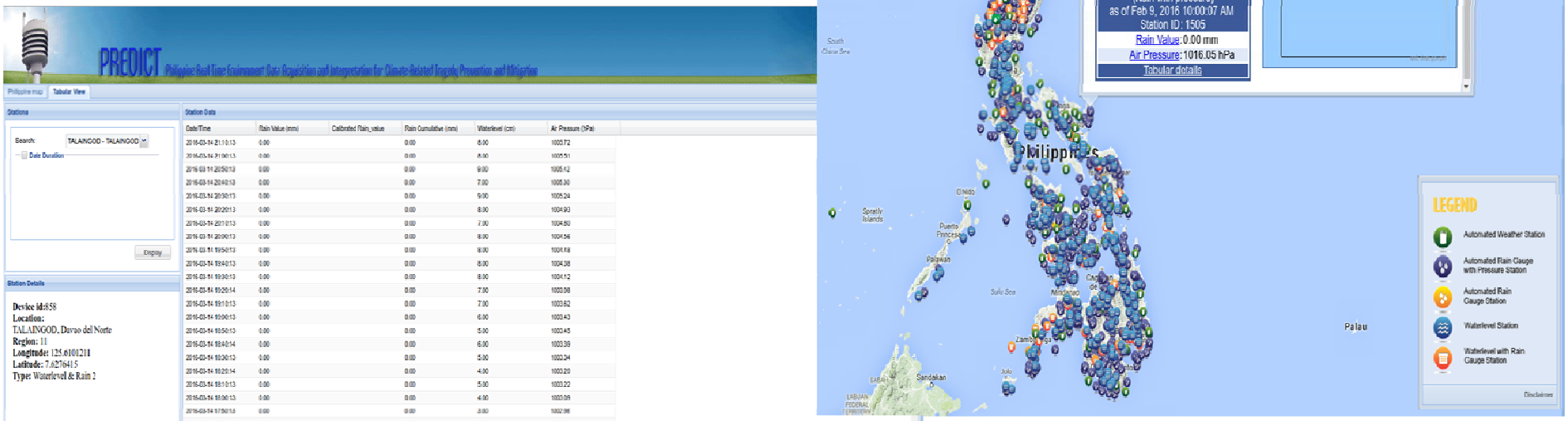
Objectives:

- Develop cost-effective platforms and applications for real-time monitoring and forecasting of environmental parameters
- Establish and maintain the nationwide environmental monitoring network

Output

- Total number of weather stations deployed as of date:
  - Automated Rain Gauges (ARG) - 876
  - Waterlevel Monitoring Stations (WLMS) - 546
  - Automated Weather Stations - 86

- Web API service available for third-party visualization and processing
- Data collected are visualized online

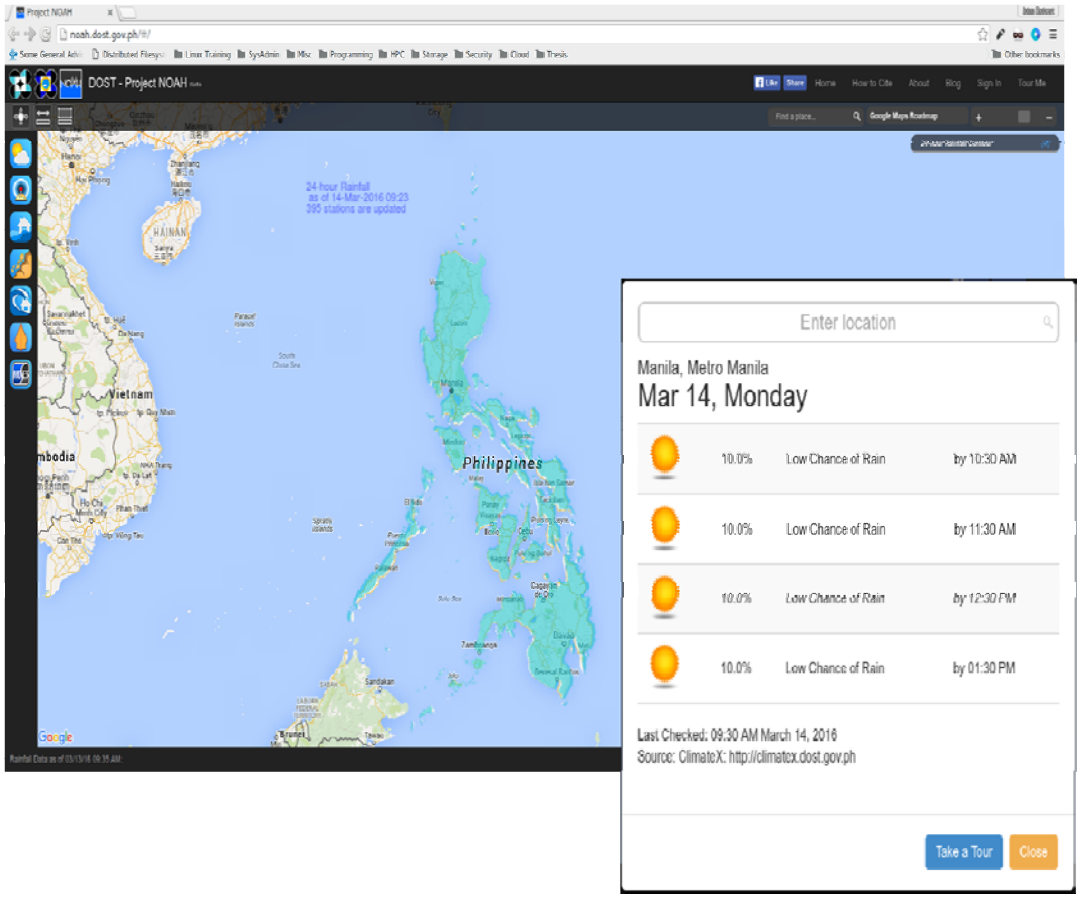


Project NOAH

- Nationwide Operational Assessment of Hazards (NOAH) Program
- Started in 2011
- undertake disaster science research and development
- advance the use of cutting edge technologies
- Provide timely advice to disaster responders
- Generate hazard maps
- More info at:

  http://noah.dost.gov.ph/

  http://blog.noah.dost.gov.ph/



Nationwide Operational Assessment of Hazards
Weather Information Integration for System Enhancement

Objectives:

•Extend the temporal range of weather forecast to 7 days with PAGASA, ClimateX and NOAH

•Improve the accuracy of the weather forecasts by assimilating data from the ground, radar and satellite measurements into numerical weather prediction model

•Provide the forecast accuracy validation protocol for the model outputs

Results:

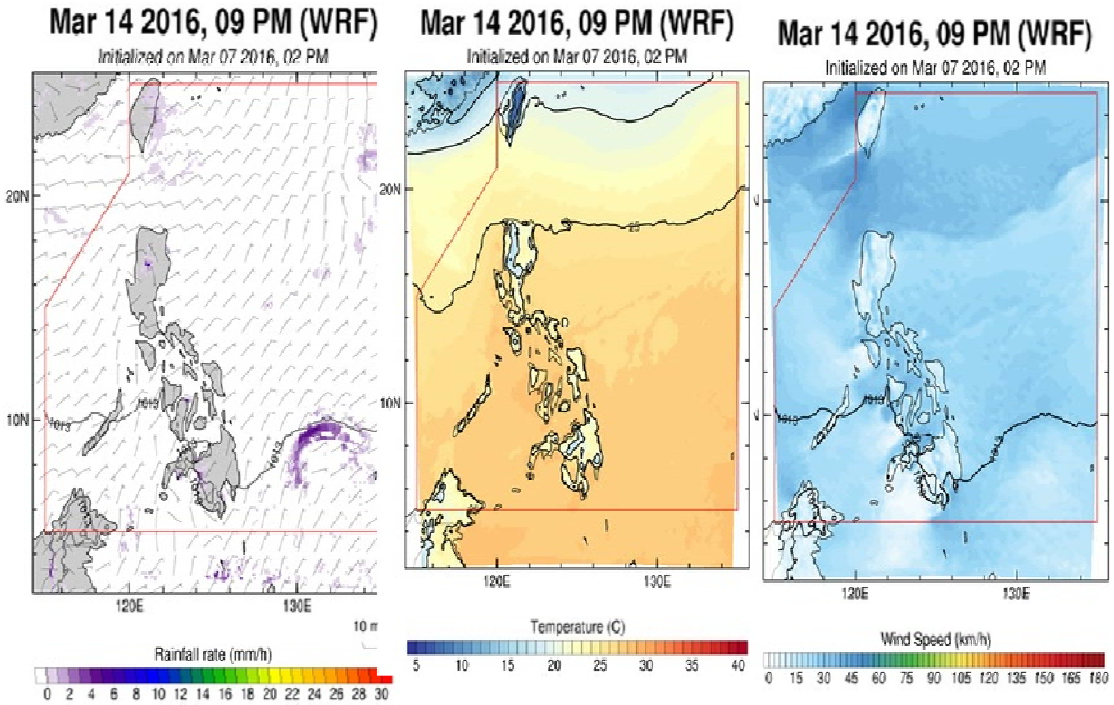
•Two fully operational WRF forecasting system

•Quality-control protocol for automatic weather stations

•3.7% and 10% improvement in wind and rainfall prediction, respectively upon assimilating AWS and Doppler radar measurements

•Improved rainfall prediction using an updated land use

•Model is produced 4 times a day; 4km and 12km resolution



3000 Rice Genomes Project (3kR

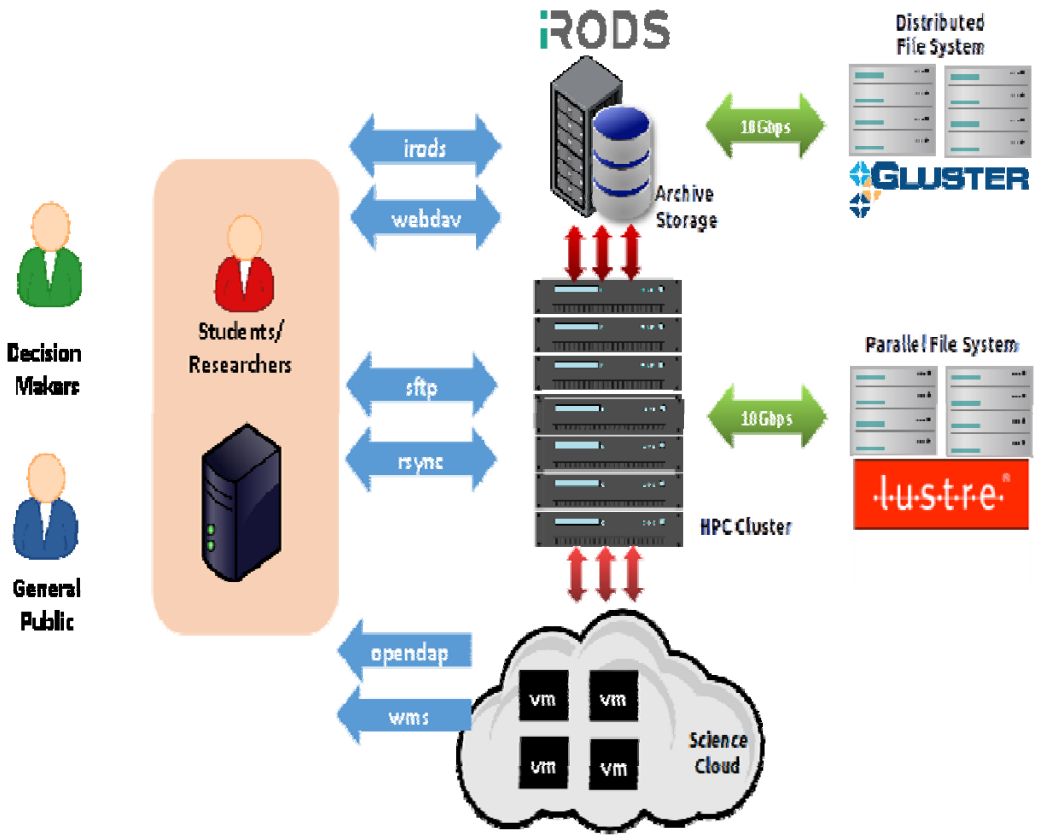
- Analysis results for variant discovery are stored and executed in ASTI
- Over 120 TB of downloadable data
- Methods for download:
- WebDAV
- iRODS
- Regular HTTP
- More info at:

  http://iric.irri.org/resources/3000-genomes-project

COMPUTING AND ARCHIVING RESEARCH ENVIRONMENT

Objectives

- Accommodate a mix of workloads required by users
- Unify access to large common datasets
- Provide tools and services that promote sharing and collaboration among users
- Rapid preparation and execution of workloads
- Provide a durable storage platform for preserving any form of scientific data

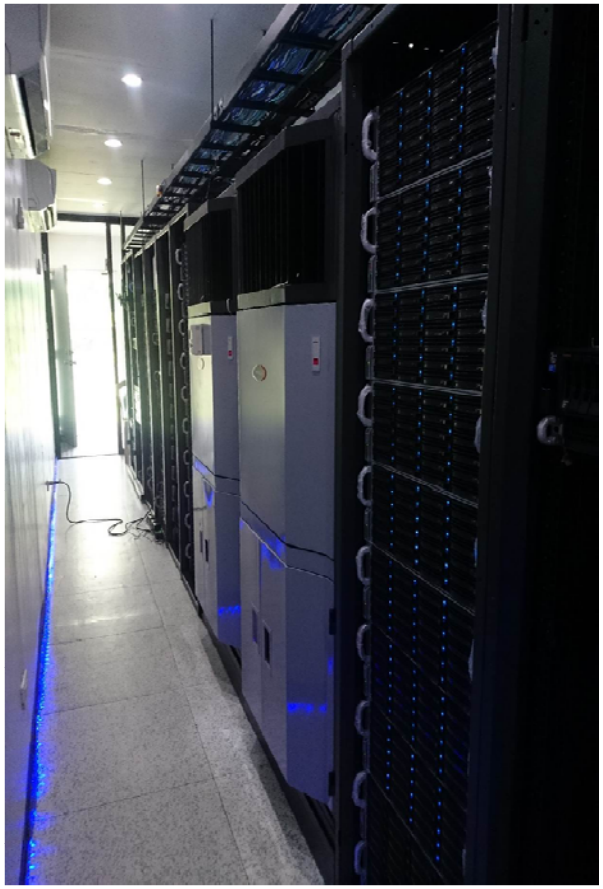


COARE

COMPUTING AND ARCHIVING RESEARCH ENVIRONMENT

- **Compute Infrastructure**
- 10 Cabinet Racks
- 60 computing nodes
- **3000+** Processor cores
- **4** NVIDIA Tesla GPU
- **14+TB** aggregated memory capacity

- **Storage Infrastructure**
- Long-term storage facility (content replicated to another data center)
- 1440 TB of usable storage capacity
- Parallel File System (LustreFS)
- 720 TB maximum storage capacity
- Users can interface with the facility using a variety of access protocols:
- **iRODS**
- **HTTP (OpenDAP, WebDAV)**



COARE

COMPUTING AND ARCHIVING RESEARCH ENVIRONMENT

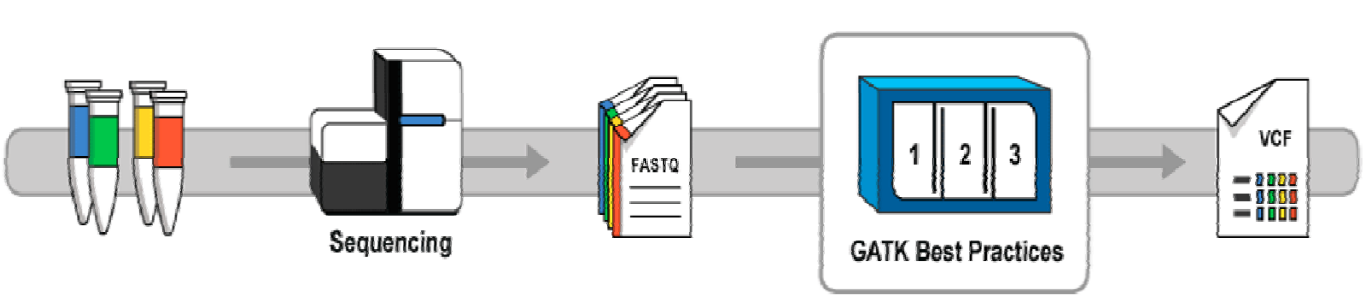
Application Areas

- Flood modelling (Gerris)
- Molecular Dynamics (NAMD)
- Numerical Weather Prediction (WRF)
- Climate Modelling (RegCM)
- Bioinformatics Pipeline (BWA, GATK, etc.)
- Data Analytics (Spark)

NAMD
Scalable Molecular Dynamics

WRF THE WEATHER RESEARCH & FORECASTING MODEL

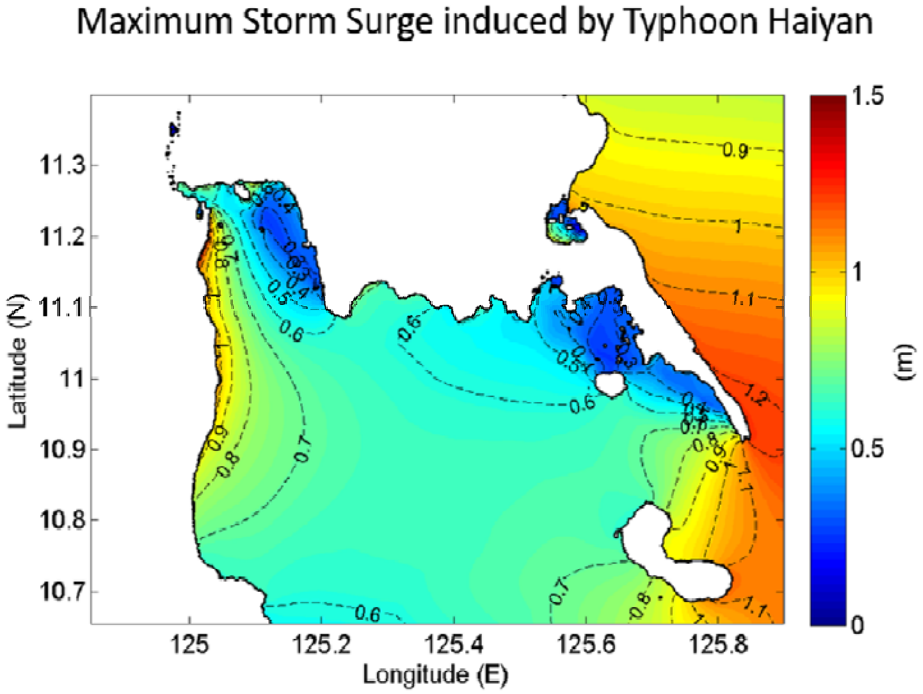
APACHE Spark™



Cooperation with ASGC and NCU

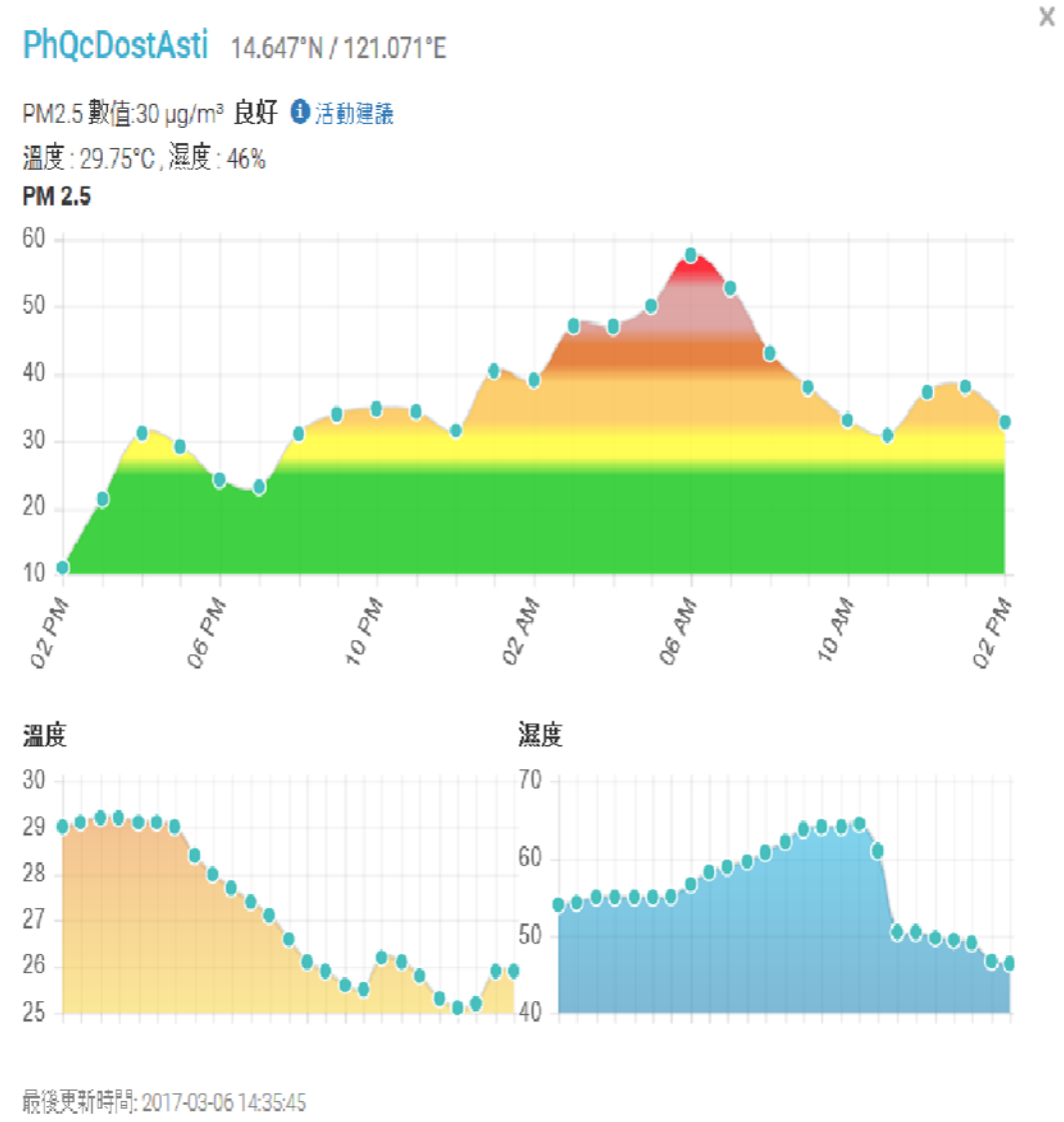
- Typhoon Haiyan Storm Surge modeling and validation

- ASTI provides …
  - Weather sensor data
  - Bathymetric data
  - Tidal gauge data
  - Elevation data
  - Doppler radar data

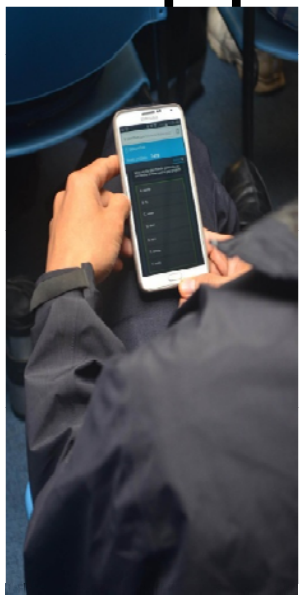


Ongoing Collaborations

Through the ASEAN-IVO Project AirBox: A Participatory Ecosystem for PM 2.5 Monitoring



Community Engagement and Support



Summary

- Demand for larger e-Science infrastructures continue to increase as local researchers are empowered with knowledge of innovative tools to carry out more intensive studies at a larger scale and faster pace

- e-Science aligns the efforts of the international research community and the goals of the national government to minimize the vulnerability of persons to disaster events

Thank you