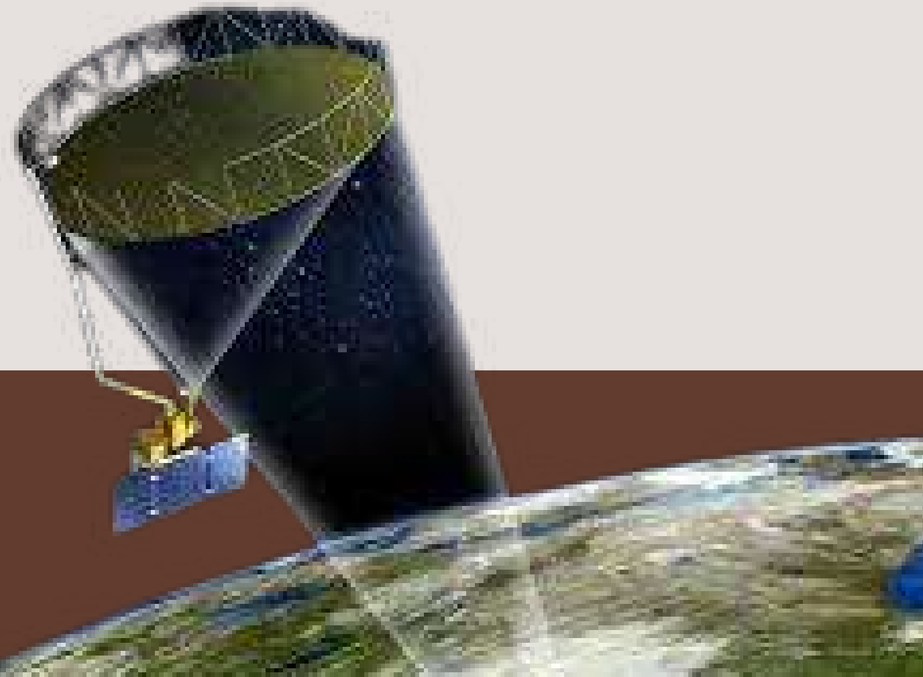
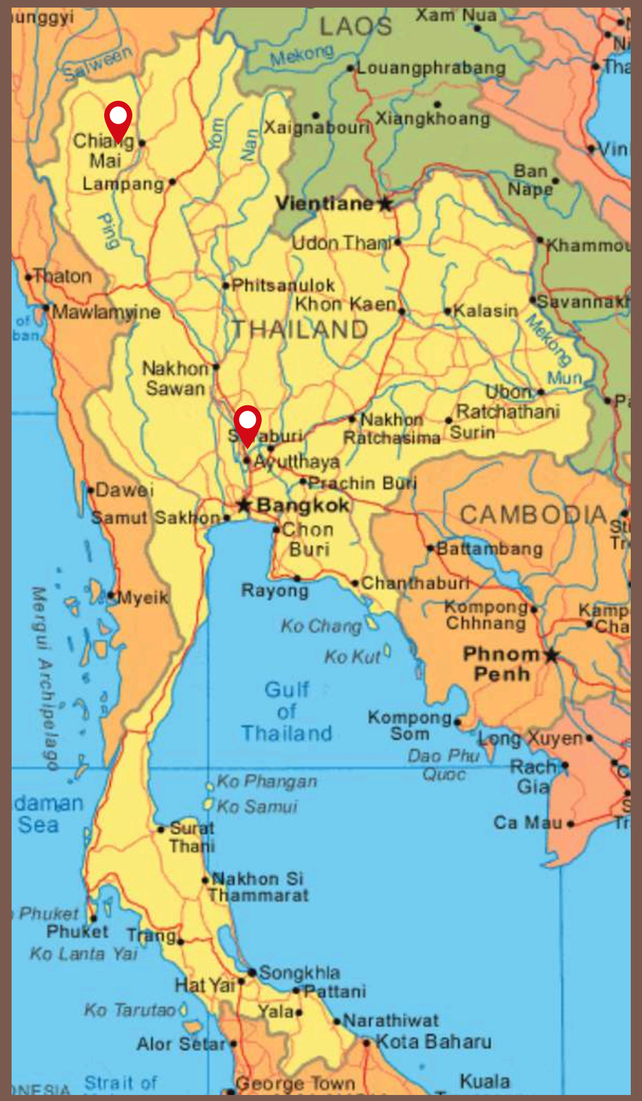
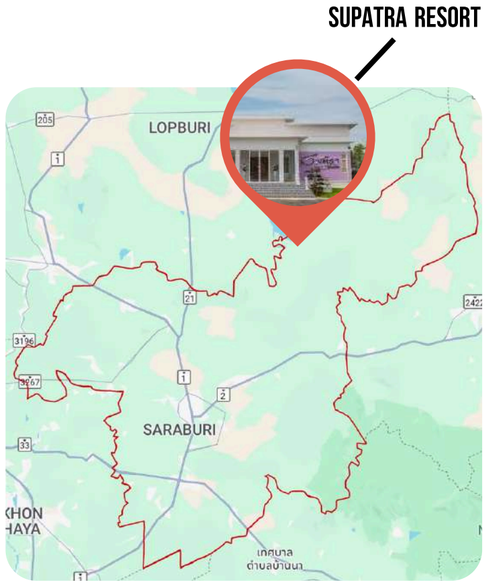
SOIL MOISTURE FLUCTATION, DURING THE SEVERE FLOODING EVENT IN CHIANGMAI, THAILAND USING SMAP SATLELITE DATA



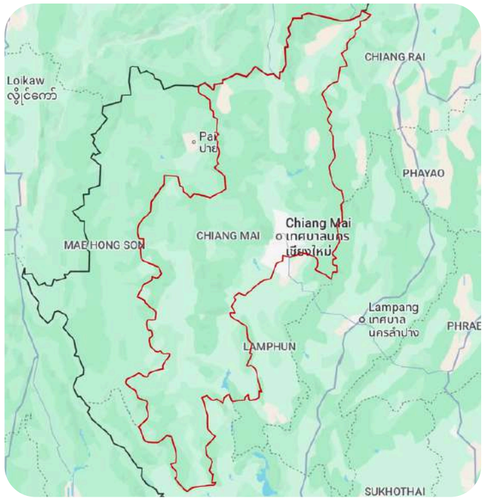
STUDY AREA



SARABURI



CHIANG MAI



INTRODUCTION

FLOODING IS ONE OF THE MOST DESTRUCTIVE NATURAL DISASTERS IN THAILAND.

INTRODUCTION

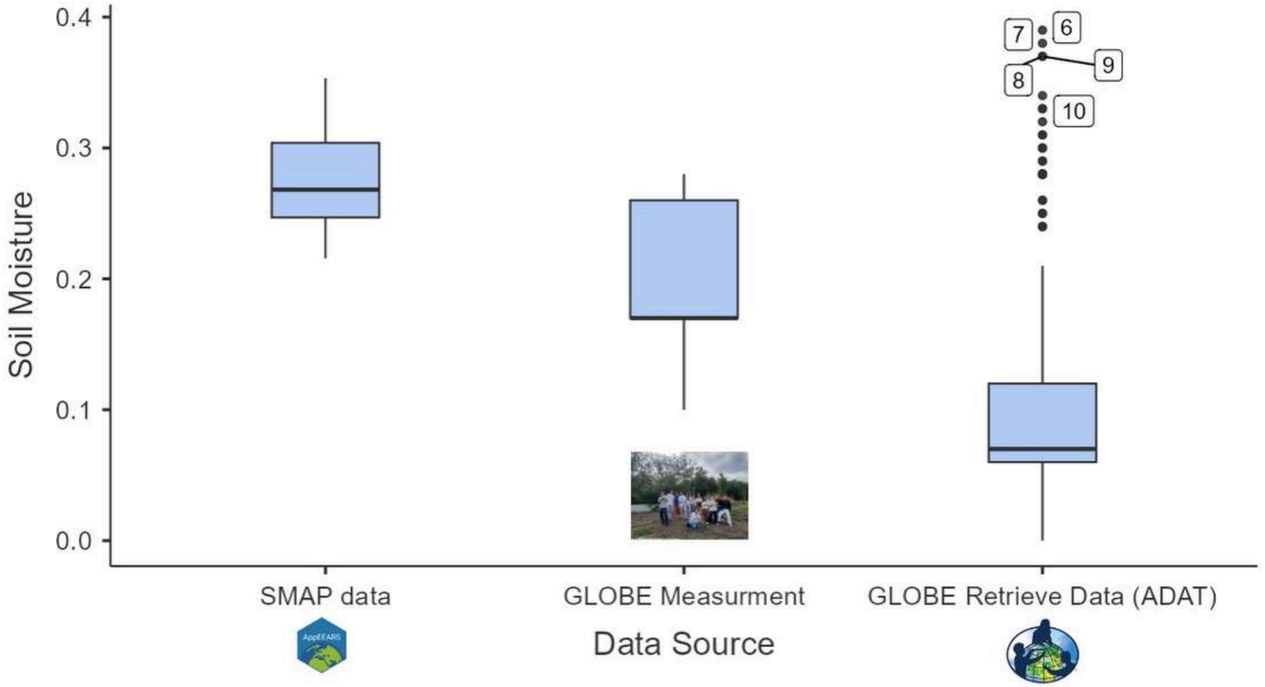
SOIL MOISTURE SERVING AS A KEY INDICATOR OF FLOOD-PRONE AREAS AND LAND-WATER INTERACTIONS.

INTRODUCTION

THIS STUDY LEVERAGES DATA FROM THE SOIL MOISTURE ACTIVE PASSIVE (SMAP) SATELLITE TO ANALYZE SOIL MOISTURE FLUCTUATIONS DURING SEVERE FLOODING IN CHIANG MAI.

GRAPH SHOWING DATA SOIL MOISTURE

THE GRAPH SHOWS THE WATER LEVEL AT EACH TIME PERIOD AND THE WATER LEVEL OF THE BANK.



GLOBE DATA

org_name	site_name	latitude	longitude	elevation	measured_on	ture via gravimetrics:me	soil moisture via gravimetrics:water content (g per g)
Donchanwittayakom	เธเธงเธเธเธเธเธเธเธเนเธเธ	16.2748	103.4043	140	6/1/2020	2020-01-06T17:10:00	0.39
Chumphae suksa schoc	Chumphae1	16.53997	102.1127	27	19/9/2016	2016-09-19T13:51:00	0.38
Princess Chulabhorn Sc	Phapayom Pittayakom Sch	7.81214	99.94231	31	7/3/2016	2016-03-07T08:07:00	0.37
Thailand GLOBE v-Scho	Sa-Nguan-Ying school	14.48538	100.1228	11.9	25/10/2017	2017-10-25T03:00:00	0.37
Hunkhapittayakom	เธเธเธเธเธเธเธเธเธเธเธ	14.98129	100.0057	19	20/2/2018	2018-02-20T15:55:00	0.34
Papayom pittayakom s	Papayom pittayakom schc	7.813339	99.94511	24	5/6/2016	2016-06-05T00:00:00	0.33
Suankularb Wittayalai	Suankularb Wittayalai Nor	13.91049	101.0416	2.5	28/2/2022	2022-02-28T12:00:00	0.33
Phlutaluang wittaya sc	Ban sa	12.7322	101.0497	63.6	29/1/2017	2017-01-29T21:30:00	0.32
Suankularb Wittayalai	Suankularb Wittayalai Nor	13.91049	101.0416	2.5	27/2/2022	2022-02-27T02:00:00	0.31
Suankularb Wittayalai	Suankularb Wittayalai Nor	13.91049	101.0416	2.5	27/2/2022	2022-02-27T02:00:00	0.31
Papayom pittayakom s	Ban Bang Hlo	7.813339	99.94511	89	7/7/2016	2016-07-07T10:10:00	0.3
Phlutaluang wittaya sc	site piutalung wittaya sch	12.71582	100.9692	44.1	30/1/2017	2017-01-30T21:30:00	0.3
Donchanwittayakom	เธเธเธเธเธเธเธเธเธเนเธเธ	16.2748	103.4043	140	7/1/2020	2020-01-07T17:10:00	0.3
Phimaiwittaya	เธเธเธเธเธเธเธเธเธเธเธ	15.21313	102.4948	160	15/8/2022	2022-08-15T07:20:00	0.29
Donchanwittayakom	เธเธเธเธเธเธเธเธเธเนเธเธ	16.2748	103.4043	140	1/1/2020	2020-01-01T17:00:00	0.29
Chumphae suksa schoc	Chumphae1	16.53997	102.1127	27	29/6/2016	2016-06-29T05:00:00	0.28
Donchanwittayakom	smap1	16.45	103.69	140	21/12/2015	2015-12-21T04:04:00	0.28
Donchanwittayakom	smap1	16.45	103.69	140	21/12/2015	2015-12-21T16:14:00	0.28
Donchanwittayakom	smap1	16.45	103.69	140	9/2/2016	2016-02-09T03:39:00	0.28
Donchanwittayakom	smap1	16.45	103.69	140	10/2/2016	2016-02-10T04:16:00	0.28
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Donchanwittayakom	smap1	16.45	103.69	140	10/3/2016	2016-03-10T04:04:00	0.28
Donchanwittayakom	smap1	16.45	103.69	140	19/4/2016	2016-04-19T04:04:00	0.28
Donchanwittayakom	smap1	16.45	103.69	140	19/4/2016	2016-04-19T16:14:00	0.28
Phimaiwittaya	เธเธเธเธเธเธเธเธเธเธเธ	15.21313	102.4948	160	15/8/2022	2022-08-15T07:00:00	0.26
Donchanwittayakom	เธเธเธเธเธเธเธเธเธเนเธเธ	16.2748	103.4043	140	8/1/2020	2020-01-08T17:10:00	0.26
Thailand GLOBE v-Scho	Sa-Nguan-Ying school	14.48538	100.1228	11.9	18/10/2017	2017-10-18T10:00:00	0.25
Shrewsbury Internatio	GlacierCatcherDwellings	13.7242	100.5032	4.8	5/11/2024	2024-11-05T07:30:00	0.25
Papayom pittayakom s	Ban Naa Pha	7.813339	99.94511	23	19/8/2016	2016-08-19T10:10:00	0.24
Chumphae suksa schoc	Chumphae1	16.53997	102.1127	27	24/6/2016	2016-06-24T04:00:00	0.24
Chumphae suksa schoc	Chumphae1	16.53997	102.1127	27	19/1/2017	2017-01-19T04:30:00	0.24
Papayom pittayakom s	Ban Naa Pha	7.813339	99.94511	23	16/8/2016	2016-08-16T10:10:00	0.21
Donchanwittayakom	smap1	16.45	103.69	140	27/11/2015	2015-11-27T04:04:00	0.21
Donchanwittayakom	smap1	16.45	103.69	140	16/12/2015	2015-12-16T04:16:00	0.21
Donchanwittayakom	smap1	16.45	103.69	140	16/12/2015	2015-12-16T16:26:00	0.21
Donchanwittayakom	smap1	16.45	103.69	140	2/1/2016	2016-01-02T04:16:00	0.21
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Donchanwittayakom	smap1	16.45	103.69	140	2/2/2016	2016-02-02T16:26:00	0.21
Donchanwittayakom	smap1	16.45	103.69	140	5/3/2016	2016-03-05T16:26:00	0.21
Donchanwittayakom	smap1	16.45	103.69	140	14/4/2016	2016-04-14T16:26:00	0.21
Donchanwittayakom	smap1	16.45	103.69	140	14/4/2016	2016-04-14T04:16:00	0.21

RESEARCH QUESTION

- HOW DOES SOIL MOISTURE CHANGE DURING A SEVERE FLOODING EVENT IN CHIANGMAI, THAILAND, AS OBSERVED FROM SMAP SATELLITE DATA?

- WHAT IS THE RELATIONSHIP BETWEEN SOIL MOISTURE LEVELS, RIVER WATER LEVELS, AND FLOOD EXTENT DURING A SEVERE FLOODING EVENT IN CHIANGMAI?

SOIL(PEDOSPHERE) INVESTIGATION

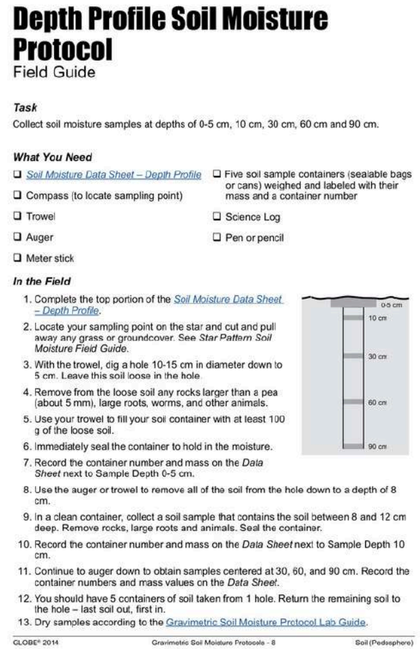
1.COLLECT SOIL MOISTURE SAMPLES AT DEPTHS OF 0-5 CM, 10 CM AND 30 CM.

1.FARMLAND

- WE COLLECT SOIL AT THREE DEPTHS : 5 CM 10 CM AND 30 CM.

2.BANANA GARDEN

- WE COLLECT SOIL AT TWO DEPTHS : 5 CM AND 10 CM.



Depth Profile Soil Moisture Protocol
Field Guide

Task

Collect soil moisture samples at depths of 0-5 cm, 10 cm, 30 cm, 60 cm and 90 cm.

What You Need

- ❑ *Soil Moisture Data Sheet – Depth Profile*
- ❑ Compass (to locate sampling point)
- ❑ Trowel
- ❑ Auger
- ❑ Meter stick
- ❑ Five soil sample containers (sealable bags or cans) weighed and labeled with their mass and a container number
- ❑ Science Log
- ❑ Pen or pencil

In the Field

1. Complete the top portion of the *Soil Moisture Data Sheet – Depth Profile*.
2. Locate your sampling point on the star and cut and pull away any grass or groundcover. See *Star Pattern Soil Moisture Field Guide*.
3. With the trowel, dig a hole 10-15 cm in diameter down to 5 cm. Leave this soil loose in the hole.
4. Remove from the loose soil any rocks larger than a pea (about 5 mm), large roots, worms, and other animals.
5. Use your trowel to fill your soil container with at least 100 g of the loose soil.
6. Immediately seal the container to hold in the moisture.
7. Record the container number and mass on the *Data Sheet* next to Sample Depth 0-5 cm.
8. Use the auger or trowel to remove all of the soil from the hole down to a depth of 8 cm.
9. In a clean container, collect a soil sample that contains the soil between 8 and 12 cm deep. Remove rocks, large roots and animals. Seal the container.
10. Record the container number and mass on the *Data Sheet* next to Sample Depth 10 cm.
11. Continue to auger down to obtain samples centered at 30, 60, and 90 cm. Record the container numbers and mass values on the *Data Sheet*.
12. You should have 5 containers of soil taken from 1 hole. Return the remaining soil to the hole – last soil out, first in.
13. Dry samples according to the Gravimetric Soil Moisture Protocol Lab Guide.

GLOBE PROTOCOL

SOIL(PEDOSPHERE) INVESTIGATION

2.WEIGH SOIL MOISTURE SAMPLES, DRY THEM COMPLETELY

GLOBE PROTOCOL

Gravimetric Soil Moisture Protocol

Lab Guide

Task

Weigh soil moisture samples, dry them completely, and weigh them again.

What You Need

- ❑ Heating lamp(s) or soil drying oven
- ❑ Thermometer capable of measuring to 110° C (if using a soil drying oven)
- ❑ Balance or scale with 0.1 g sensitivity and at least 400 g capacity (600 g recommended)
- ❑ Soil samples in containers, sealable bags or cans, depending on drying method
- ❑ Appropriate soil moisture data sheet (Star, Transect, Depth Profile)
- ❑ Science Log
- ❑ Pen or pencil

In the Lab

1. Calibrate the balance according to the manufacturer's directions. In your science log, record the standard mass used to calibrate the balance. If using an electronic balance, check that the balance is measuring in grams and is zeroed properly.
2. Shake the sample bag to move soil to one end of the bag.Fold the bag so the soil can occupy as little space as possible and it can be placed entirely on the scale to measure the wet mass of the soil sample and bag (figure 1).
3. Record the mass to the nearest 0.1 g as the Wet Mass next to the appropriate sample container number on the *Soil Moisture Data Sheet*. (Be sure to select the data sheet that corresponds to your collection method: Star Pattern, Transect Pattern, or Depth Profile.)
4. Open bag(s) and dry beneath a 250 watt heating lamp (figure 2). If using a drying oven place the sample can in the oven without the lid (Do not place bags in oven).
5. Determine when the sample is dry by weighing the bag or can and sample, reheating for a few more hours and then weighing the sample again. When the mass of the sample does not change it can be considered dry.
   [**Note:** drying times vary based on drying method and soil water content; heating lamps may take 2-3 days to dry soil in a zip lock bag. Drying ovens should dry soil in a can overnight.]
6. Carefully remove the bag and soil sample from beneath the heating lamp (or can from the oven) when the samples are dry.
7. Determine the mass of the dry soil sample (figure 3) and record it next to the appropriate container number on the *Data Sheet*.
8. Repeat steps for each soil sample.

Note: Dried soil should be returned to the site to fill in holes so site may be used in future years.

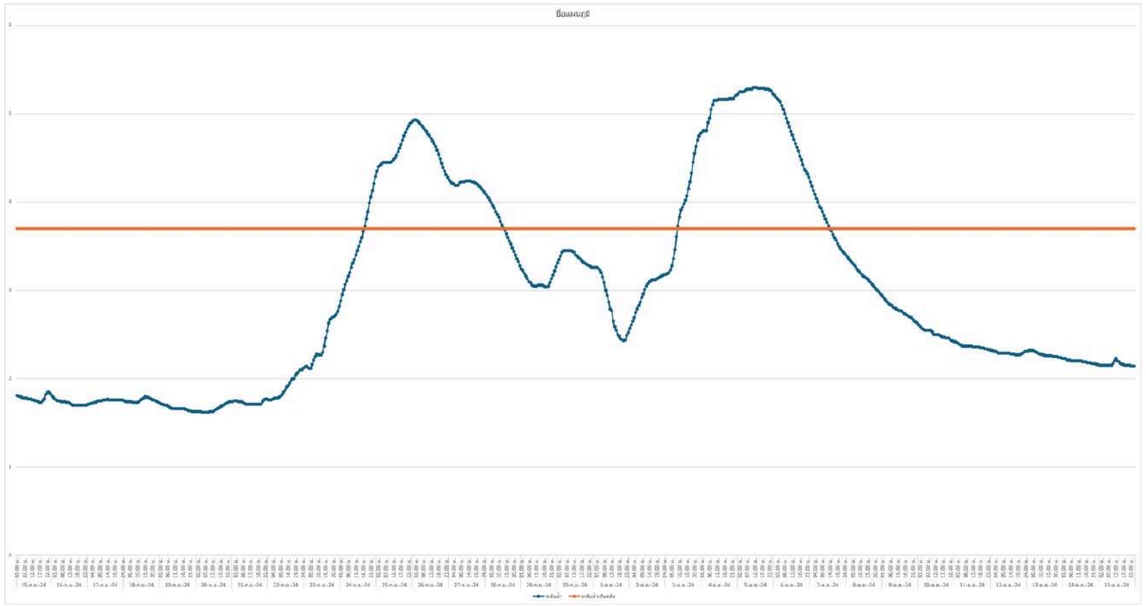
Figure 1, determine wet mass of soil sample and bag

Figure 2, drying soil under heating lamp

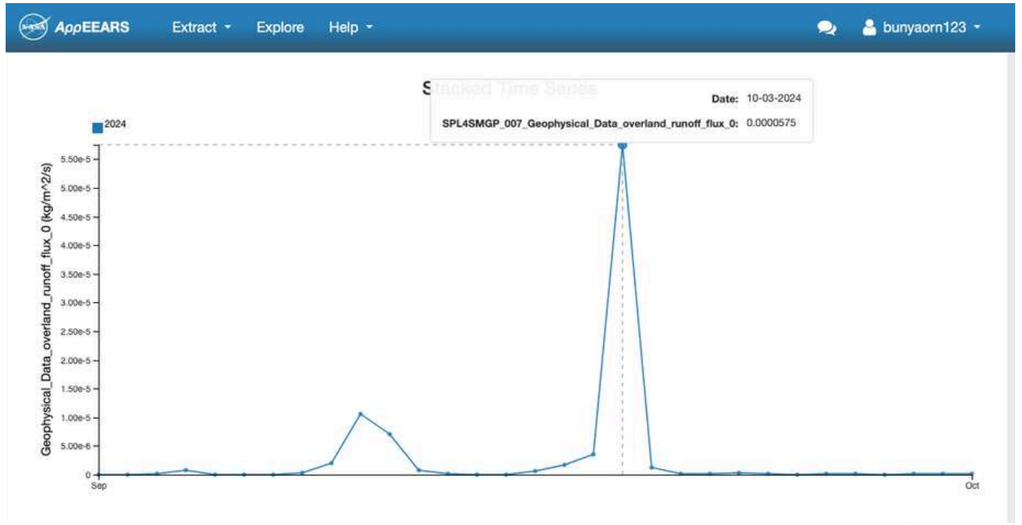
Figure 3, determine dry mass of soil sample and bag

ADD ABOUT 100 G OF SOIL TO THE CUP

DRY THE SOIL FOR 9 HOURS

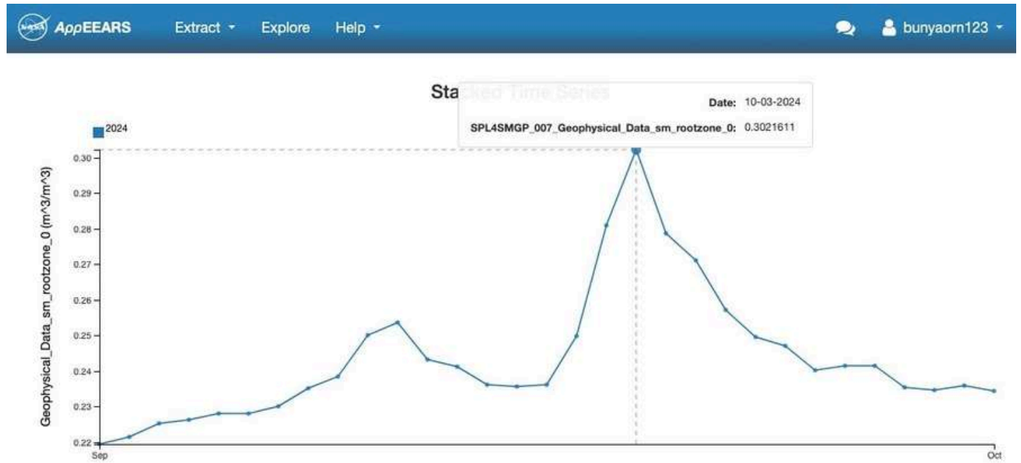


GRAPH SHOWING DATA THE WATER LEVEL

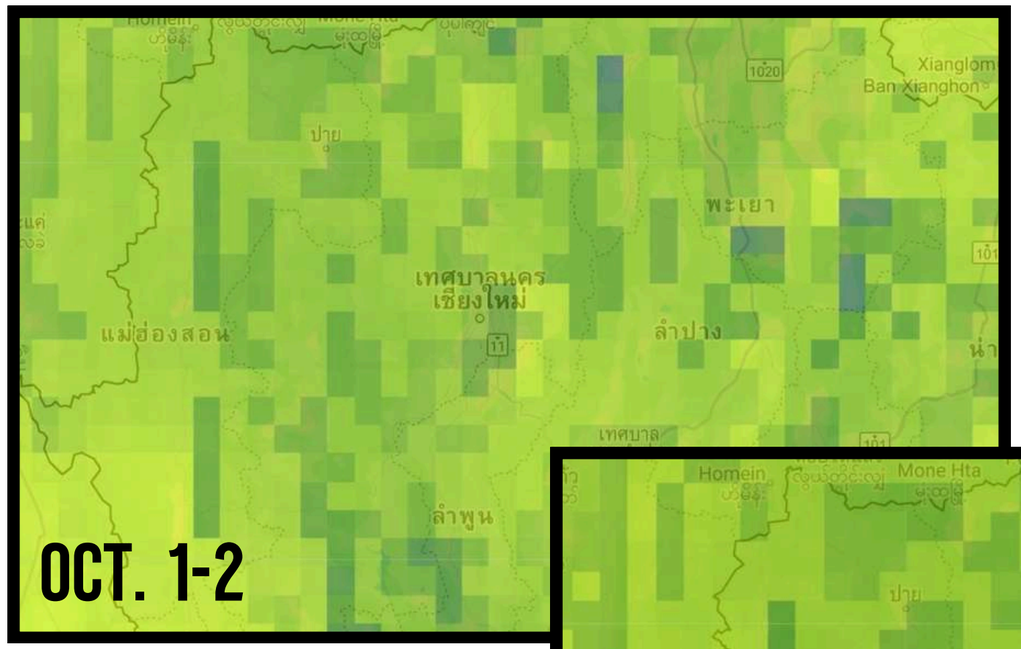


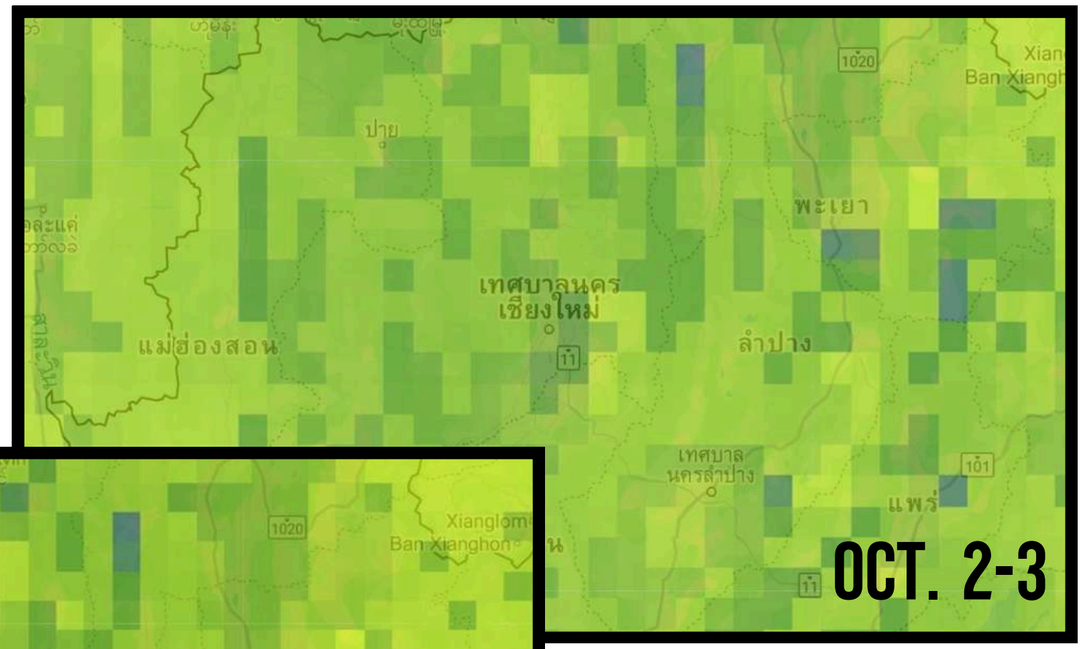
GRAPH SHOWING DATA SOIL MOISTURE

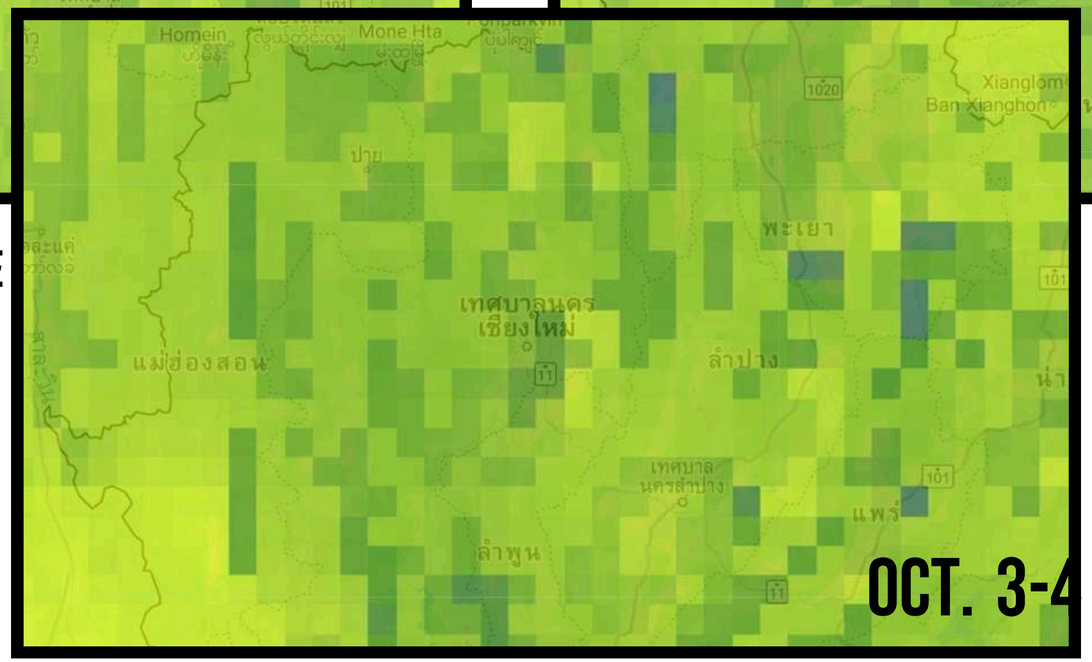
GRAPH SHOWING DATA RUNOFF FLUX



EARTH ENGINE

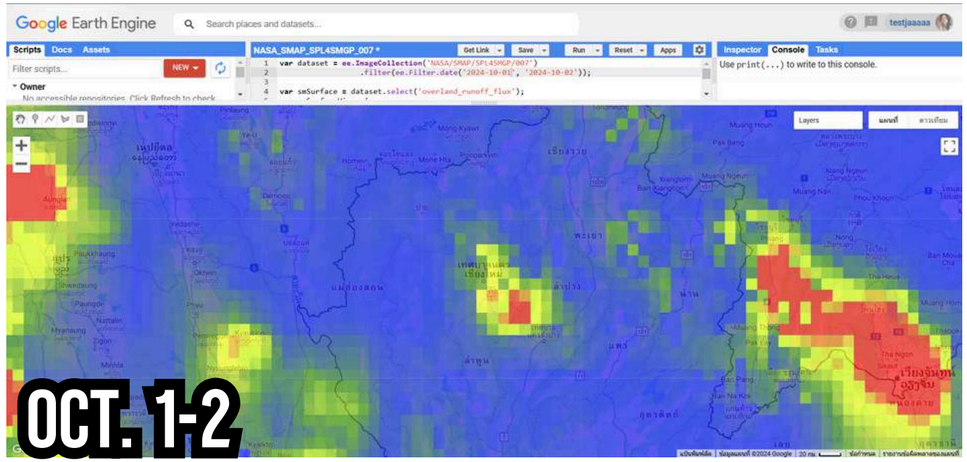


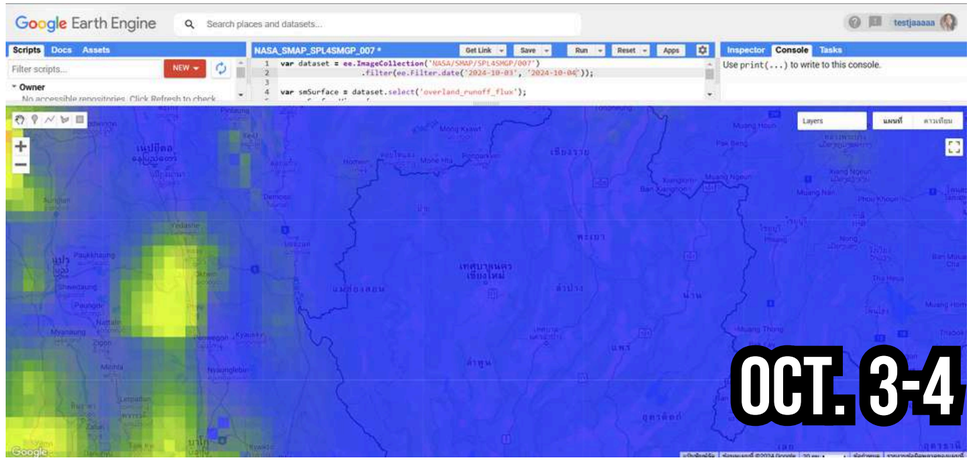


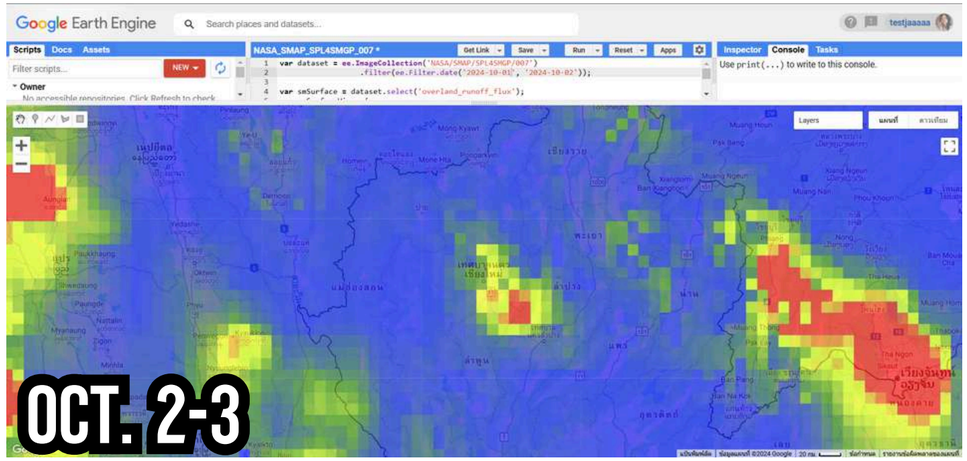


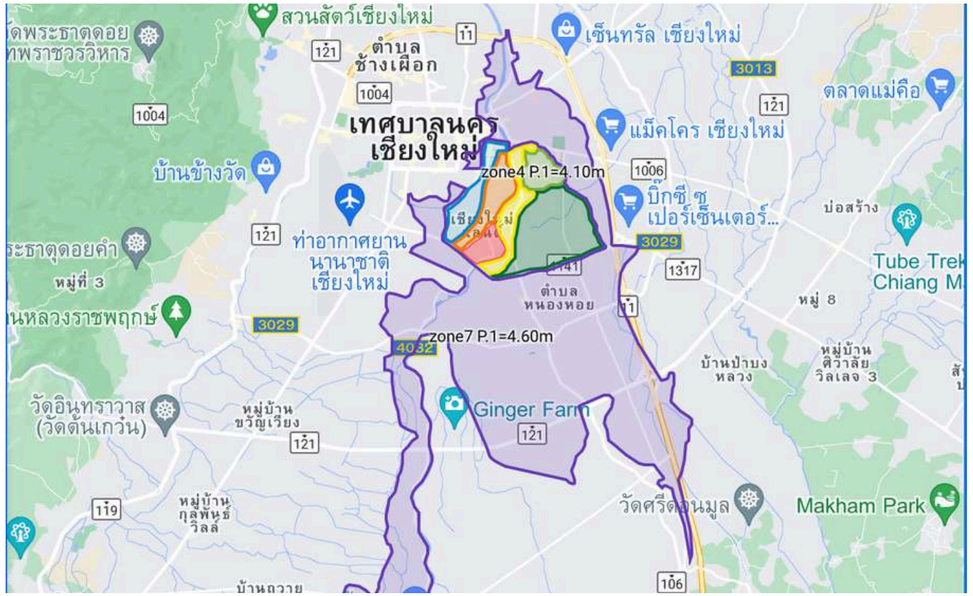
YOU CAN SEE THAT THE SOIL MOISTURE IN THE ROOT ZONE IS ALMOST THE SAME FOR ALL THREE DAYS. NEXT, WE WILL CREATE THE OVERLAND RUNOFF FLUX MAP FOR THE SAME DAYS AS THE SOIL MOISTURE ROOT ZONE.

EARTH ENGINE







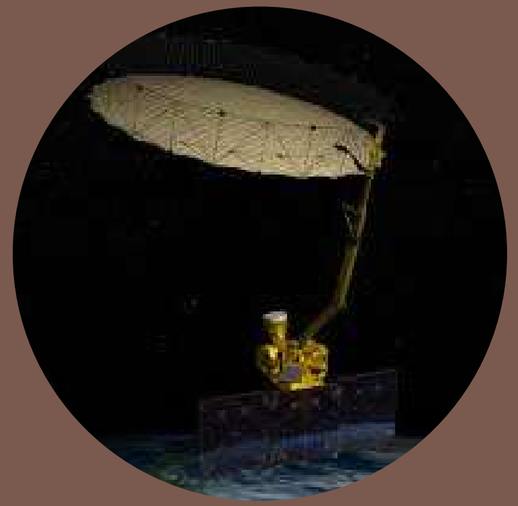


THE IMAGE SHOWS THAT OVERLAND RUNOFF (WATER FLOWING OVER THE SURFACE) IS HIGH, AND THE COLORS ON THE MAP INDICATE FLOOD SEVERITY. RED MEANS SEVERE FLOODING, YELLOW MEANS MODERATE FLOODING, AND BLUE MEANS NO FLOODING.

CONCLUSION

CONCLUSION

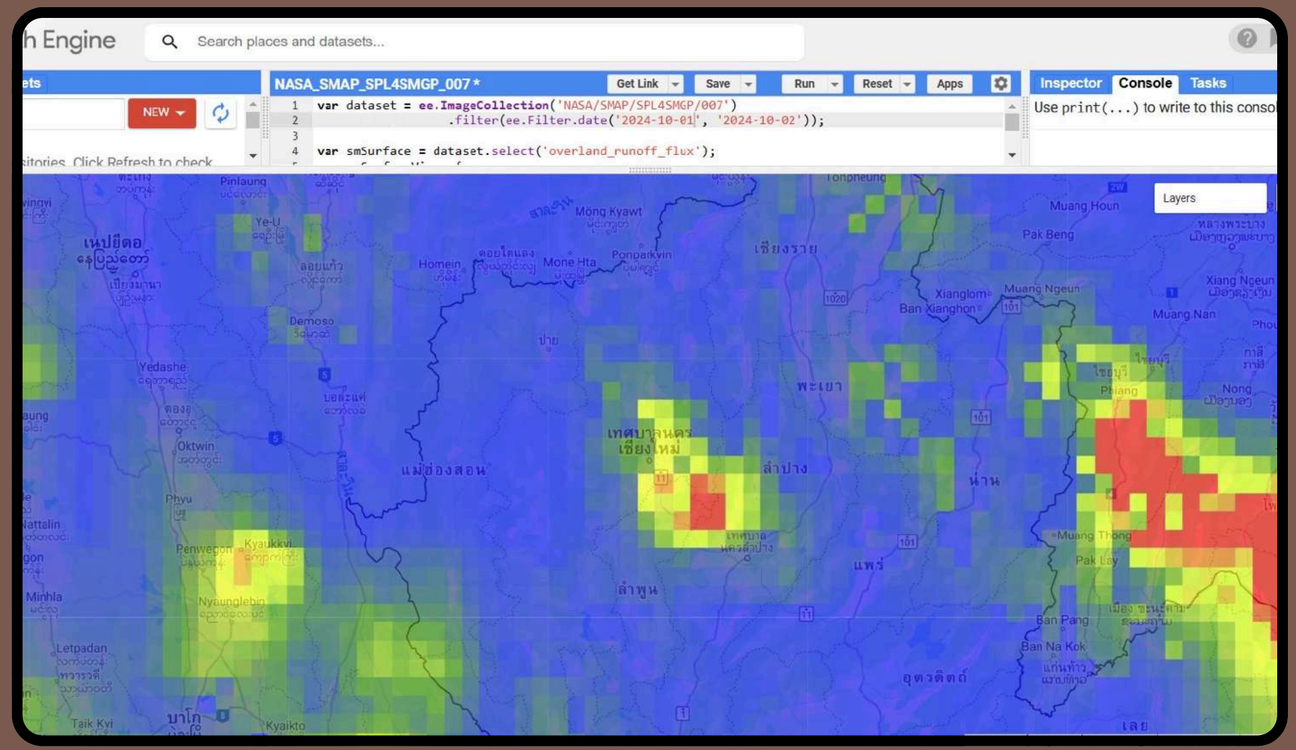
- THE SMAP SATELLITE CAN BE USED TO PREDICT FLOODS.



- THE STUDY FOUND THAT THE MOST RELIABLE AND USABLE DATA IS THE SOIL MOISTURE ROOT ZONE OVERLAND RUNOFF FLUX.

CONCLUSION

- DATA FROM SMAP CAN BE USED TO CREATE MAPS USING GOOGLE EARTH ENGINE, WHICH HELPS TO VISUALIZE THE APPLICATION OF DATA IN FLOOD MANAGEMENT. THIS ALSO ENABLES THE PUBLIC TO BETTER PREPARE FOR FLOOD EVENTS IN ADVANCE.




THANK YOU