

# M·S Dept. Math 518 Group

## Estimation of tsunami-affected areas and evacuation sites

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### Motivation :

Japan has a lot of earthquakes and the junior high school we used to attend is located right next to the ocean, but it was used as a tsunami (up to 18m) shelter, and I wondered if it was really safe there.

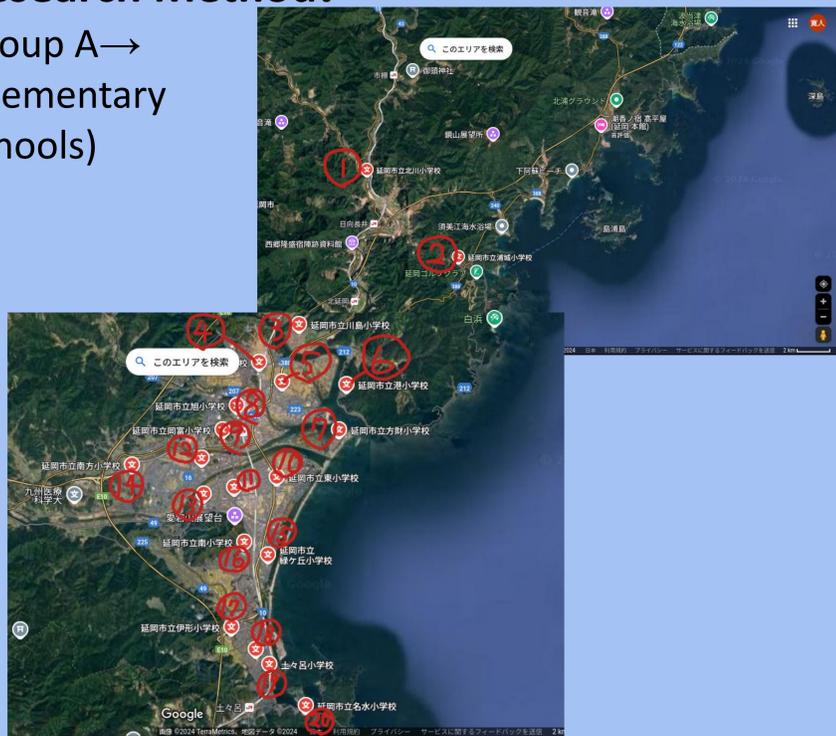
### Objective :

To raise our awareness of disaster preparedness

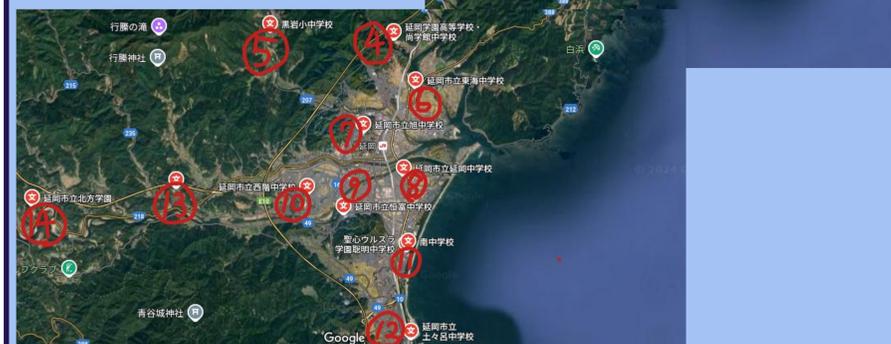


### Research Method:

Group A→  
(elementary schools)



Group B→  
(junior high schools)



Group C→  
(high schools)

- ①: Watch the tsunami's movement on Google Earth.
- ②: Since it takes 18 minutes from the time an earthquake occurs to the time a tsunami arrives, consider evacuation locations within the distance we can get to in that time.

### Hypothesis :

In any district, the highest elevation mountain would be the safest evacuation site.

### Results to date :

Group A: elementary schools (ES)

Name of School	Sea Level	Evacuation Site	Reason	Evacuation Time
① Kitagawa ES	13m	Kitagawa ES	Sea level is high enough	0 minutes
② Urashiro ES	8m	Newly completed slope	Sea level is 14m	3 minutes
③ Kawashima ES	2.8m	Back hill near Shrine	The highest altitude in the area	5 minutes
④ Toumi ES	12m	Toumi ES	Sea level and school building height are enough	0 minutes
⑤ Toumihigashi ES	7m	Toumihigashi ES	The rooftop is the designated evacuation shelter.	0 minutes
⑥ Minato ES	15m	Minato ES	There are no buildings nearby and the site is at a sufficient Sea Level	0 minutes
⑦ Houzai ES	5m	Houzai ES	The highest elevation in the vicinity	0 minutes
⑧ Asahi ES	9m	Asahi ES	There are no rivers nearby and sea level is sufficient.	0 minutes
⑨ Okatomi ES	9m	Municipal Okatomi multi-unit apartments	It is 18m above sea level and far from any rivers.	3 minutes
⑩ Higashi ES	3m	Rooftop of AEON	Not high enough, but this is the highest elevation we have.	20 minutes
⑪ Tsunetomi ES	4m	Rooftop of AEON	Elevation is 13m above sea level and there are no rivers nearby.	4 minutes
⑫ Nobeoka ES	6.5m	Nobeoka ES	The school building and the sea level are high enough.	0 minutes
⑬ Nishi ES	6m	Souka Society Nobeoka Cultural Hall	It's 21m above sea level.	3 minutes
⑭ Minamikata ES	6m	Nishishina cemetery	It's 25m above sea level and away from rivers.	1 minutes
⑮ Midorigaoka ES	4m	Nobeoka Rest Home	The height of the building is more than 20m	3 minutes
⑯ Minami ES	5m	Seihou HS	It's on high ground and the elevation is about 21m above sea level	16 minutes
⑰ Igata ES	18.1m	Igata ES	It's on high ground and 15m above sea level	0 minutes
⑱ Hitotsugaoka ES	4m	Golf courses in the vicinity	It is 28.1m above sea level and close to the school	1 minutes
⑳ Totoro ES	3.2m	Umezaki Hills	It is 85m above sea level	17 minutes
㉑ Meisui ES	3m	Kuroki Office Co.	It is 23m above sea level	5 minutes

Group B: junior high schools (JHS)

Name of School	Sea Level	Evacuation Site	Reason	Evacuation Time
① Kitaura JHS	9m	Kitano Ground	It's 20m above sea level	13 minutes
② Minamiura JHS	4m	Rooftop of Kumano ES	It is a designated evacuation center	2 minutes
③ Kitagawa JHS	16m	Kitagawa JHS	There's enough elevation above sea level	0 minutes
④ Syougakkukan JHS	9m	Soccer field	There's enough elevation above sea level	0 minutes
⑤ Kuroiwa JHS	35m	Kuroiwa JHS	35m above sea level	0 minutes
⑥ Toumi JHS	9m	Toumi JHS	It is a designated evacuation center	0 minutes
⑦ Asahi JHS	13m	Asahi JHS	School buildings and elevation above sea level are sufficient	0 minutes
⑧ Nobeoka JHS	3m	Third floor in Nobeoka JHS	School buildings and elevation above sea level are sufficient	0 minutes
⑨ Tsunetomi JHS	6m	Souka Society Nobeoka Cultural Hall	The elevation is more than 21m above sea level	3 minutes
⑩ Nishishina JHS	15m	Nishika Athletic Park	There are large spaces and multiple shelters	3 minutes
⑪ Minami JHS	5m	Nobeoka Rest Home	The building is more than 20m high	5 minutes
⑫ Totoro JHS	5m	Totoro JHS	There are no buildings in the area tall enough to evacuation	0 minutes
⑬ Minamikata JHS	52m	Minamikata JHS	There's enough elevation above sea level	0 minutes
⑭ Kitakatagakuen JHS	76m	Kitakatagakuen JHS	There's enough elevation above sea level	0 minutes
⑮ Okatomi JHS	8m	Okatomi JHS	There's enough elevation above sea level	0 minutes

Group C: high schools (HS)

Name of school	Sea Level	Evacuation Site	Reason	Evacuation Time
① Nobeokagakuen HS	9m	Nobeokagakuen HS	The total height of the school building is 17m above sea level	0 minutes
② Seion HS	4m	Seion HS	There are no tall buildings nearby	0 minutes
③ Nobeoka HS	8m	Souka Society Nobeoka Cultural Hall	Sea level is enough	3 minutes
④ Nobeoka Technical HS	6m	Nobeoka Rest Home	It's more than 20m high	16 minutes
⑤ Seishin Ursula HS	5m	Nobeoka Rest Home	It's more than 20m high	5 minutes
⑥ Seihou HS	9m	Seihou HS	It is located on high ground	0 minutes

◎ Considering the distance from the school and the arrival time of the tsunami, the mountain is not always the best choice.

### Reference :

Assumption of Miyazaki Prefecture Earthquake, Tsunami and Damage

[https://www.pref.miyazaki.lg.jp/documents/4579/4579\\_20200318114609-1.pdf](https://www.pref.miyazaki.lg.jp/documents/4579/4579_20200318114609-1.pdf)