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EGI-ACE Community Workshop

Disaster Mitigation and Agriculture

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Agenda:https://indico.egi.eu/event/5360/

Background

- Vision: Sustainability of the Humanity and the Earth
- Goal: Capacity building for hazard risk analysis
  - Enhance the knowledge of hazard risk reduction
  - Improve accuracy and efficiency of hazard risk simulation
- Approaches: deeper understanding of natural hazards
  - Quantify risks and reduce risk determinants (Vulnerability x Exposure x Hazards) by evolved knowledge of physical processes behind the disaster events
  - Improving efficiency of numerical simulations according to the knowledge of root cause and drivers of target hazards
  - Case study approach: develop best practices; find out gaps to get insights; discover challenges and further requirements
  - Open science model
- The collaboration: coordinated by ASGC/TW, with groups of domain scientists, observation data network (incl. government institutes), research infrastructure providers and application/platform supporters in all partners.
  - Partners: BD, ID, IN, JP, MM, MY, NZ, PH, TH, and VN

Case Study by Deeper Understanding Approach Realize Best Practices for Capacity Building

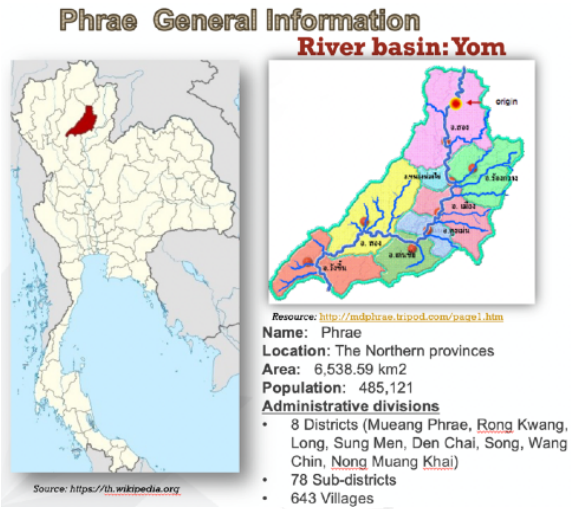
Disaster Mitigation & Agriculture

- 18 case studies of 6 types of hazards in 8 partner country had been Conducted
  - Tsunami, Typhoon & Storm surge, Dust transportation of biomass burning, Flood, Fire/Haze/Smoke monitoring, Lightning
- Values of Case Study commented by Prof. JN Liew (UKM, MY)
  - Case studies are important in meteorology
    - As integral component to improve weather forecast
    - Reveal processes that were not understood previously
  - Assist in future field programs and numerical experiments design
  - Contribute to meta-analysis
- Deeper understanding approach:
  - Translate evolving scientific knowledge into accurate numerical simulations
  - Understanding the trends of changes of hazard impacts
  - Develop risk analysis and mitigation capability
  - Buildup flexible/dynamic collaboration models of all parties
  - Integrate analysis pipeline and improve the distributed infrastructure
- More case studies of various types of hazards in different countries and more new partners as well as more engaged local user communities are happening
- More data/analysis methods/simulation engine/knowledge resulted from case studies will be shared

Achieving Food Security through Climate-Smart Agriculture

Disaster Mitigation & Agriculture

- Vision: sustainability of the humanity and the EARTH
- Objectives: efficient production, environment friendly & harmless, flexible adaptation to climate change and needs
  - Consistent with FAO Sustainable Development Goals
- Strategy:
  - Better understanding of climate/weather impacts on food security
  - Identification and track of the gaps, challenges, root causes between the practices and goals through time.
- Expected Outcomes
  - Impact analysis workflow design by integrating weather simulation and agricultural risk analysis
  - Reproducible case studies with shared materials based on open science framework
- Climate-Resilient Agriculture for Disaster Risk Reduction (CRADR)
  - Asi@Connect funded project (Dec. 2020 - May 2021)
  - Case study on Phrae Province, Thailand
  - 3 Online Workshops hosted by TH & IN (Feb), JP (Mar), and TW (May)



Case study target: Phrae Province (Northern Thailand)

Utilization of Earth Observation Information

Disaster Mitigation & Agriculture

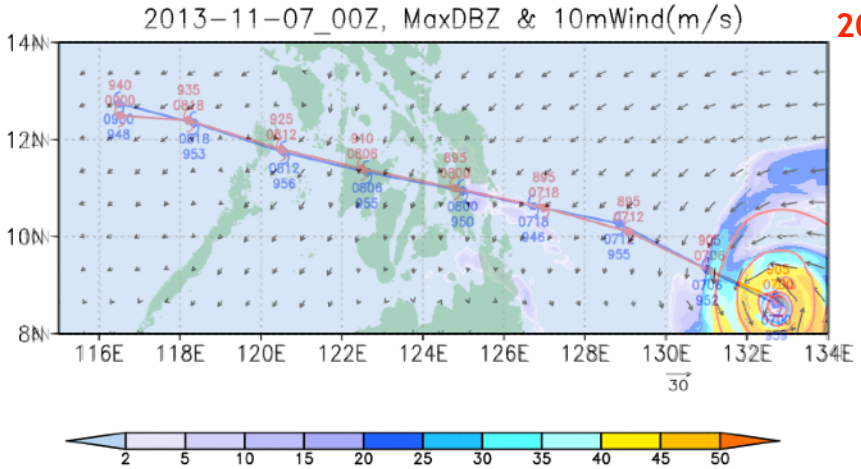
- Collaborations and Data Source: information sharing and application support/development
  - Himawari Satellite Mirror Sites (JP, TH, PH, TW)
  - Sentinel Asia: ISRO (India), the JAXA (Japan), the GISTDA (Thailand), the KARI (Korea), NARL (Taiwan), CRISP (Singapore)
    - Linking with UN-SPIDER and UNOOSA (International Charter)
- Satellite Data Applications: in addition to real-time observation/monitoring of weather, dust, etc.
  - Forest/wild fire/haze/maze/smoke detection and monitoring
  - Satellite Derived Bathymetry for tsunami inundation simulation
  - Aerosol Optical Depth (AOD) data
  - Assessment of damage and causality
  - Lightning observation
  - Typhoon tracks and characteristics
  - Better analysis of satellite images of Earth: automate the processes of satellite image analysis
    - Automatically identify certain types of information from satellite images: road networks, buildings, and land use, etc.
    - Automated satellite-image analysis is essential when natural disasters strike and emergency services must reach the affected areas quickly.
    - If the data could be widely available at low cost, it is very helpful for much broader applications such as climate change research and urban planning etc.
- Intelligent and Efficient Data Transmission

Open Science Approach

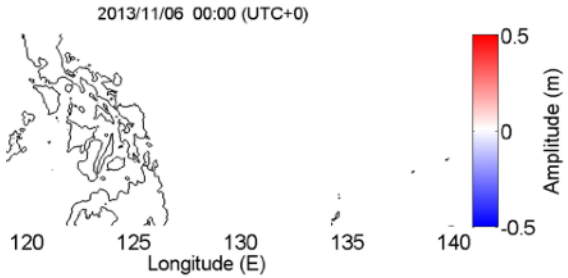
- Case Study-driven: deeper understanding approach
  - Values of case study
  - Case-based openness and reproducibility: data sets, algorithm, analysis tools, workflow, application development model and domain knowledge
- Science Gateway: Support reproducibility/reusability/repurposing by integrating data analysis pipeline and e-Infrastructure
  - Data analysis pipeline: Experiment, data collection, data analytics and metadata management
  - Web portal based
- Community-wide or generic resource sharing & openness
  - Identify requirements & challenges (gap analysis)
- e-Infrastructure: distributed cloud, AAI, FAIR, data network

2013 Super Typhoon Haiyan (Yolanda)

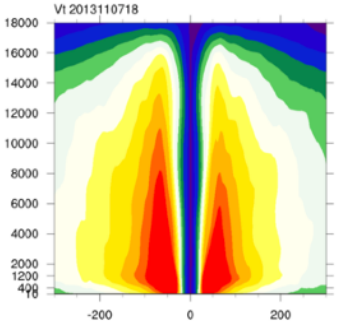
Typhoon Life Cycle: November 3rd – 11th

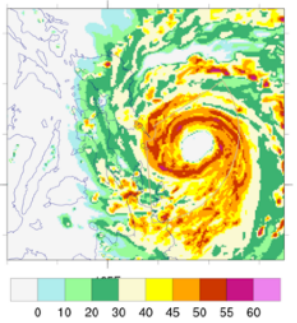


Simulation of impacts from Storm surge caused by super typhoon by combining atmospheric model and oceanic model

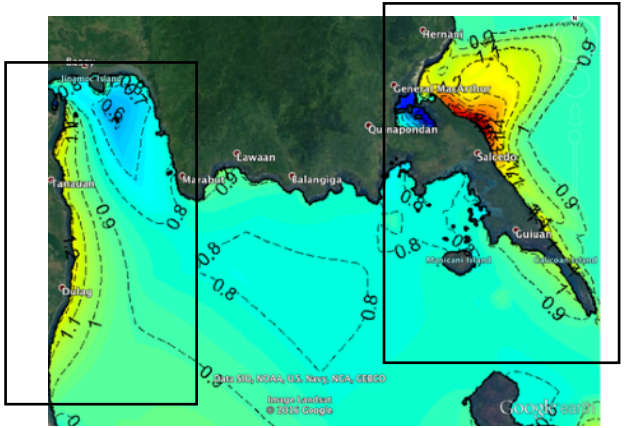


Improved Vertical Wind Field Structure and Eyewall Contraction for Typhoon Haiyan

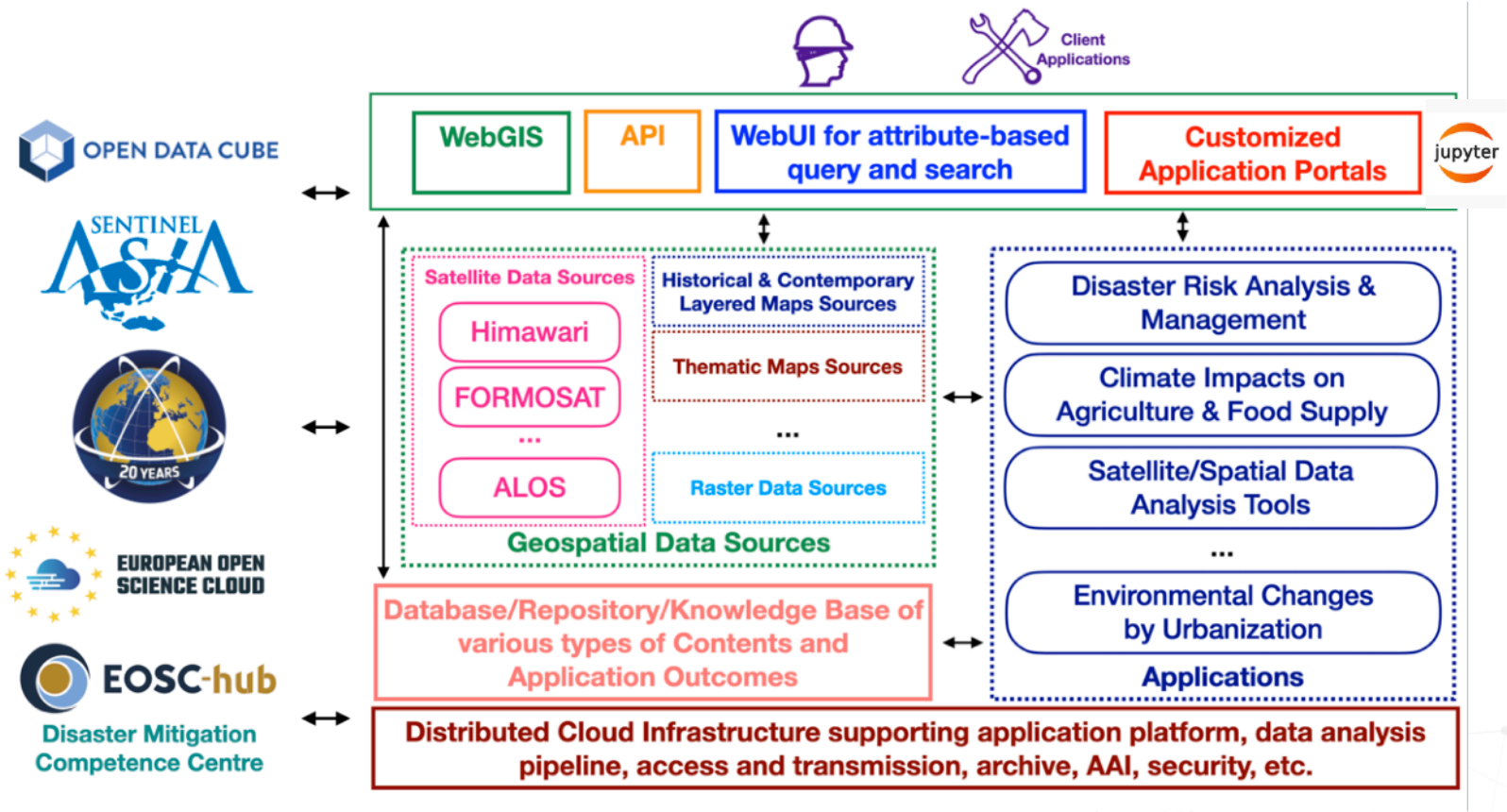




Maximum Simulated Storm Tides at Leyte Gulf



High-level architecture



Key Tasks and Requirements

- At least two case studies of various types of hazards in different countries
  - Flood, Long-distance transmission of aerosol, tsunami, storm surge, typhoon
- At least one case study on agriculture: Phrae Province, TH
- Prototype of integrating applications over regional infrastructure
  - Data repository with metadata management, numerical simulation portal, open data cube, distributed cloud infrastructure, AAI and FAIR model
- Resource federation by distributed cloud
  - hybrid computing resources managed by K8S & Container
  - Data transmission across sites and between storage and computing nodes
  - Build up catalog of data sources at partner countries
- Plan for attaining actionable insights from case studies and advanced analytics efficiently
  - ML-enabled big data analytics
  - GPU-enabled high efficient computing
  - Intelligent and automatic workflow
- Identify requirements and challenges implementing open science model

Training and Outreach

- Regional collaboration platform: APAN (Primary), ASEAN
  - More new partners as well as more engaged local user communities are happening
  - Our partner are leading Disaster Mitigation Working Groups, Agriculture WG and Open & Data Sharing WG in APAN
- EU and around the world: experience sharing, resource federation and further collaborations
- Events
  - Joint workshop on disaster mitigation at ISGC 2021: 24-26 March 2021
  - CRADR Workshop I: 22-24 Feb 2021
  - CRADR Workshop II: March 2021
  - Training in April (TH)
  - CRADR Workshop III: May 2021
  - Joint workshop or APAN WG meetings: Aug/Sep 2021 @APAN52 (ID)

Acknowledgement

- Special Thanks to Great Supports From EGI, Asi@Connect, NSPO/NARL, Sentinel Asia and Academia Sinica
- Also Appreciate all Contributions From Partners
  - BD, ID, IN, JP, MM, MY, NZ, PH, TH, TW, VN and CZ, DE

Thank you!