

# Potential use of QZSS monitoring station for future research

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**AIT**  
Asian Institute of Technology

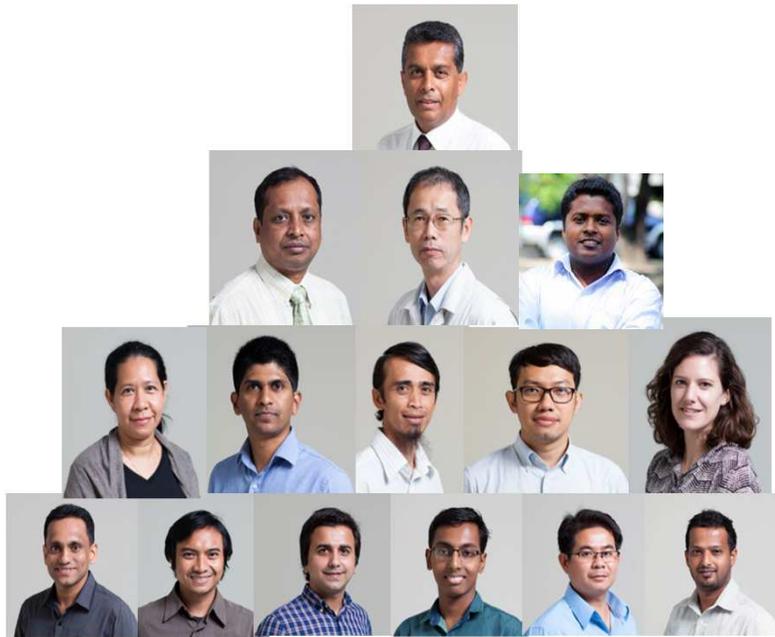


Geoinformatics Center  
Established in 1999





## Geoinformatics Center Established in 1999 (Self Funded)



[www.geoinfo.ait.ac.th](http://www.geoinfo.ait.ac.th)

## Activities of the GIC/AIT

- Projects and Consulting Works
- Training Programs, primarily in Asia and the Pacific
- QZSS GPS Monitoring Station and GNSS Research
- Emergency Disaster Response Mapping
  - Rapid Mapping Support for Sentinel Asia & IDC
  - Applied Research (DRR, Poverty, Environment, Aquatic ..)
- Exchange Programs: Students, Researchers, Experts .....
- Information Sharing and Publications: Journal, Conference, Reports, Manuals etc.

# Past GNSS projects



- Growing Navis
  - Funded by the European GNSS Agency (GSA) under the FP7 (Seventh Framework Programme for Research and Development).
- MGA JAXA joint experiment
  - With joint collaboration with JAXA
- Improving LEX based PPP positioning accuracy.



# QZSS monitoring station/ equipped with other GNSS receivers

## Trimble-NetR9 receiver

QZSS, GPS, GLONASS, GALILEO, BeiDou, IRNSS, and augmentation signals; SBAS, MSAS, SDCM and GAGAN

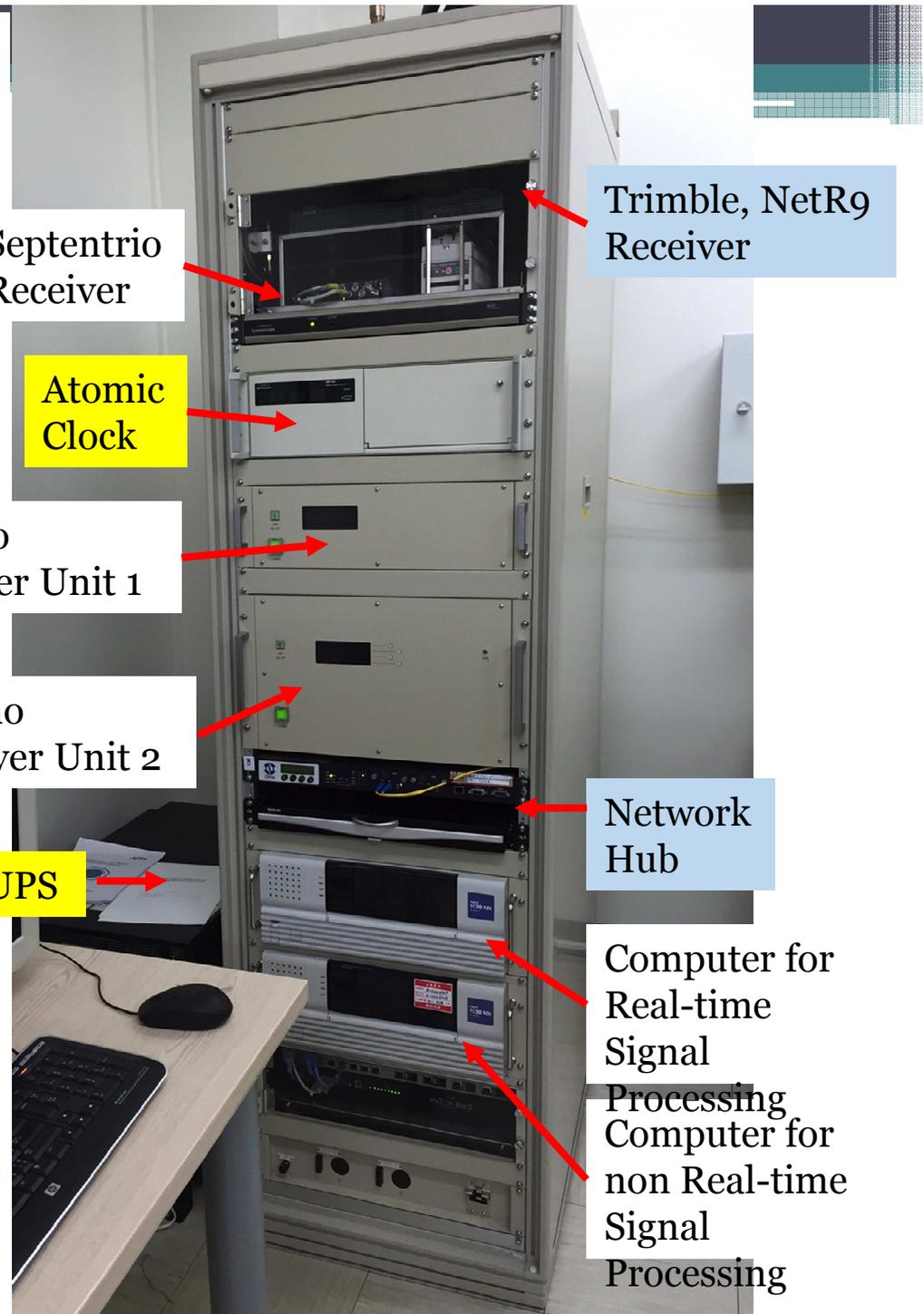
## Trimble-Septentrio receiver

## Furuno receiver

Signal quality monitoring (SQM)

## Weather measurements

Dr. Dinesh Manandhar (The University of Tokyo, visiting faculty in AIT) is supporting us in all the aspects.



# Use of QZSS/GNSS monitoring station

## Base station

- Establishment
- Contribute to IGS

## Research

- Disaster applications,
- Opportunities for postgraduate students in AIT

## Capacity building

- GNSS Training hub for Asian countries
- Workshops

# Use of QZSS/GNSS monitoring station

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## Capacity building

The Ntrip caster was stopped after the flood in 2011, this will be soon started and link to IGS too



# Use of QZSS/GNSS monitoring station

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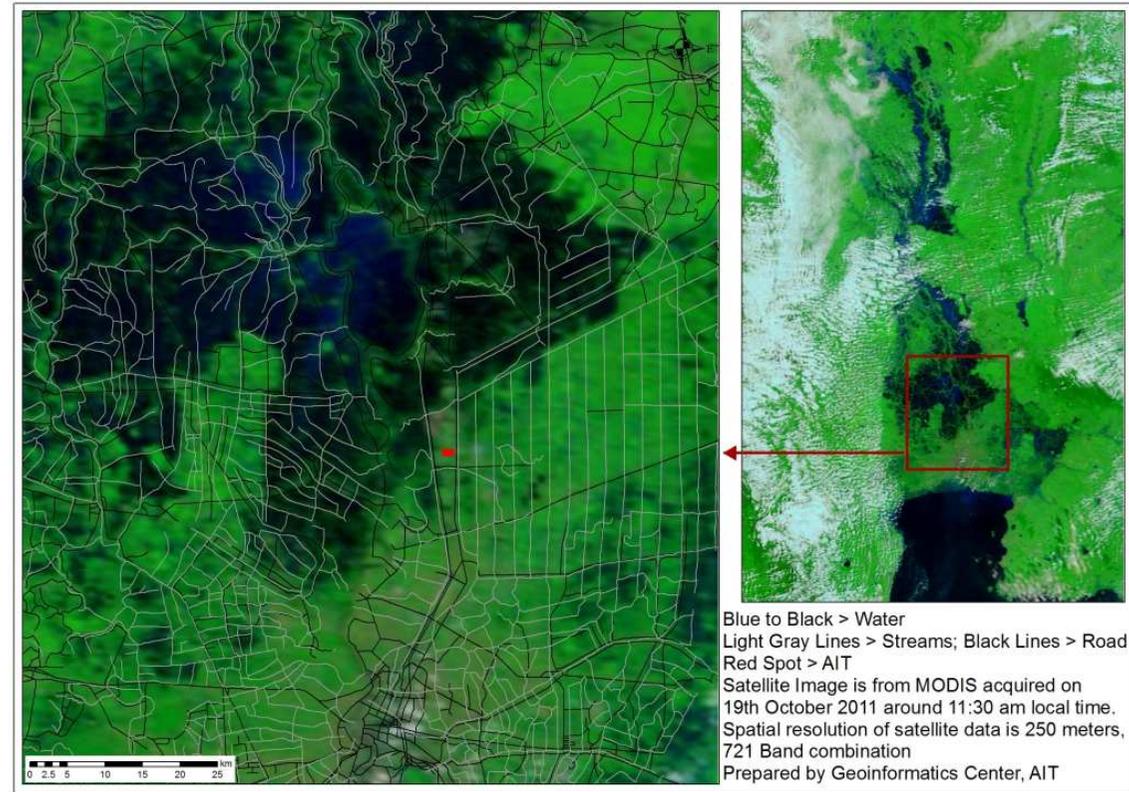
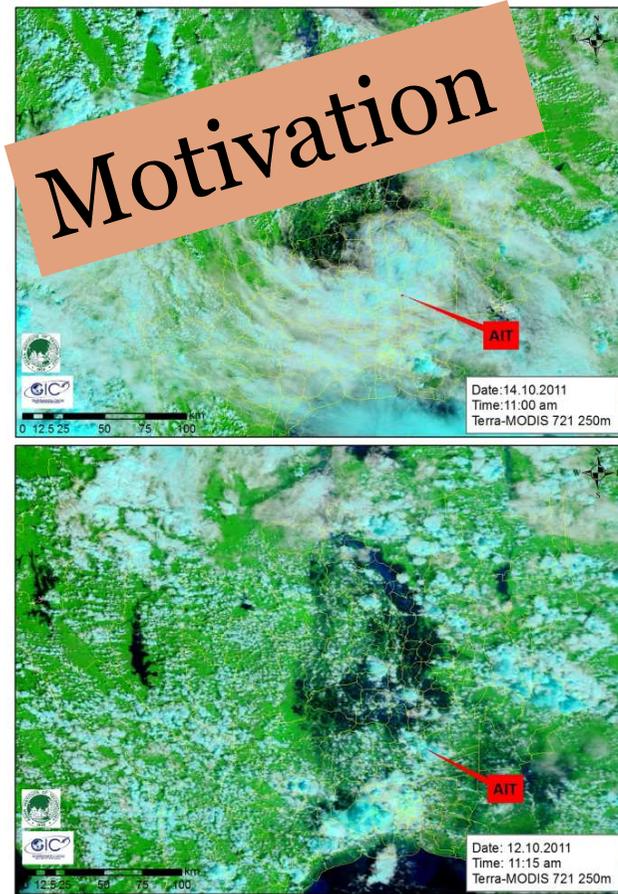
## Research

- Disaster applications, and more
- Opportunities for postgraduate students in AIT

## Capacity building

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# Flood in Thailand and AIT



19<sup>th</sup> October 2011

1<sup>st</sup> step

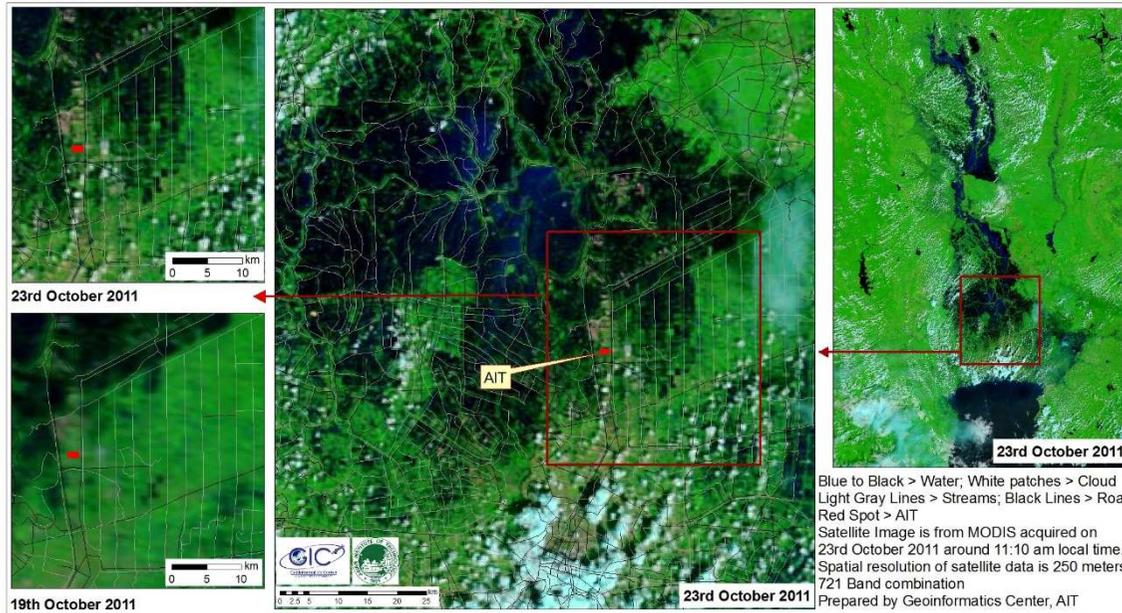
14<sup>th</sup> October 2011

2<sup>nd</sup> step



# Flood in Thailand and AIT

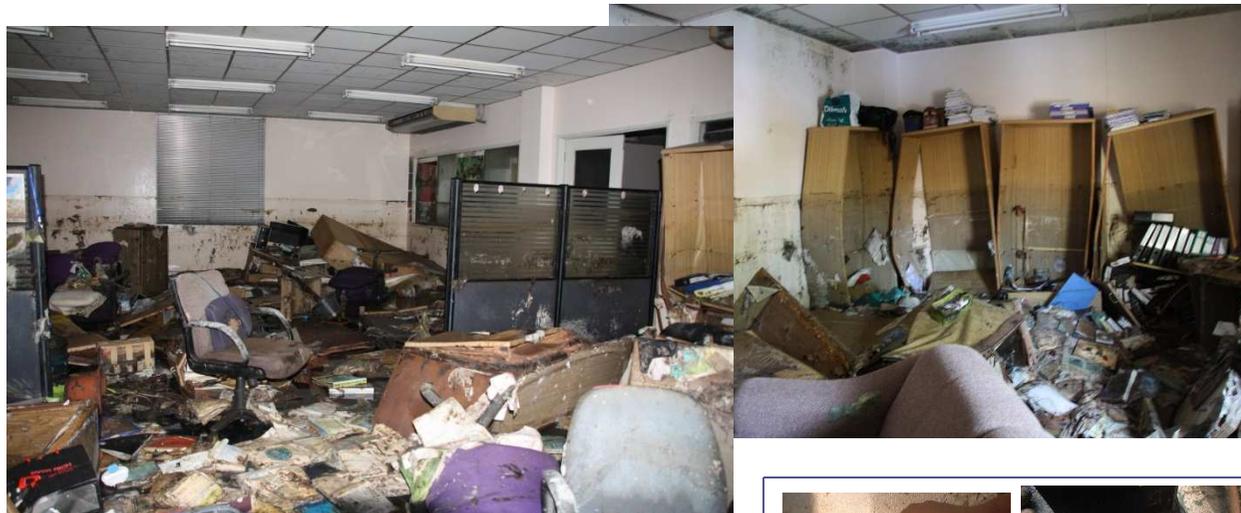
AIT was flooded on 21<sup>th</sup> October 2011



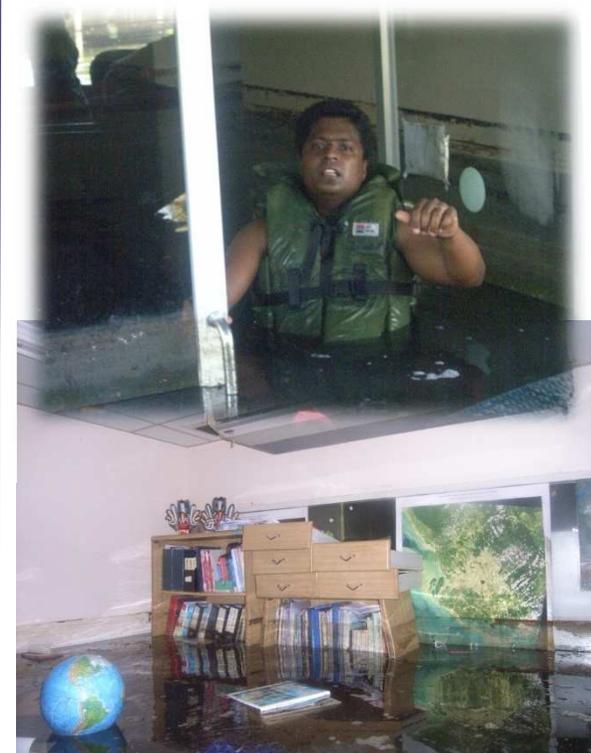
23<sup>rd</sup> October 2011



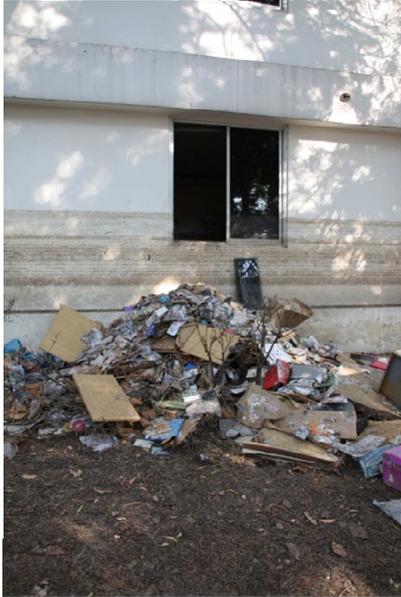
2<sup>nd</sup> November 2011



2<sup>nd</sup> December 2011



# Flood in Thailand and AIT - Cleaning



# Flood in Thailand and AIT - Renovation

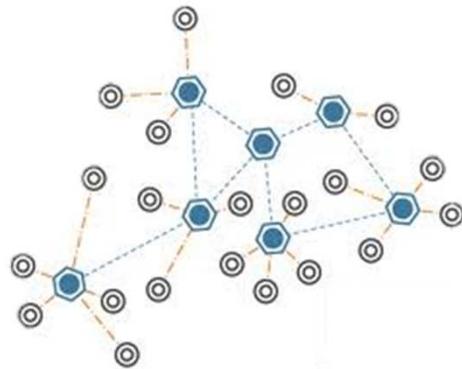




# Research Question

How to improve the flood modeling accuracy using GNSS?

- Accurate DEM.
  - Changes with sand bags.
- Flood height data.
  - Real ground situation

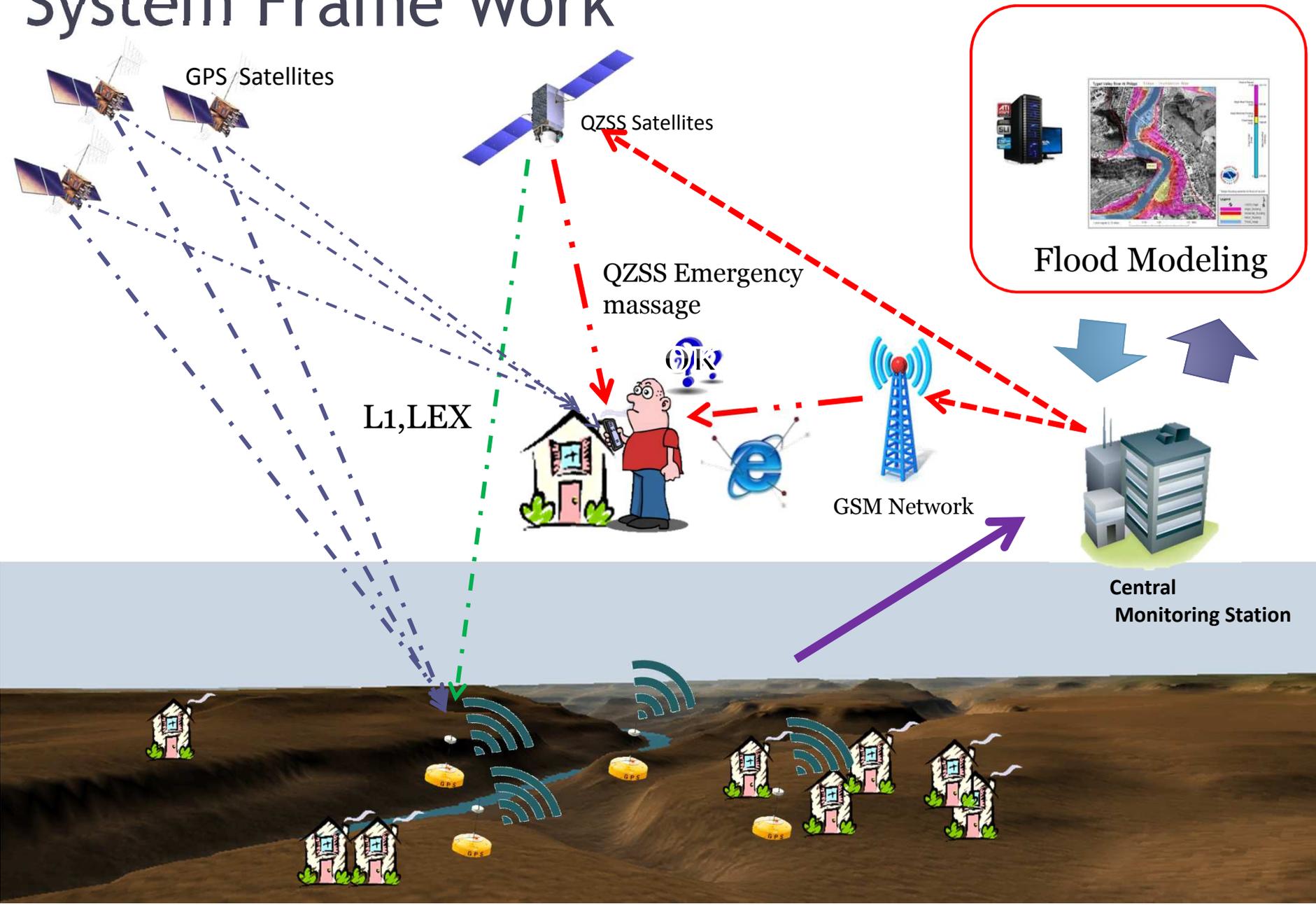


\* This study was carried out by former staff, Mr. Chatura Wickramasinghe (currently, PhD student at RMIT, Australia)

# Objective

- **First stage**
  - Identify measurable minimum vertical movement using real time PPP(Precise Point Positioning) QZSS-LEX.
  - Develop algorithm to accurately calculate the flood water increasing rate using QZSS-LEX based PPP.
- **Final Target**
  - *Develop real time flood monitoring sensor network and new flood model that can use the data for real time dynamic flood modeling.*

# System Frame Work



# Advantages

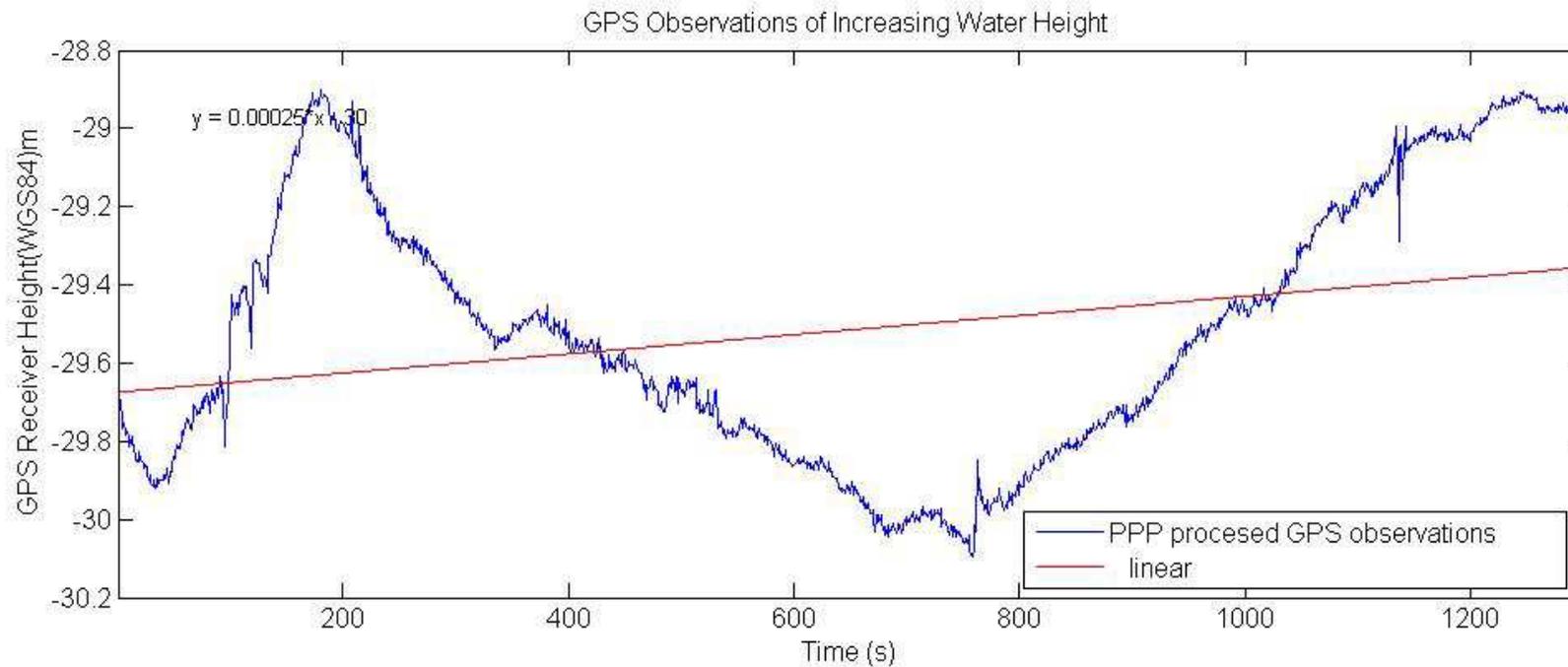


- Highly accurate flood monitoring.
  - Any location
  - Change data gathering point according to the situation.
- Accurate mitigation
  - Monitor how ground situation is deviation from the model and response.
    - Sand bag walls will change the water flow.
- Centralized system.
- Relatively low implementation cost.

# Data Collection



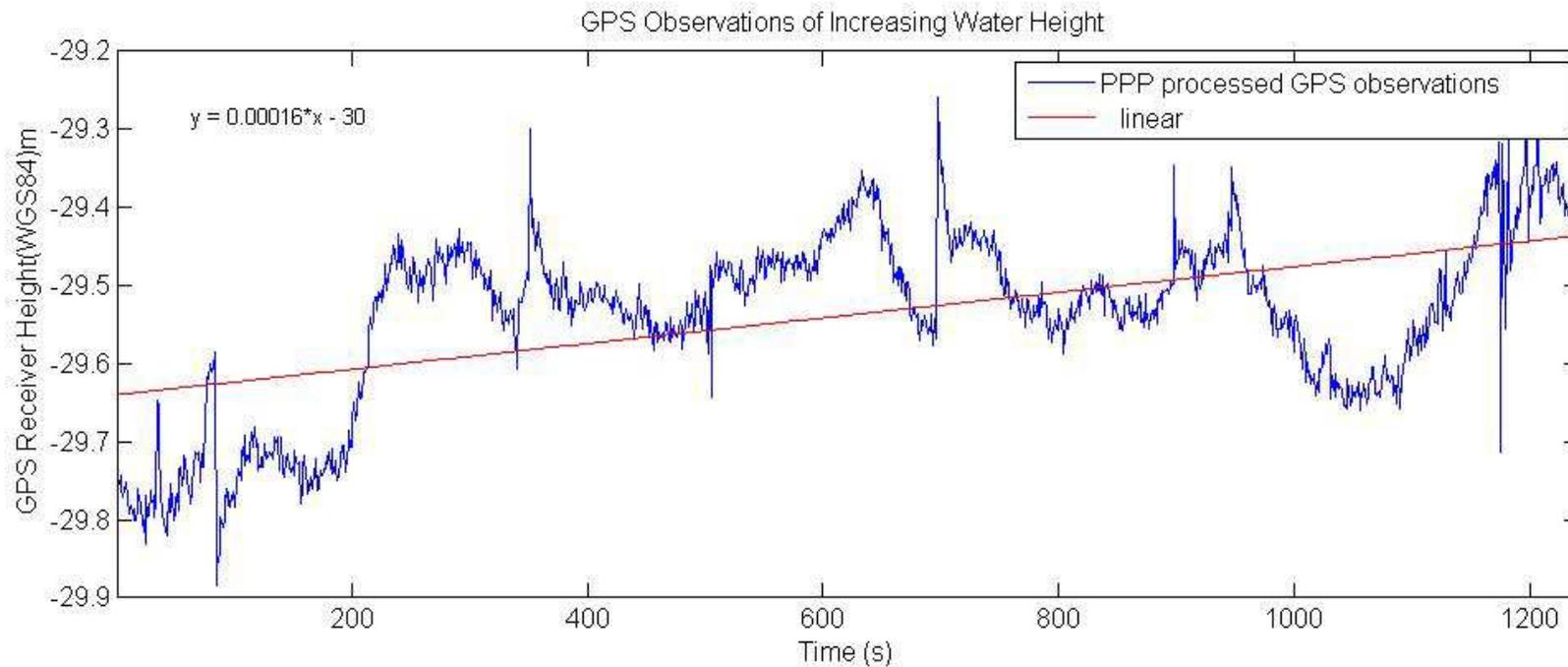
# Initial observation data



Average Water increasing rate 0.028 cm/sec

Linear fit Gradient 0.025 cm/sec

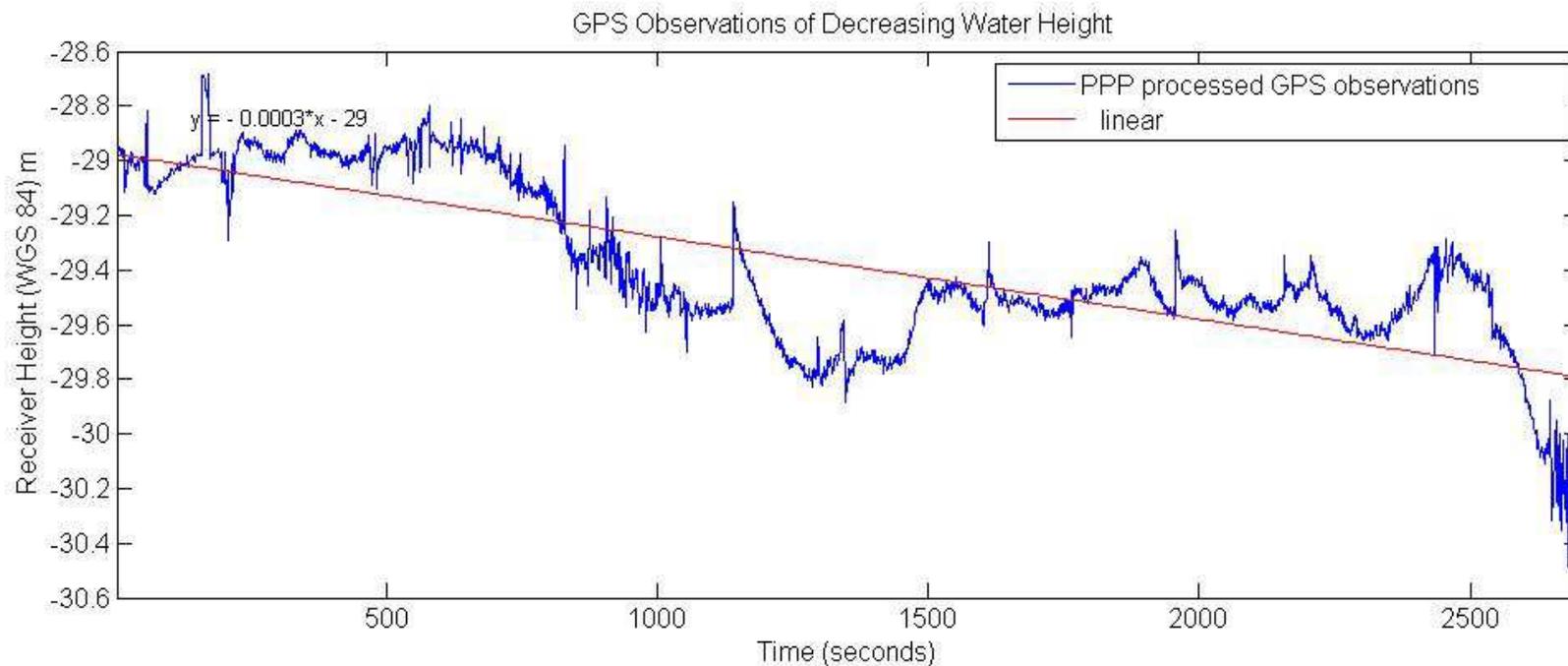
# Initial observation data



Average Water increasing rate 0.026 cm/sec

Linear fit Gradient 0.025 cm/sec

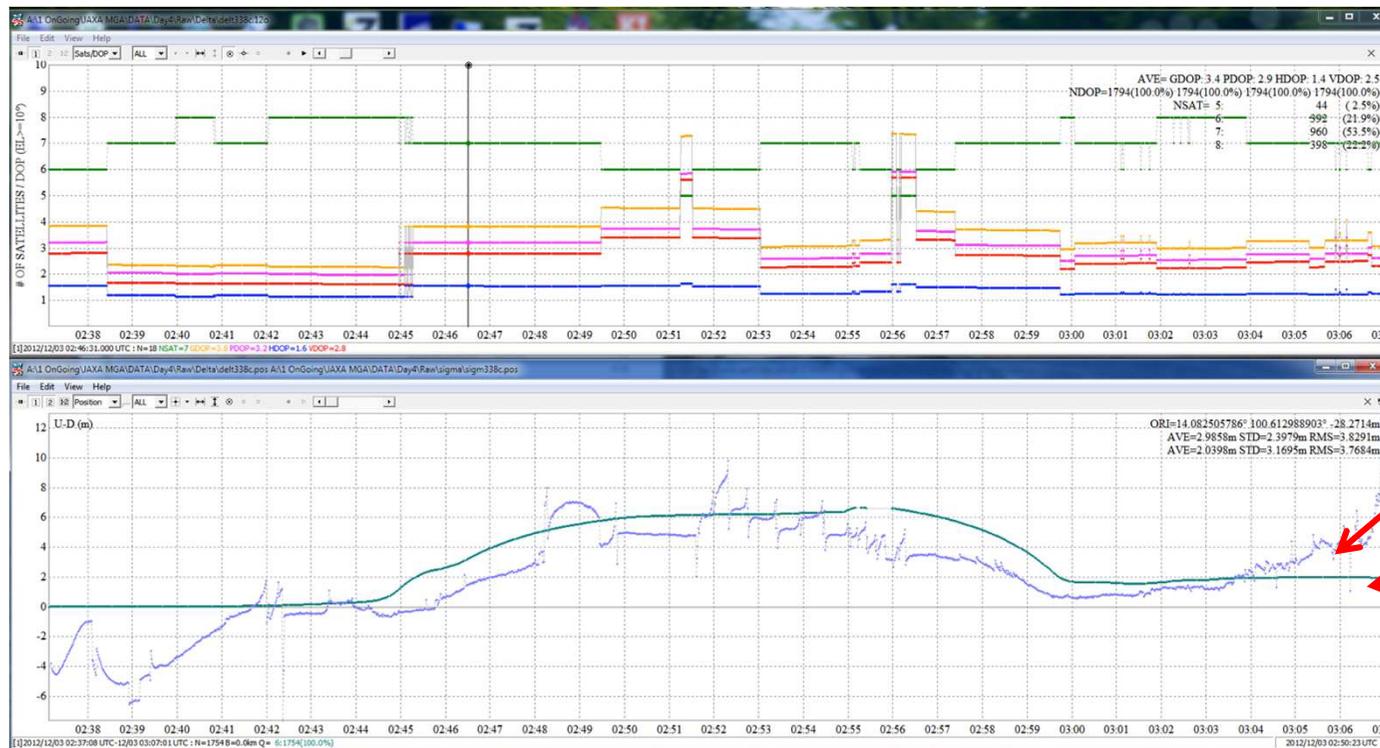
# Initial observation data decreasing water

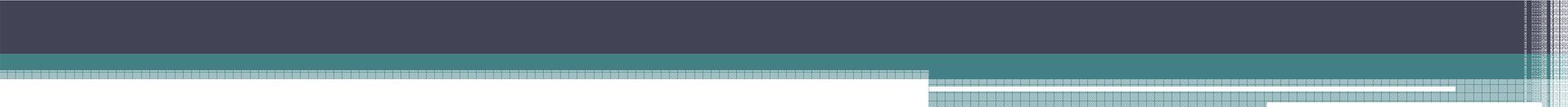


Average Water increasing rate 0.008 cm/sec

Linear fit Gradient 0.03cm/sec

# Initial observation data Cont..





A ongoing project

# APPLYING SPACE-BASED TECHNOLOGY TO STRENGTHEN DISASTER RESILIENCE

Funded by ADB

Implementation agencies: AIT (lead), RESTEC, ADRC, PASCO, GGeoThings

# Project at a Glance

Budget	2 million USD financed by Japan Fund for Poverty Reduction
Duration	2 years ( – March 2017)
Impact	Improved information-based DRM systems and services
Outcome	Improve quality and timeliness of information for disaster preparedness and response using SBT and ICT
Implementation	AIT (lead), RESTEC, ADRC, PASCO, GGeoThings
Output	<ol style="list-style-type: none"><li>1) Enhanced disaster-related information collection, sharing, and utilization of applying SBT and ICT in selected communities</li><li>2) Expanded knowledge on SBT and ICT applications for DRM in each country and the region</li><li>3) Policy guidelines developed regarding sustainable SBT and ICT applications for DRM in each country</li></ol>

# Pilot Countries



# Overall Approach

## (i) Community-based OpenStreetMap base map development



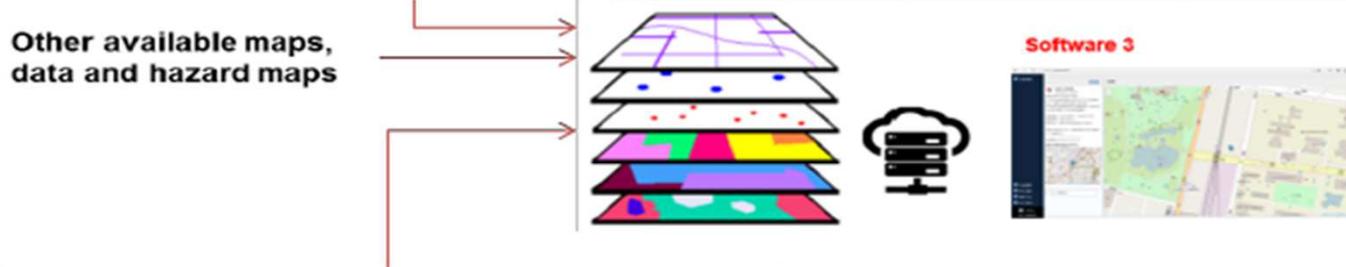
## (ii) Community-based hazard risk and evacuation mapping



## (iii) Crisis mapping



## (v) Data Mgt. using GIS at the local government



## (iv) Utilization of satellite-based damage assessment



## (vi) Utilization of data at community level for disaster risk reduction, response and recovery



# Data Management System

## Integral point of SBT and ICT

- Data sharing and management system among stakeholders
- Simple analysis functions for disaster risk

The screenshot displays a data management system interface. On the left, a panel shows a photo of soil erosion at Nawaka Village, dated 2016-04-28 06:46. The photo shows a group of people standing in a field with eroded soil. On the right, a map of the village is shown with building foundations marked by blue pins. A blue box highlights a specific area on the map with the text "Building foundation < = possible at-risk area for flooding". Below the map, a list of building details is visible:

- Visual condition
- Building material
- Roof material
- Landscape etc

# Use of QZSS/GNSS monitoring station

## Base station

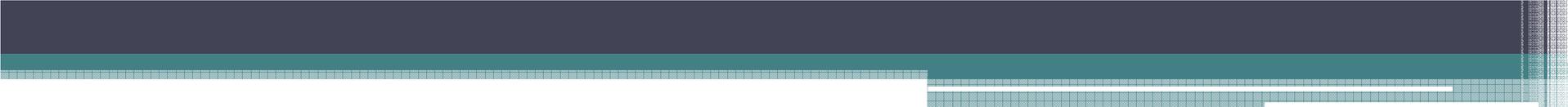
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## Research

- Disaster applications, and more
- Opportunities for postgraduate students in AIT

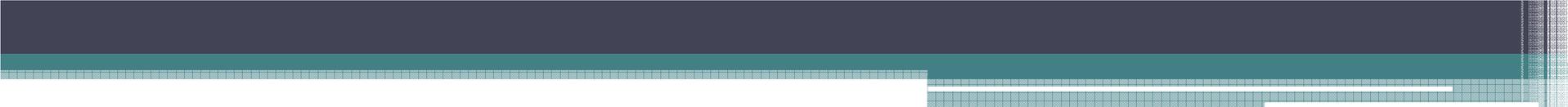
## Capacity building

- GNSS Training hub for Asian countries
- Workshops



# GNSS training hub for Asian countries

- Geoinformatics center has long history of conducting geomatics related programs for Asian countries
- Association with the University of Tokyo for delivering advanced training programs and workshops
- We thrive with the partnerships and collaborations: looking for fostering new collaborative research in the field of GNSS and applications



# Thank You!

Contact:

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