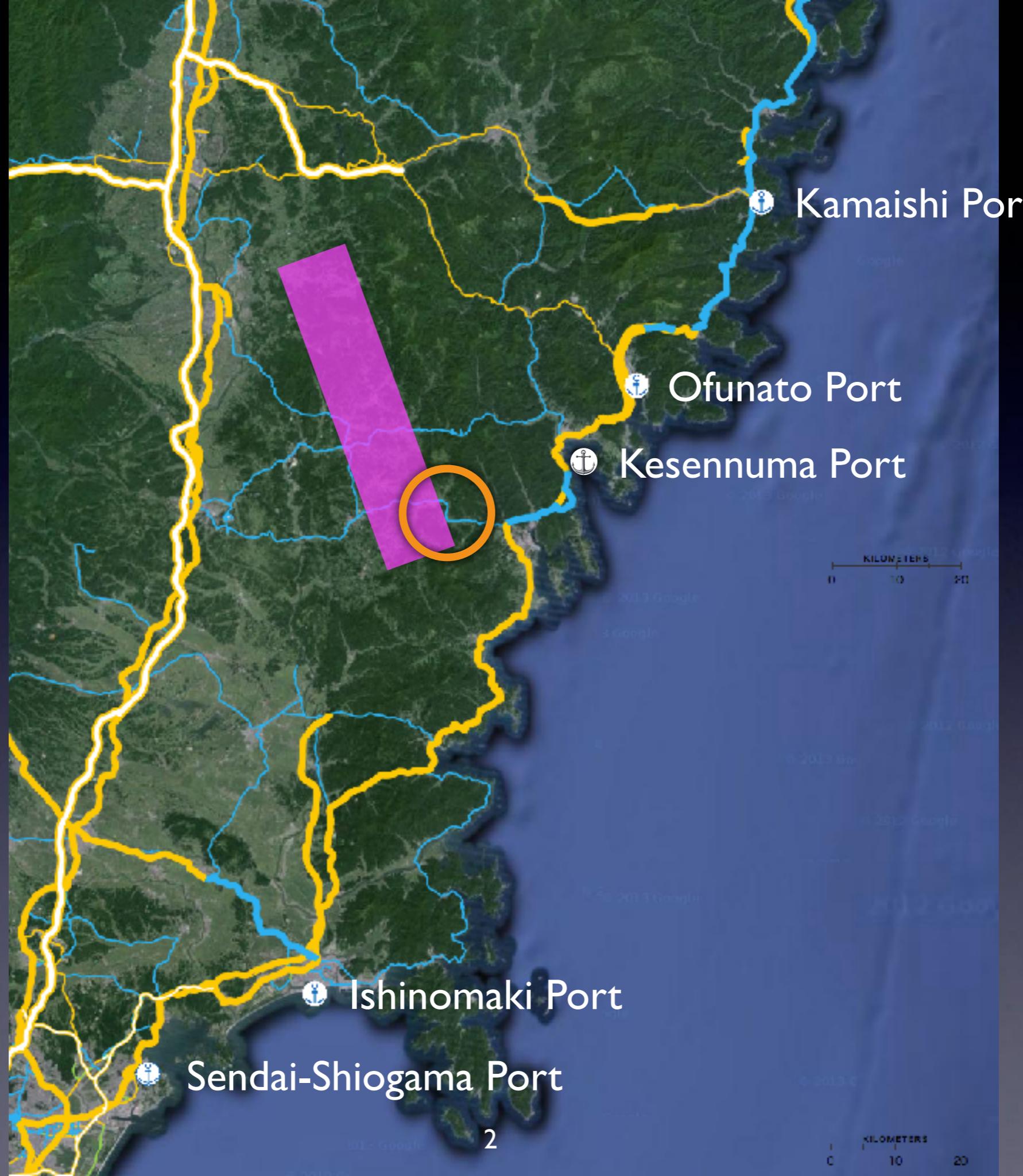
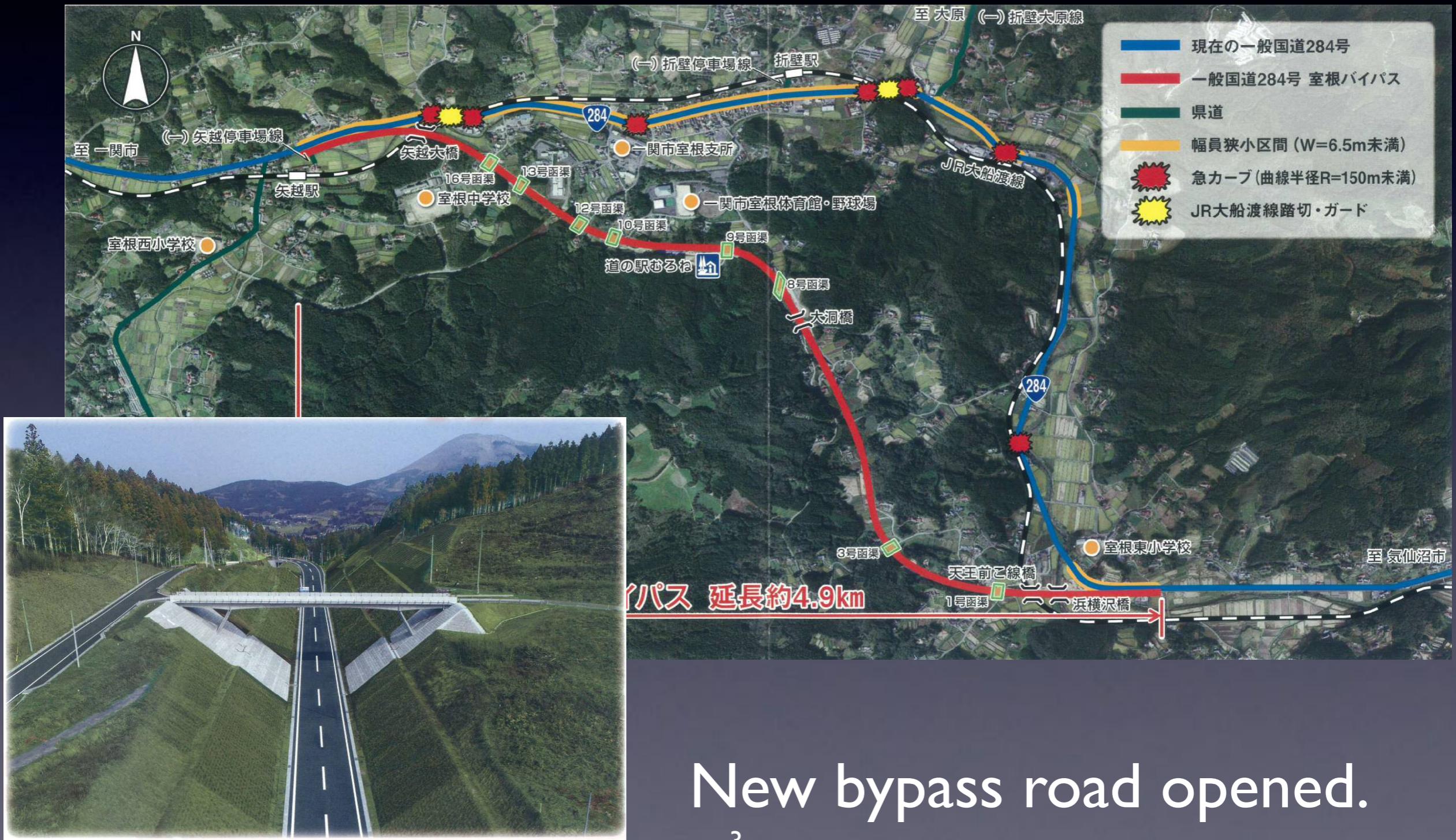
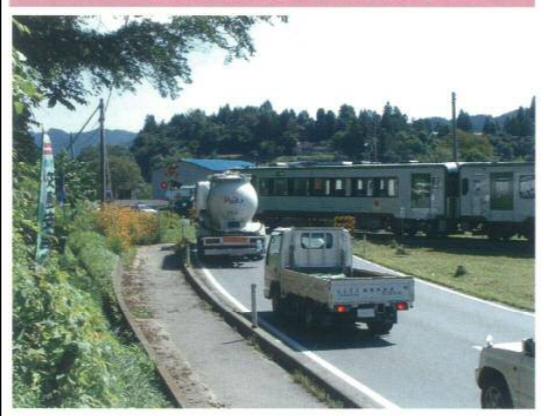


# Tunnel floor vibration issue

Tomo SANUKI (Tohoku U.)





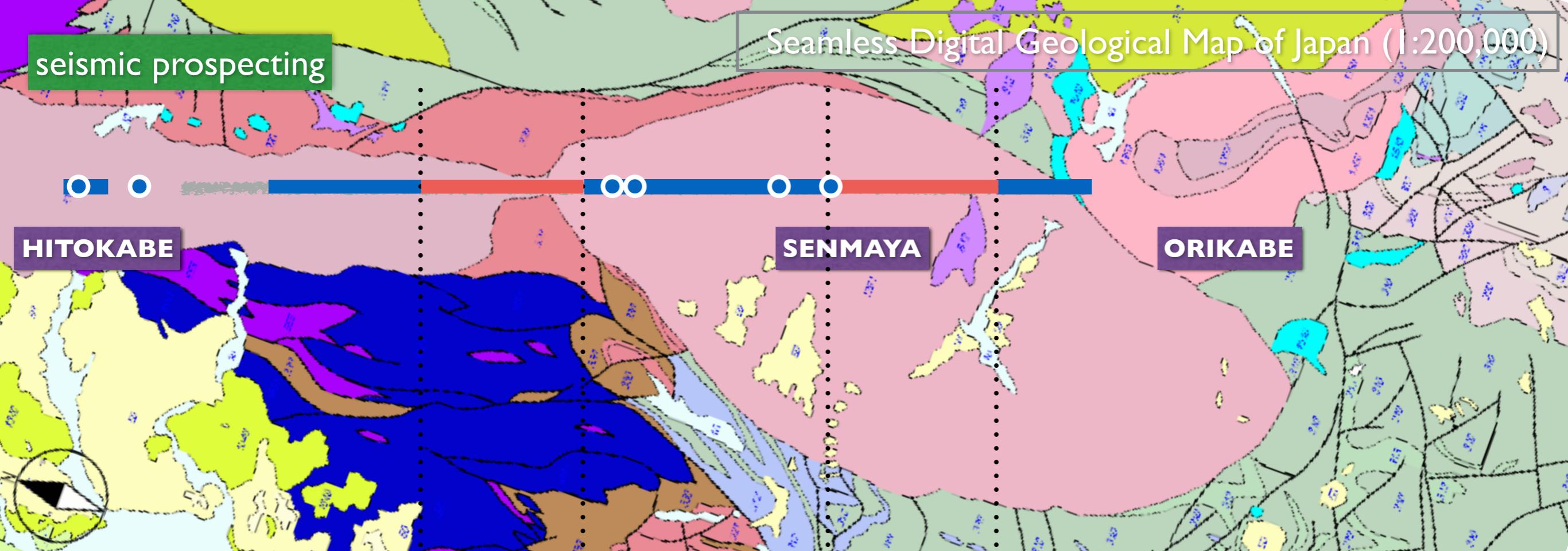
New bypass road opened.

- Geological survey
- Vibration measurement

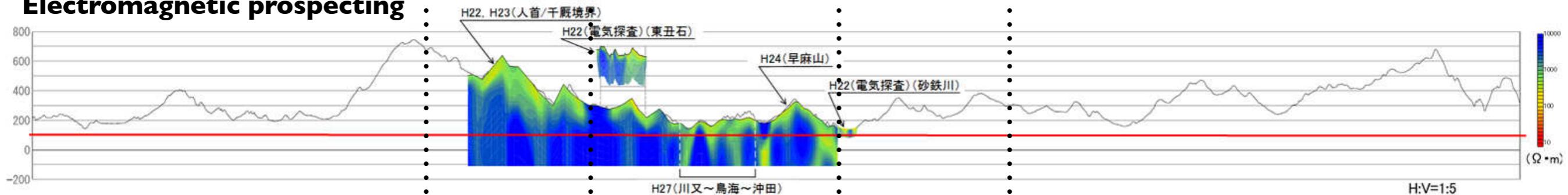
# Geological survey

## seismic prospecting

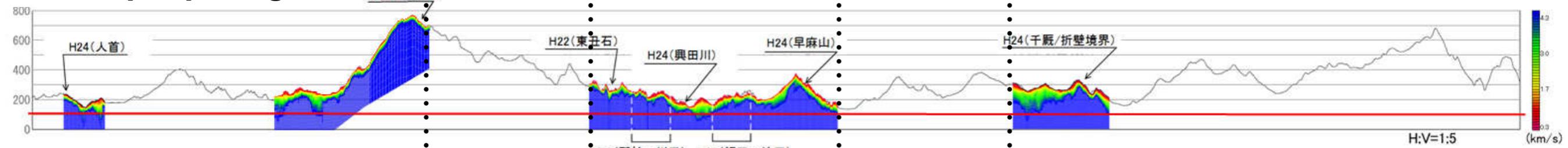
## Seamless Digital Geological Map of Japan (1:200,000)



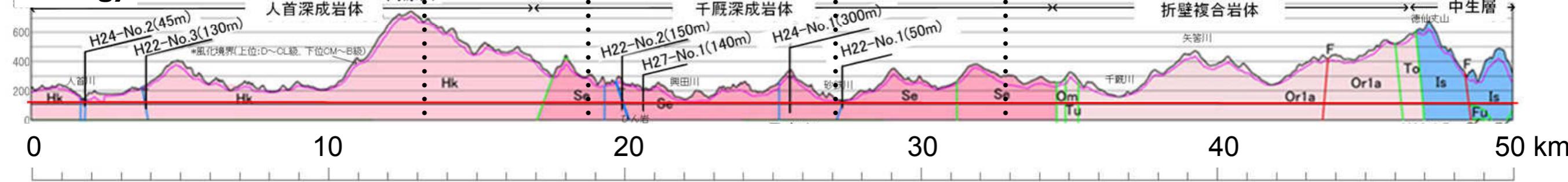
## Electromagnetic prospecting



## Seismic prospecting

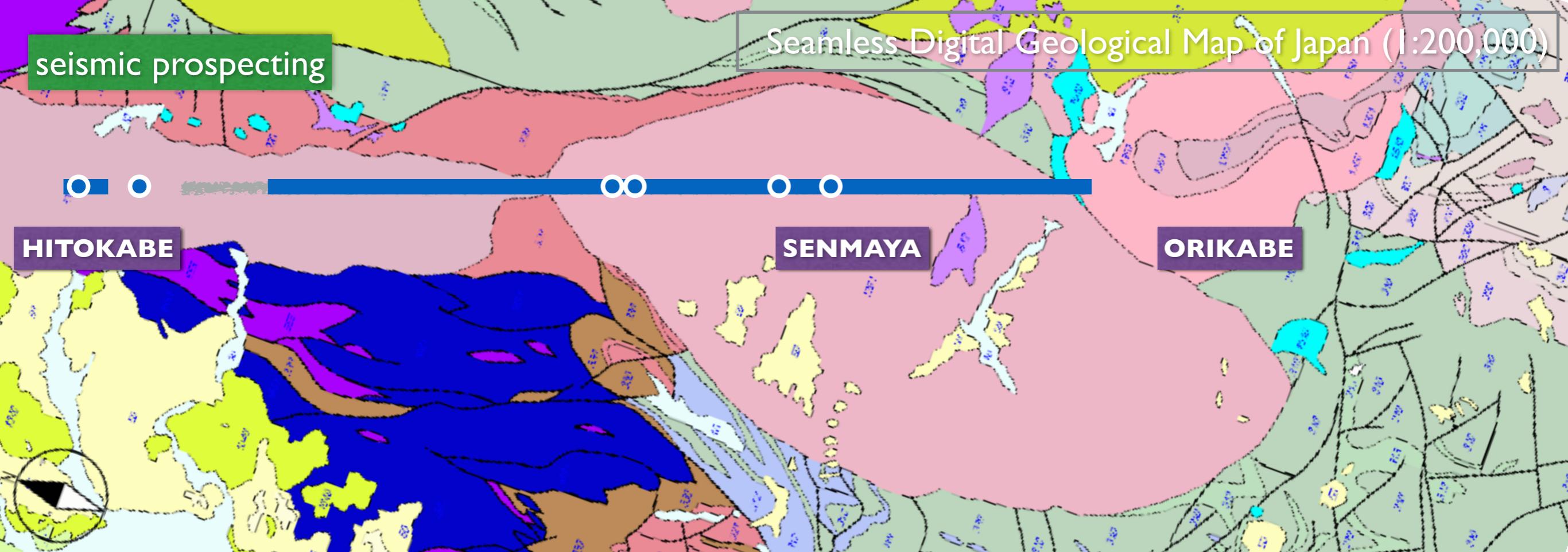


## Geology

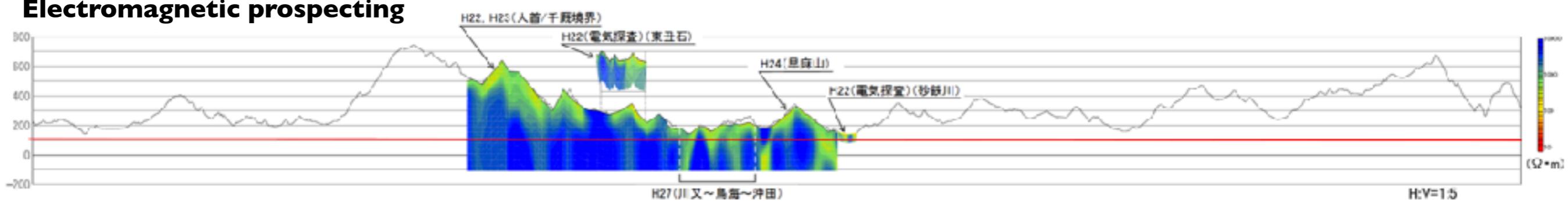


seismic prospecting

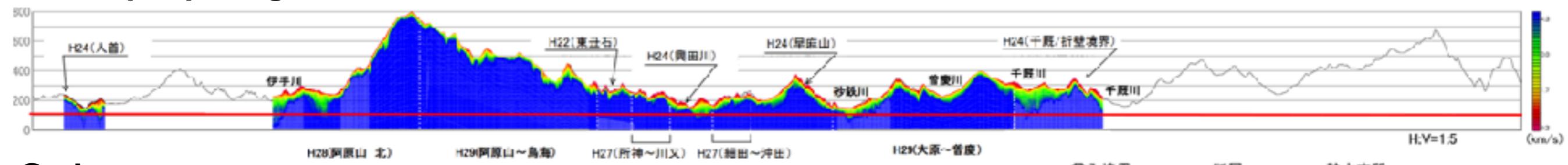
Seamless Digital Geological Map of Japan (1:200,000)



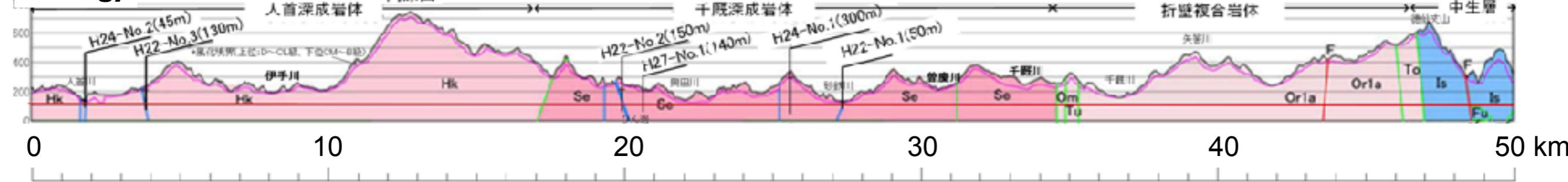
Electromagnetic prospecting



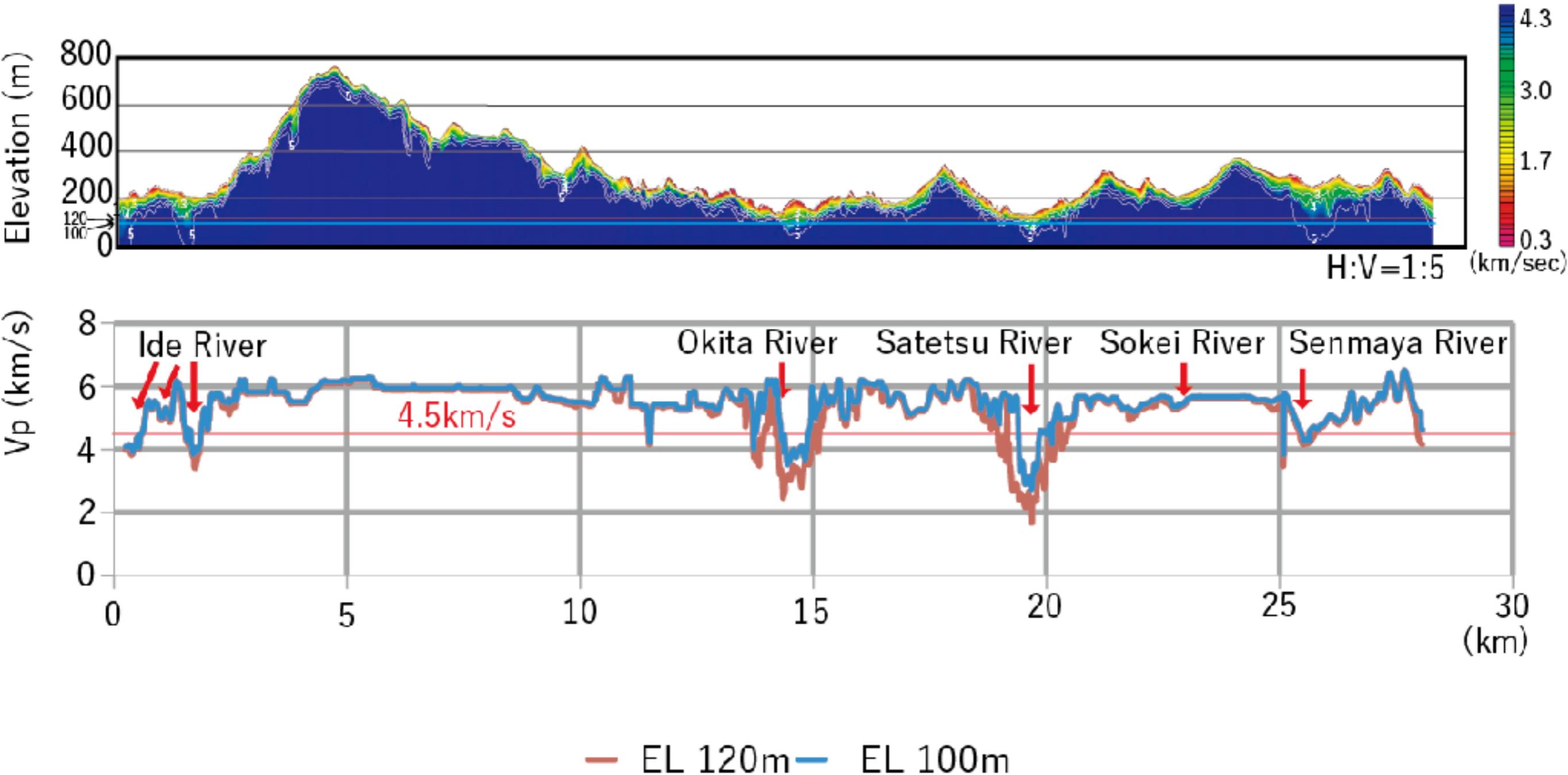
Seismic prospecting



Geology



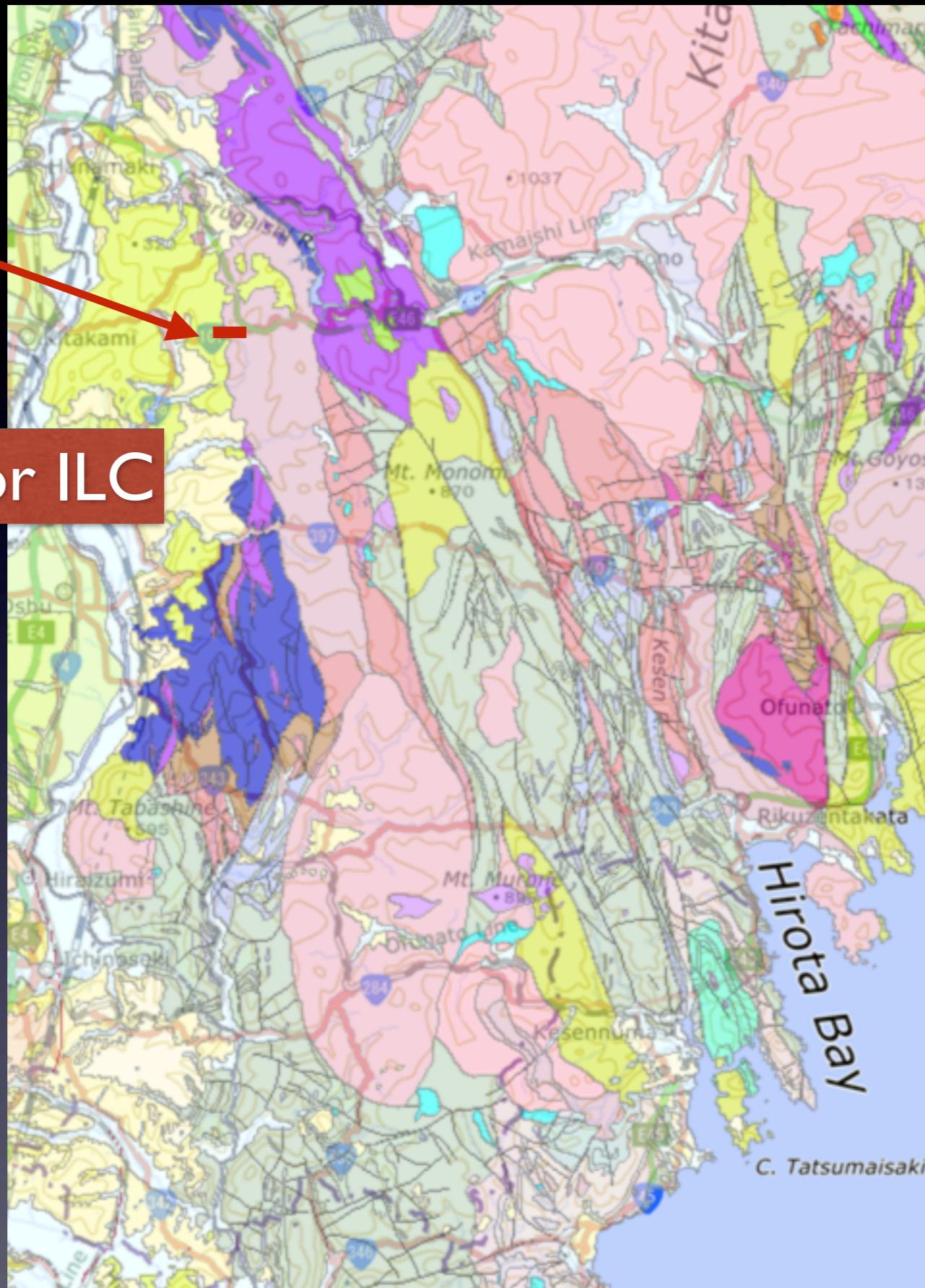
## seismic prospecting



- Covered the whole ILC250 line
- Got the whole picture of the geology
  - Nice, for the most part
  - Requires attention, only a part of the line

# Vibration measurement (tunnel excavation)

- Tunnel floor vibration caused by
  - Tunnel excavation / blasting
  - Road traffic



YANAGAWA Tunnel  
L=1,022m

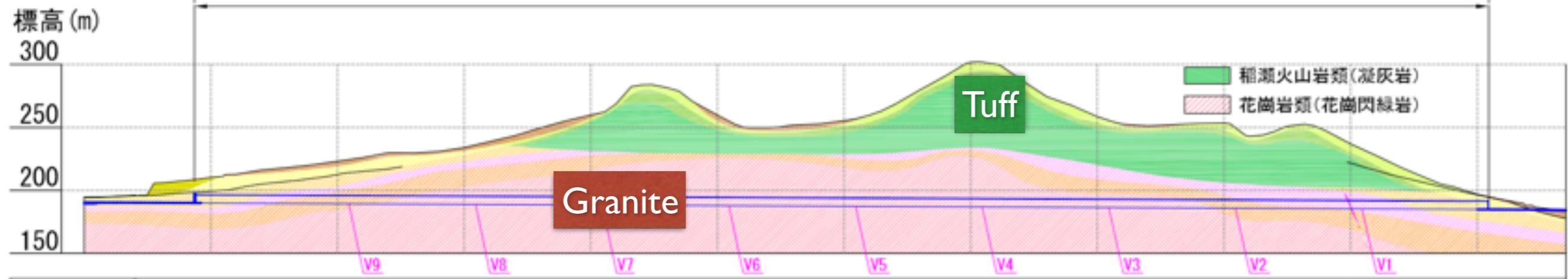
“Pilot tunnel” for ILC



fresh granite  
2017.9

YANAGAWA T.

L=1022.000m



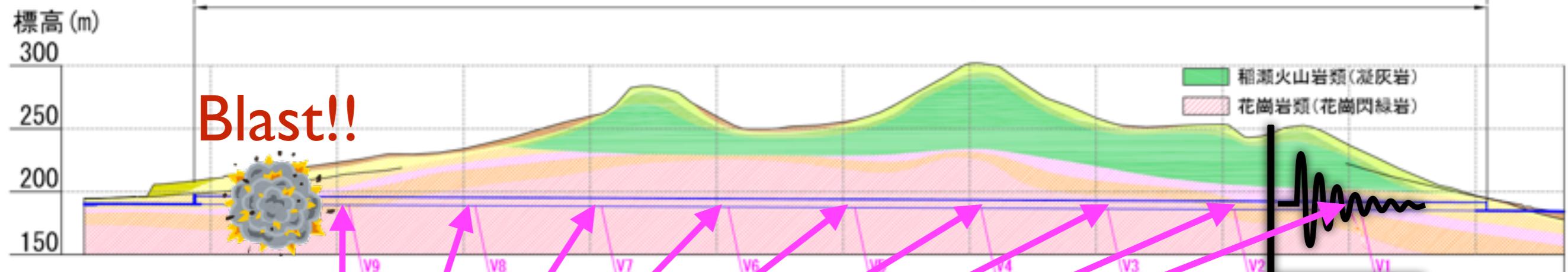
The same rock as ILC.  
Similar to ILC access tunnel



civil engineering work

YANAGAWA T.

L=1022.000m



Vibration meter

15

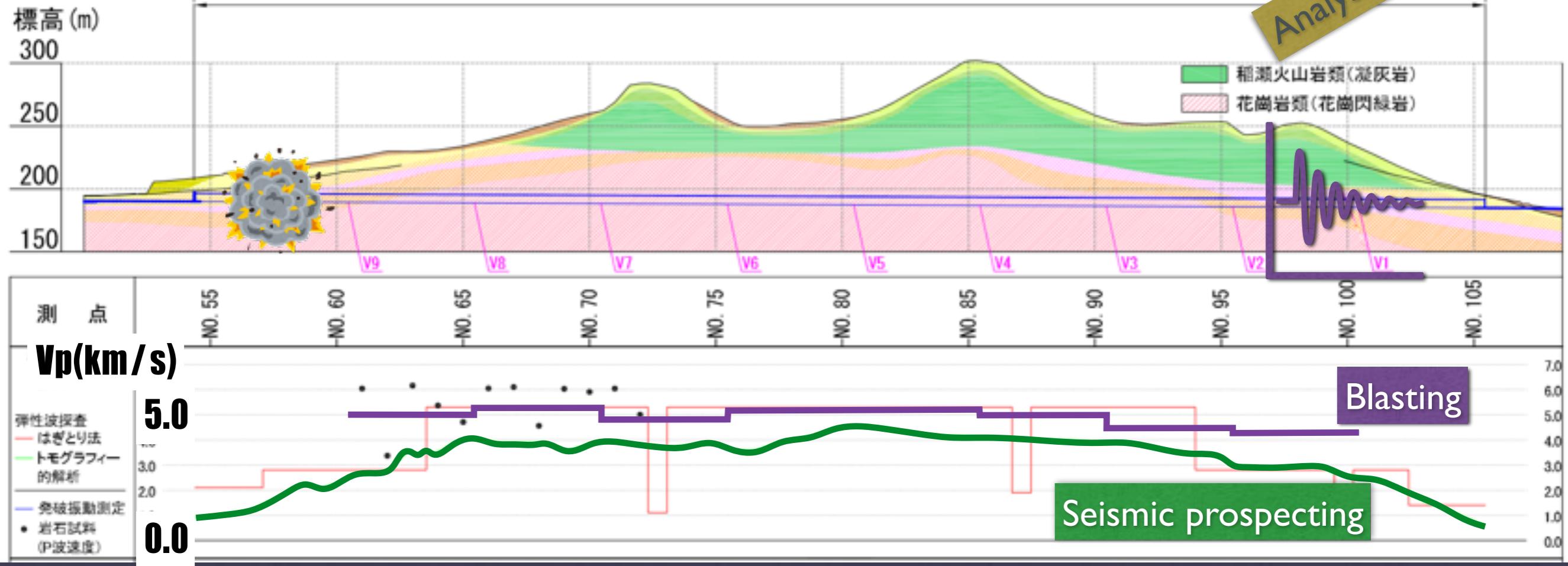


PC

Analysis in progress

## YANAGAWA T.

L=1022.000m



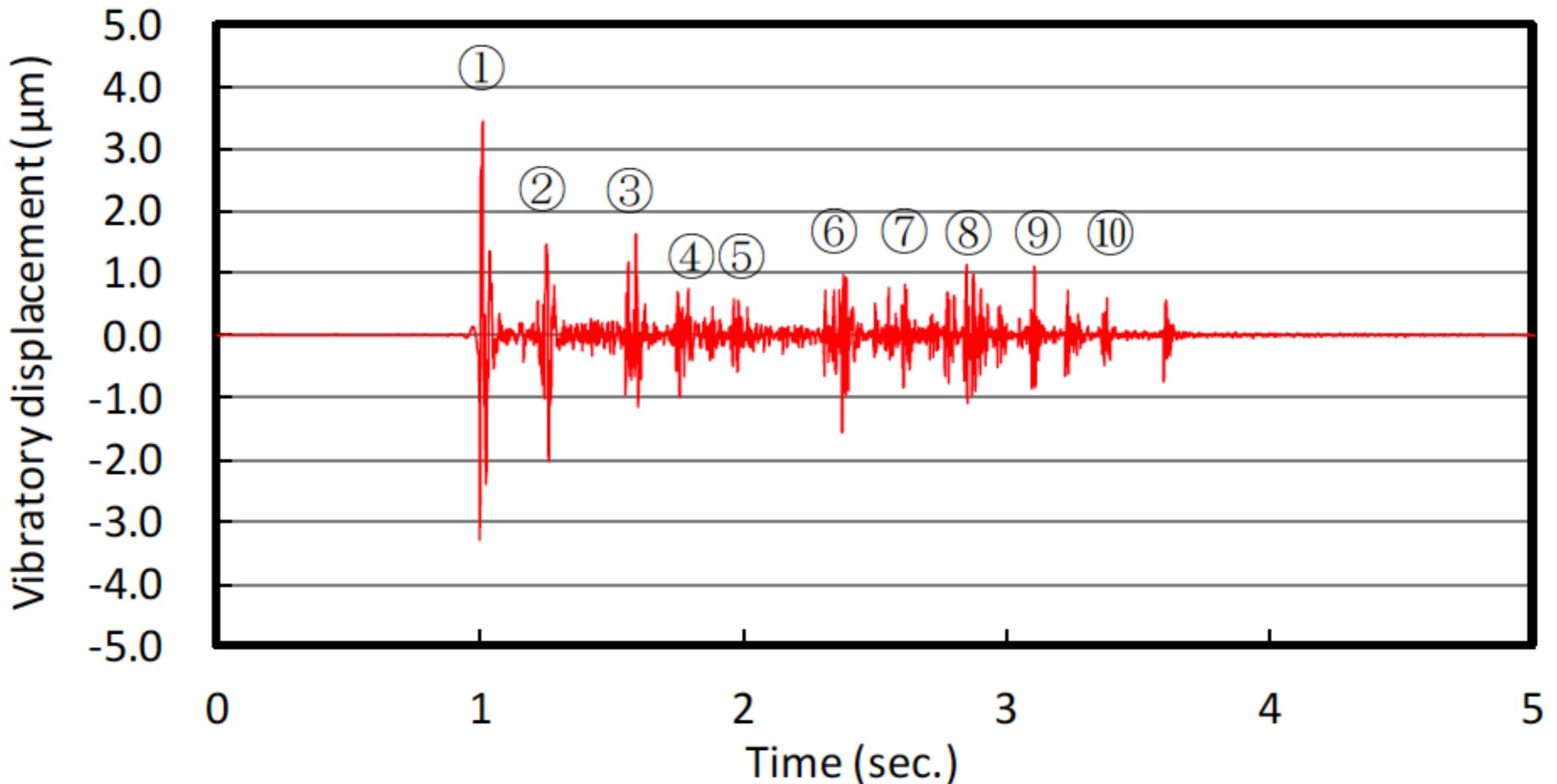
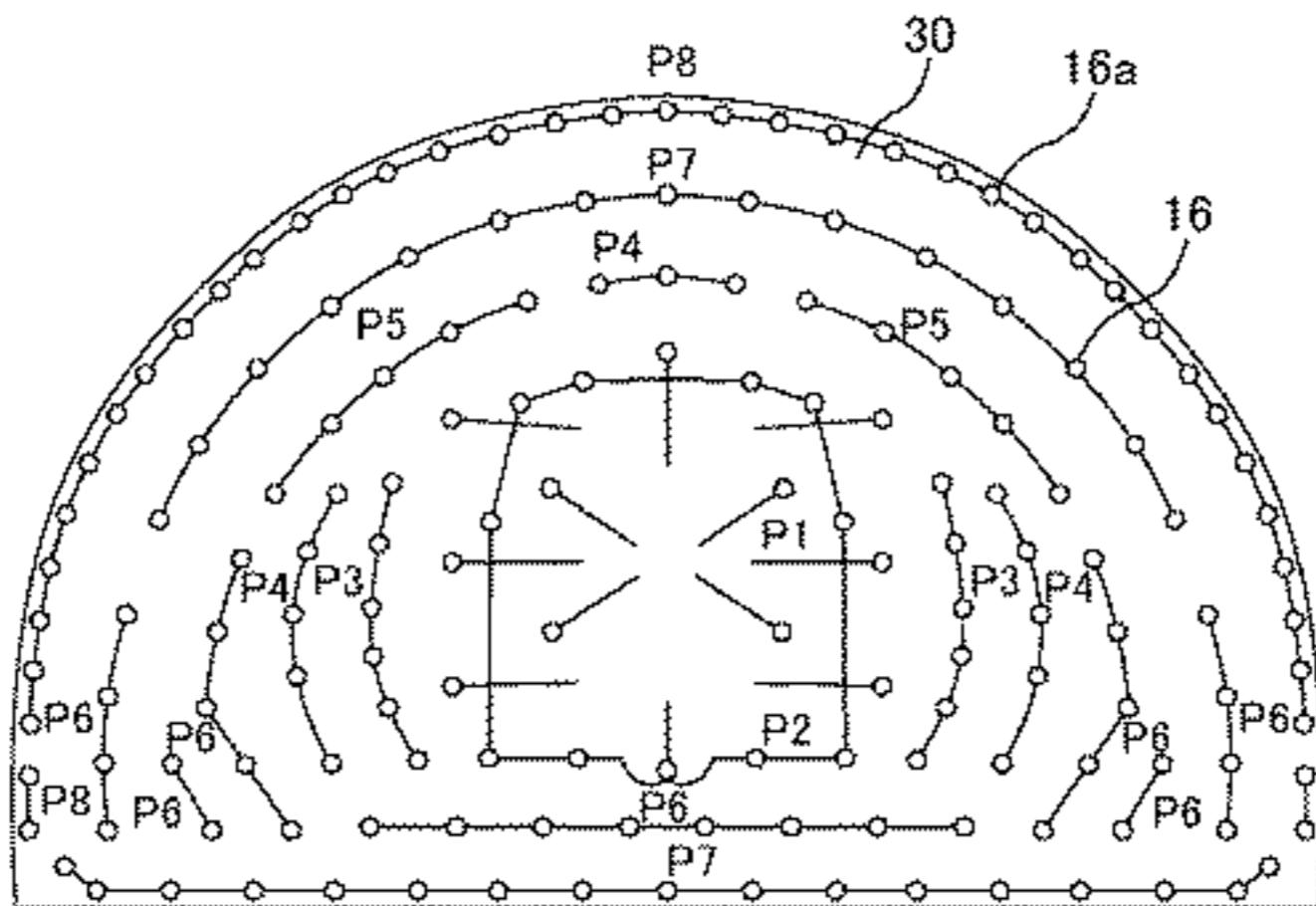


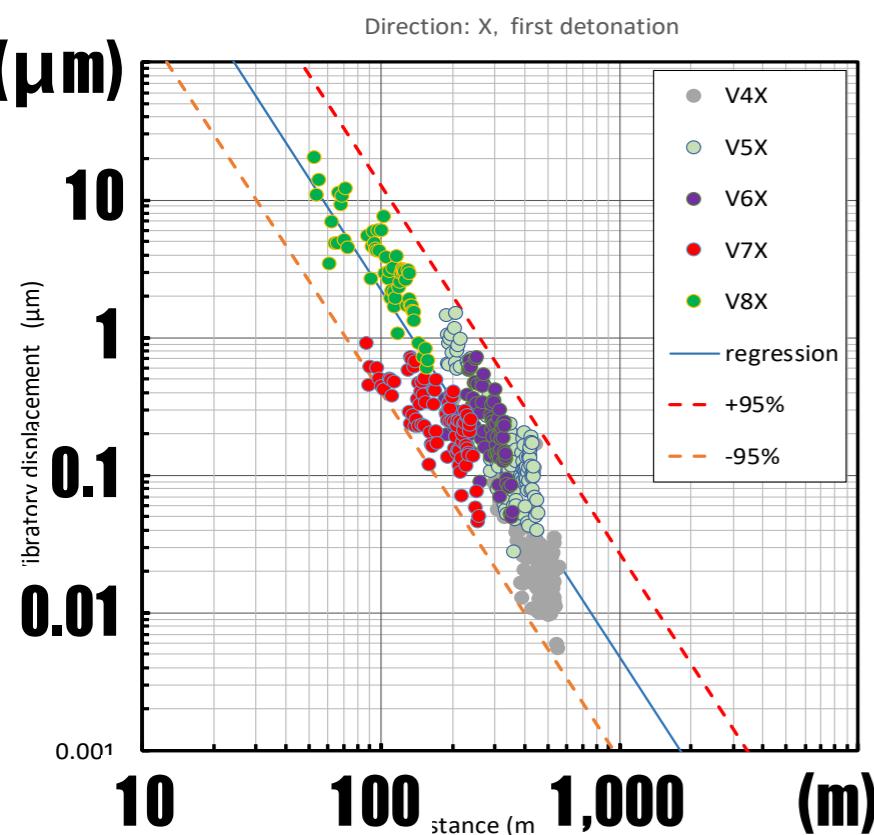
Figure 2.2: Time response of blasting vibration,  
Measurement point: V8, Direction: Y



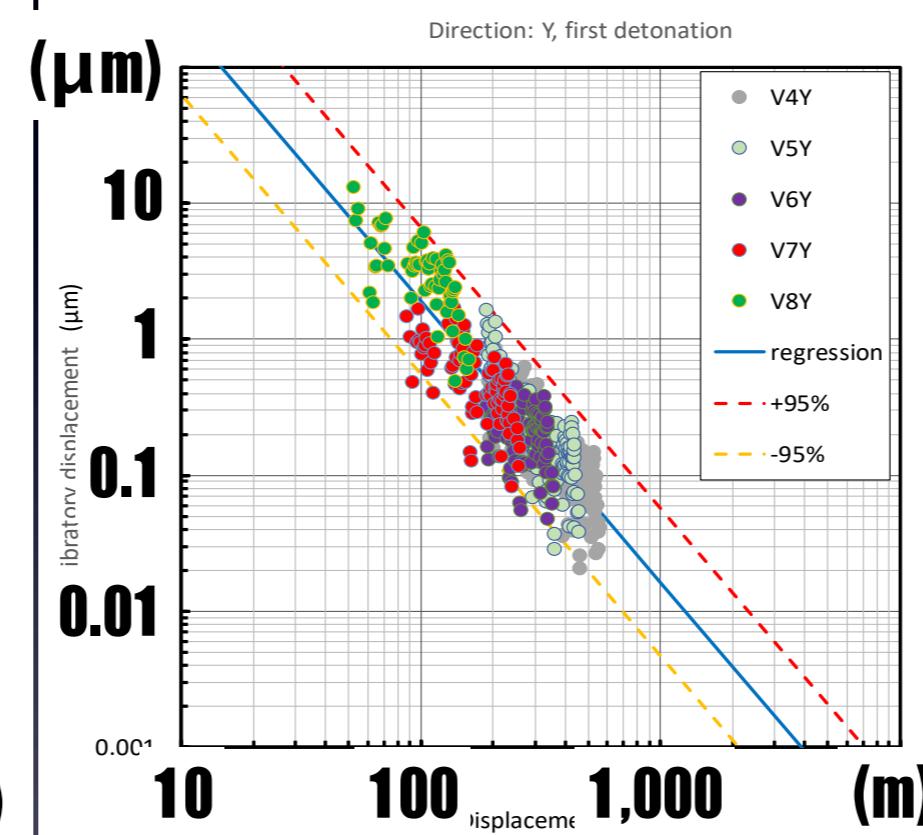
<https://astamuse.com/ja/published/JP/No/2009168375>

# Displacement ( $\mu\text{m}$ ) vs Distance (m)

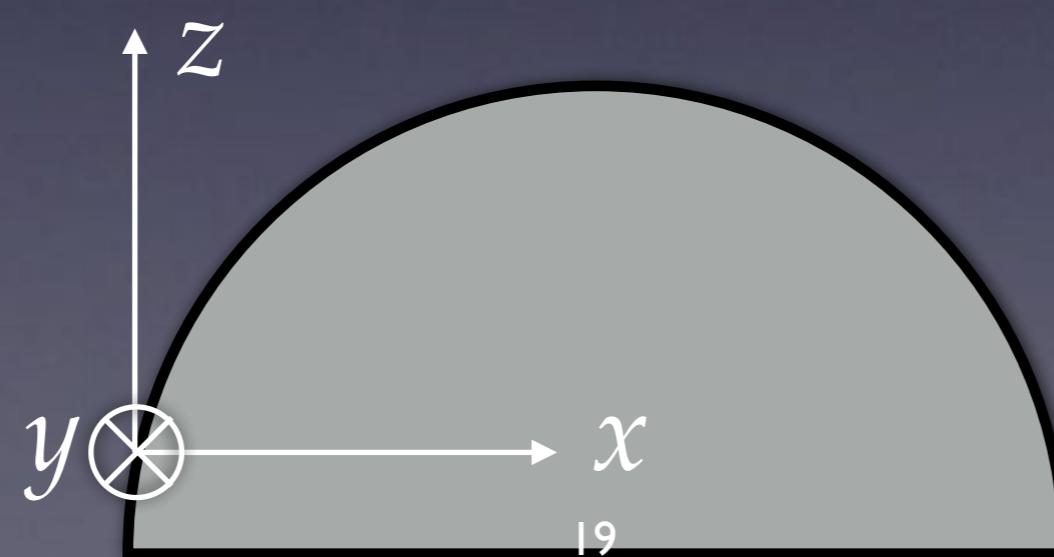
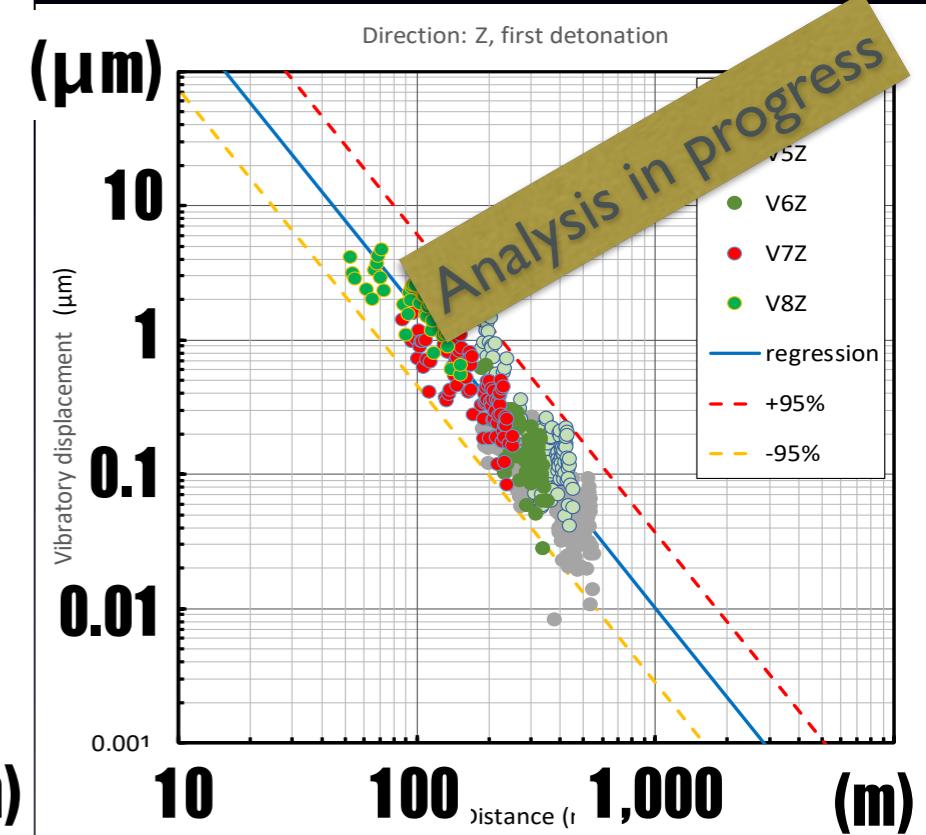
$x$ -direction



$y$ -direction



$z$ -direction



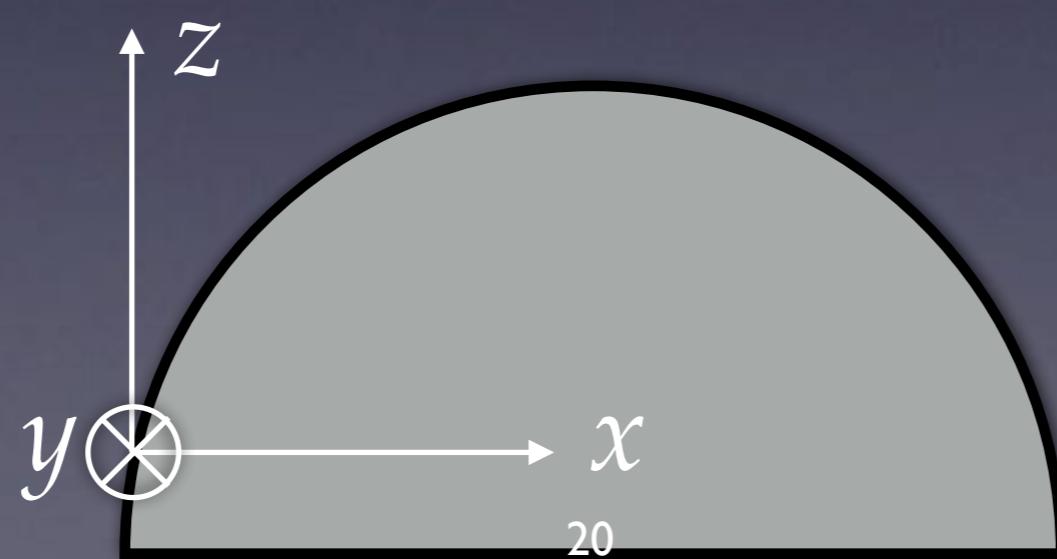
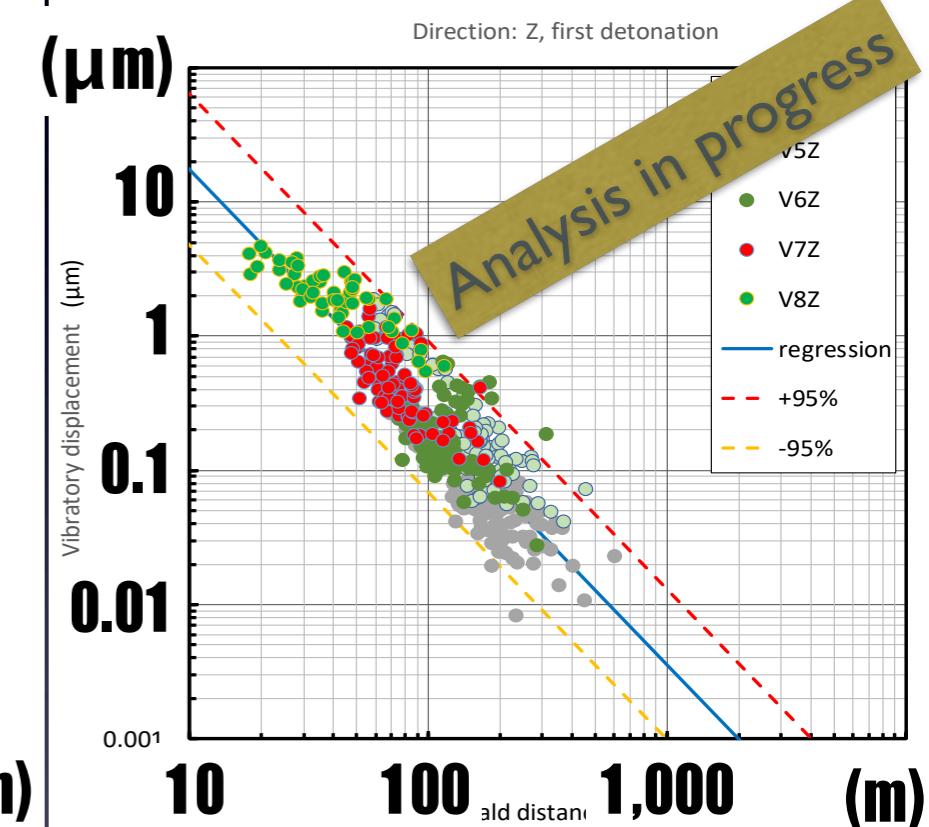
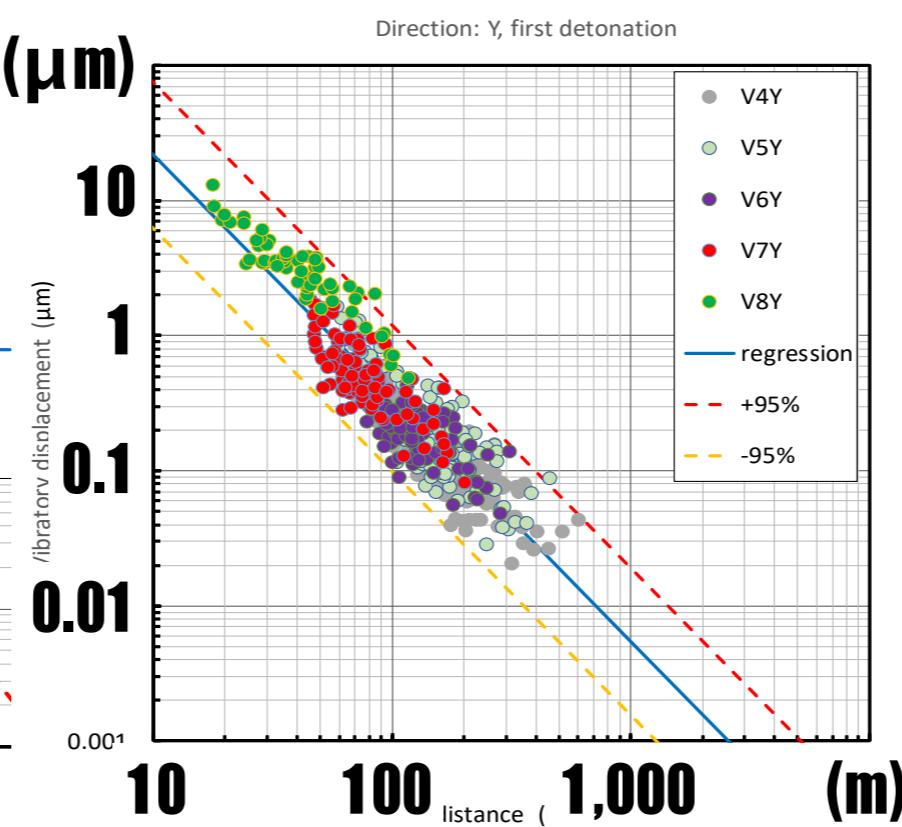
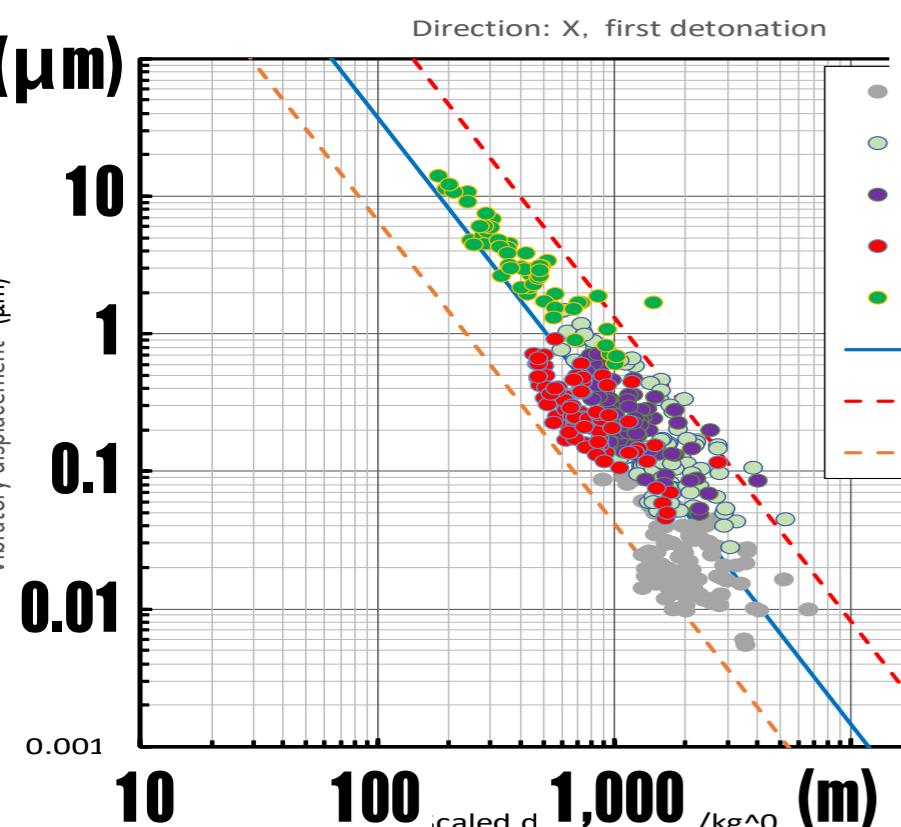
# Displacement ( $\mu\text{m}$ ) vs Distance/ $W^{1/2}$ ( $\text{m}/\text{kg}^{1/2}$ )

$W$  : weight of gunpowder

$x$ -direction

$y$ -direction

$z$ -direction

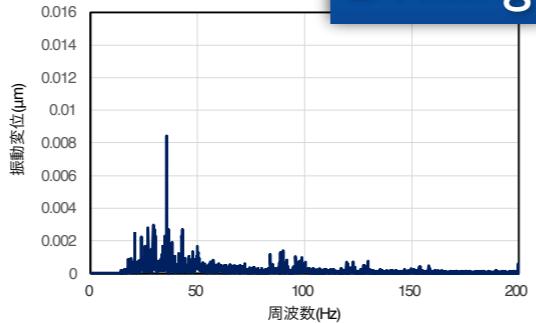
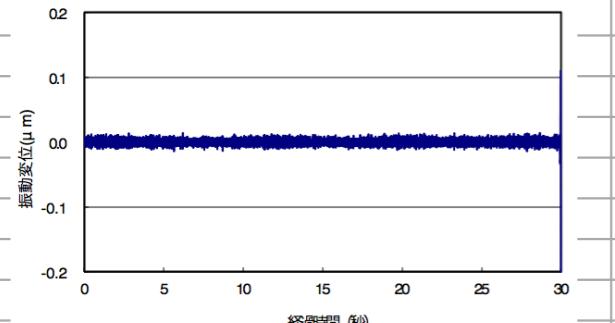


# heavy construction equipment.

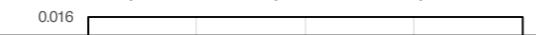
作業名	ドリル打撃
振動源	ドリルビット
振動源位置	TD857.6
観測位置	TD800
振動源からの離隔	57.6m



Drilling

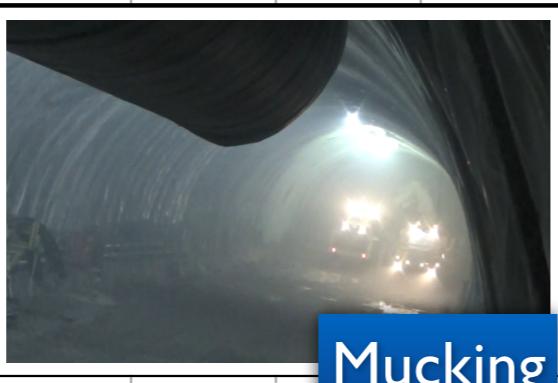


X: トンネル横断方向

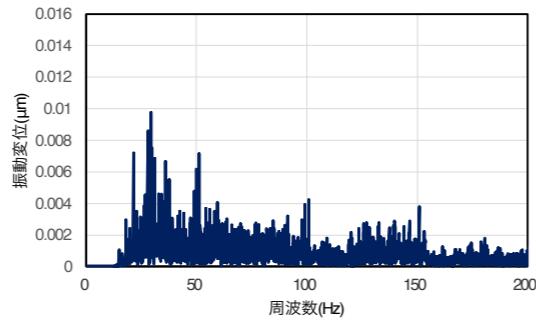
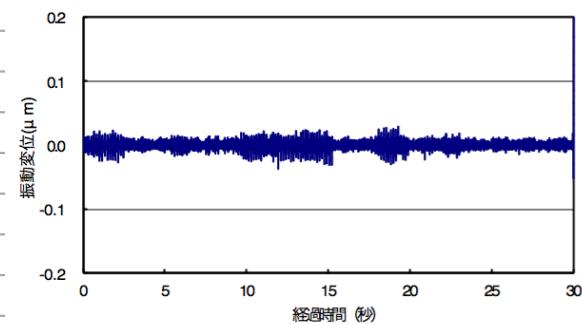


■20180116 梁川トンネルにおける坑内振動（変位）の計測結果

作業名	すり出し
振動源	ブレーカー-1.3ton
	サイドダンプ
	重ダンプ
振動源位置	TD857.6 付近
観測位置	TD800
振動源からの離隔	50m程度



Mucking



X: トンネル横断方向

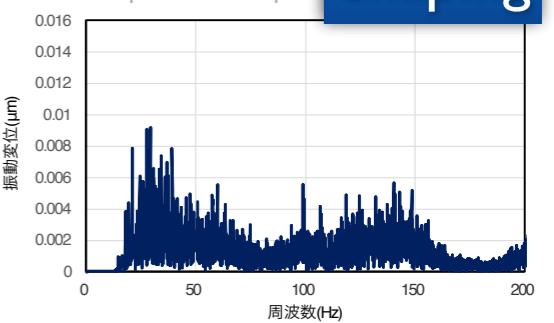
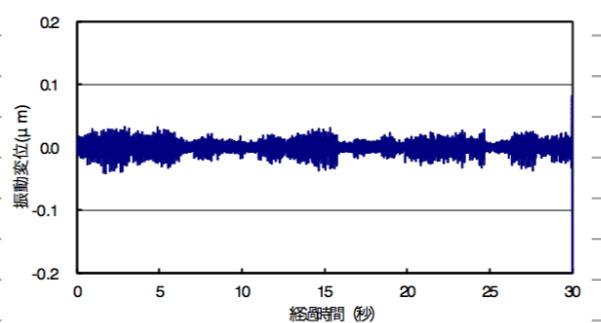


■20180116 梁川トンネルにおける坑内振動（変位）の計測結果

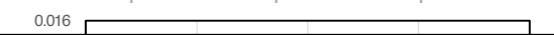
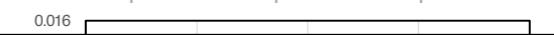
作業名	コソク
振動源	ブレーカー-1.3ton
振動源位置	TD857.6 付近
観測位置	TD800
振動源からの離隔	57.6m



Shaping



X: トンネル横断方向

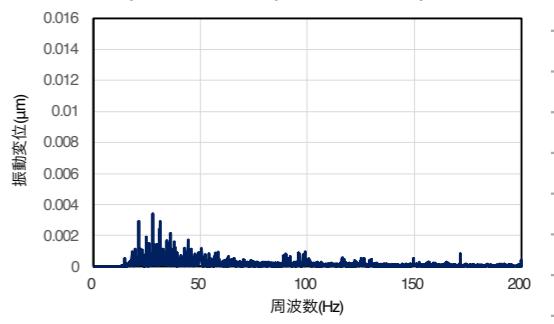
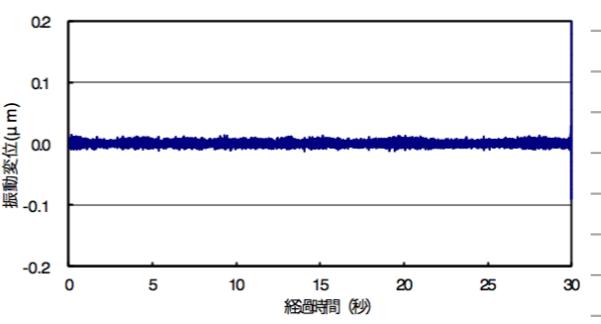


■20180116 梁川トンネルにおける坑内振動（変位）の計測結果

作業名	コンクリート吹付け
振動源	吹付機
振動源位置	TD857.6
観測位置	TD800
振動源からの離隔	57.6m



Concrete Spraying



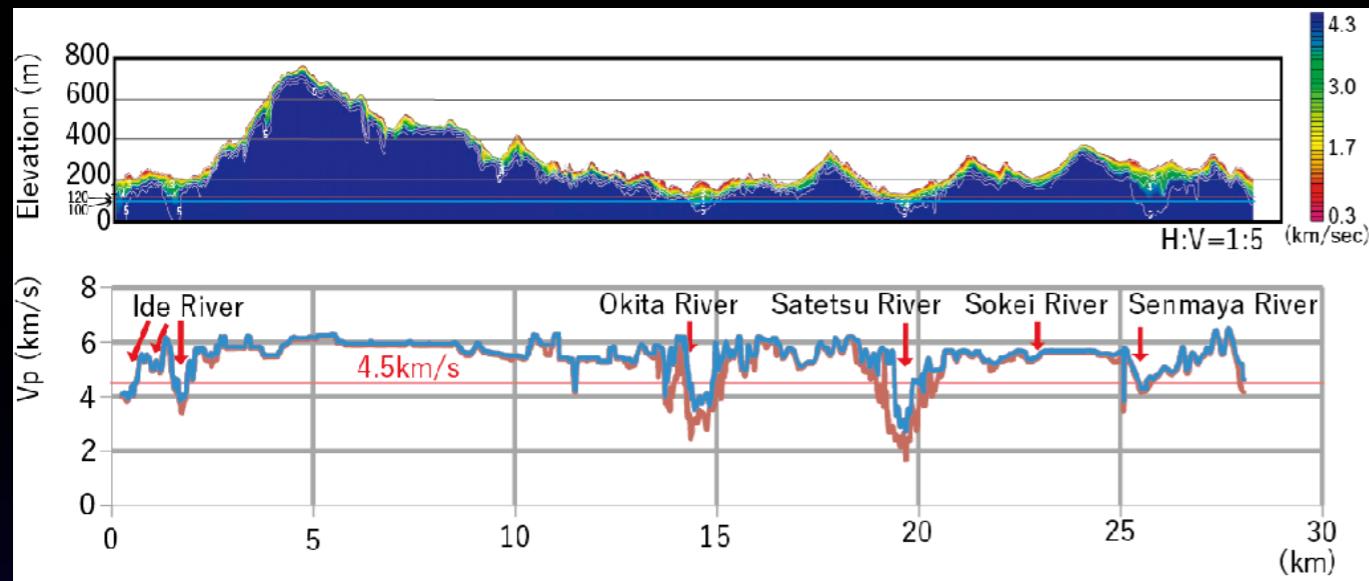
X: トンネル横断方向



Analysis in progress

# Vibration measurement (road traffic vibration)

Near future plan



“Thin” earth covering

The road parallels the river.

??

Road traffic vibration => underground tunnel

Vibration measurement

@surface

@~10m below the surface

In this summer

Beside the road & inside the YANAGAWA tunnel

# Summary

- Geological survey
  - Covered the whole ILC250 line
  - Nice, for the most part (tunnel)
  - More detailed survey (detector hall, portal)
- Vibration measurement (Analysis in progress)
  - Blasting
  - Heavy construction equipment.
  - Road traffic

Many thanks to



Iwate



Ichinoseki

