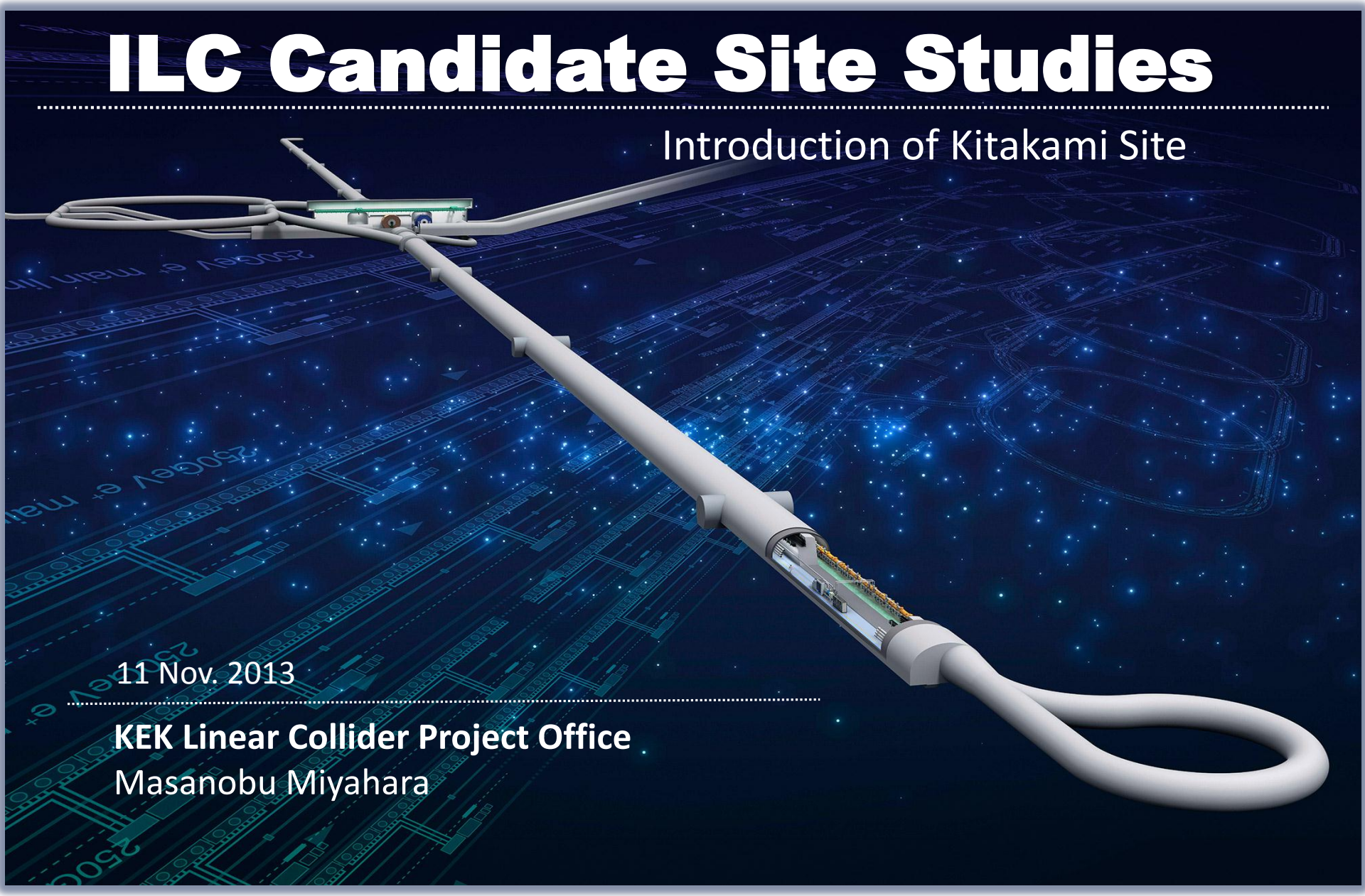
ILC Candidate Site Studies

Introduction of Kitakami Site



11 Nov. 2013

KEK Linear Collider Project Office
Masanobu Miyahara

Contents

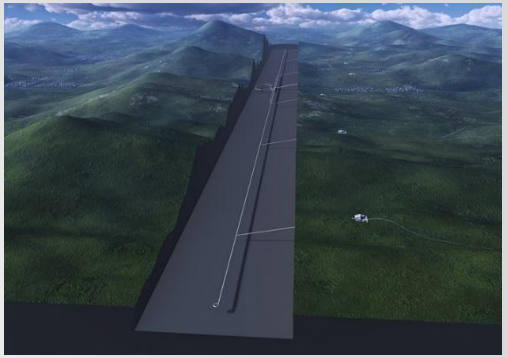
Ⅰ. Overview of Kitakami Site

Ⅱ. Geology and Topography

Ⅲ. Summary

Ⅰ. Overview of Kitakami Site

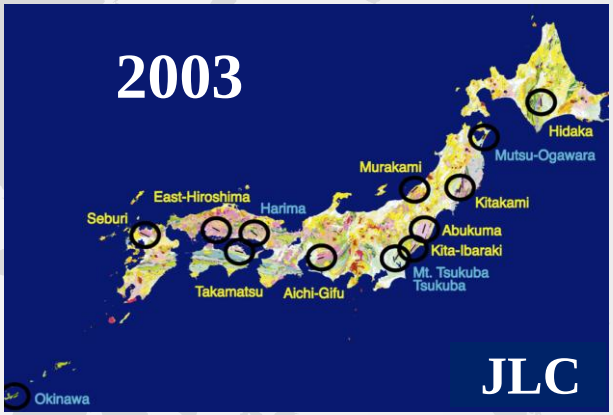
- **The site is located in the foot of Kitakami Highlands.**
  - Kitakami Highlands forms gentle and undulating mountainous landscape.
  - The area is a rural countryside blessed with rich natural environment.



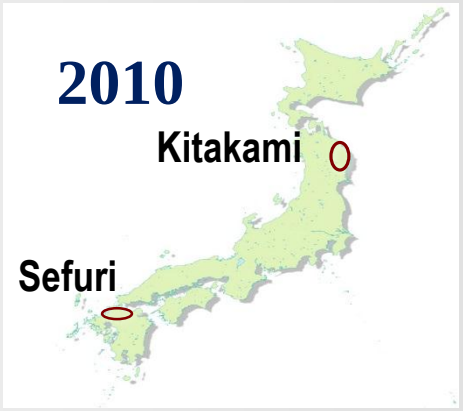
Kitakami Site

History of the candidate site in Japan

Primary candidate site



Two candidate sites



Site unification

2013

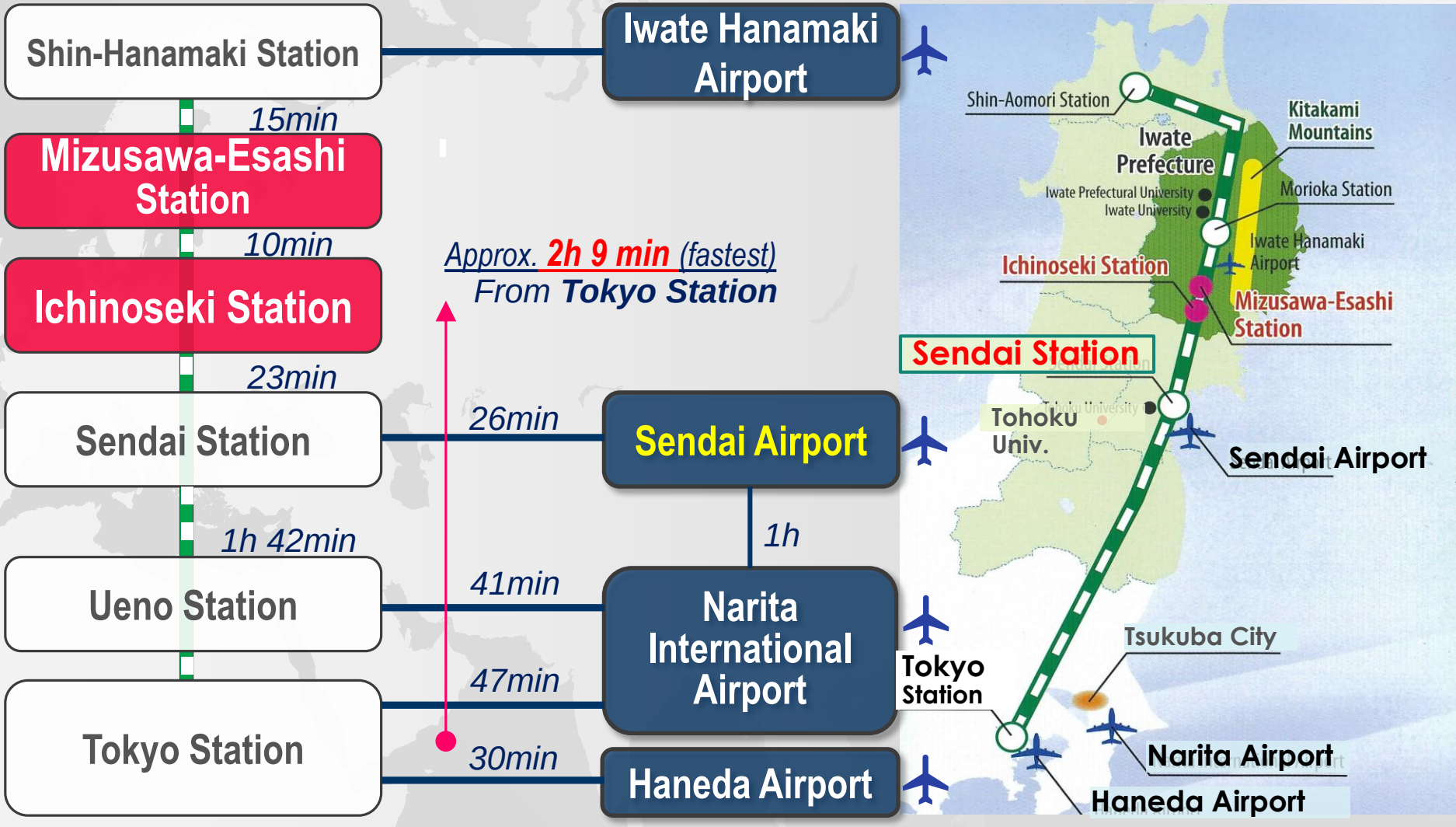
-Site Evaluation

-International Review

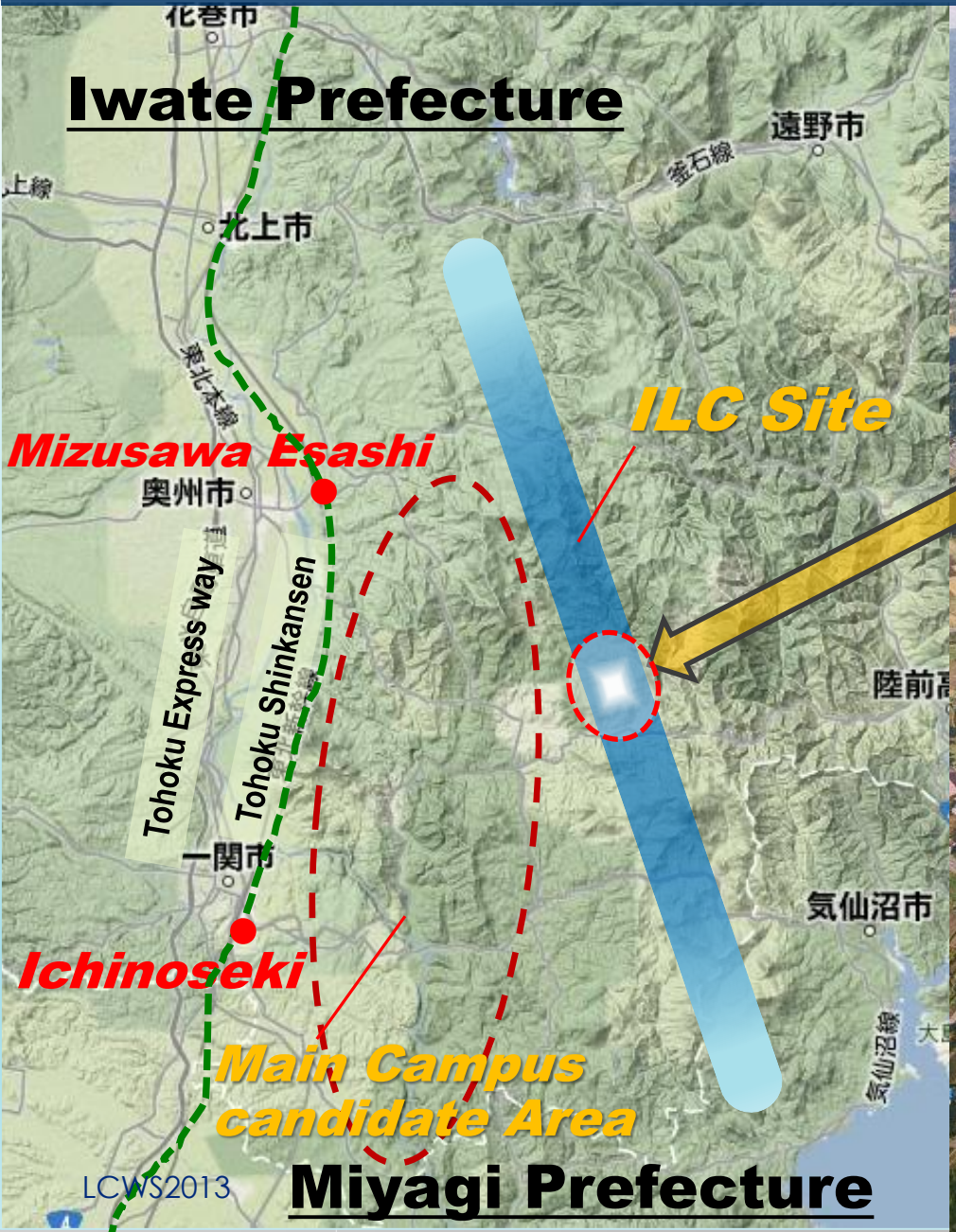
Kitakami Site

- Site evaluation committee was evaluated as the best **Kitakami site**
- The committee released the evaluation result on August 23.

Access to the site from Tokyo



Location


Iwate Prefecture
花巻市
遠野市
北上市
ILC Site
Mizusawa Esashi
奥州市
Tohoku Express way
Tohoku Shinkansen
一関市
気仙沼市
Ichinoseki
Main Campus
candidate Area
Miyagi Prefecture


Central region
Satetu-gawa River

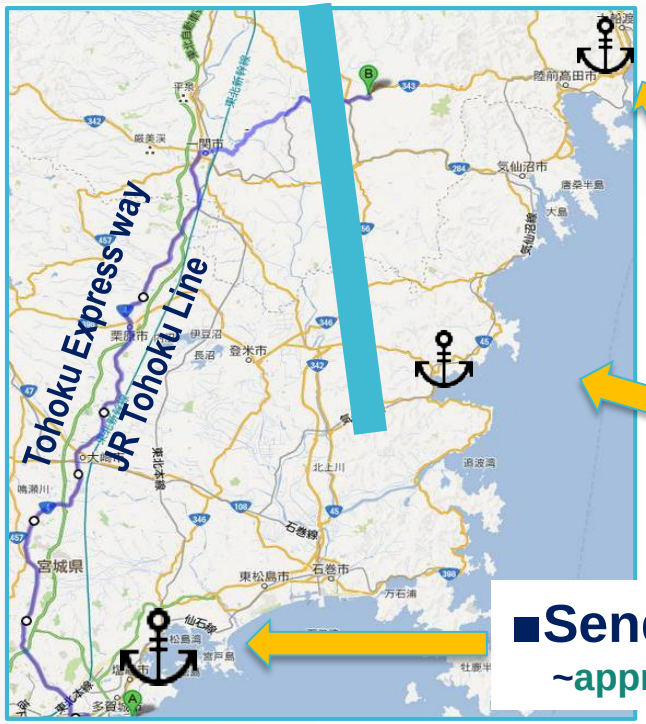
Transportation

■ Port facilities, railway, highway

Cryomodule

Detector

International Marine Container(45F)



■Ohunato Port
~approx. 30 km

■Kesennuma Port
~approx. 20 km

■Sendai-Shiogama Port
~approx 130 km

□ Transport object

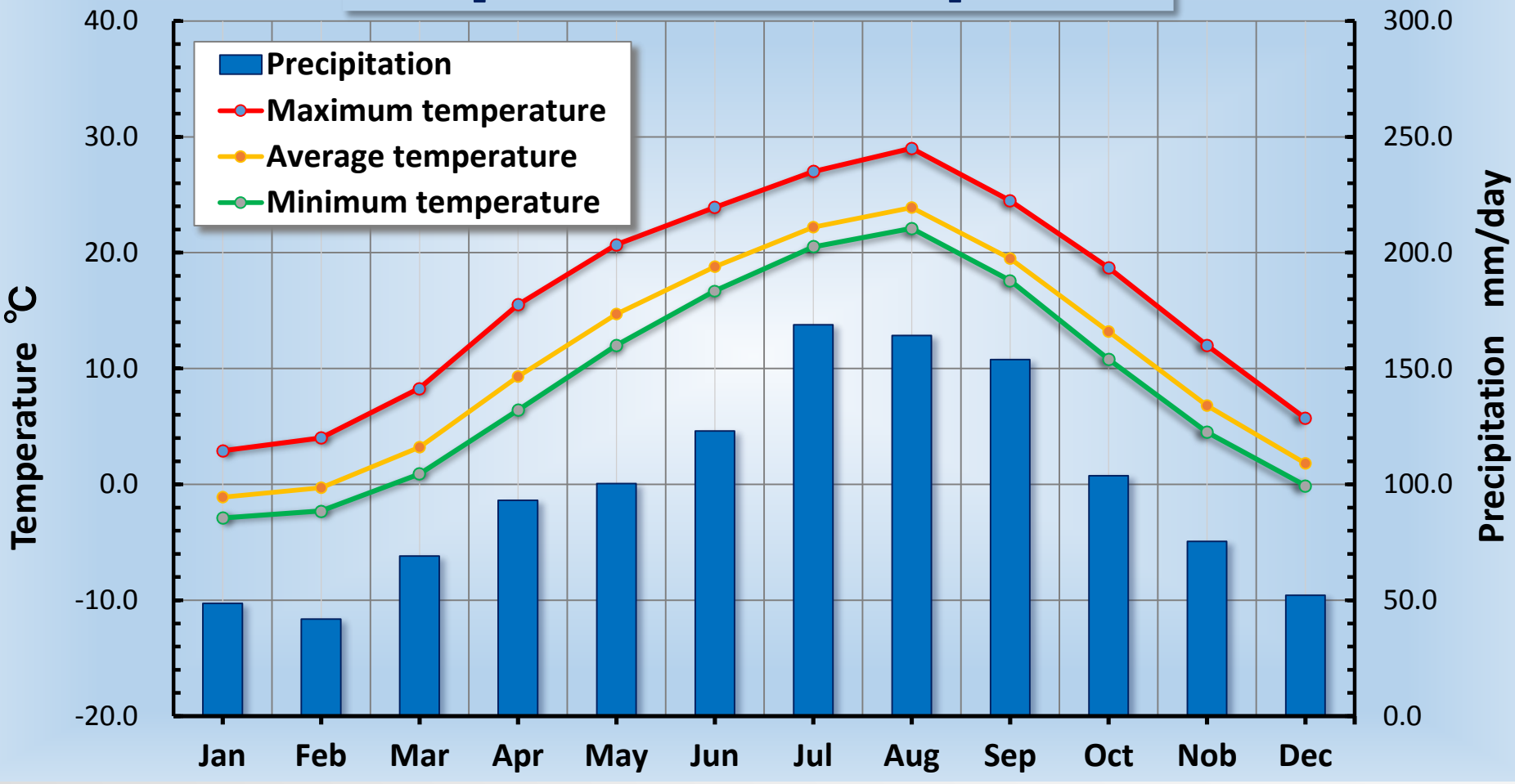
Object	W(m)	L(m)	H(m)	W(t)
Return York	2.0	2.0	2.0	50
Solenoid coil	6.2	6.2	2.8	65
TPC	4.0	5.0	4.0	2
Cryomodule	1.0	15.0	1.0	10

□ Overview of the neighboring port facilities

Port name	Facility	Depth(m)	Ship scale	Unloading machine
Kamaishi	Quay	-11.0	18,000 D/W	30.5t(Rating load)
Ofunato	Quay	-13.0	40,000 D/W	51.6t/45.0t
Kesennuma	Quay	-7.5	5,000 D/W	None
Sendai	Quay	-14.0	50,000 D/W	56.2t/40.6t/36.0t

Climate

Temperature & Precipitation



- Annual Precipitation: 1,188 mm
- Average Temperature of the warmest month: 29.0 ℃
- Average Temperature of the coldest month: -4.9 ℃

Scenic Spots

Attractions, Historic sites around the site


Chusonji, Konjikido


World Heritage site "Hiraizumi"

Tohoku is blessed with beautiful natural surroundings and abundant agriculture, and our people represent the spirit of hospitality. —from Iwate Prefecture Web site—

Ⅱ. Geology & Topography

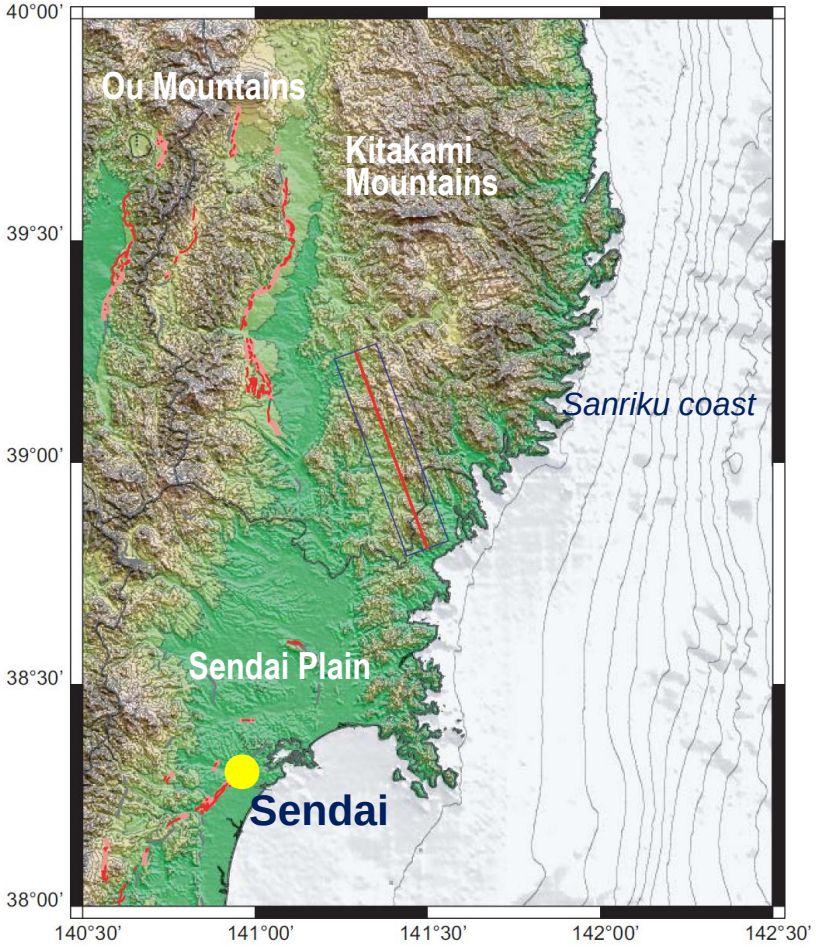
■ Development of Geological Survey

- 2005
  Primary Survey <Iwate Pref.>
- 2009
  Secondary Survey <Iwate Pref.>
- 2010
  Investigation including Boring etc.
  <Iwate Pref. & Tohoku Univ.>
- 2011
  Ground Water Survey <Tohoku Univ.>
- 2012~13
  Investigation by National Budget
  <KEK & Tohoku Univ.>

Acknowledgements

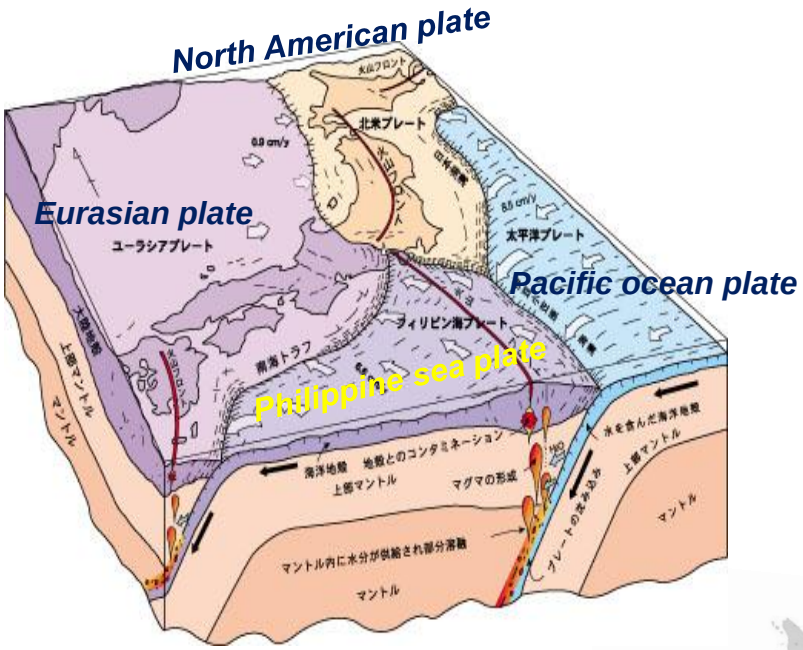
- *Part of this report is based on the materials provided from the Tohoku University*

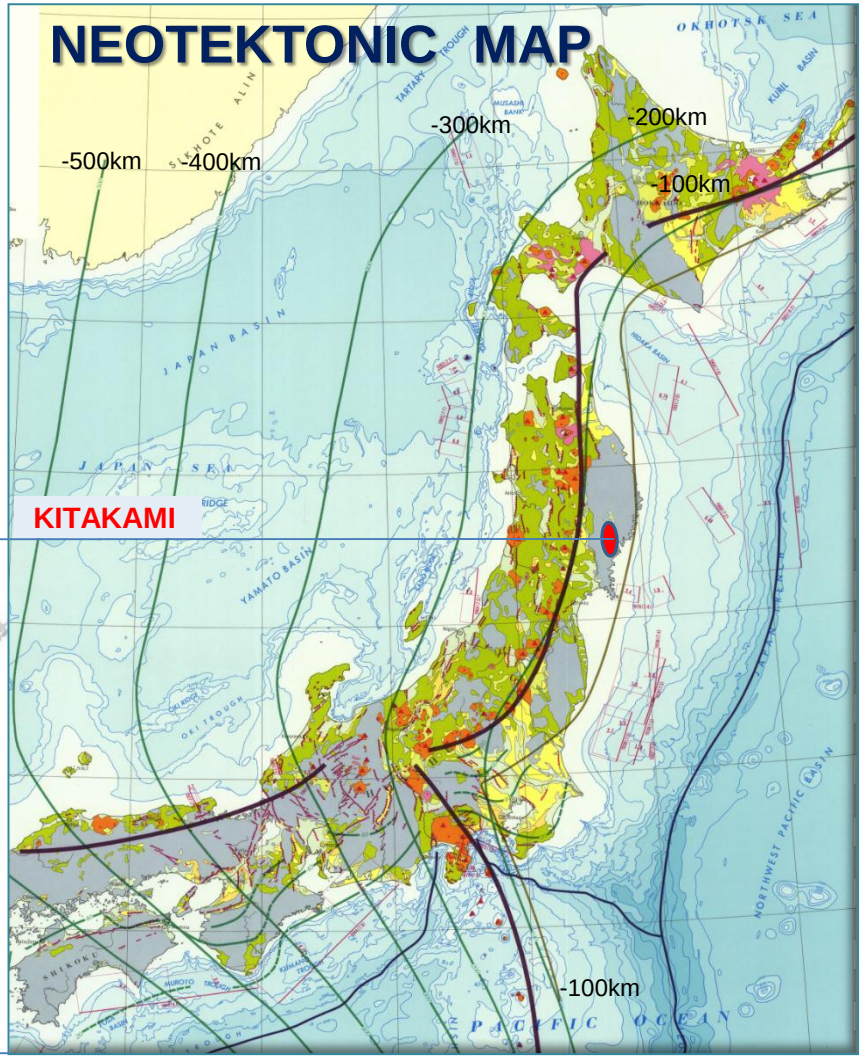
Geophysical map around the site



Geological Overview

☐ Crustal Structure of Tohoku region



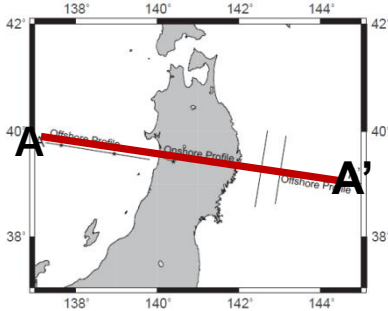


Legend

- Sea Trench
- Volcanic front
- Upper surface of subducting plate

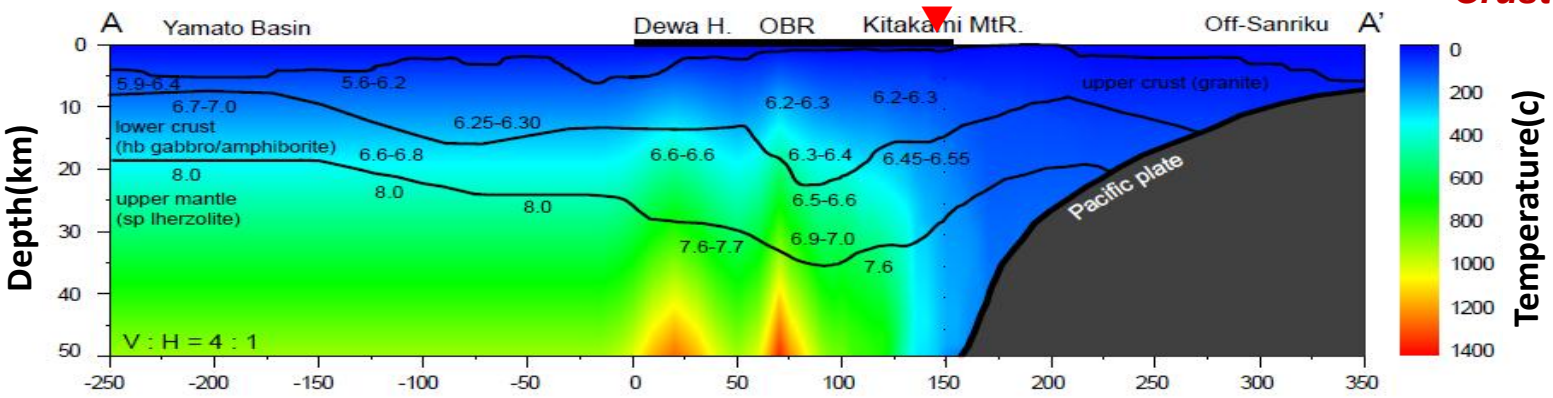
Study of Crustal Structure

- *Kitakami site is located on the very solid plate.*
- *The stable ground which an Active Fault does not produce easily.*

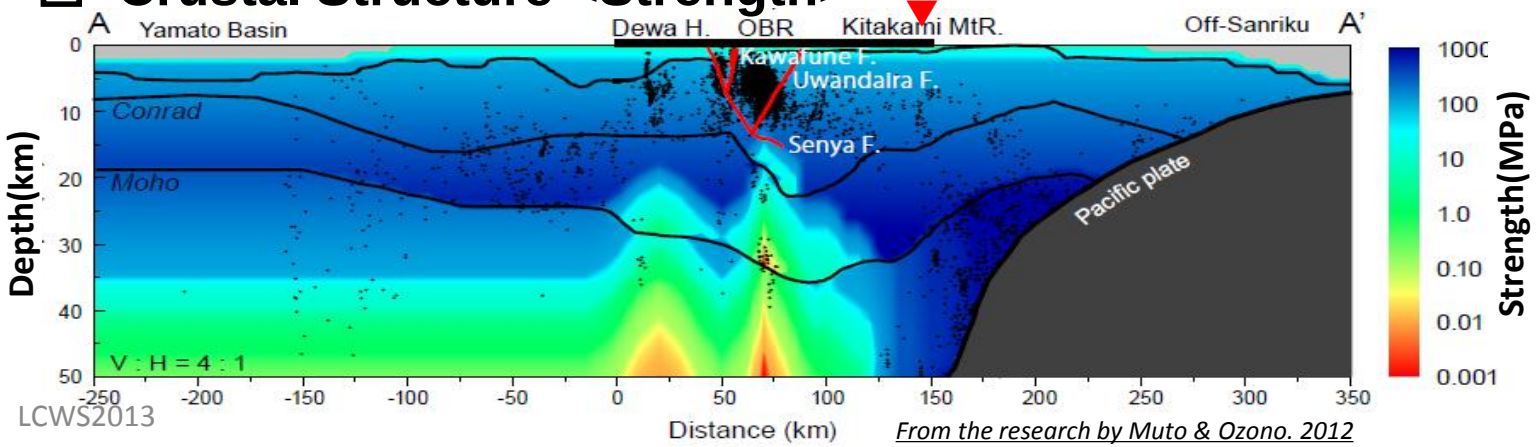


Crust Exploration 1997~1998

☐ Crustal Structure <Velocity and Geothermal>



☐ Crustal Structure <Strength>



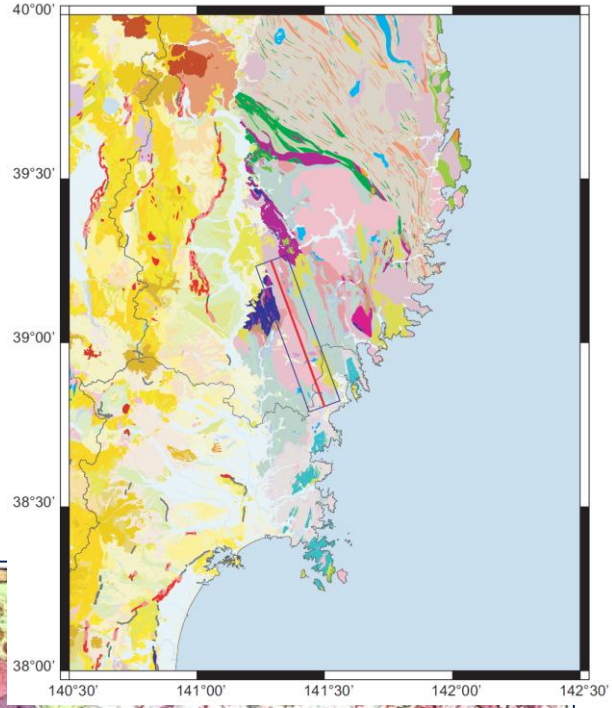
From the research by Muto & Ozono. 2012

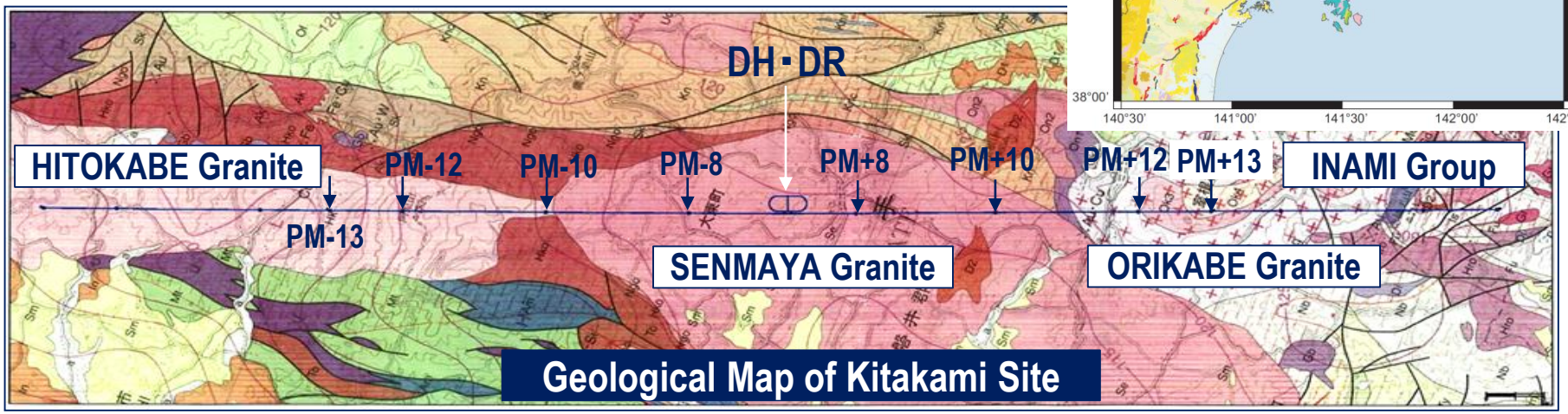
Geological feature

- **KITAKAMI site has good Geological conditions for tunneling and machine stability.**

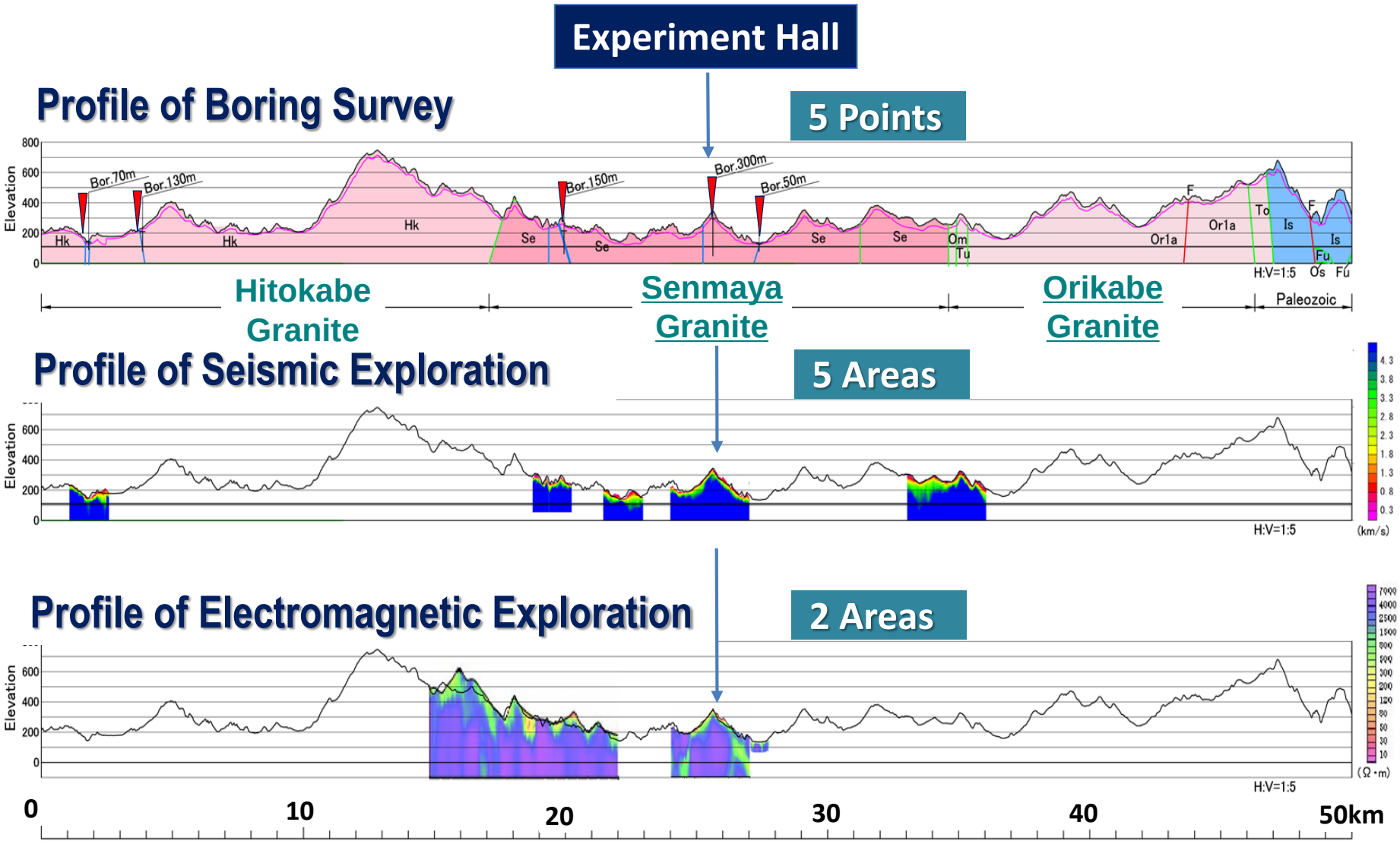
Findings

- Distribution of the hard bedrock by length more than 50 kilometers.
- No active fault zones along the ILC route area.
- Low seismic noise of constantly.



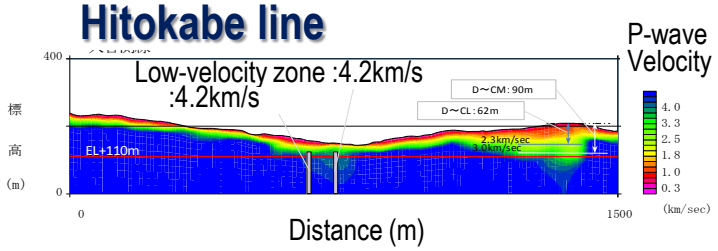


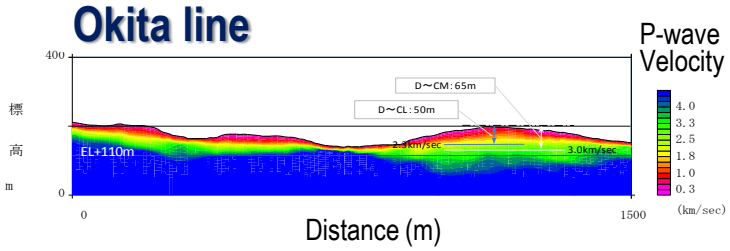
Site Surveys along ILC Route

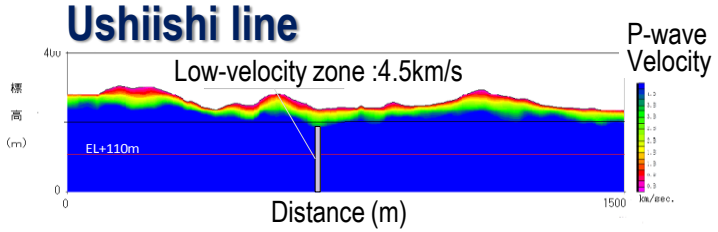


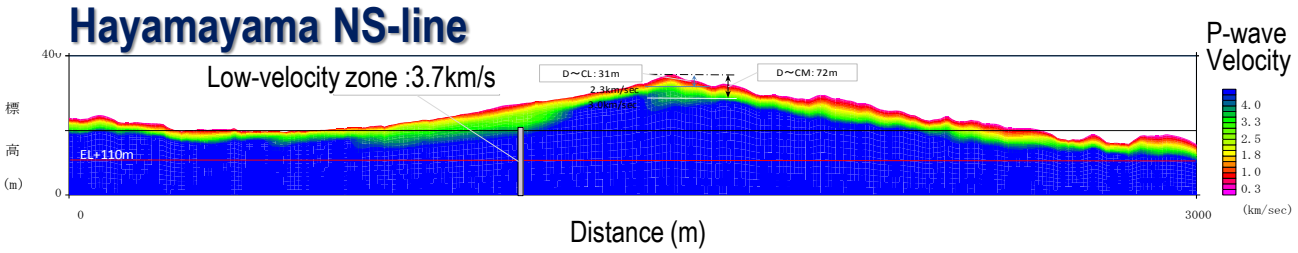
The state of Bedrocks Property

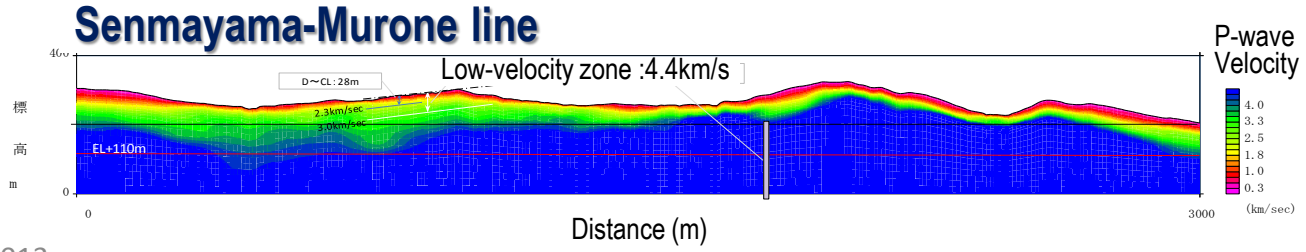
Seismic Exploration results (Refraction method)



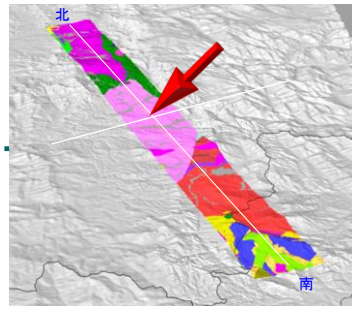




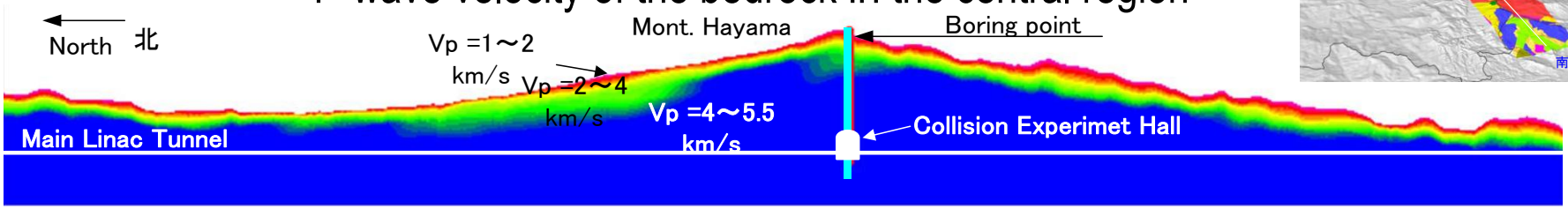




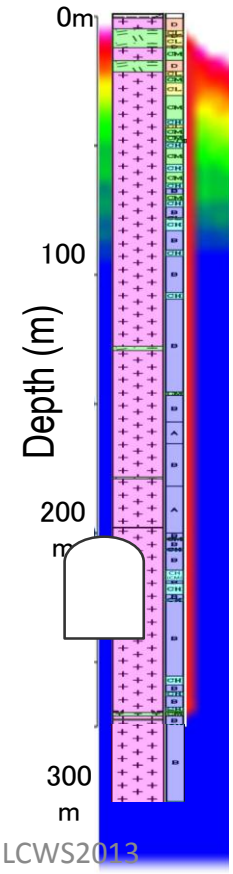
Bedrock Property in the central region



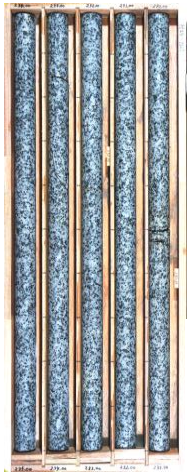
P-wave velocity of the bedrock in the central region



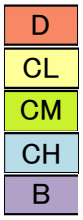
Columnar Section

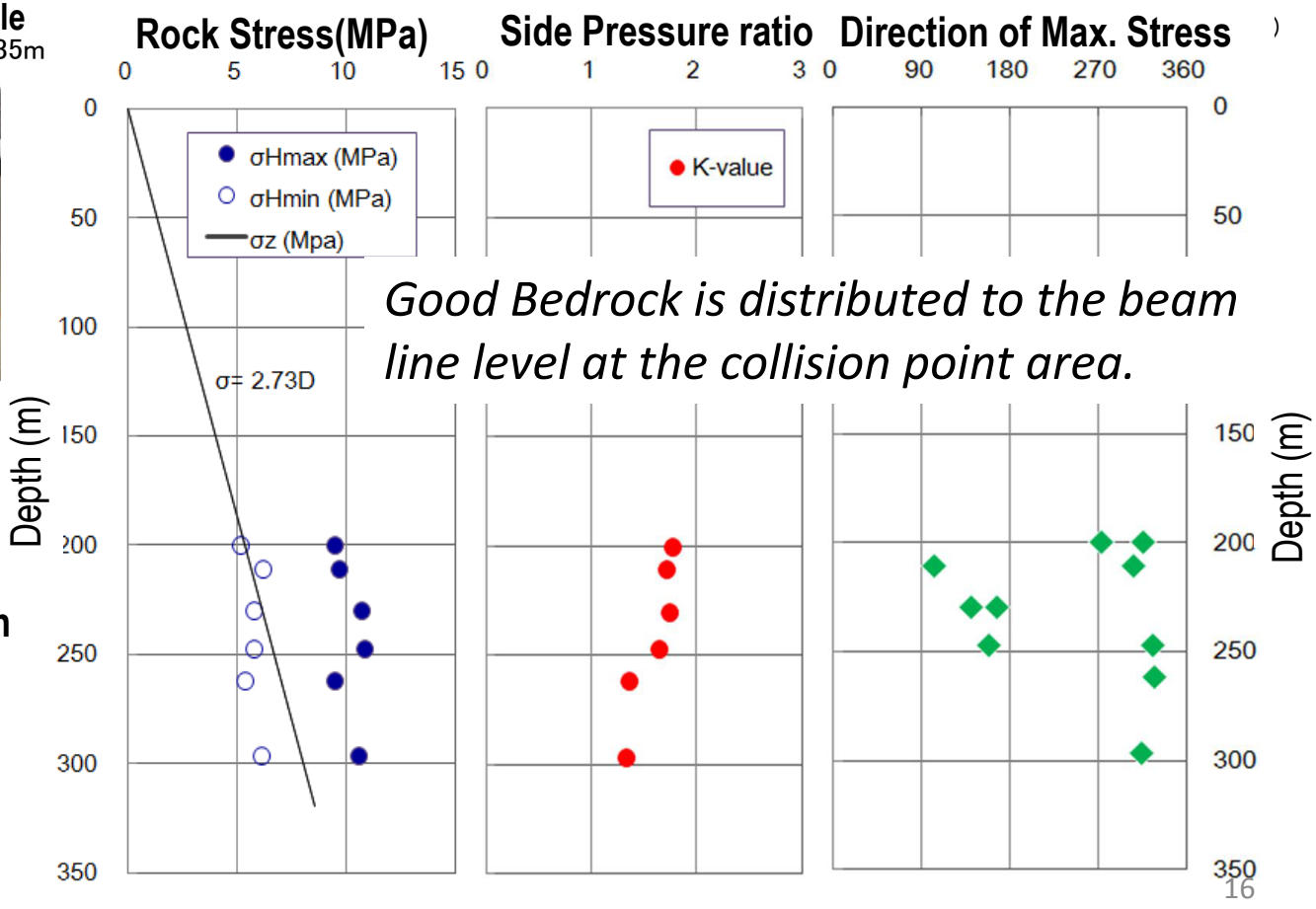


Core Sample from 230m–to 235m



Classication

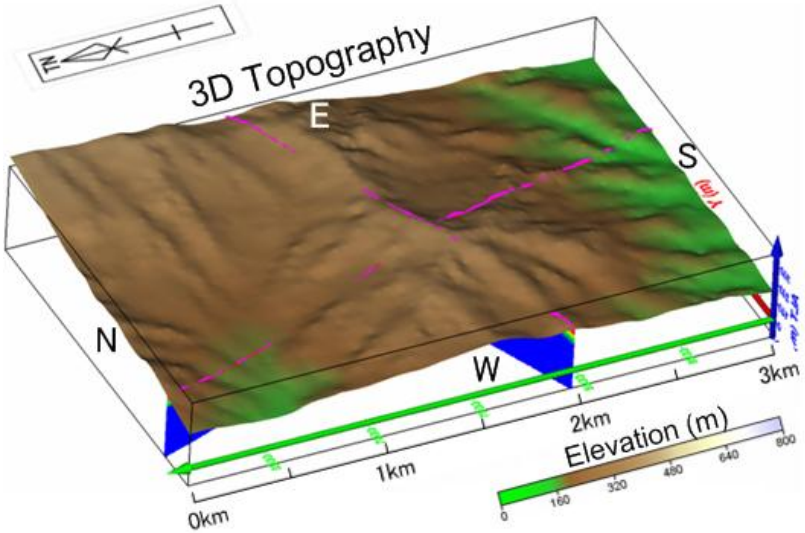


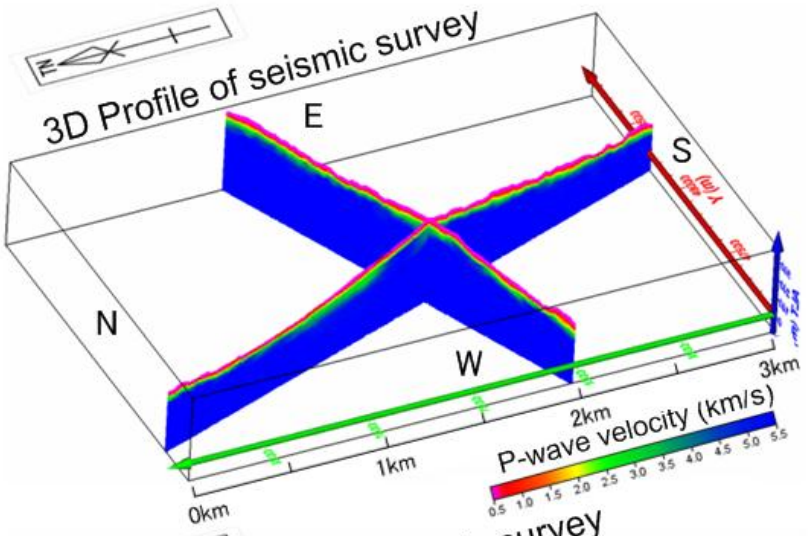


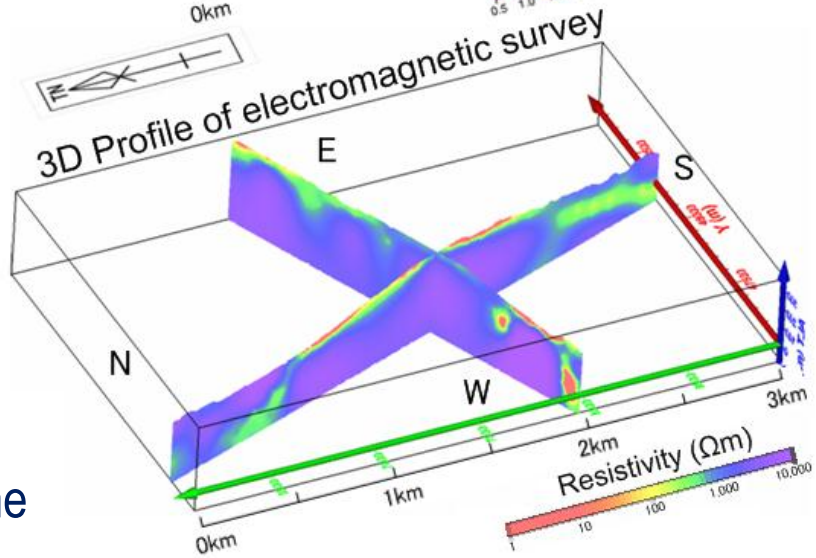
Good Bedrock is distributed to the beam line level at the collision point area.

Summary of Survey Result

-- 3D Profile of Survey results --







Findings

- Seismic exploration result:
  Distribution of Good Baserock beyond the P-wave velocity 4.0km/sec in whole central region.

- Electromagnetic exploration results;
  High Resistivity distribution except for some

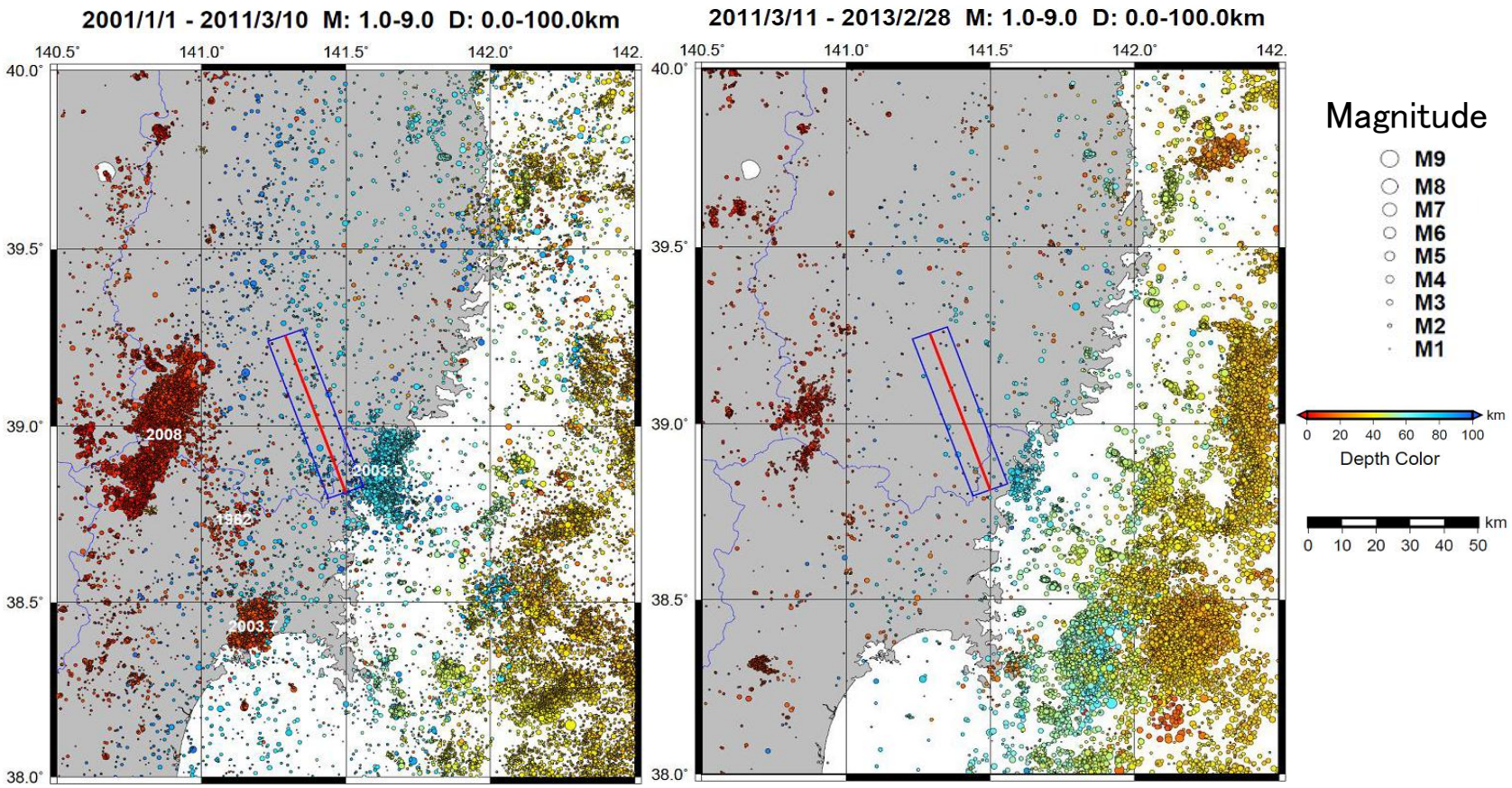
Earthquake (1)

☐ Hypocenter distribution map (1)

before and after the 2011 Earthquake off the Pacific coast of Tohoku

Ten years before 3.11 Earthquake

Two years after 3.11 Earthquake

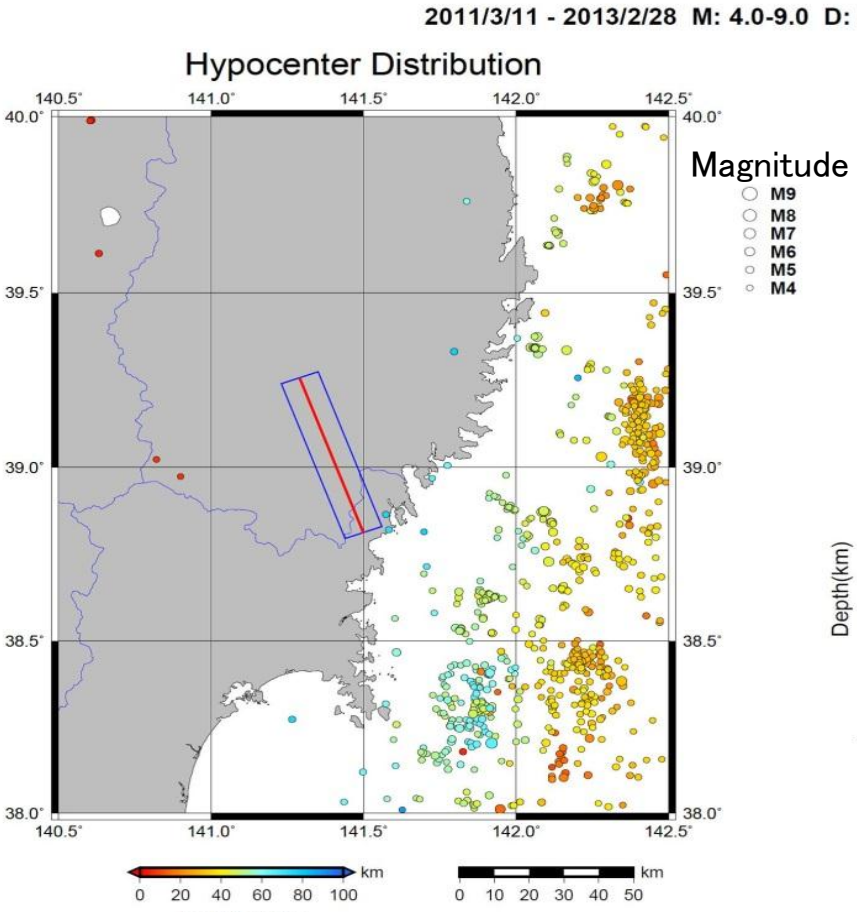


- ***There are No change in the Hypocenter distribution before and after the Earthquake***

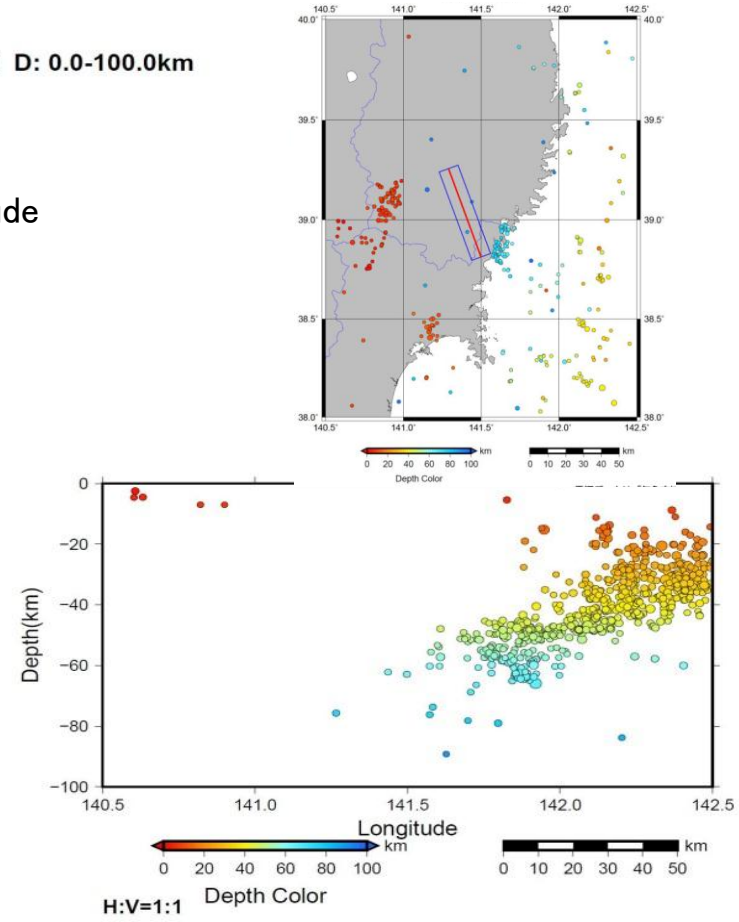
Earthquake (2)

☐ Hypocenter distribution map (2)

Two years after the Earthquake



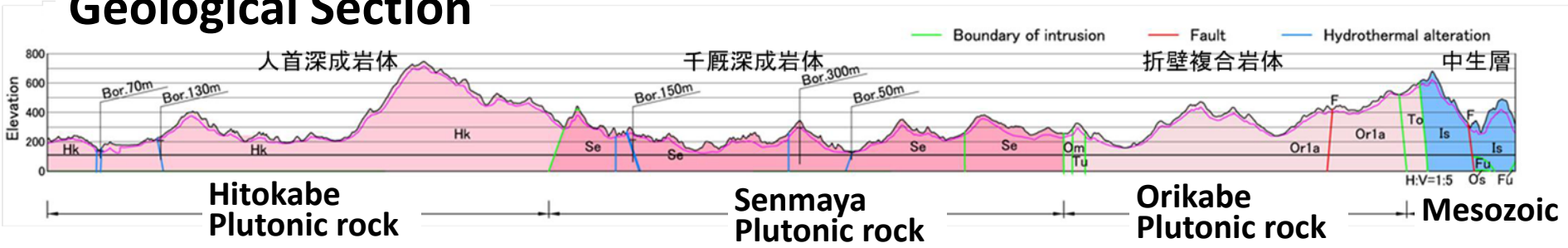
Ten years before the Earthquake



- No Earthquake of M4 or above are observed during this period.

Summary

Geological Section



Findings by the geological survey results

- The hard stable base rock belt is distributed over the foundation of the ILC project route in the range over 50 km.
- Active fault across the route is not confirmed.
- It is estimated that a good bedrock of seismic velocity 4km/sec or more are spread throughout the site.
- There is no big trouble in construction of the accelerator tunnel and the experiment hall cavern from the survey results so far.