

# COVID-19 Pandemic in Thailand

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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](mailto:sittiporn@gistda.or.th)**



# Outline

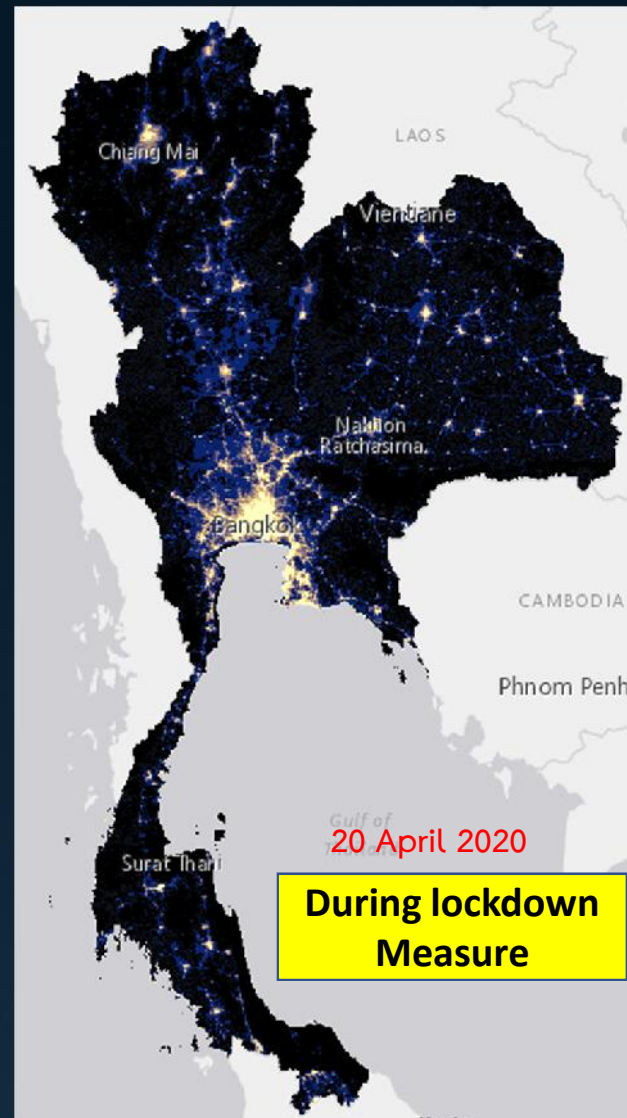
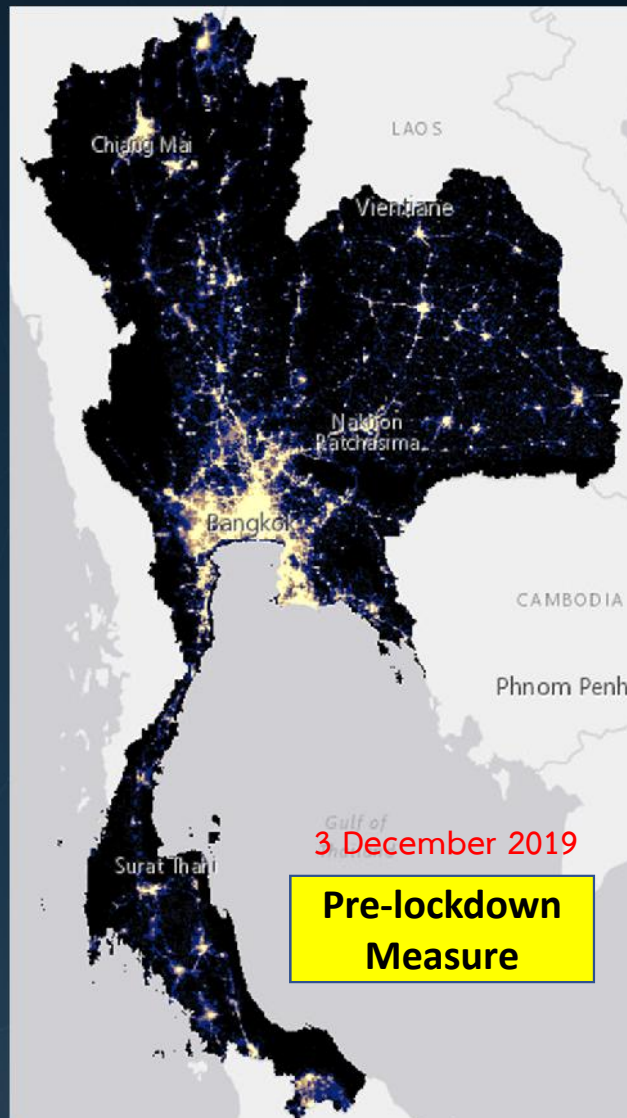
- Introduction and current COVID-19 situation
- Centre for Covid-19 Situation Administration: CCSA
- Challenges



# Introduction



## Reduce Night Light Image (Suomi NPP)





# Current situation

## COVID-19 OUTBREAK

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



### THAILAND SITUATION

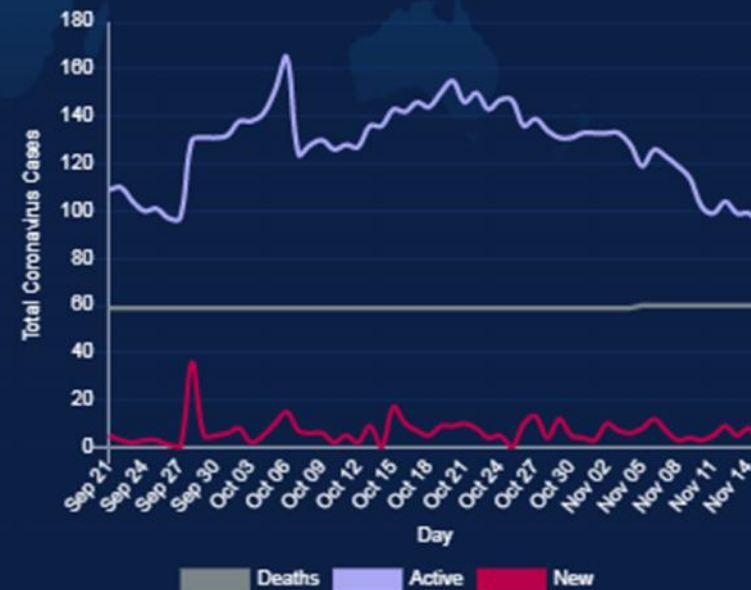
Total cases:  
**3,892**

Recovered:  
**3,745**

Deaths:  
**60**

New cases:  
**+4**

Rank:  
**151**



24/11/63



# Centre for Covid-19 Situation Administration: CCSA



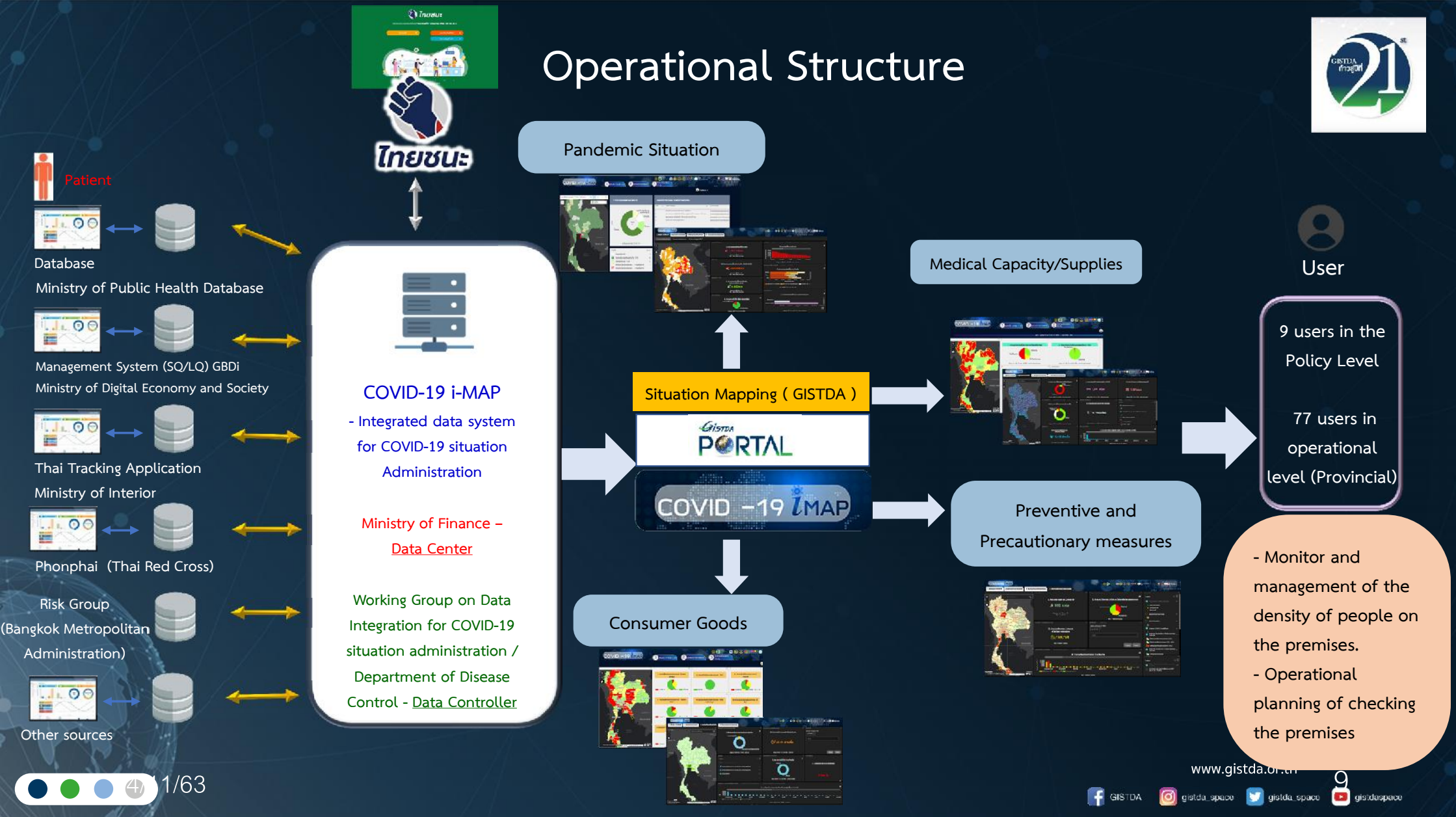
# Centre for Covid-19 Situation Administration: CCSA

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- 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

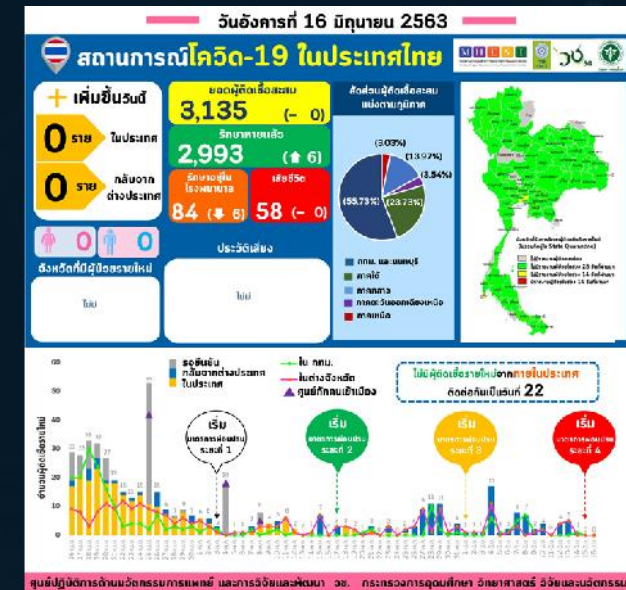


# Operational Structure





# Apps & Social Medias



Variety of data, information & numbers from related agencies

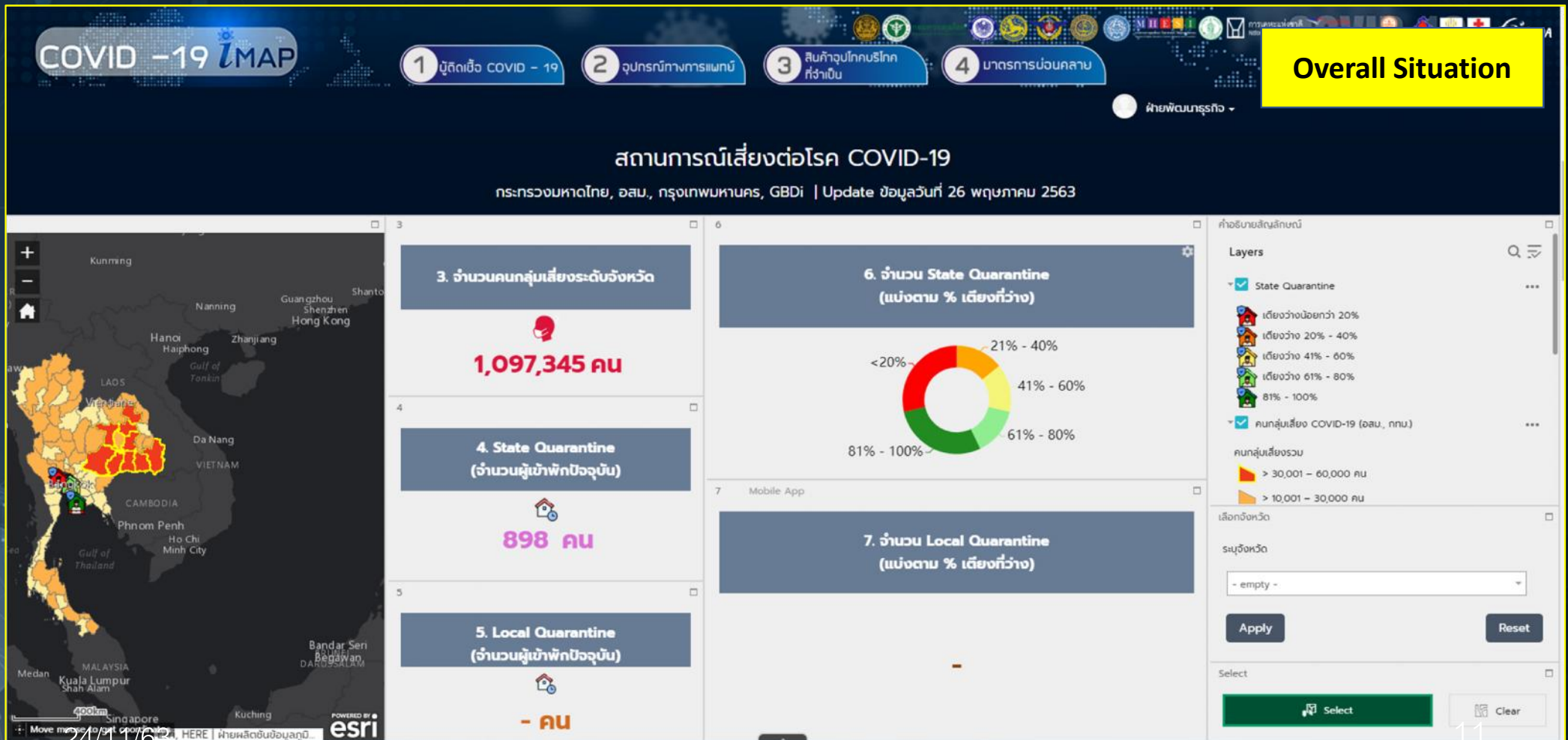


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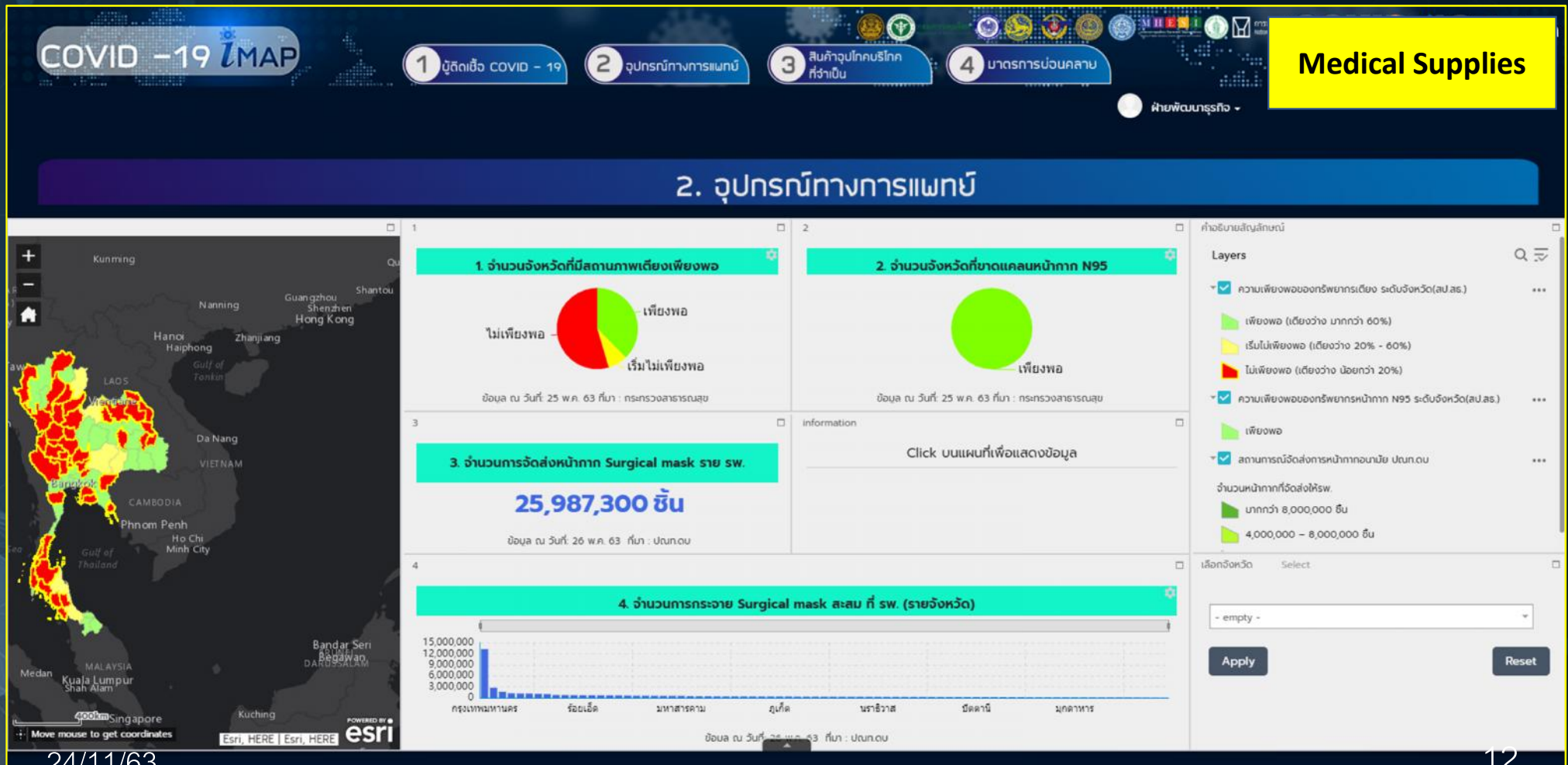


# Samples Operation Dashboard





# Samples Operation Dashboard

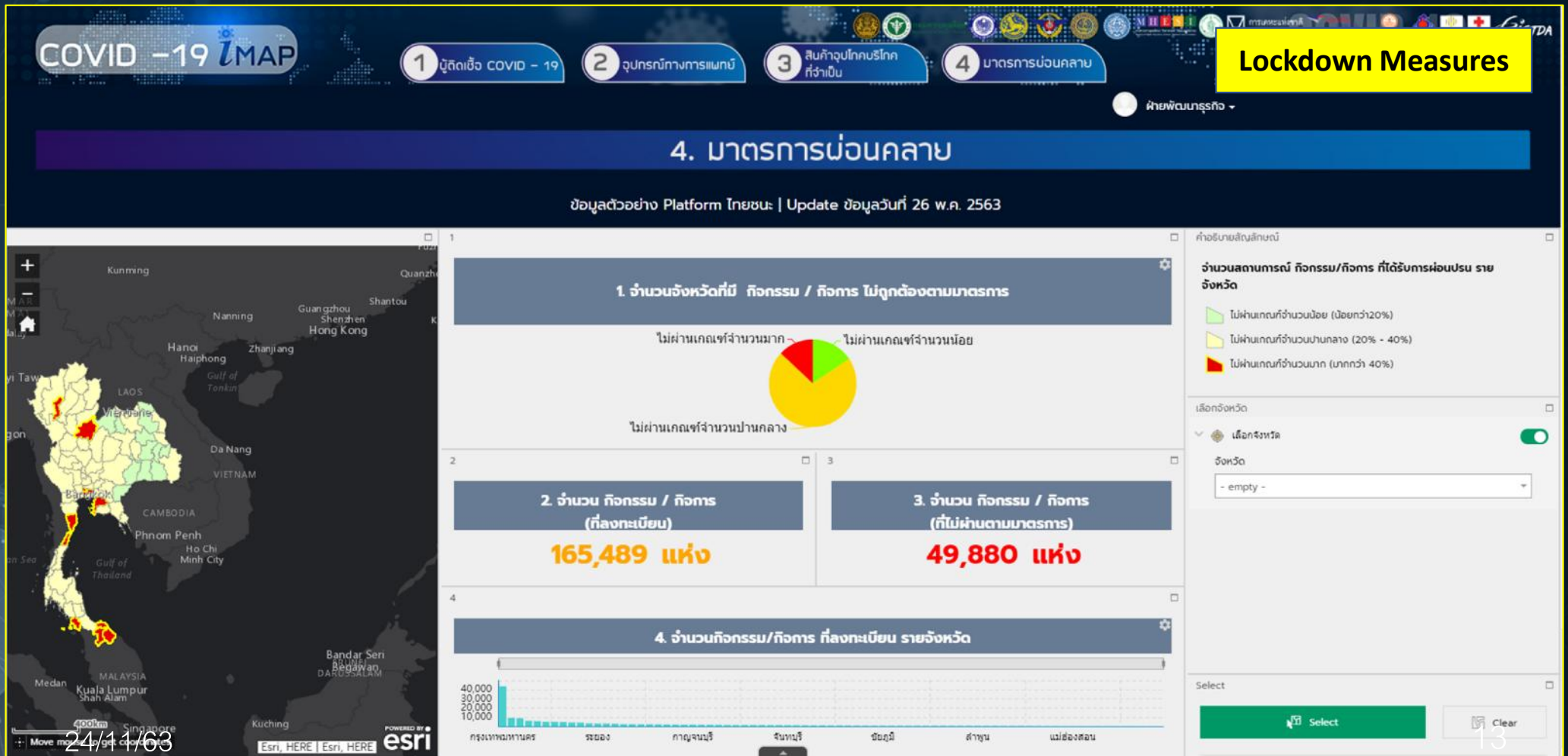


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# Samples Operation Dashboard





# Samples Operation Dashboard





# Challenges



# Challenges

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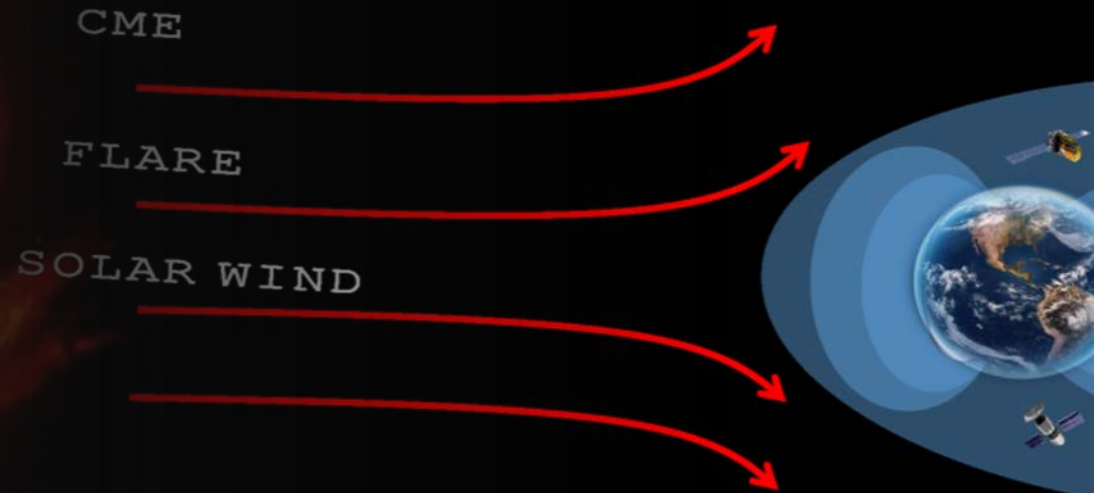
- To drive from “policy” to “action”
- Cooperation and authority are essential
- Completeness of data
- Data accessibility vs data privacy
- From current situation to projection (social and economic impacts)



# Thank you for your attention



# (Online) AOSWA 2020 Workshop



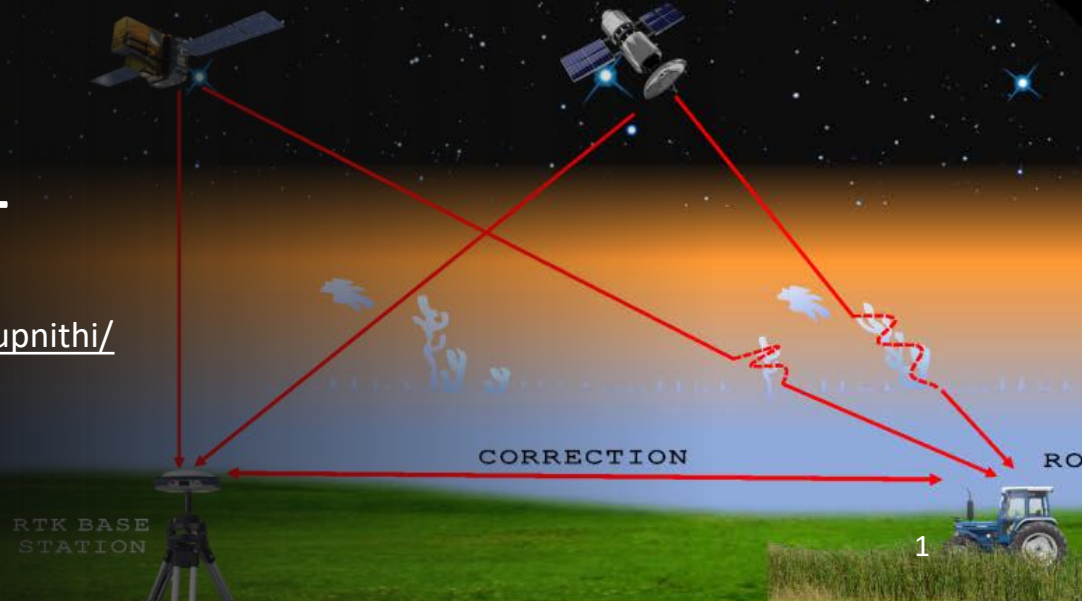
**Prof.Pornchai Supnithi**  
**Faculty of Engineering, KMITL**

Email: [pornchai.su@kmitl.ac.th](mailto: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

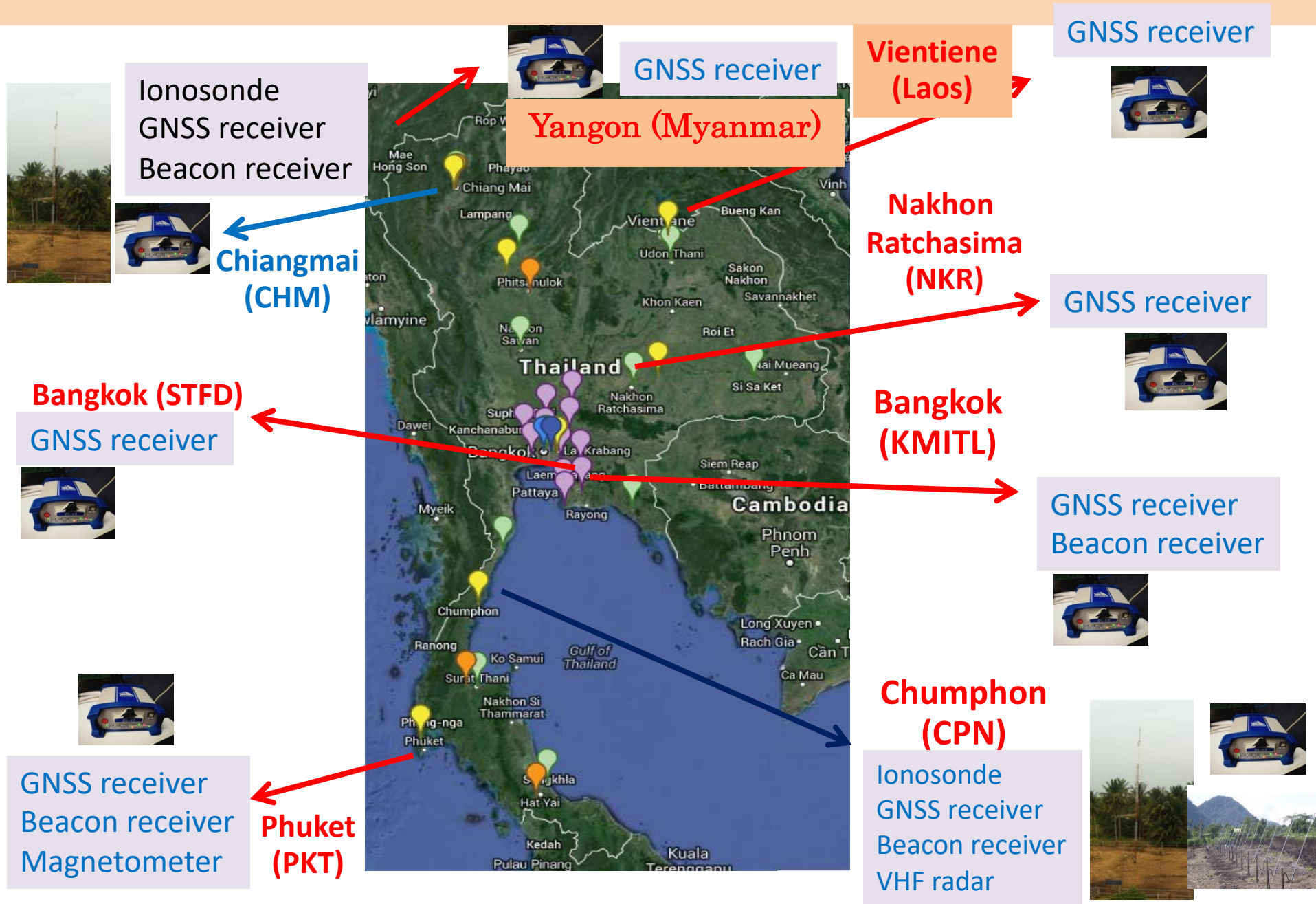
- How is the impact on our activity with COVID-19, social impact?
- Update Information on our activity
- Lesson learned and step for future



# **Impact on our activity with COVID-19**

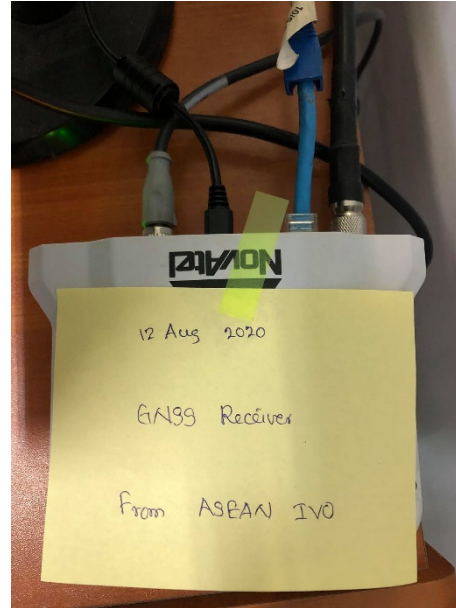


# Obstacles on new GNSS stations

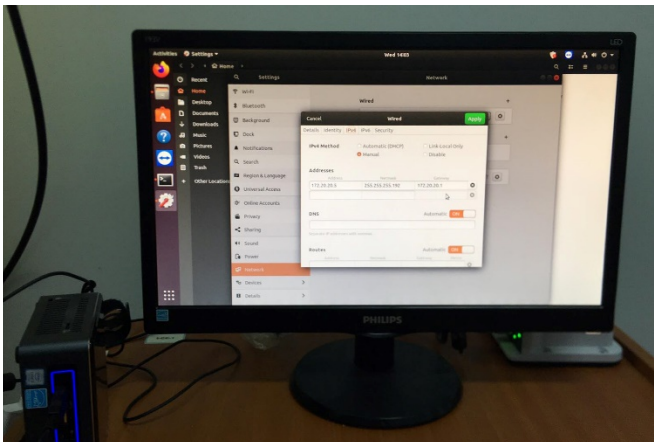




# YTU station (Yangon technological university)



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





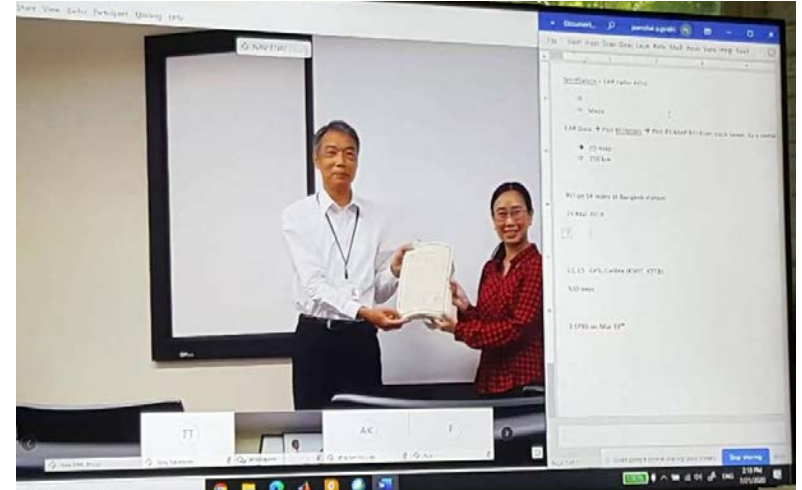
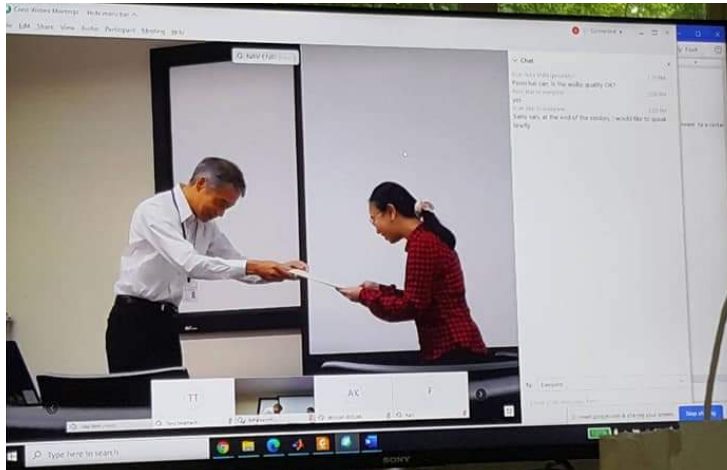
# NUOL station (National University of Laos)

- 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	3 <sup>rd</sup>	3 <sup>rd</sup>	3 <sup>rd</sup>	2 <sup>nd</sup>	1 <sup>st</sup>
Model/simulation	3 <sup>rd</sup>	3 <sup>rd</sup>	3 <sup>rd</sup>	2 <sup>nd</sup>	1 <sup>st</sup>
Application	3 <sup>rd</sup>	3 <sup>rd</sup>	3 <sup>rd</sup>	1 <sup>st</sup>	1 <sup>st</sup>
Operation	1 <sup>st</sup>	1 <sup>st</sup>	1 <sup>st</sup>	1 <sup>st</sup>	1 <sup>st</sup>

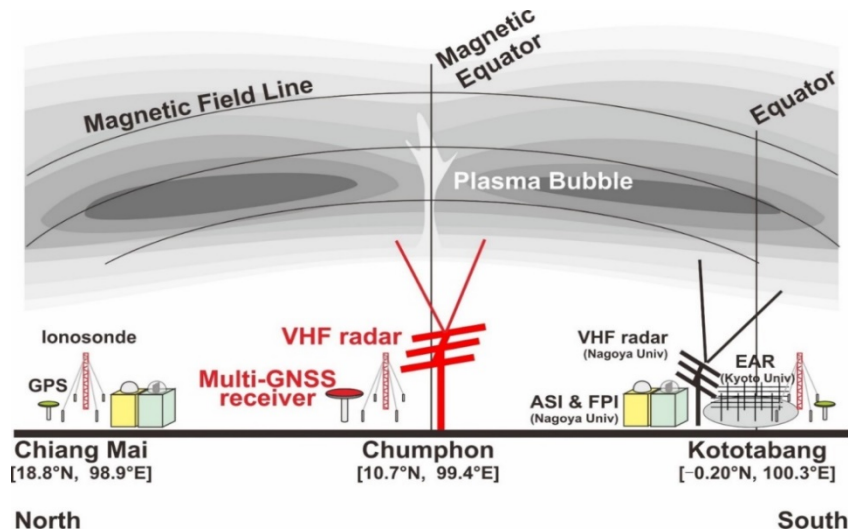


# Chumphon VHF Radar station



Assoc. Prof. Punyawit Jamjareegulgarn

(KMITL) Chumphon campus



VHF antenna array  
39.25 MHz

Official Opening: Jan. 2020



# (Domestic)

## Research seminar: GNSS and Ionosphere

### “Trends and Challenges in Precise Positioning Technology”

30<sup>th</sup> October, 2020

About 100 participants (online, offline)



## Speakers

English Presentation

**Prof. Pornchai Supnithi (KMITL)**  
Professor, Telecommunications Engineering Department  
“KMITL Research on GNSS and Equatorial Plasma Bubble Detection”

**Dr. Mamoru Ishii (NICT, Japan)**  
Director, Space Environment Laboratory  
“Space Weather Data Service at NICT”

**Dr. Sittiporn Channumsin (GISTDA)**  
Researcher, Astro Lab  
“Thai Space Weather Consortium Update”

**Prof. Chalermchon Satirapod (CU)**  
Professor & Department Chair  
Department of Survey Engineering  
“Trends in RTK, PPP-RTK Technology”

**Mr. Wasit Wattanasap (AIS)**  
Senior Vice President Nationwide Operations and Support, Advanced Wireless Network Co. Ltd.  
“Positioning technology in 5G Service”

**Dr. Veerasak Kritsanapraphan (TRUE)**  
Head of Technology Innovation,  
True Digital Group Co. Ltd.  
“Industrial Case Study in Positioning Technology”

**Dr. Ningbo Wang (CAS, China)**  
Researcher, Aerospace Information Research Institute  
“Real-time Ionospheric SSR Corrections in support of High Accuracy GNSS Applications”

Telecommunications Engineering Department, Faculty of Engineering  
King Mongkut's Institute of Technology Ladkrabang

FRIDAY, OCTOBER 30<sup>TH</sup>, 2020  
AUDITORIUM ROOM #3, E12 BUILDING  
FACULTY OF ENGINEERING, KMITL

RESEARCH SEMINAR ON  
**GNSS & IONOSPHERE:  
TRENDS AND CHALLENGES  
FOR FUTURE PRECISE  
POSITIONING**

**Register at**  
<https://forms.gle/Ca9adUSZbaV7M9rf7>

Limited \*\*40 seats\*\* only (due to social distancing)  
Maximum 2 persons/per organization only.  
Breaks and Lunch will be provided.

We will confirm your registration via email.

This seminar is supported by NXPO, ASEAN IVO and The Program Management Unit for Human Resources & Institutional Development



# 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

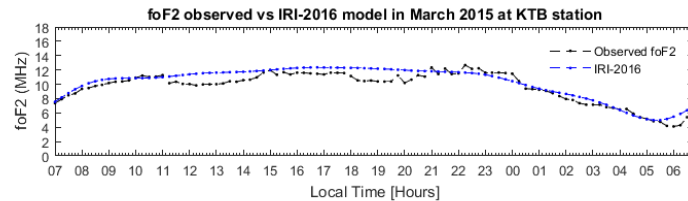
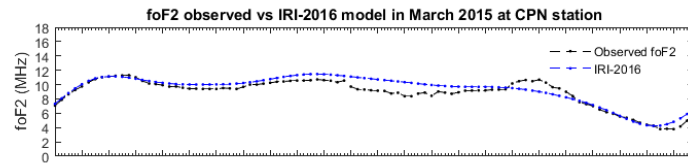
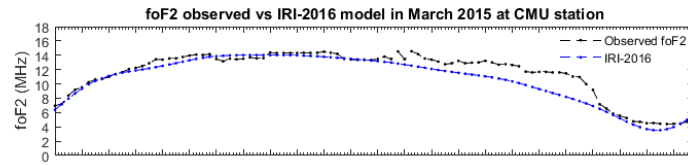
Table 3 RMS of positioning via multi GNSS.

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	<b>0.6603</b>	<b>7.1870</b>	4-7
Beidou	<b>1.5457</b>	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	<b>0.9406</b>	<b>0.4272</b>	7.4440	10-17
GLO+GAL	1.8381	1.2243	<b>6.5923</b>	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	<b>0.8545</b>	<b>0.3958</b>	6.8806	14-24
GAL+GLO+BEI	1.0400	0.8780	<b>6.3635</b>	12-21
GNSS	0.9596	0.5420	6.7196	18-31

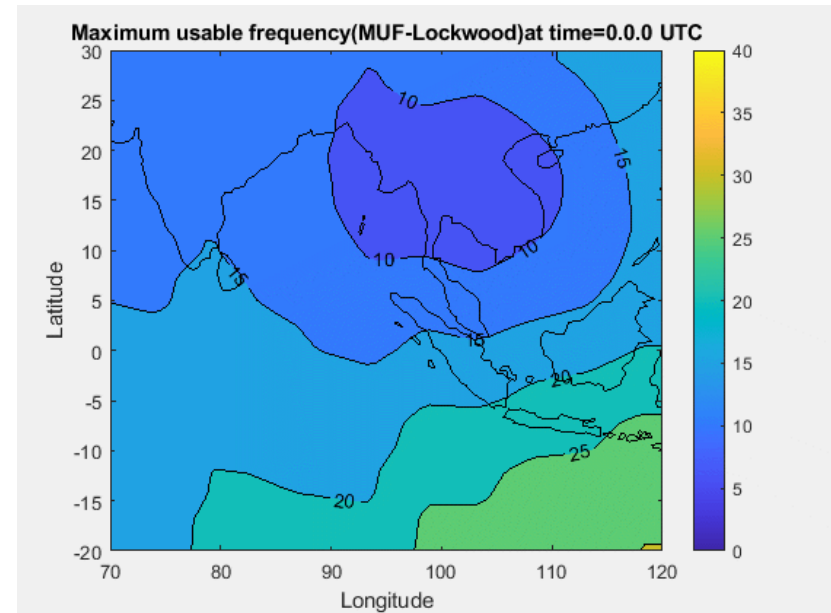
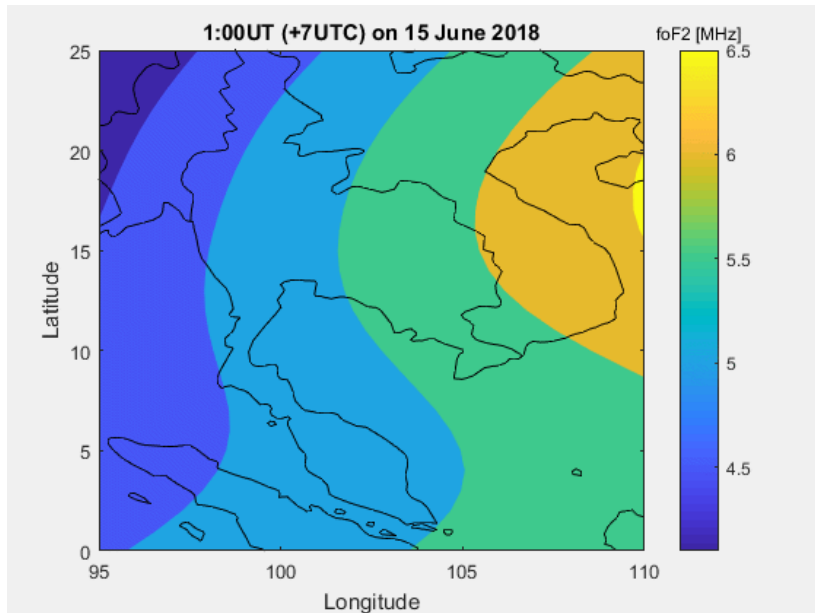


# foF2 map, MUF map



**Critical frequency  
at F2 layer (foF2)**

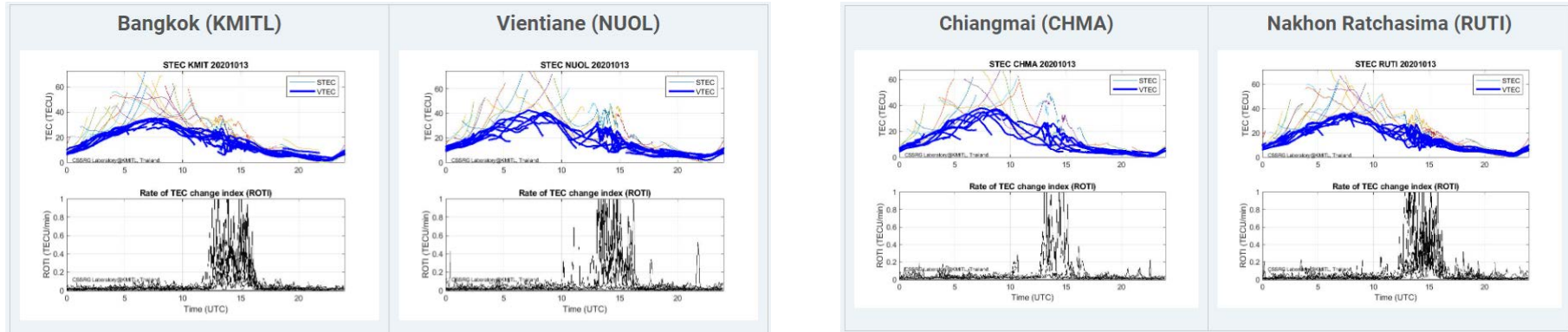
**Maximum usable frequency  
MUF map (2-30 MHz)**



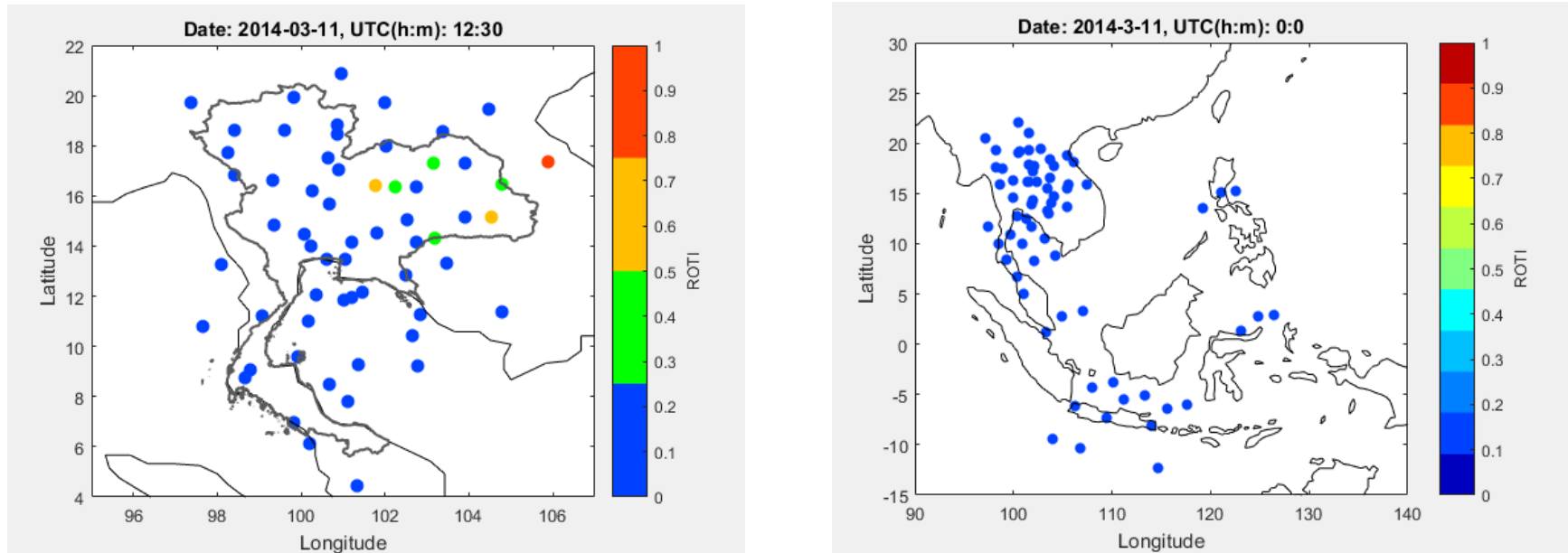


# 1-D, 2-D TEC/ROTI Map

## Daily TEC/ROTI Plots



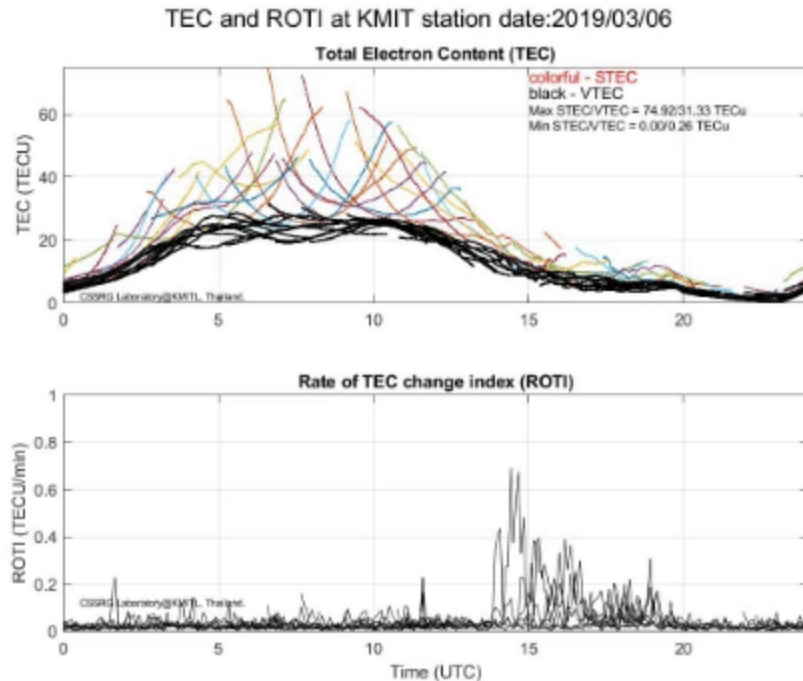
## 2-D ROTI Map



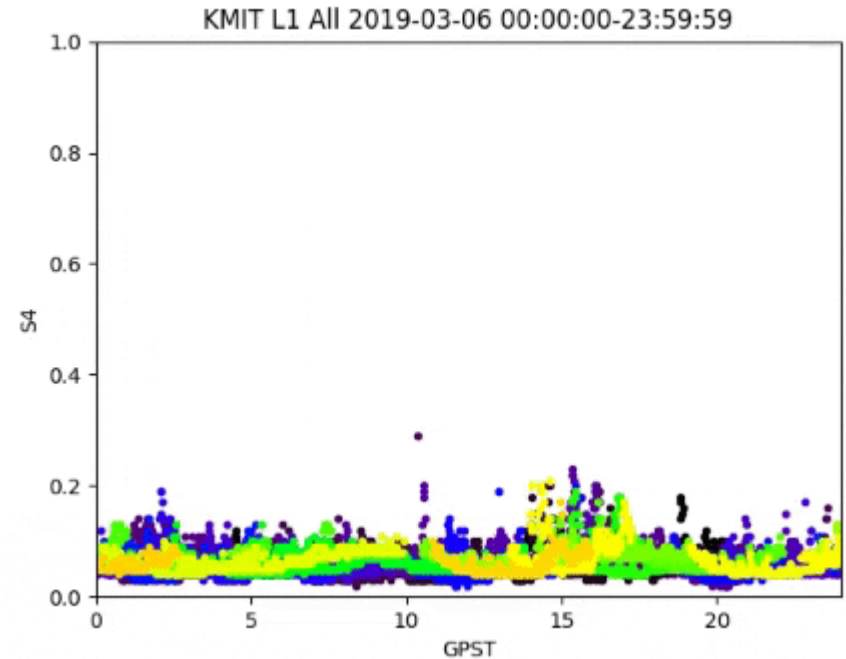


# Scintillation statistics

## TEC / ROTI Plots



## S4 index

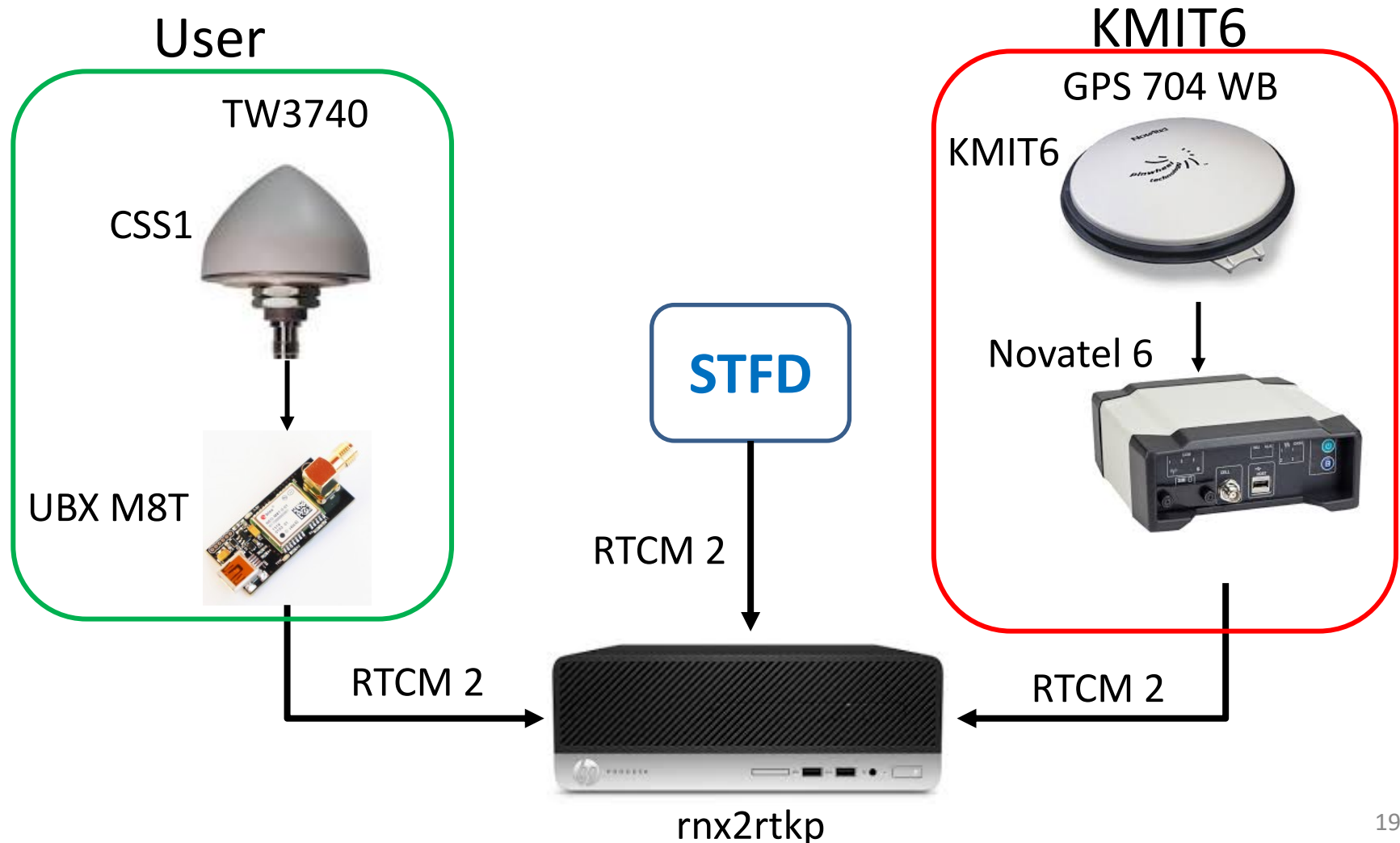


**# days with scintillation (2019) = 47 days**



# Low-cost RTK performances (disturbed time)

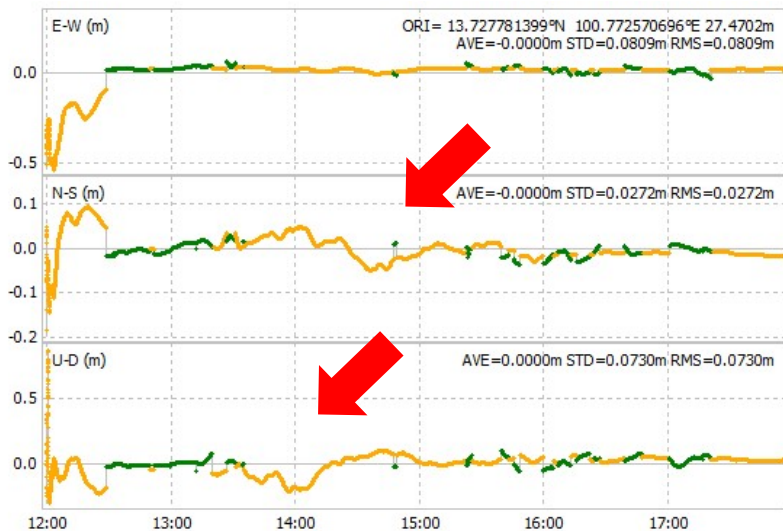
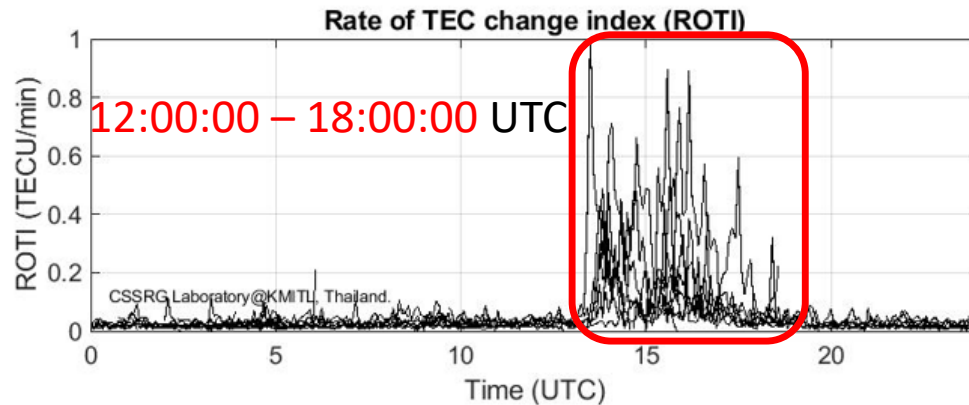
## Experimental Design: Hardware



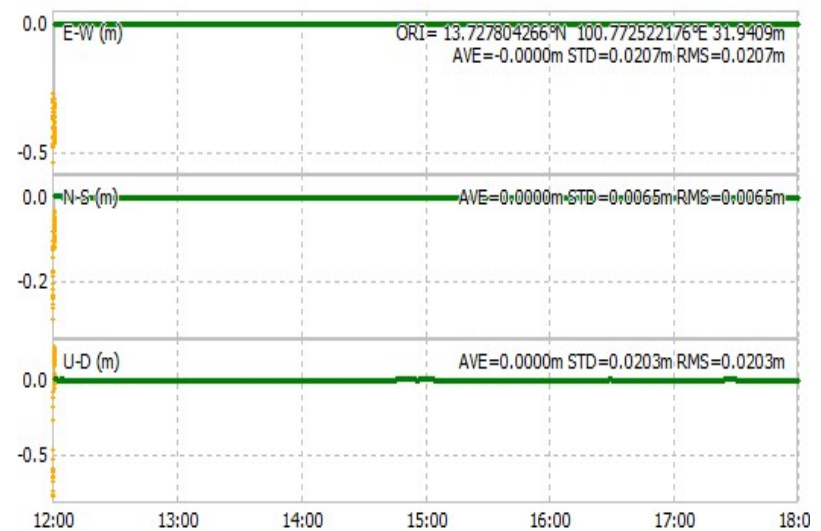


# Low-cost RTK Performance (disturbed time)

DOY78,  
2020



Positioning: Baseline 8 km.



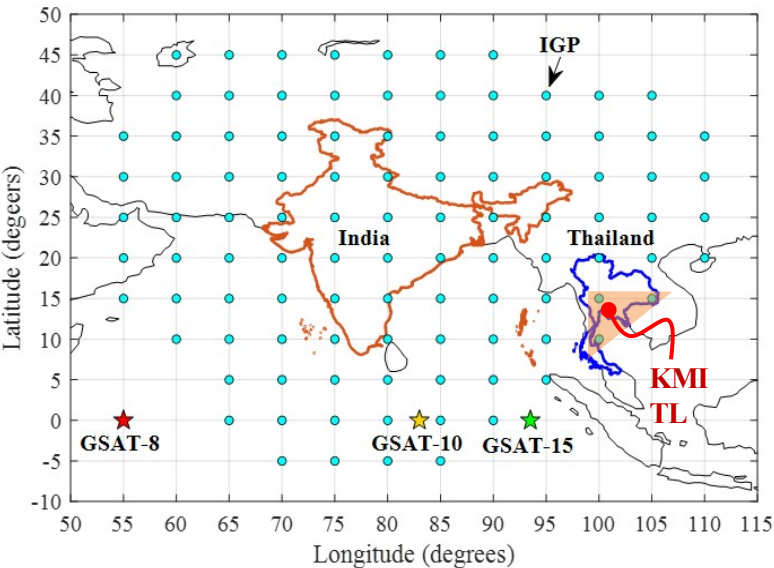
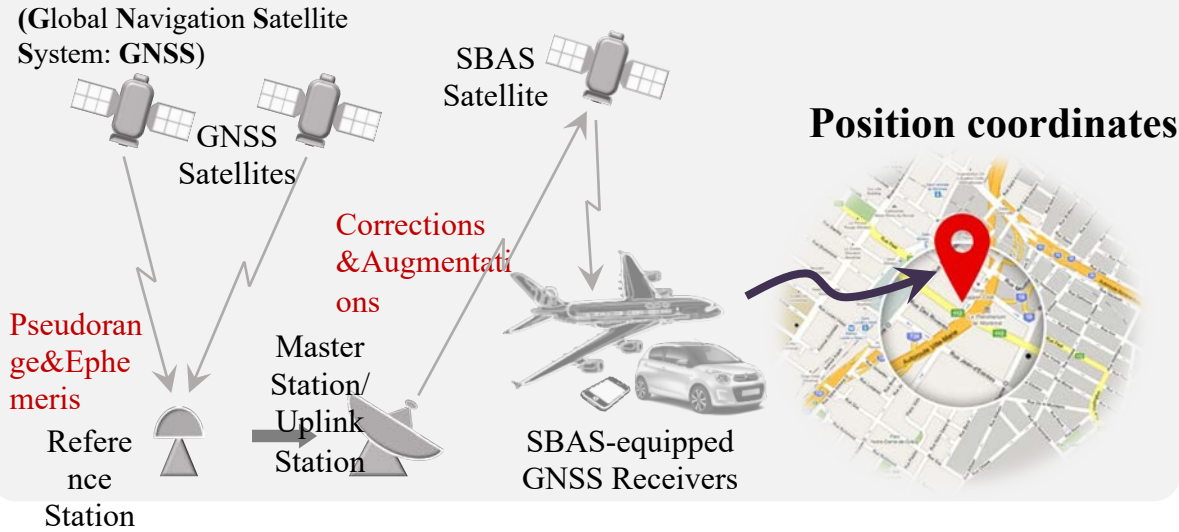
Positioning: Baseline 22 m.



# Effects of EPB on SBAS

SBAS-I – L1

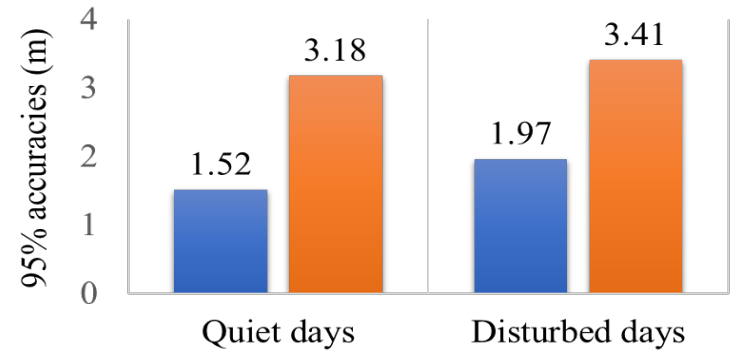
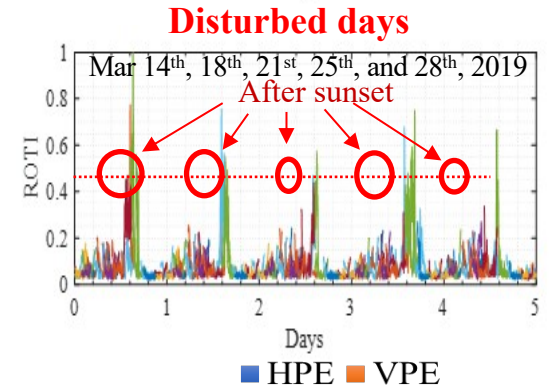
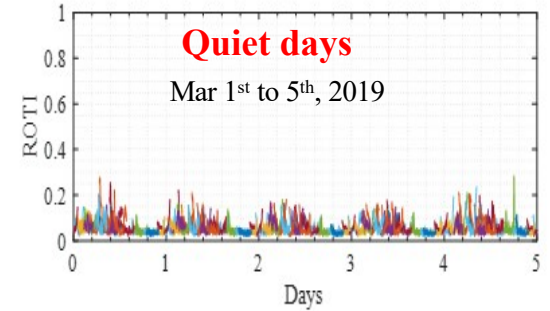
DFMC SBAS - L1, L5



NovAtel GPS-704-WB



NovAtel ProPak6





**Thank you**



# Backup



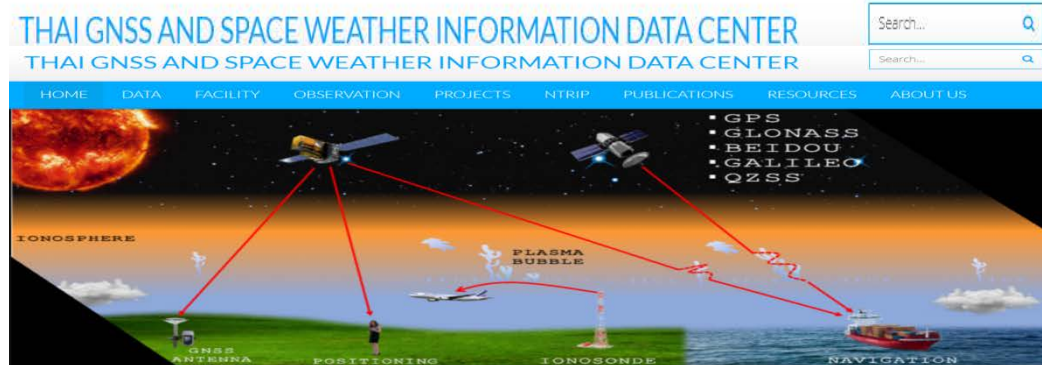
# Future collaboration

- 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

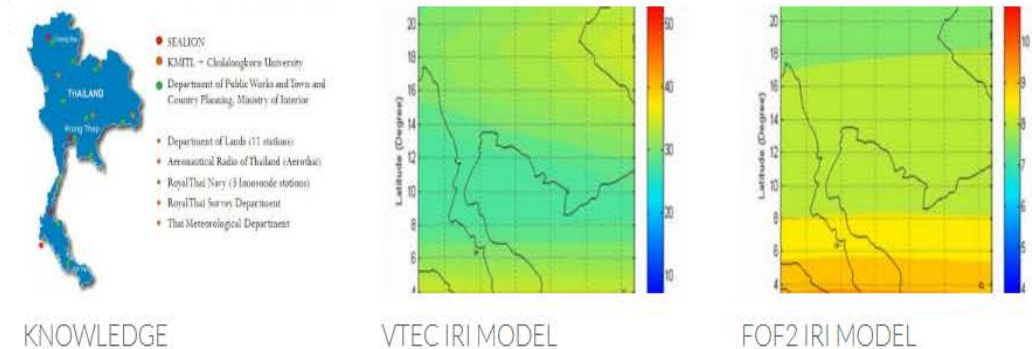
Website: <http://iono-gnss.kmitl.ac.th>



## WELCOME

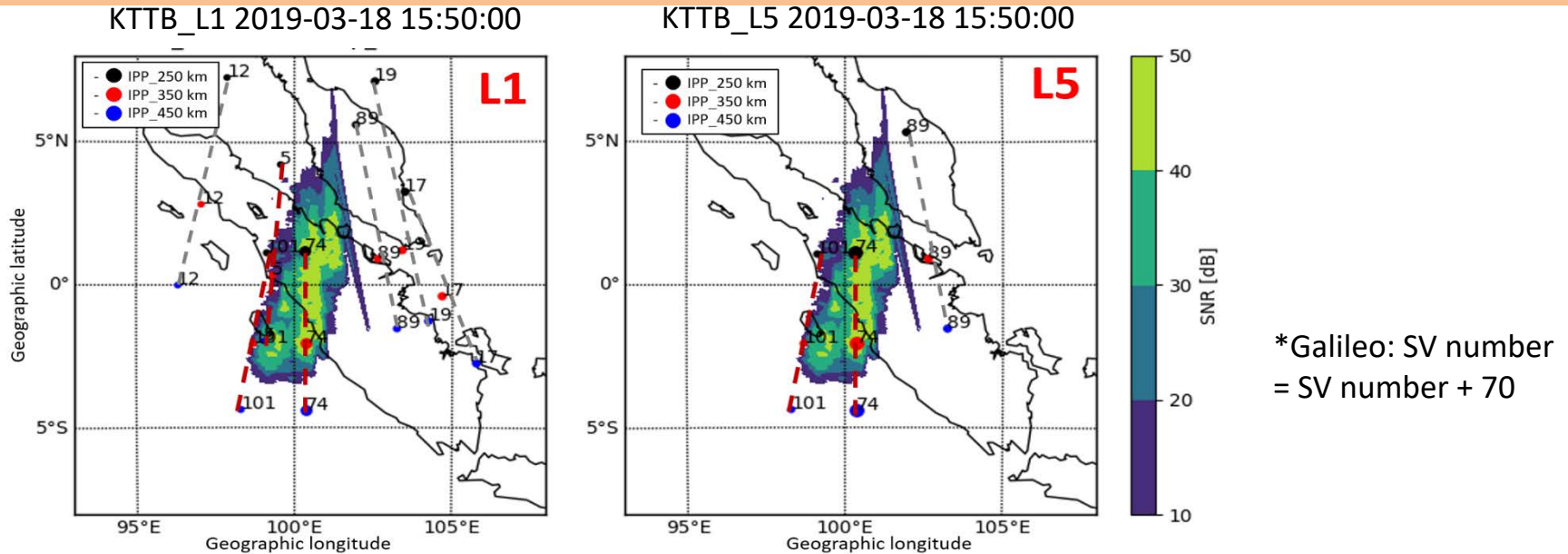
Welcome to the Thailand GNSS and Space Weather Information Data Center hosted at King Mongkut's Institute of Technology Ladkrabang (KMITL)

This Project presents the current status of GNSS and Ionospheric monitoring networks and the efforts to create a GNSS and Ionospheric database in Thailand. These data are important for the study of the Ionosphere, Troposphere, GPS/GNSS technology, Geodesy and applications on the aeronautical navigation, satellite communication, earthquake study among others. At present KMITL, Chulalongkorn University, Chiangmai University, NICT as well as Kyoto University, Japan have cooperated to install a number of Ionospheric monitoring equipment such as Ionosondes, all-sky imager, magnetometer as well as GNSS receivers in various locations of Thailand such as Chiangmai, Chumphon, Bangkok, and Phuket. Other GPS networks and Ionosonde stations exist, whereby each network is owned and operated independently. For example, the Department of Land has 11 stations, the Royal Thai Navy owns three Ionosonde stations, the Thai Meteorological Department houses 5-7 GPS receivers and the Aeronautical Radio of Thailand owns 3-4 GPS receivers. We aim to create the database of GPS data and Ionospheric parameters in the Thailand location. In our plan, the data center with collaboration among various universities and agencies is being foreseen. At present, Thai GNSS and Space Weather Information Data Center is collecting the data



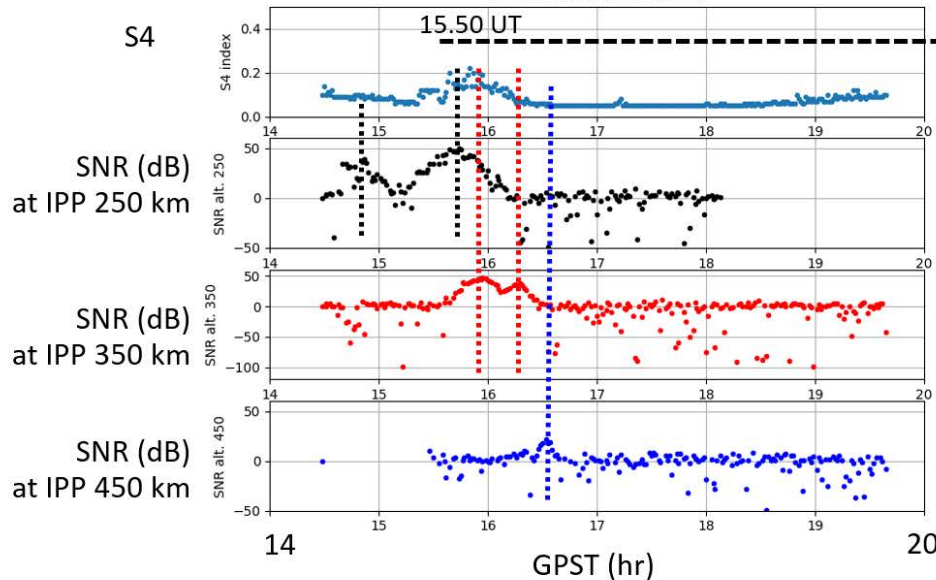


# VHF radar and Scintillation on L1, L5 signals



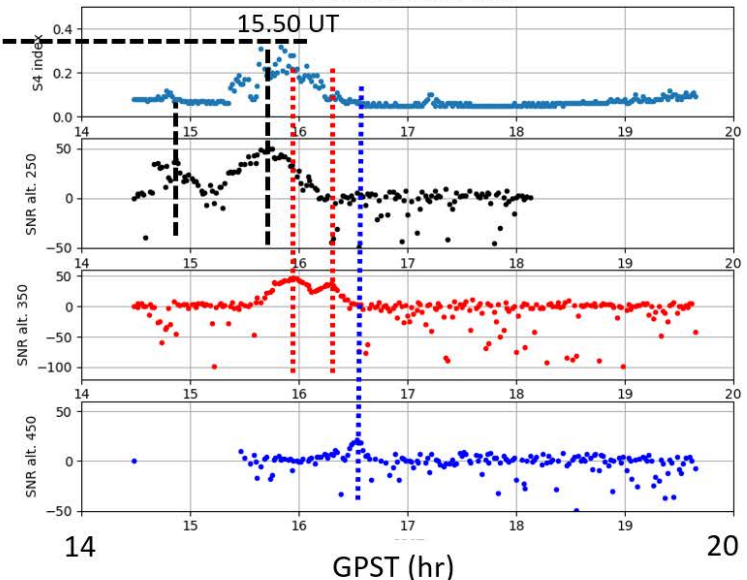
## Galileo04 (L1)

KTTB L1 SV074 2019-03-18



## Galileo04 (L5)

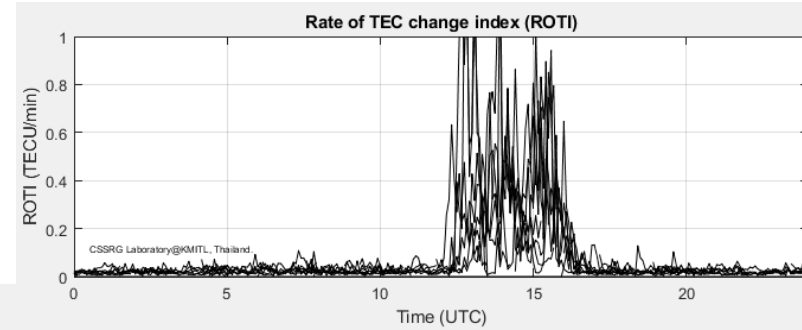
KTTB L5 SV074 2019-03-18



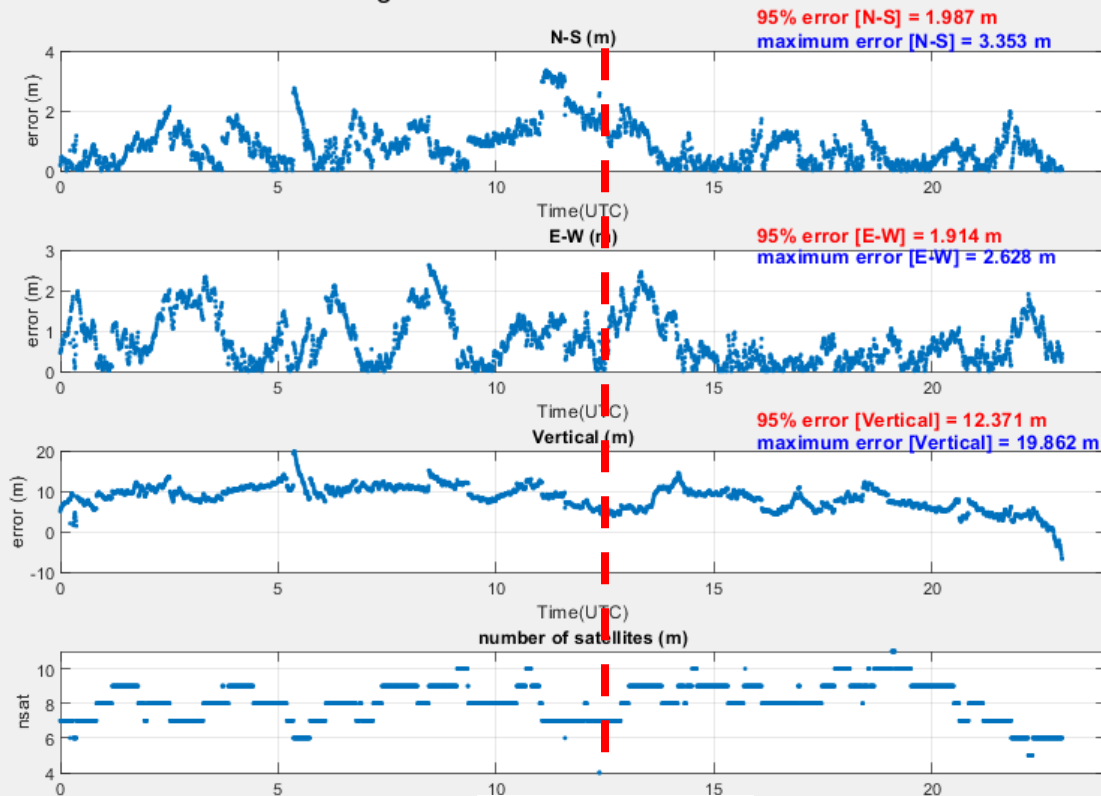


# SPP on disturbed day

13 Oct 2020  
KMIT station



Positioning error at KMIT station date:2020/10/13



Sunset-time



# Scintillation on L1, L5 signals

