AOSWA
Asia-Oceania Space Weather Alliance

COVID-19 Pandemic in Thailand

Sittiporn Channumsin, Ph.D.
Researcher, GISTDA, Thailand

About me

Qualification

-PhD Aerospace engineering (2016) University of Glasgow, UK

-Master of Science (MSc Space Technology and Planetary Exploration, AWD MSc merit) University of Surrey, UK

-Bachelor of Engineering (B.Eng in electronics engineering, Magna cum laude) KMITL, Thailand

Research

- Astrodynamics Spacecraft autonomous, flight mechanics and control, space debris and asteroid orbital dynamics and planetary exploration mission

Current responsibility

- Earth Space System Frontier Research manager (GISTDA)
- Chief of Astrodynamics Research Laboratory (AstroLab)
- Current Project: Onboard flight software of small satellites (TOPAZ)
  Development of space traffic management system (ZIRCON)
  Development of space weather forecast (JASPER)
- Fundamental of Astronautical engineering courses
- Lecturer and academic services

Dr. Sittiporn Channumsin (Researcher , professional level)

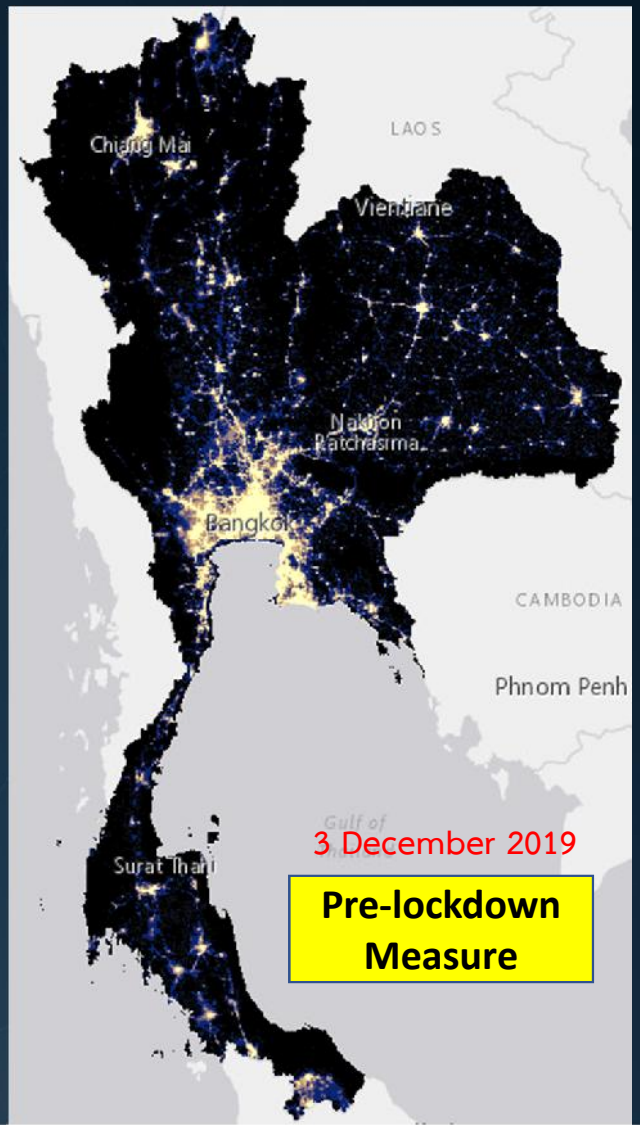
Email: sittiporn@gistda.or.th

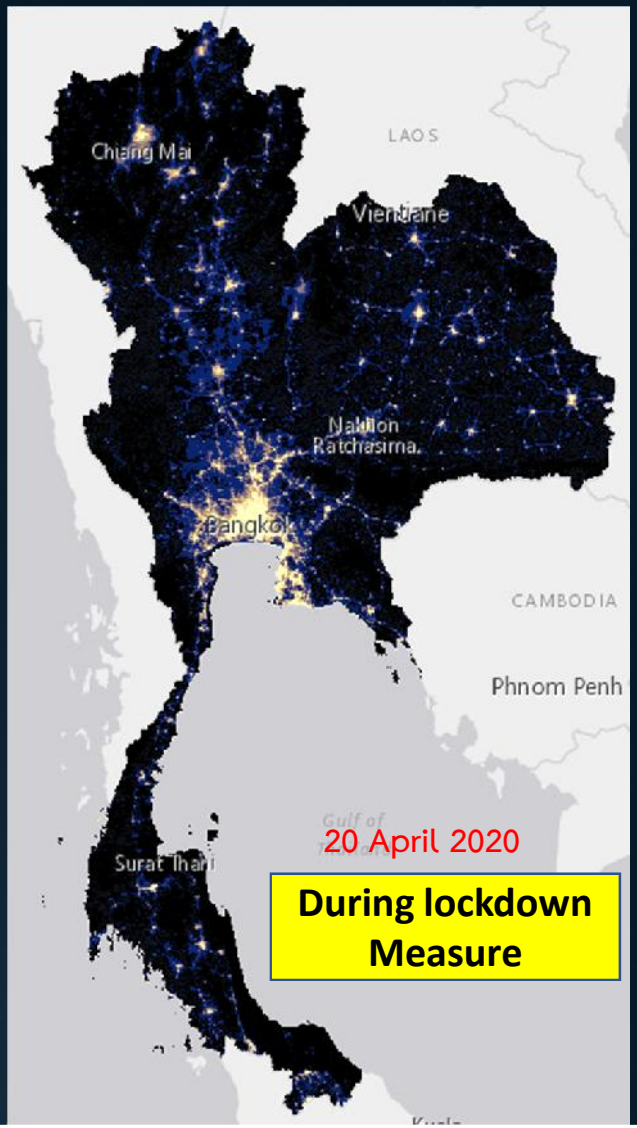
Outline

- Introduction and current COVID-19 situation
- Centre for Covid-19 Situation Administration: CCSA
- Challenges

Introduction

Reduce Night Light Image (Suomi NPP)





Current situation

COVID-19 OUTBREAK

Last updated: Nov 20, 2020 at 19:13 hrs.

THAILAND SITUATION

Total cases: 3,892	Recovered: 3,745
	Deaths: 60
New cases: +4	Rank: 151

Centre for Covid-19 Situation Administration: CCSA

Centre for Covid-19 Situation Administration: CCSA

- operation platform
- support the policy makers, the Working Group on Data Integration and Analysis for Covid-19 Situation
- For operation planning, and support inspection teams, Centre for Correction of Security Emergency, and Provincial Disease Control Centre's
- The essential data were summarized, linked to the map and displayed on a developed dashboard for the situation administration

Operational Structure

ไทยชนะ

Patient

Database
Ministry of Public Health Database

Management System (SQ/LQ) GBDi
Ministry of Digital Economy and Society

Thai Tracking Application
Ministry of Interior

Phonphai (Thai Red Cross)

Risk Group
(Bangkok Metropolitan Administration)

Other sources

COVID-19 i-MAP

- Integrated data system for COVID-19 situation Administration

Ministry of Finance – Data Center

Working Group on Data Integration for COVID-19 situation administration / Department of Disease Control - Data Controller

Pandemic Situation

Situation Mapping (GISTDA)

GISTDA PORTAL

COVID -19 iMAP

Medical Capacity/Supplies

Preventive and Precautionary measures

Consumer Goods

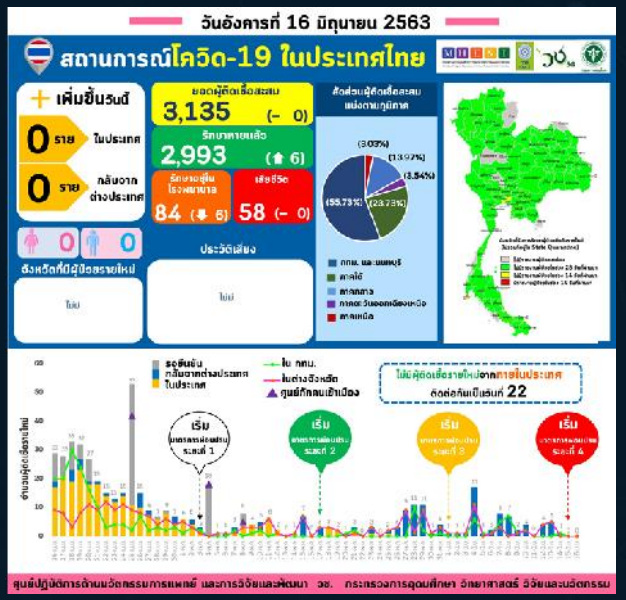
User

9 users in the Policy Level

77 users in operational level (Provincial)

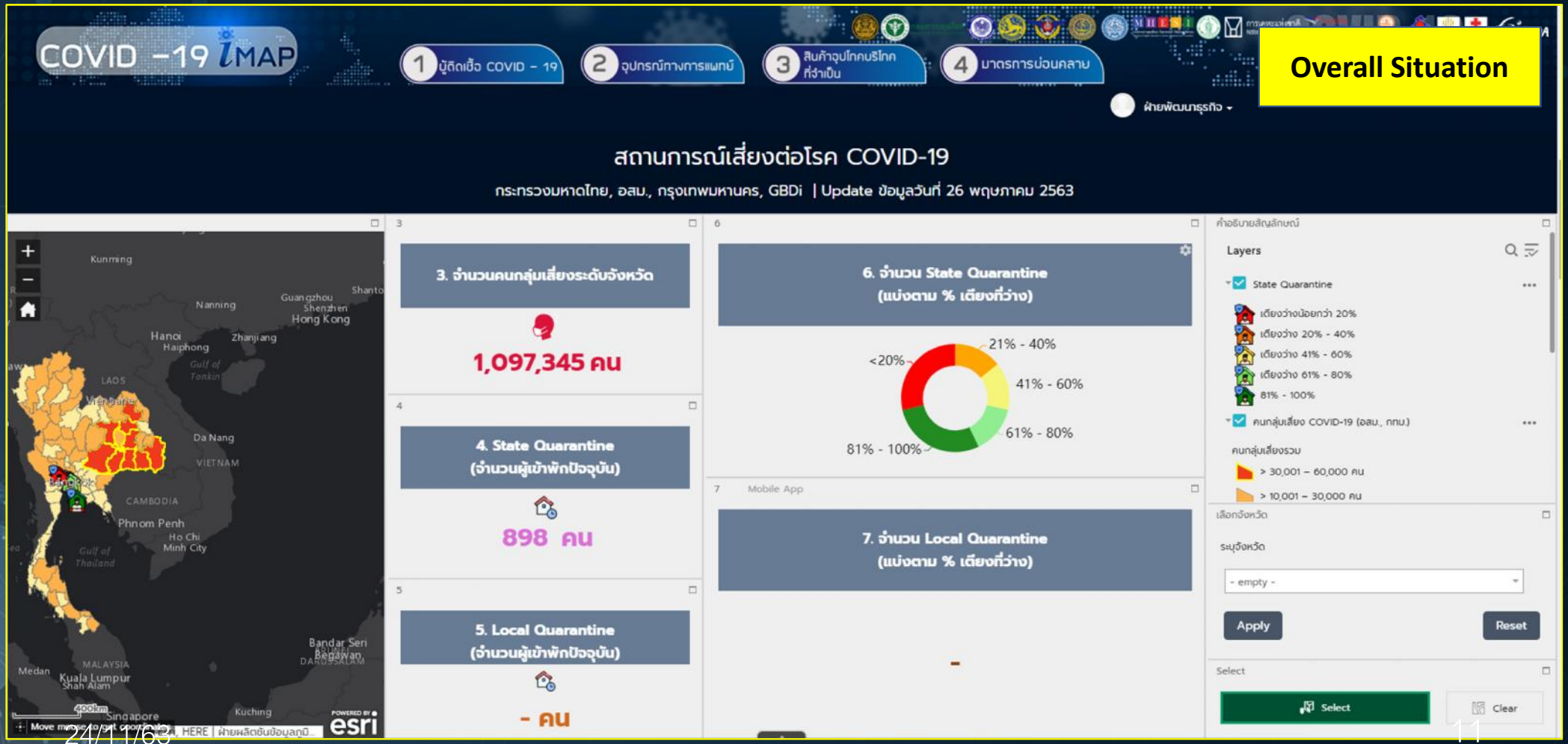
- Monitor and management of the density of people on the premises.
- Operational planning of checking the premises

Apps & Social Medias

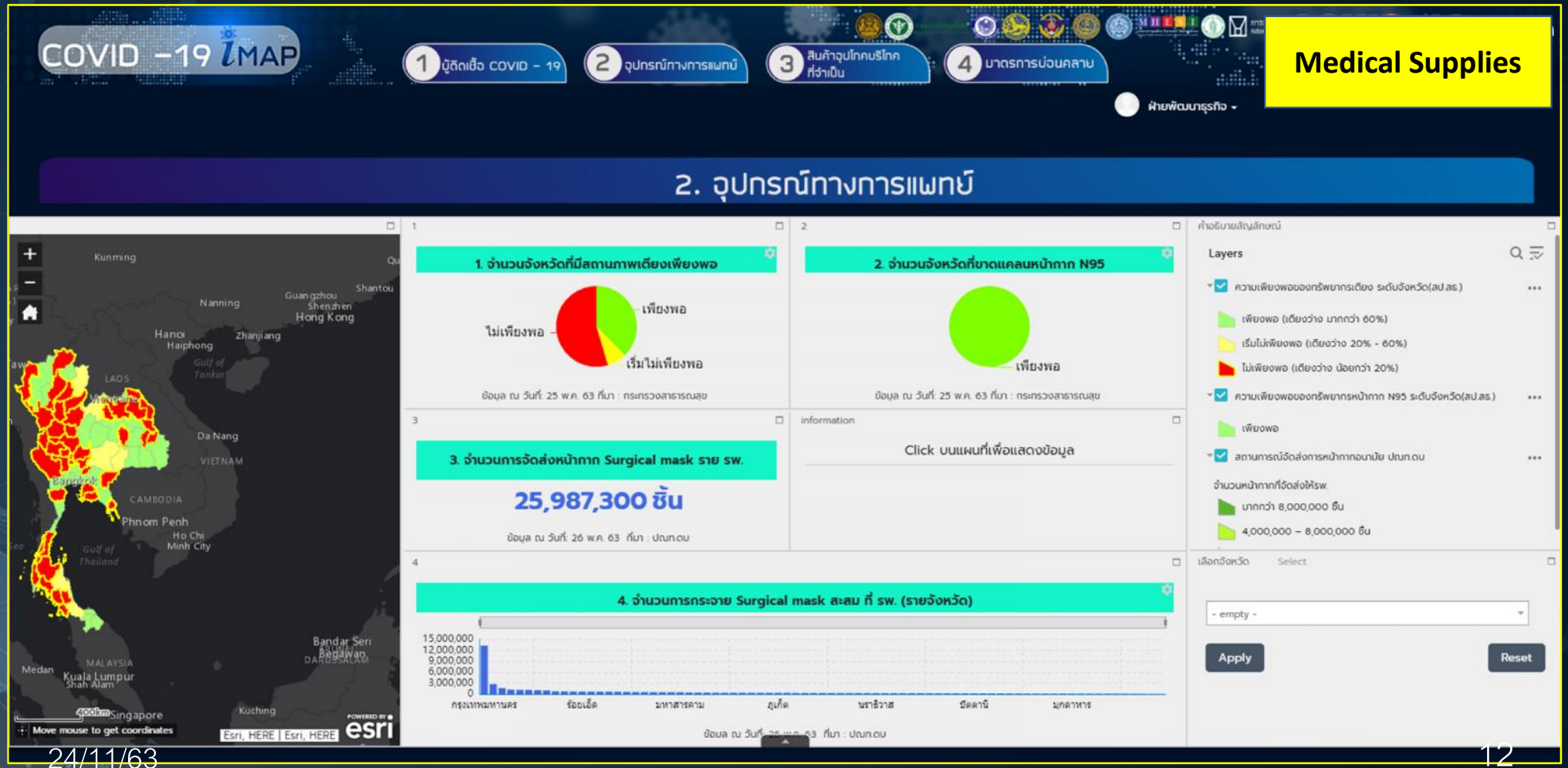


Variety of data, information & numbers
from related agencies

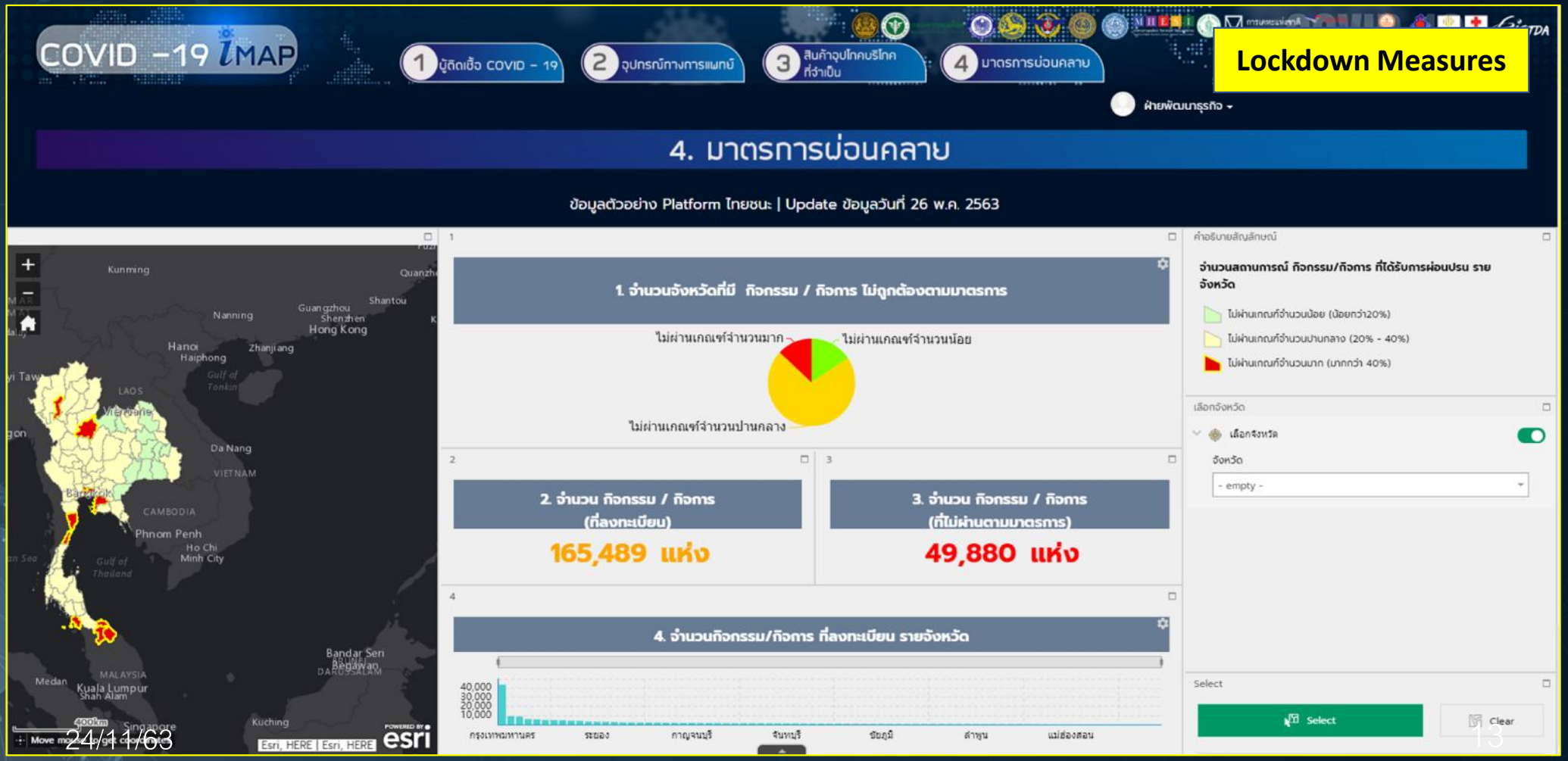
Samples Operation Dashboard



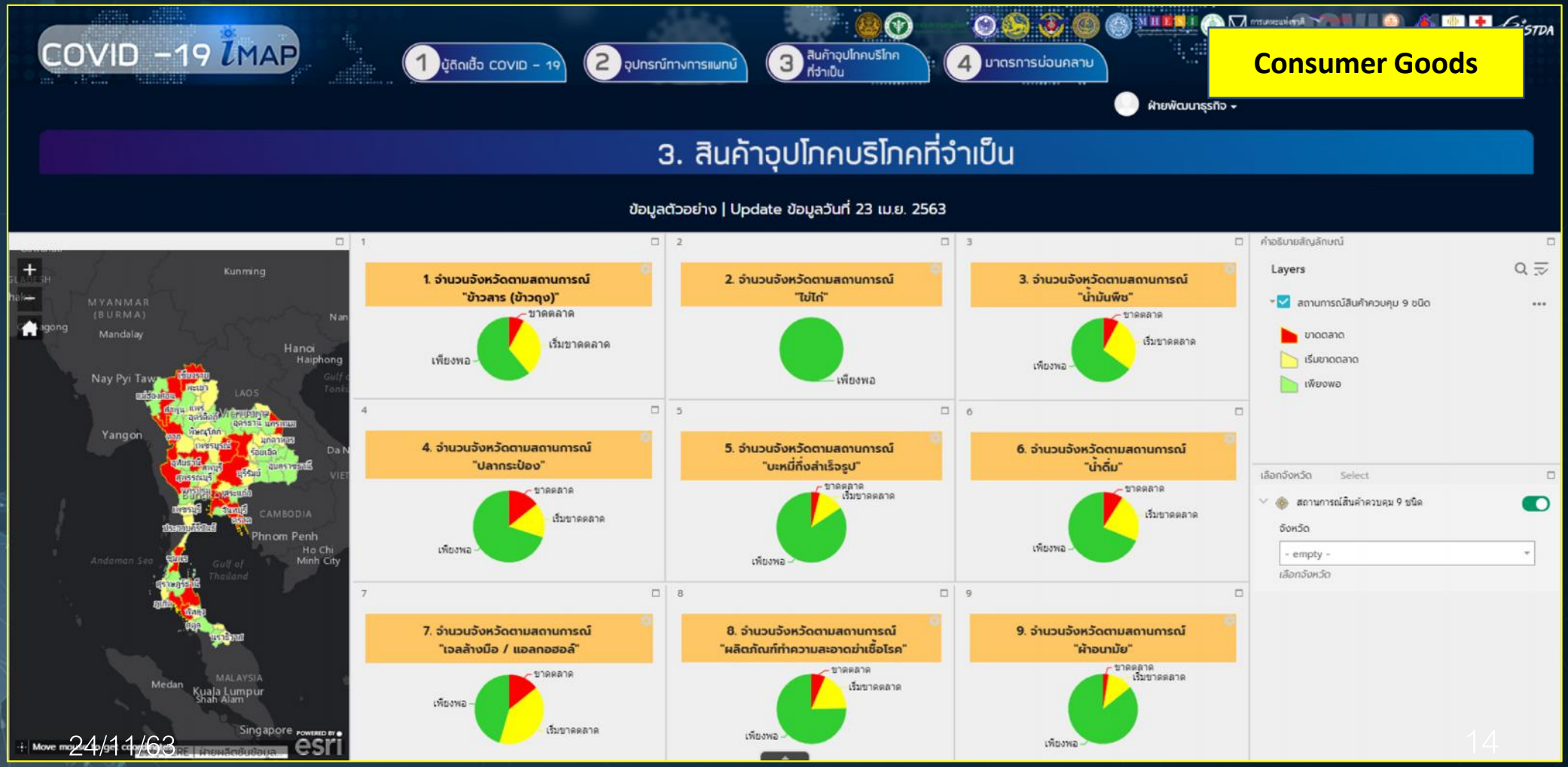
Samples Operation Dashboard



Samples Operation Dashboard



Samples Operation Dashboard



Challenges

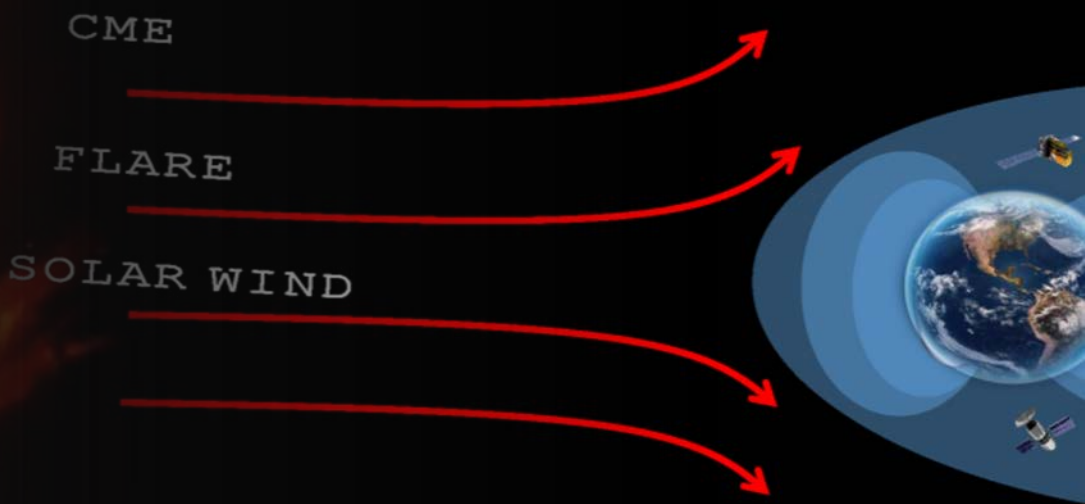
Challenges

- To drive from “policy” to “action”
- Cooperation and authority are essential
- Completeness of data
- Data accessibility vs data privacy
- From current situation to projection (social and economic impacts)

AOSWA
Asia-Oceania Space Weather Alliance

Thank you for your attention

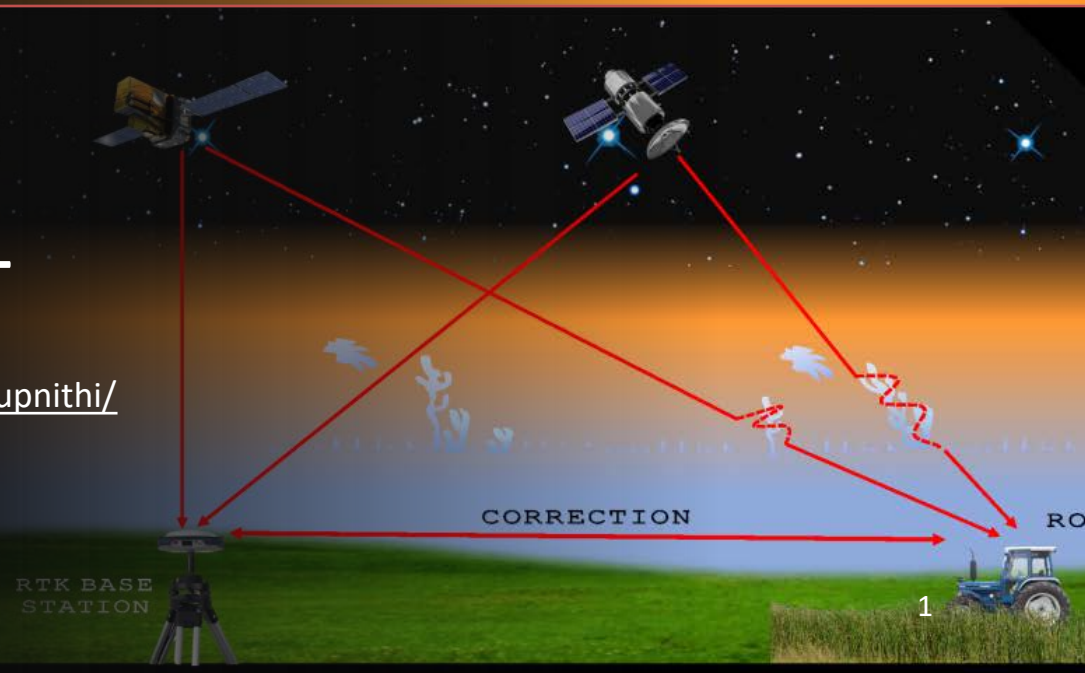
(Online) AOSWA 2020 Workshop



Prof.Pornchai Supnithi
Faculty of Engineering, KMITL

Email: pornchai.su@kmitl.ac.th
Website: https://sites.google.com/view/pornchaisupnithi/

GNSS and Space Weather Information Center
http://iono-gnss.kmitl.ac.th



Outline

- How is the impact on our activity with COVID-19, social impact?
- Update Information on our activity
- Lesson learned and step for future

Impact on our activity with COVID-19

Obstacles on new GNSS staions

Ionosonde
GNSS receiver
Beacon receiver

Chiangmai (CHM)

GNSS receiver

Yangon (Myanmar)

Vientiene (Laos)

GNSS receiver

Nakhon Ratchasima (NKR)

GNSS receiver

Bangkok (STFD)

GNSS receiver

Bangkok (KMITL)

GNSS receiver
Beacon receiver

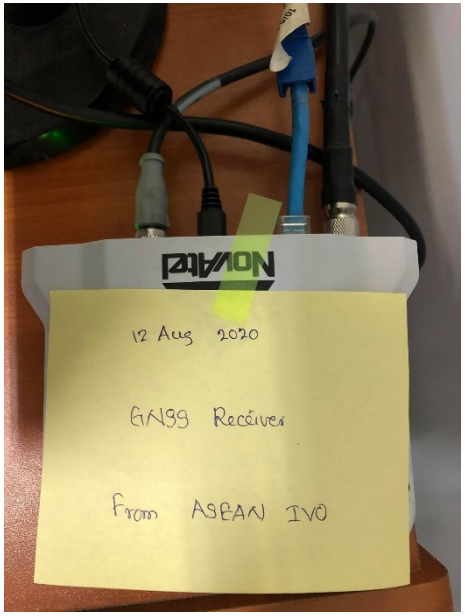
GNSS receiver
Beacon receiver
Magnetometer

Phuket (PKT)

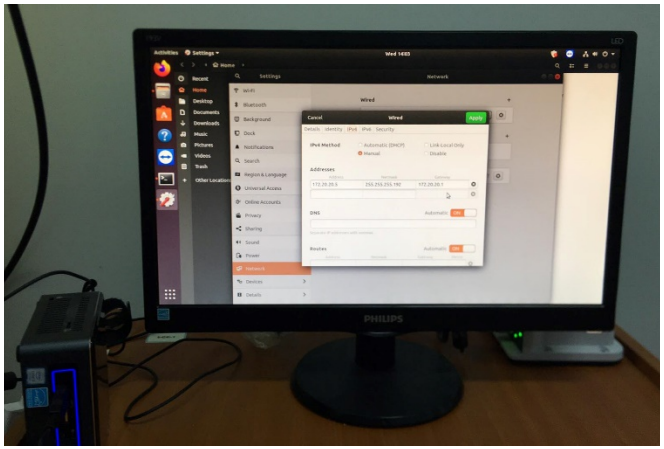
Chumphon (CPN)

Ionosonde
GNSS receiver
Beacon receiver
VHF radar

YTU station (Yangon technological university)



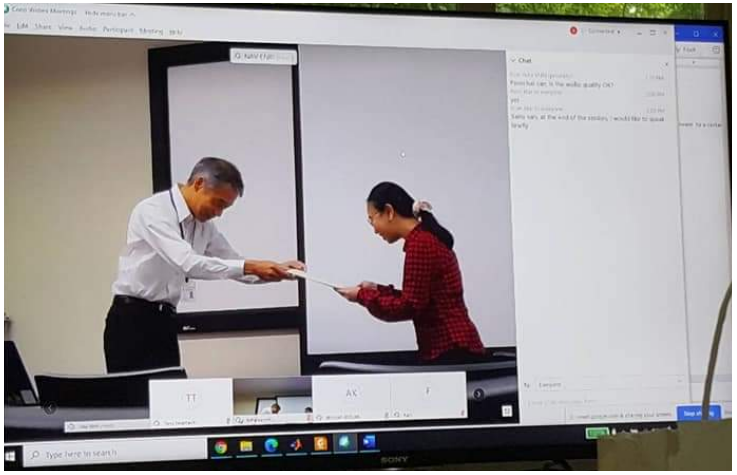
- New station installed
- 'Second wave'
  - ➔ campus is closed down
    no electricity
- No travel yet

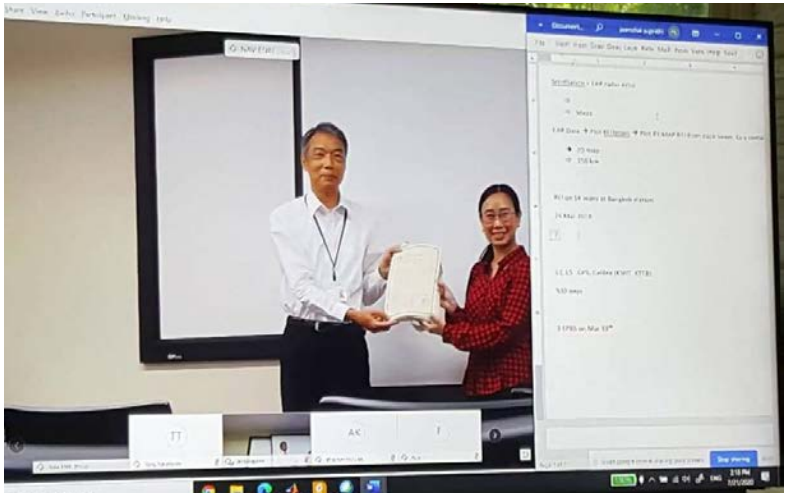


NUOL station (National University of Laos)

- New GNSS receiver for replacement is waiting to be installed
- No travel yet

Disruption in International visit





Prolonged doctoral student abroad (ENRI, Japan)

8 months ➔ 14 months

- *Immediate future International exchange visit still not possible*

Some activities

Thai Space Physics & Space Weather workshop

Host: Prof David John Ruffolo (Mahidol University)

Purpose : **To present and update research in space weather**

2019

2020

MOU between NICT and GISTDA (Dec 2019)

Research development plan

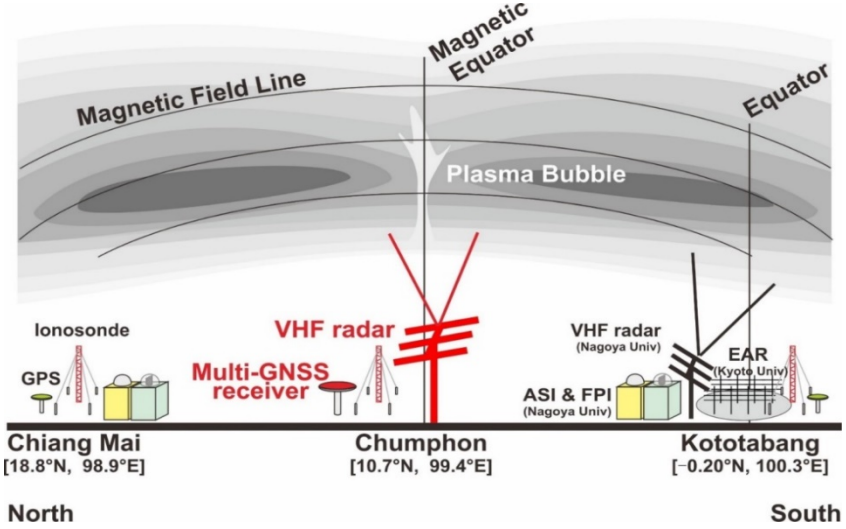
(Priority)

	Research area				
Research level	Sun	Solar wind	Magnetosphere	Geomagnetic	Ionosphere
Observation	3rd	3rd	3rd	2nd	1st
Model/simulation	3rd	3rd	3rd	2nd	1st
Application	3rd	3rd	3rd	1st	1st
Operation	1st	1st	1st	1st	1st

Chumphon VHF Radar station

Assoc. Prof. Punyawi Jamjareegulgarn

(KMITL) Chumphon campus



VHF station

VHF Antenna

VHF antenna array
39.25 MHz

Official Opening: Jan. 2020

(Domestic)
Research seminar: GNSS and Ionosphere

“Trends and Challenges in Precise Positioning Technology”

30th October, 2020

About 100 participants (online, offline)

KMITL Lab visit (Open House)

New MOUs/Collaboration

- **Renewed MOUs**
  - KMITL-ENRI (Japan)

- **New MOUs/Collaboration**
  - KMITL-GISTDA (Space Weather)
  - ASEAN-India Collaboration

    "Artificial intelligence (AI) for …."
  - KMITL-CAS Collaboration

    "Effects of ionospheric scintillation on PPP-RTK service"

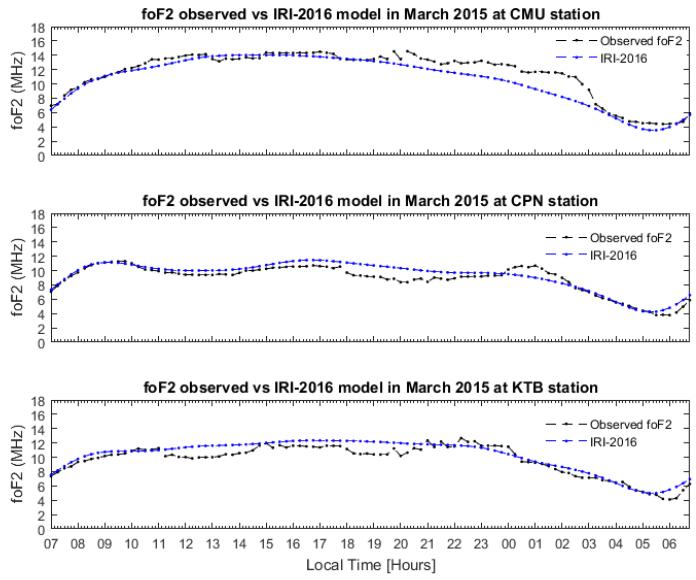
Multi GNSS Positioning Accuracy

Table 3 RMS of positioning via multi GNSS.

Quieted day 2018

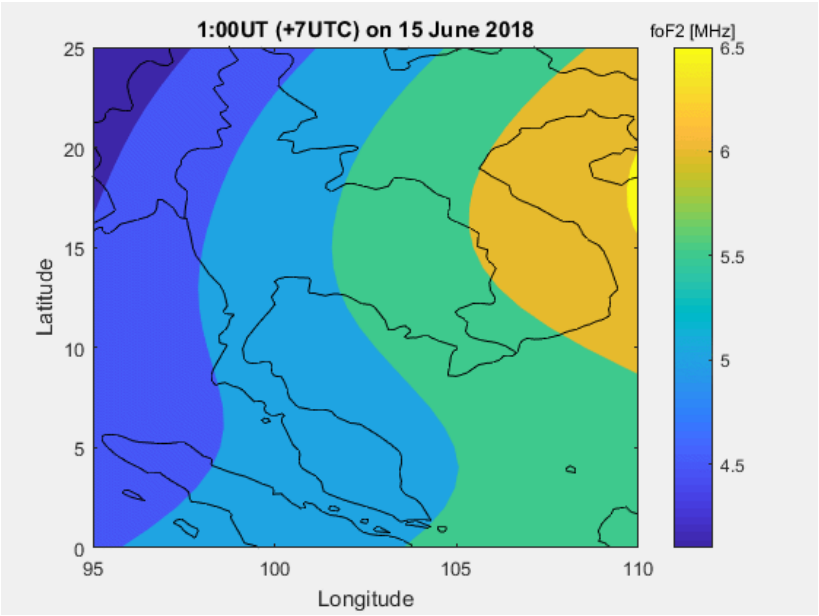
Systems	E-W (m)	N-S (m)	U-D (m)	Number of sat
GPS	1.5729	0.8638	8.5413	6-10
Glonass	3.5841	2.6598	10.9645	4-7
Galileo	2.0029	**0.6603**	**7.1870**	4-7
Beidou	**1.5457**	0.8666	7.3465	4-7
GPS+GLO	1.6770	0.9363	7.5195	10-17
GPS+GAL	1.6321	0.5033	7.5990	10-17
GPS+BEI	**0.9406**	**0.4272**	7.4440	10-17
GLO+GAL	1.8381	1.2243	**6.5923**	8-14
GLO+BEI	1.1863	1.1566	7.0672	8-14
GAL+BEI	1.5457	0.8666	7.3465	8-14
GPS+GLO+GAL	1.5965	0.6168	7.0866	14-24
GPS+GLO+BEI	0.9178	0.6627	7.0622	14-24
GPS+GAL+BEI	**0.8545**	**0.3958**	6.8806	14-24
GAL+GLO+BEI	1.0400	0.8780	**6.3635**	12-21
GNSS	0.9596	0.5420	6.7196	18-31

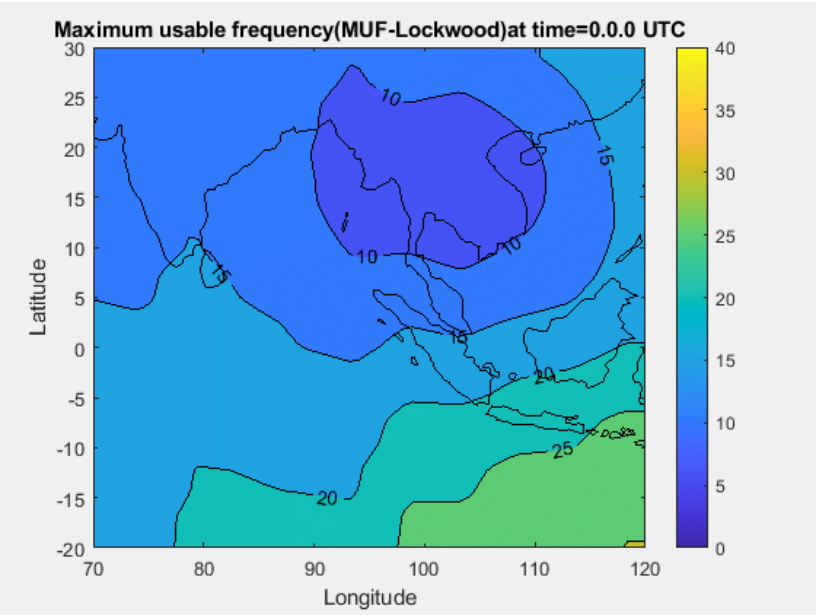
foF2 map, MUF map



Critical frequency at F2 layer (foF2)

Maximum usable frequency MUF map (2-30 MHz)

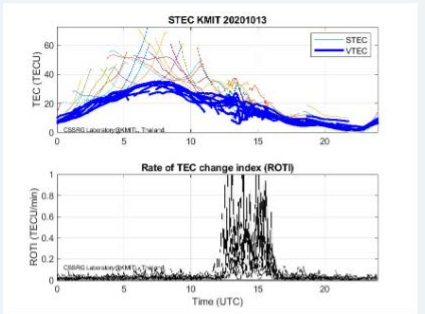




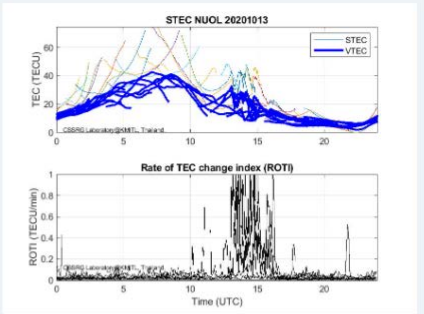
1-D, 2-D TEC/ROTI Map

Daily TEC/ROTI Plots

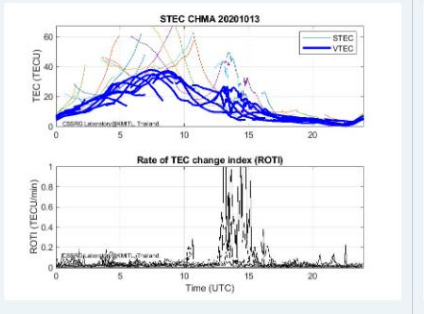
Bangkok (KMITL)



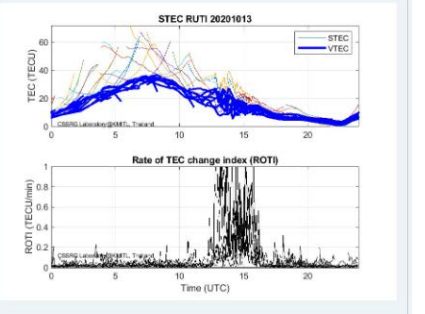
Vientiane (NUOL)



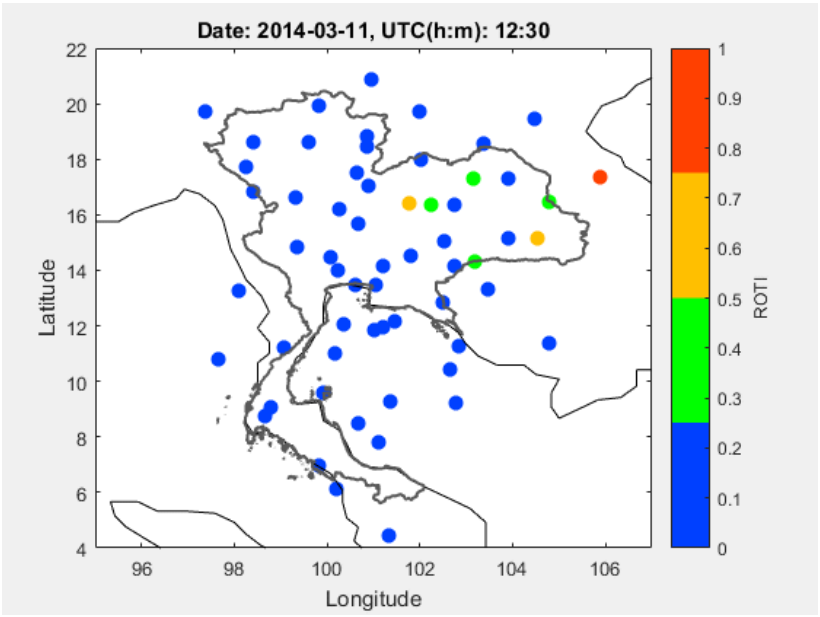
Chiangmai (CHMA)

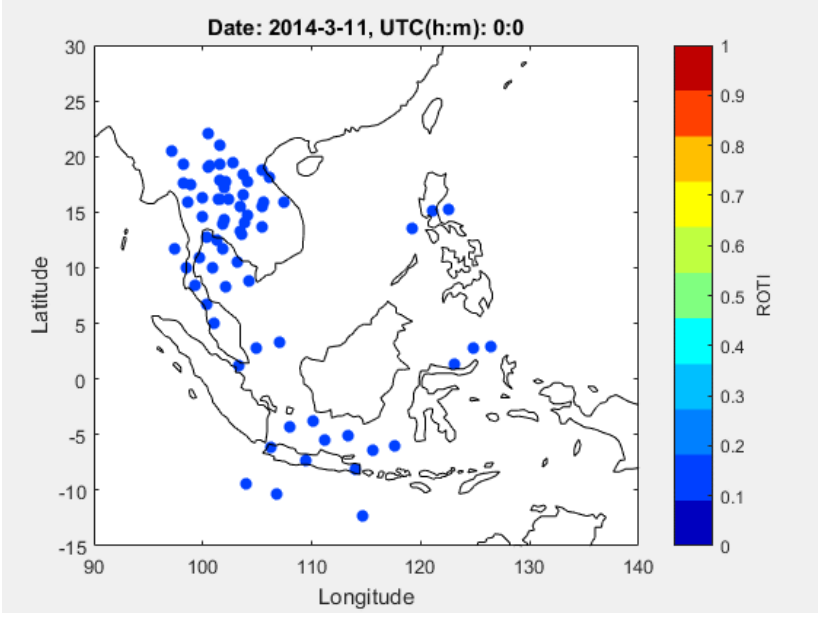


Nakhon Ratchasima (RUTI)



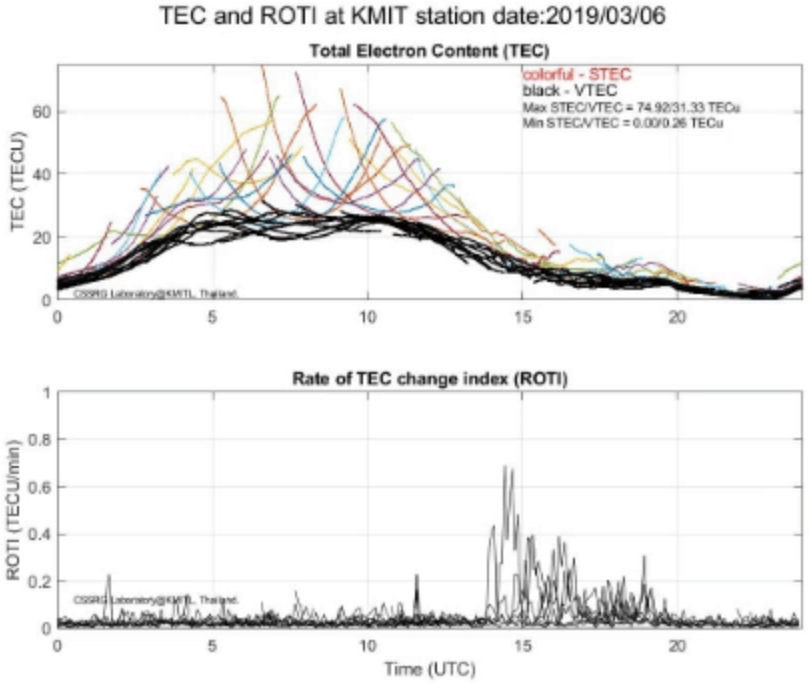
2-D ROTI Map



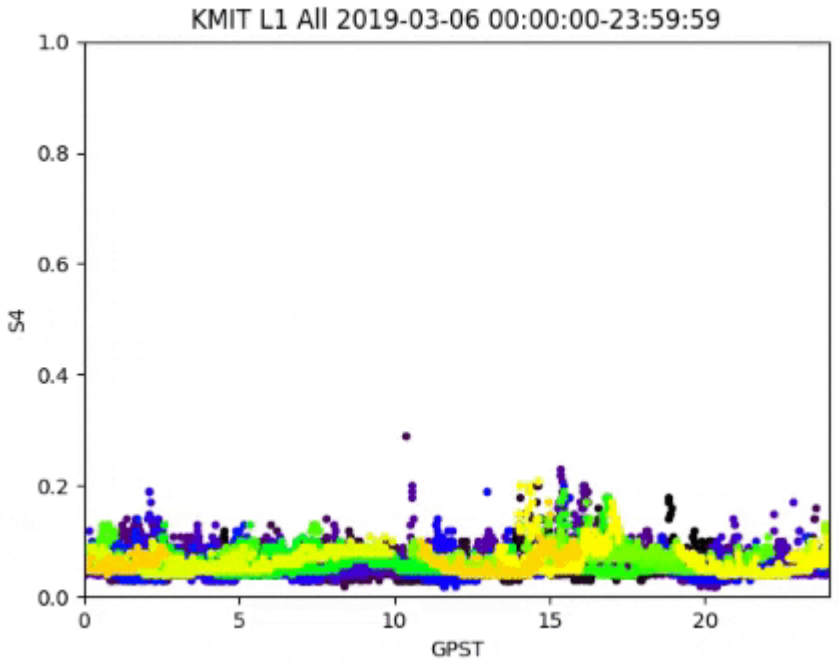


Scintillation statistics

TEC / ROTI Plots



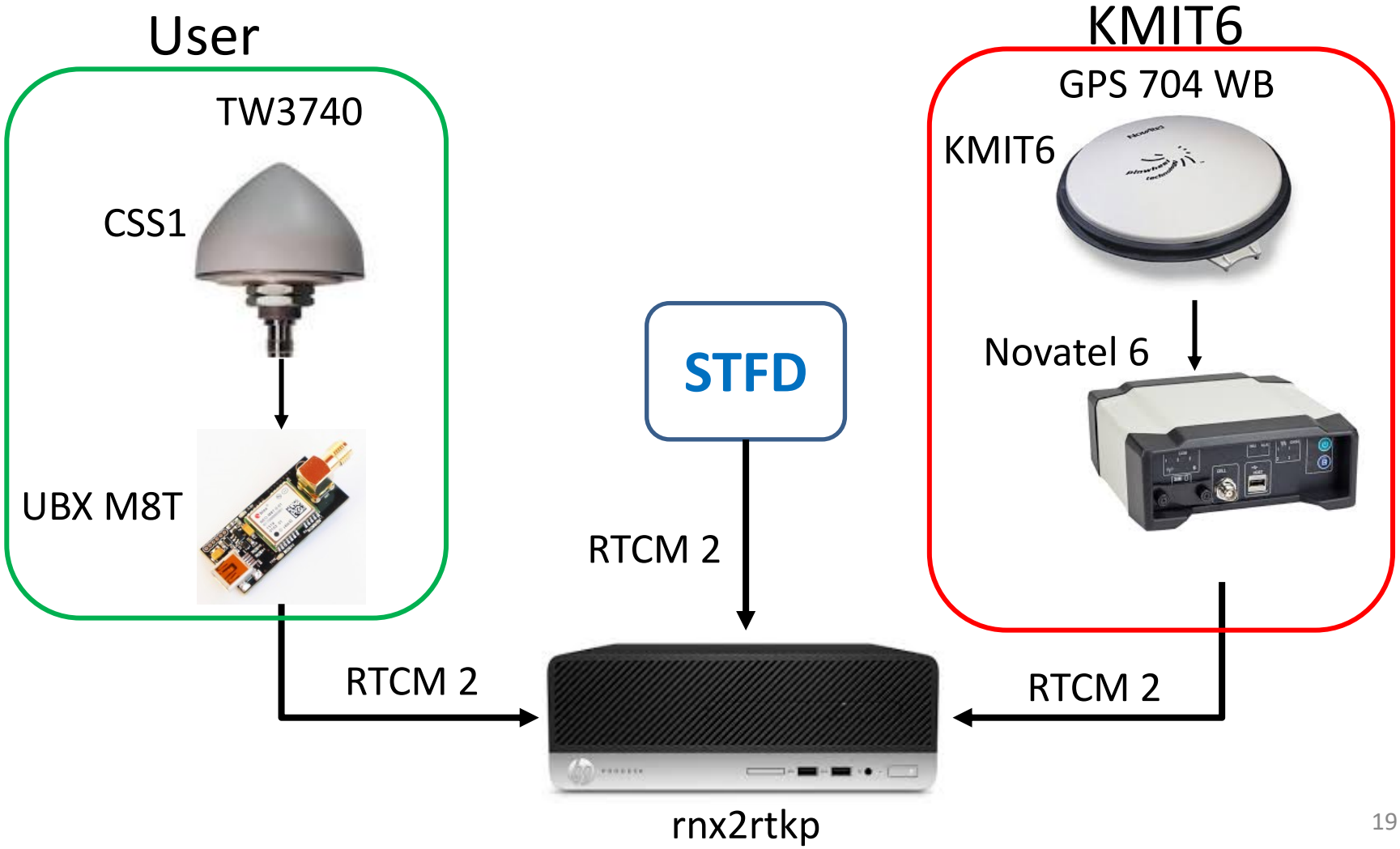
S4 index



 # days with scintillation (2019) = 47 days

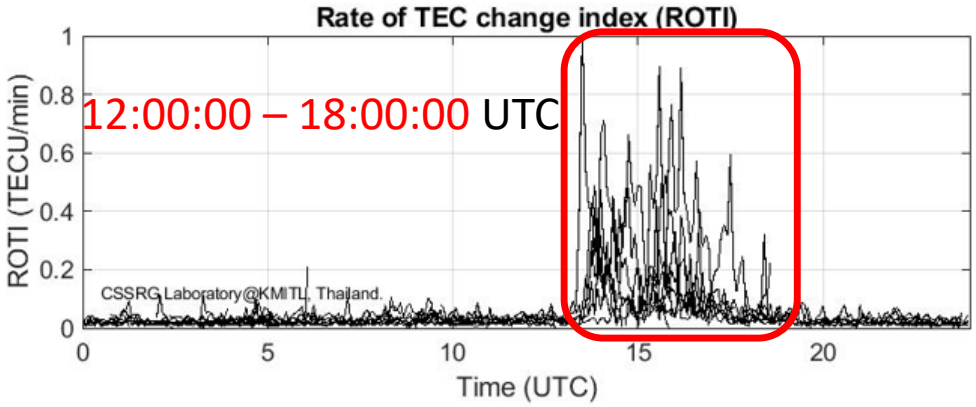
Low-cost RTK performances (disturbed time)

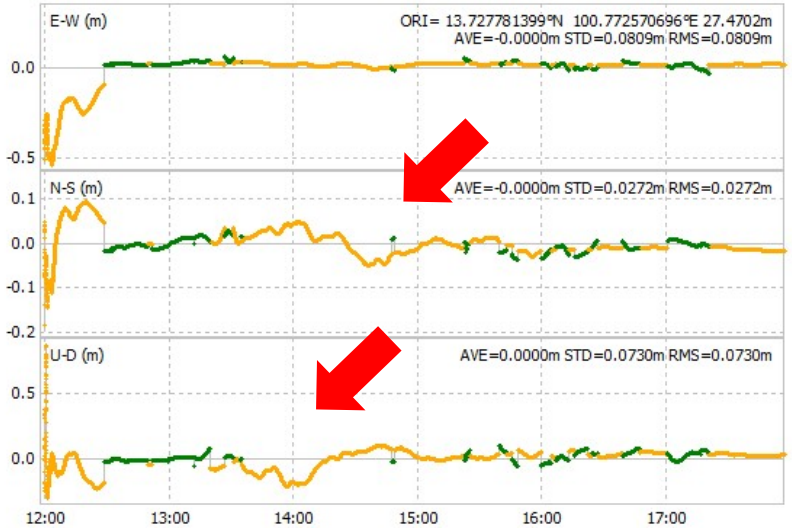
Experimental Design: Hardware

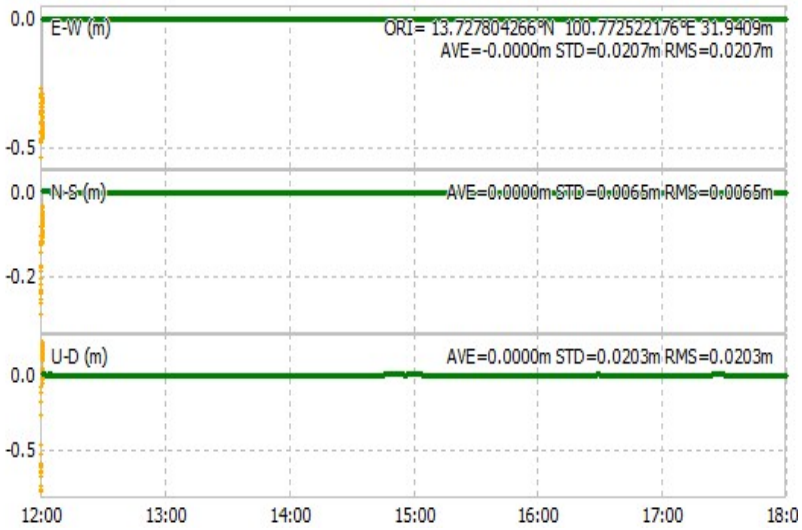


Low-cost RTK Performance (disturbed time)

DOY78, 2020





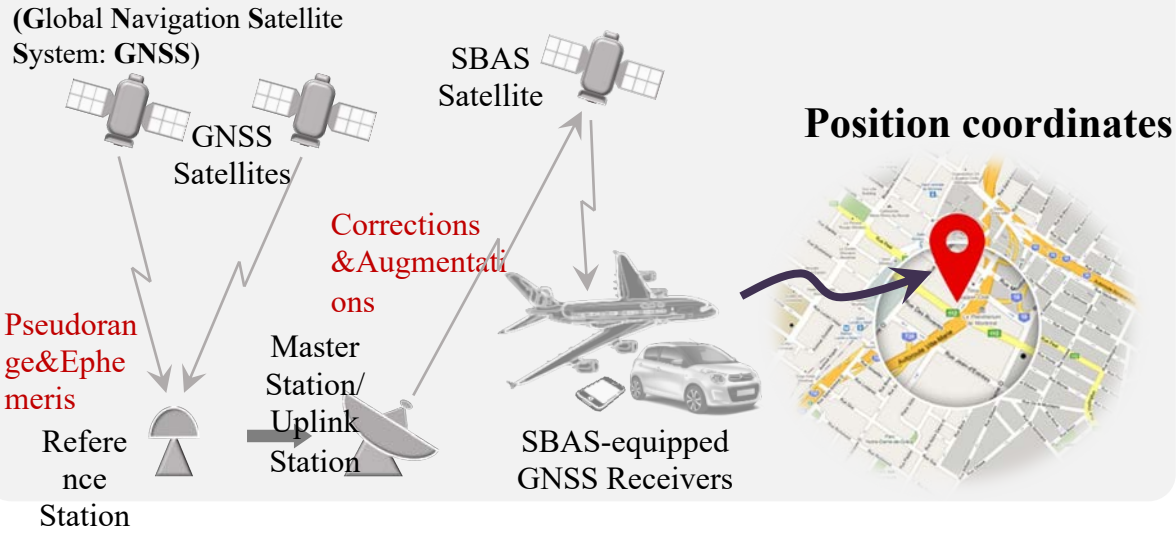


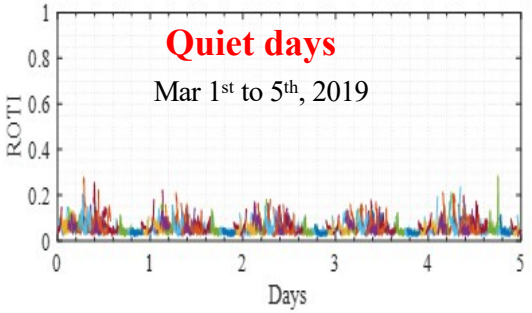
Positioning: Baseline 8 km.

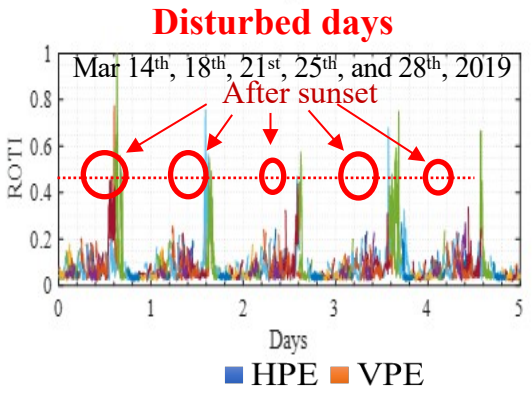
Positioning: Baseline 22 m.

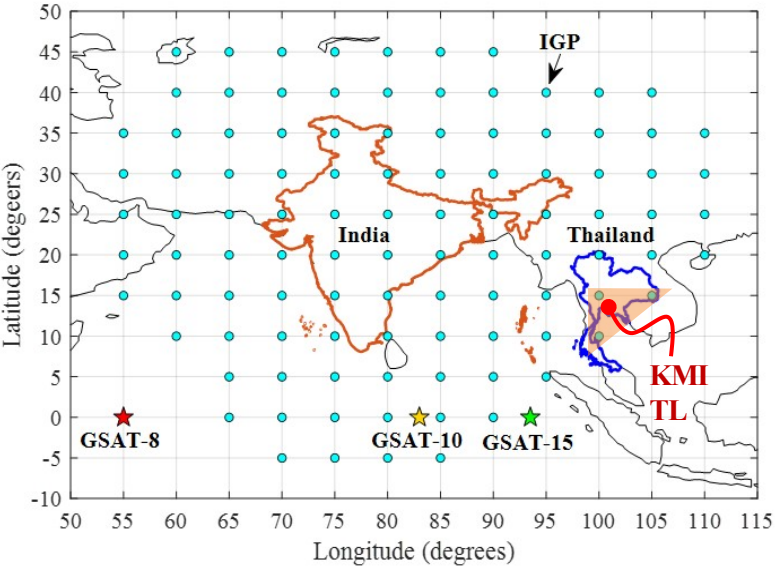
Effects of EPB on SBAS

SBAS-I – L1 DFMC SBAS - L1, L5



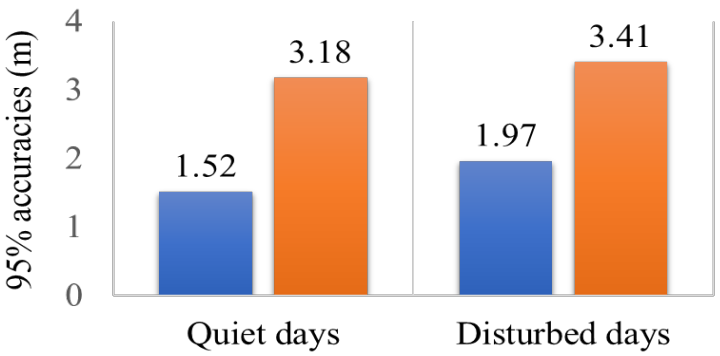






NovAtel GPS-704-WB

NovAtel ProPak6



Thank you

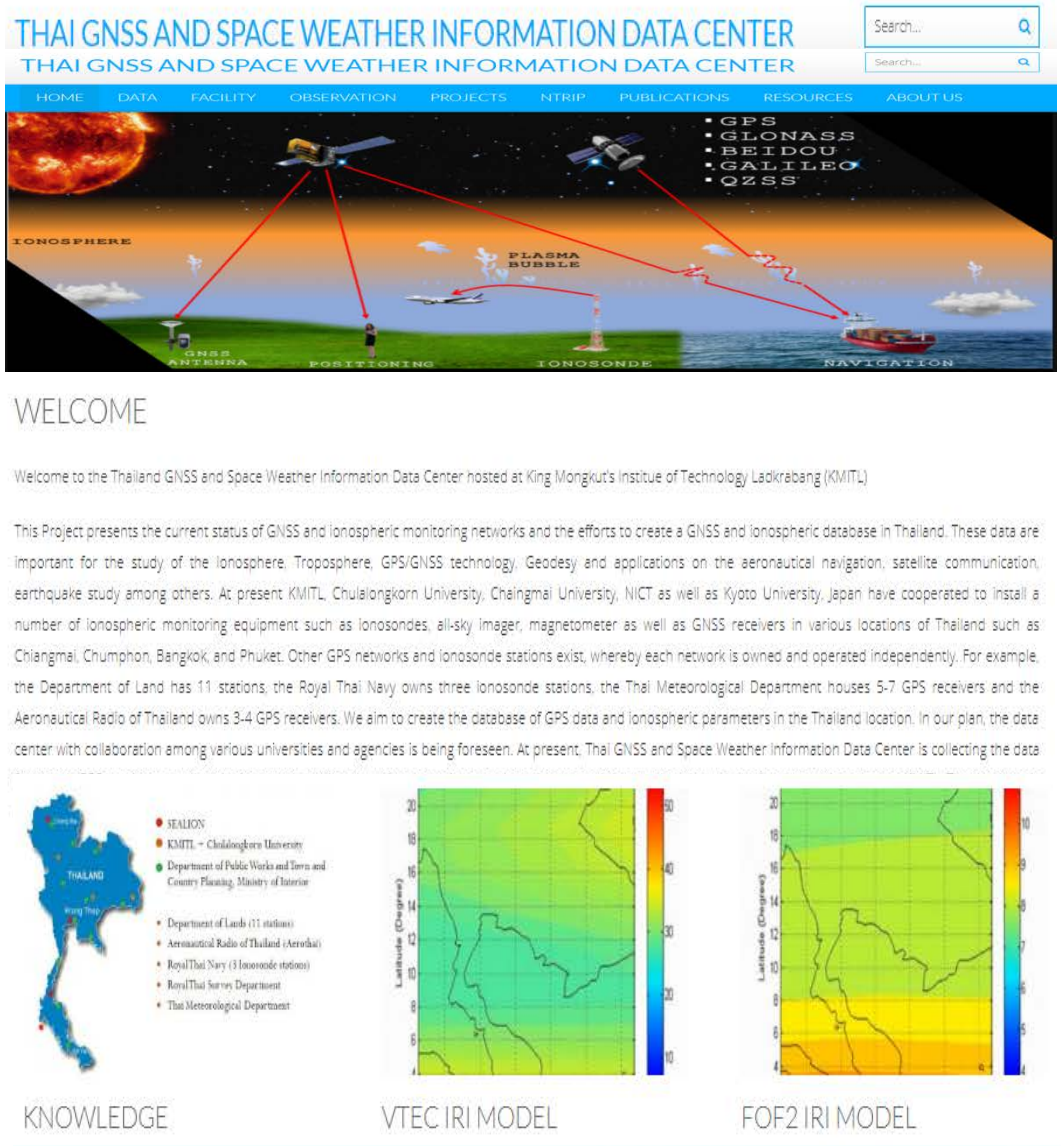
Backup

Future collaboration

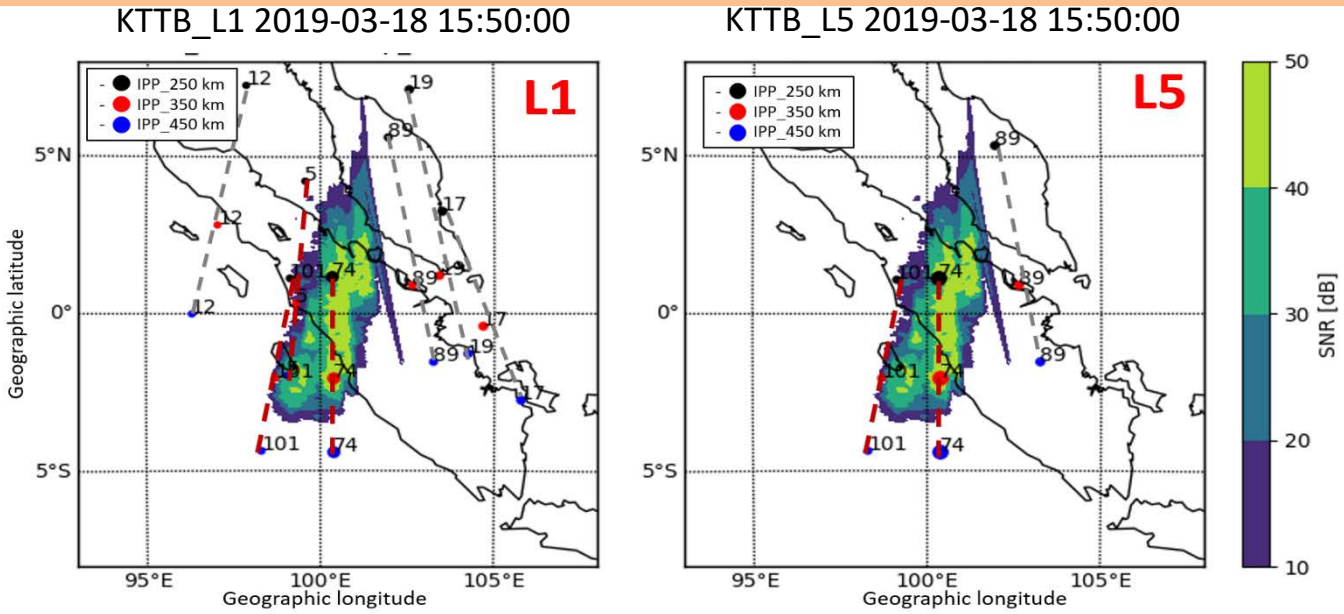
- Disturbance prediction using AI
- Real-time TEC map
- New Klobuchar model for Multi-GNSS
- Effects of scintillation on SBAS-II
- Effects of scintillation on PPP-RTK

GNSS and Space Weather Information Center

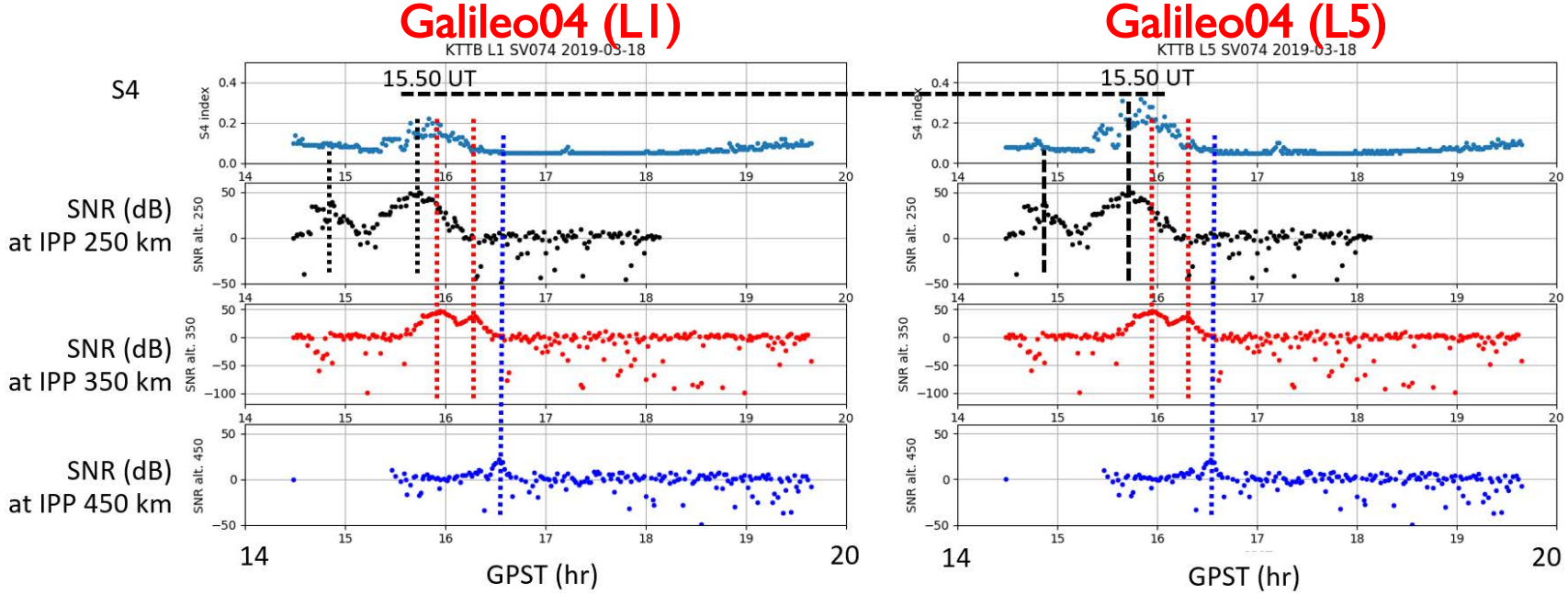
Website: http://iono-gnss.kmitl.ac.th



VHF radar and Scintillation on L1, L5 signals

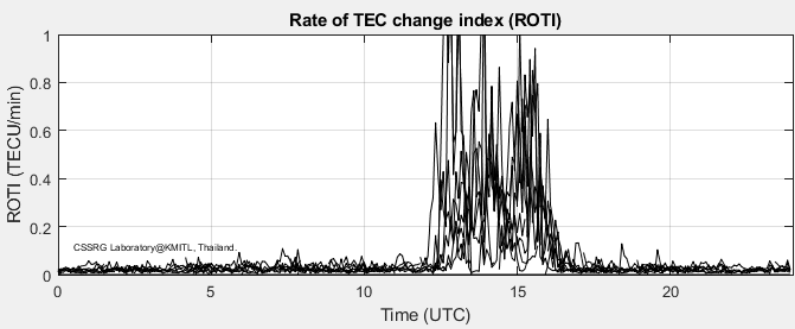


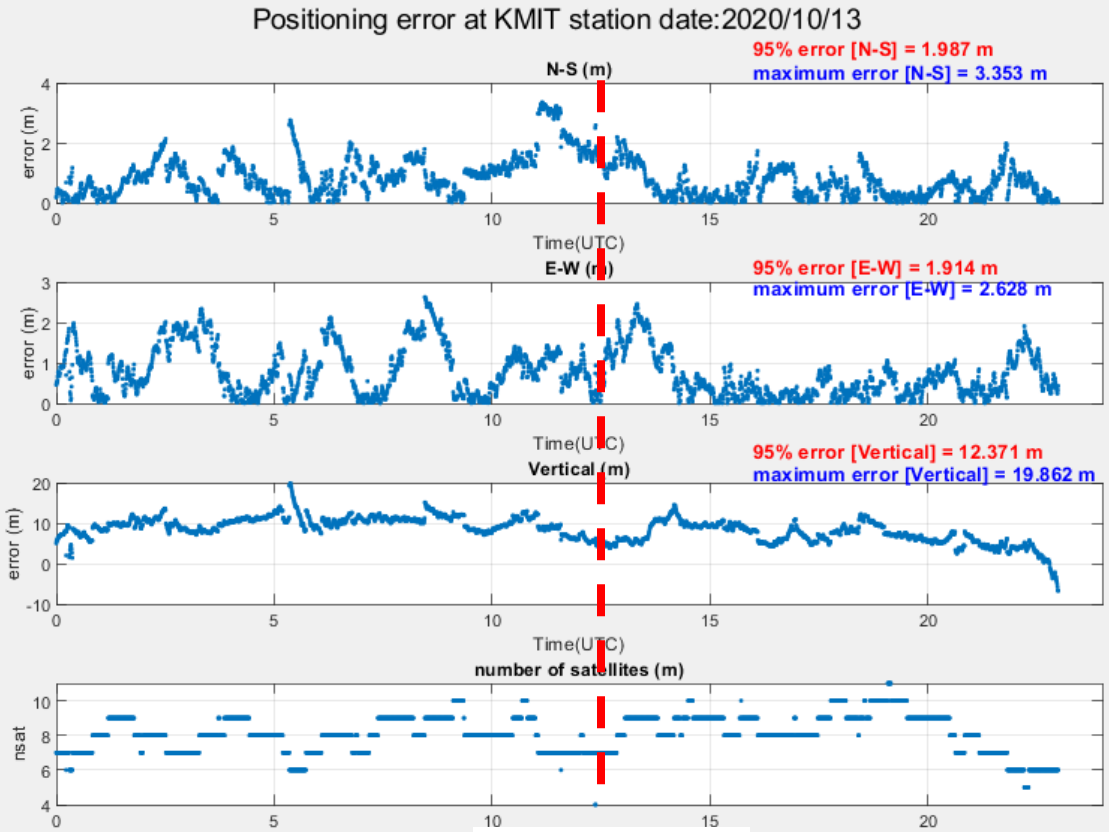
*Galileo: SV number
= SV number + 70



SPP on disturbed day

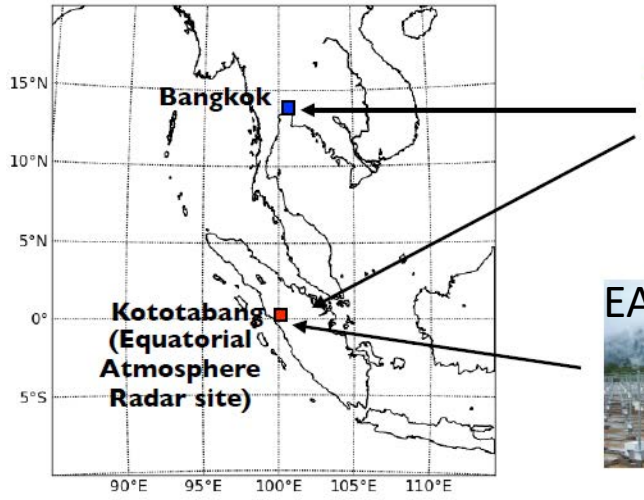
13 Oct 2020
KMIT station





Sunset-time

Scintillation on L1, L5 signals



Septentrio
PolaRxS Pro

Equatorial Atmosphere
Radar (+airglow imager)