Regarding the report on the response to the addition of opinions upon considered by NISA in relation to the report of the evaluation results on seismic safety of existing nuclear power reactor facilities etc. in light of the new Seismic Regulatory Guide for based on the 2011 Tohoku District -Off the Pacific Ocean Earthquake

In response to the directive, “the response to the addition of opinions upon considered by NISA in relation to the report of the evaluation results on seismic safety of existing nuclear power reactor facilities etc. in light of the new Seismic Regulatory Guide for based on the 2011 Tohoku District -Off the Pacific Ocean Earthquake” dated April 28, 2011” (04.28.2011 Nuclear Number 4) dated on April 28, 2011, we will report as below.

With the occurrence of the 2011 Tohoku District-Off the Pacific Ocean Earthquake (“the Earthquake”), in light of the movement of massive tectonic plates was observed, we have summarized information regarding the faults located in the surrounding area of Fukushima Daiichi Nuclear Power Station, Fukushima Daini Nuclear Power Station and Kashiwazaki Kariwa Nuclear Power Station that are not considered in the seismic design of Nuclear Power Plant based on the previous survey and that are necessary to examine the possibilities of falling under the faults that requires consideration of the seismic design of Nuclear Power Plant.

The faults that are not capable faults required seismic design consideration of Nuclear Power Plant for the Fukushima Daiichi Nuclear Power Station and Fukushima Daini Nuclear Power Station are shown in the List 1, 2 and those for the Kashiwazaki Kariwa Nuclear Power Station are shown in the List 7, 8.

In addition, due to the massive tectonic plates caused by the earthquake on Mar 11, it is said seismic activity of southern Hamadori area in Fukushima Prefecture become active. Under such circumstance, on April 11, with the occurrence of earthquake which recorded magnitude 7 near the Idosawa Fault located in the related area, it is said surface earthquake fault has appeared in the location of Idosawa Fault and Yunodake Fault.

In light of the occurrence of the Earthquake, we survey and review of Idosawa Fault and Yunodake Fault are underway and pay close attention to these faults including result of survey of other institutions afterward.

With regards to the “1) detailed method and decision criteria to review active fault that is necessary to consider in the seismic design in light of the fact that regional stress field was affected due to the Earthquake” and “2) decision criteria to evaluate earthquake which occur in areas where seismicity was conventionally in active or near faults that are not capable faults required seismic design consideration after the Earthquake”, we will pay close attention to the discussion of the governmental body and gather most recent findings and properly reflect in the future evaluation.

End

Table 1. Evaluation of Faults which was not considered in the seismic design (around/near the site)

Fukushima Daiichi・Fukushima Daini Nuclear Power Station

No.	Name	Area	Length*1	Distance from site*2 (upper；From Daiichi，low；From Daini)	Reason to deny its activity	Note
①	Southern Futaba Fault (South of Baba)	Land Area	46 km	7.5 km 10.3 km	No displacement/deformation found on middle terrace surface of basal surface sediment of middle terrace surface.	Table 3, Table 5, Figure 1 and Attachment1
②	Soma Fault (Northern Futaba Faults)	Land Area	45 km	49.6 km 60.6 km	No displacement/deformation found on upper terrace surface and middle terrace surface covering flexure structure. Erosional feature.	Table 3, Table 5, Figure 1 and Attachment2
③	Hatakegawa Fault	Land Area	43.5 km	17.3 km 22.1 km	Fault fracture consolidated. Erosional feature.	Table 3, Table 5, Figure 1 and Attachment3
④	Yaguki Fault	Land Area	4.5 km	30.5 km 19.5 km	Fault fracture consolidated. Erosional feature.	Table 3, Table 5, Figure 1 and Attachment4
⑤	Futatsuya Fault	Land Area	12.5 km	32.7 km 22.3 km	Fault fracture consolidated. Erosional feature.	Table 3, Table 5, Figure 1 and Attachment5
⑥	Osaka-Ashizawa lineament	Land Area	4km	19.5 km 9.0 km	No faults found. Erosional feature.	Table 3, Table 5, Figure 1 and Attachment6
⑦	Yunotake Fault	Land Area	13.5 km	49.6 km 39.8 km	Fault fracture consolidated. No displacement on middle terrace surface.	Table 3, Table 5, Figure 1 and Attachment7
⑧	Faults offshore of the site	Sea area	–	– –	No displacement/deformation found below C layer base. Gravity fault, no displacement/deformation found by inversion in the playstocene	Table 4, Table 5, Figure 1 and Attachment8
⑨	Faults southeast offshore of the site	Sea Area	–	– –	No displacement/deformation found below C layer base. Gravity fault without accumulated displacement.	Table 4, Table 5, Figure 1 and Attachment9
⑩	Faults offshore of Shioyazaki	Sea Area	–	– –	No displacement/deformation found on C_2 layer.	Table 4, Table 5, Figure 1 and Attachment10

＊1 Judged from aerial photographs for the length of “Land Area”.

＊2 Distance from the center of each power station site to the center of the fault.

Table2 Evaluation on the faults which was not considered in the seismic design (in the site)

Fukushia Daiichi Nuclear Power Station

No.	Name	Reason to deny its activity	Note
①	(No specific name)	No displacement found in the Tomioka layer of the pleiocene.	Table６, Attachment１１
②	(No specific name)	No displacement found in the Tomioka layer of the pleiocene.	Table６, Attachment１１

Fukushima Daini Nuclear Power Station

No.	Name	Reason to deny its activity	Note
—	—	—	No fault was found in the site.

Chart 3 Geological Formation Sequence Chart of Continental Area around the Site

Geological Era				Bed Name			Major Facies/Lithological character		Intrusive rocks
Cenozoic era	Quaternary	Helocene			Alluvium		Gravel, Sand, Shilt – Cray layer		
		Pleistocene			Terrace Sediment		Gravel, Sand, Shilt – Cray layer		
	the Neocene	Pliocene	Late	Sendai layers (upper)	Tomioka layer		Sandy mud rock, Sand rock.Tuffs layer mixture.		
			Early	Sendai layers (upper)	Kuboma layer		Sandy mud rock.Upper:sand rock, sandy mud rock, sand rock gravel.		
			Early	Sendai layers (lower)	Yotsukura layer		Sandy mud rock.Upper:sand rock, sandy mud rock,/sand rock layer.		
		Miocene	Late	Taga layers	Minamiisowaki layer		Sandy mud rock. Rubble sand rock bottom layer.		
						Akashiba layer		Gravel rock, Sand rock.	
			Middle			Natori layers: Yamairi layer		Gravel rock, Sand rock.	Notegamiyama basalt
			Early	Takahisa layers	Numanouchi layer Kamitakahisa layer	Yoshigasawa layer	Gravel rock, Sand rock, tuff sand rock, tuff mud rock.	Gravel rock, Sand rock, Mud rock.	
				Shirato layers	Minamishirato layer Yoshinodani layer	Hasama layer	Gravel rough sand rock.	Mud rock, Tuff sand rock.	
				Yunagatani layers – Taira layer	Misawa part layer	Takatate layer	Tuff sand rock.	Andesite lava, homogeneous volcaniclastic rocks, Gravel rock, Sand rock.	
				Yunagatani layers – Taira layer	Hontani part layer	Ouchi layer	Block siliceous mud rock.	Gravel rock, Sand rock, Mud rock.Tuff and Glanite layer mixture.	
				Yunagatani layers – Taira layer	Ishimoriyama part layer	Tenmyozan layer	Andesite tuff gravel rock.	Gravel rock, Basalt – Basalt andesite volcaniclastic.	
				Yunagatani layers	Kamenoo layer	Shiote layer	Placoid siliceous mud rock.	Gravel rock. Sand rock. Coal bed mixture.	
				Yunagatani layers	Mizunotani layer	Shiote layer	Sandy mud rock.		
				Yunagatani layers	Goann layer	Shiote layer	Gravel sand rock. Coal bed mixture.		
				Yunagatani layers	Mondaira layer	Shiote layer	Gravel rock. Coal bed mixture.		
	Paleogene	Oligocene	Late						
			Early	Hakusui layers	Shirosaka layer		Block shale rock.		
			Early	Hakusui layers	Asagai layer		Muddy fine sand rock.		
		Eocene	Late	Hakusui layers	Sekijyo layer		Gravel rock, Sand rock, Mud rock. Coal bed mixture		
			Early						
		Paleocene							
Mesozoic	Cretaceous	Late		Futaba layers	Tamayama layer		Sand rock/Mud rock layer.		
				Futaba layers	Kasamatsu layer		Sand rock/Mud rock layer.		
				Futaba layers	Ashizawa layer		Gravel rock, Sand rock, Sandy mud rock.		
		Early							Granite rocks Base – urtra base rocks
					Takakura layer/Koukakusan layer/ Takakura andesite rocks		Rhyolitic tuff, Dacitic – andesite lava, tuff, tuff breccia.		
	Jurassic period	Late			Soma-nakamura layers		Sand rock, Shale rock, Gravel rock, Limestone mixture.		
		Middle							
		Early							
	Triassic period								Base – urtra base rocks
Paleozoic period	Pelm period				Takakurayama layer		Shale rock, Sand rock, Sand rock/Shale rock layer, Limestone.		
	Carboniferous period				Soma palaerozoic strata				
	Late devonian period				End peiod palaerozoic strata/ Karousan layer				
	Pre-late devonian period				Metamorphic rocks		Muddyshist, Siliceousshist, Greenshist, Blackshist.		

Non-conformance — Interchange relationship — Same era strata but direct relationship unknown.

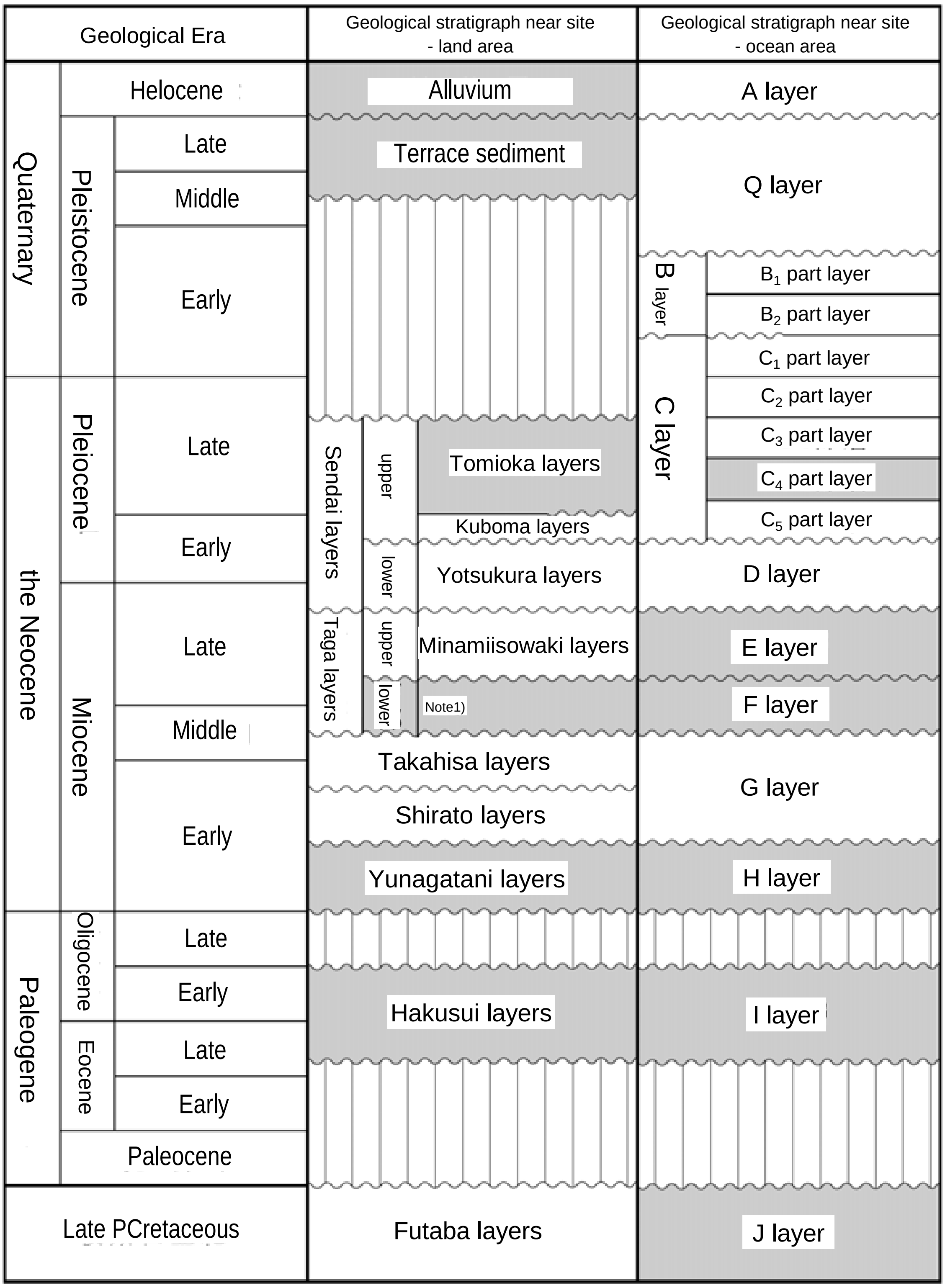
Chart 4 Comparison of Formation of the Land around the Site and Sea Area

Geological Era			Geological stratigraph near site - land area	Geological stratigraph near site - ocean area
Quaternary	Helocene		Alluvium	A layer
Quaternary	Pleistocene	Late	Terrace sediment	Q layer
Quaternary	Pleistocene	Middle	Terrace sediment	Q layer
Quaternary	Pleistocene	Early		B layer: B1 part layer; B2 part layer / C layer: C1 part layer
the Neocene	Pleiocene	Late	Sendai layers (upper): Tomioka layers	C layer: C2 part layer; C3 part layer; C4 part layer
the Neocene	Pleiocene	Early	Sendai layers (upper): Kuboma layers / Sendai layers (lower): Yotsukura layers	C layer: C5 part layer / D layer
the Neocene	Miocene	Late	Taga layers (upper): Minamiisowaki layers	E layer
the Neocene	Miocene	Middle	Taga layers (lower): Note1) / Takahisa layers	F layer / G layer
the Neocene	Miocene	Early	Shirato layers / Yunagatani layers	G layer / H layer
Paleogene	Oligocene	Late		
Paleogene	Oligocene	Early	Hakusui layers	I layer
Paleogene	Eocene	Late	Hakusui layers	I layer
Paleogene	Eocene	Early		
Paleogene	Paleocene			
Late PCretaceous			Futaba layers	J layer

Note1) Lower of Taga layers were confirmed its existence underground by Yanagisawa etc(1989).

Conformity (straight line) — Un-conformity (wavy line)

Chart 5 Comparison of Formation of the Land around the Site and Sea Area



Note1) Lower of Taga layers were confirmed its existence underground by Yanagisawa etc(1989).

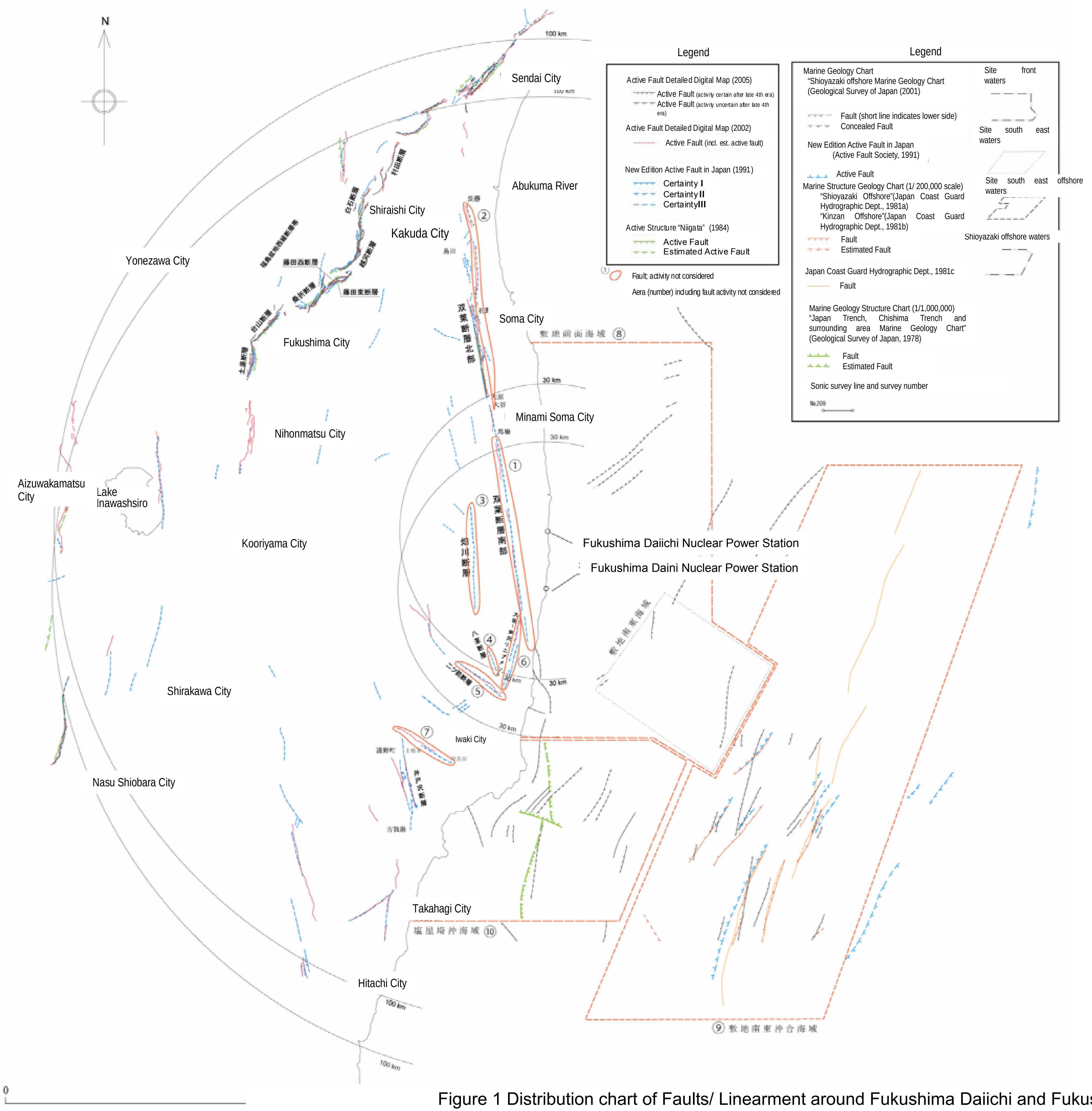
Conformity — Un-conformity

Geological strata neat site

Chart 6 Geological Stratigraphic Chart inside the Site

Geological Era		Bed name			Major Facies/Lithological character	
Quaternary		Alluvium			Dark green gray to brown colored cray and sand, unconsolidated	
		Terrace sediment			Yellow browned sand gravel and sand, half consolidated.	
the Neocene	Pleiocene	Sendai layers	Tomioka layers	T_3 part layer	Sandy mud rock – mud rock, pumice particle, tuff mixture. Upper, sand rock mixture.	
				T_2 part layer	Muddy sand rock, pumice particle, tuff mixture.	
				T_1 part layer	Muddy sand rock, pumice particle, many tuff mixture.	
	Miocene	Taga layers		upper	Muddy sand rock	
				lower	Muddy sand rock	Pumice particle, scoria particle, tuff rock mixture
		Yunagatani layers			Mud rock, Sand rock/mud rock layer	
Paleogene	Oligocene	Hakusui layers			Hard muddy sand rock – Mud rock	

Un-conformance



No.	Name
①	Southern Futaba Fault (South of Baba)
②	Soma Fault (Northern Futaba Fault)
③	Hatakegawa Fault
④	Yaguki Fault
⑤	Futatsuya Fault
⑥	Osaka-Ashizawa lineament
⑦	Yunotake Fault
⑧	Faults offshore of the site
⑨	Faults southeast offshore of the site
⑩	Faults offshore of Shioyazaki

Figure 1 Distribution chart of Faults/ Linearment around Fukushima Daiichi and Fukushima Daini NPS

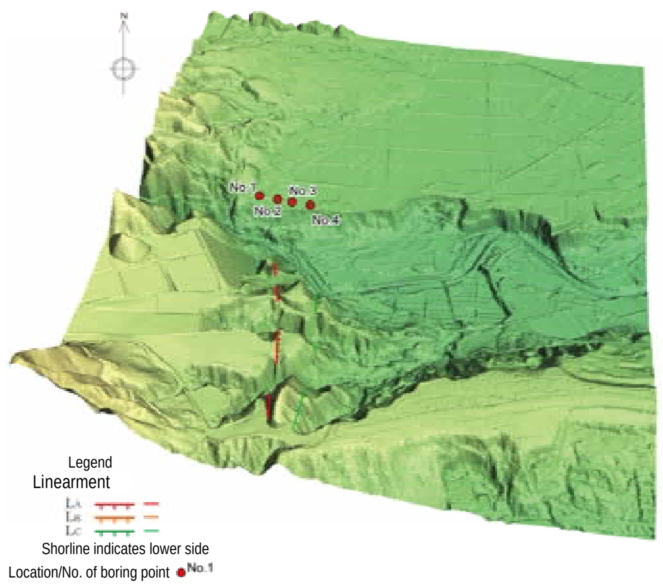
Attachment1

Faults around/near the site

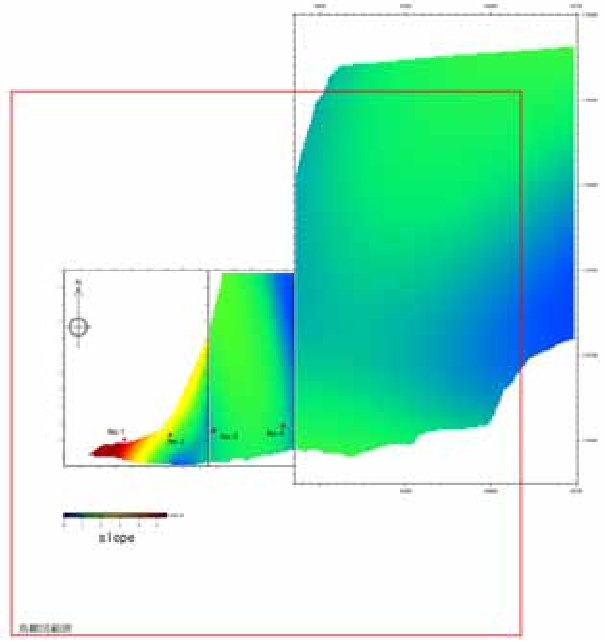
① Southern Futaba Fault (South of Baba)

Survey	Method	Result	Note
Literature Survey	—	・[New Edition] Faults in Japan (1991)：Length approx. 35km, Certainty **II**, Activity B；Length approx. 5.5km, Certainty**III**, Activity C	
		・Detailed Digital Map of Active Faults (2002)：Length approx. 7.5km, Estimated Active Faults・(no description about activity)；Length approx. 2.5km, Estimated Active Faults・(no description about activity)；Length approx. 5km, Estimated Active Faults・(no description about activity)；Length approx. 6.5km, Estimated Active Faults・(no description about activity)	
		・Active Structure Map － Niigata (1984)：none	
Tectonic Geomorphologic Survey	Aerial Photograph DEM geomorphic analysis	・Consists of cliff, col, straight valley, NNW – SSE directed, approx. 46km long, lineament L_A・L_B・L_C・L_D recognized	Figure1－1
		・Bulge H_2 face near Katakura. Extended short lineament of $L_{A,}$ L_B found in its west. L_C lineament in the east. No lineament found on the M_2 face of its northern extension.	
		・Lineament found in the border of Abukuma mountains and Sousou hillside or in the Hirono hillside in south Katakura、several L_D and part of L_C lineament running parallel but intermittent and lacking linearity.	
Surficial geologic Survey	Ground Surface Survey Boring Survey	・No displacement/ deformation found M_2face and basal surface sediment of same terrace surface at Baba point.	Figure1－1
		・No displacement found M_1 face and its lower terrace surface in the south of Baba and no displacement/ deformation found in the basal of M_1' sediment surface and M_2 terrace surface sediment.	Figure1－2
Literature Survey	・It is judged no activity for the Southern Futaba fault after the late Pleistocene as no geographical displacement on M_1' face and its lower terrace surface located on the extension line of the faults, and no displacement/ deformation was found on M_1' terrace sediment and basal of M_2 terrace sediment.		

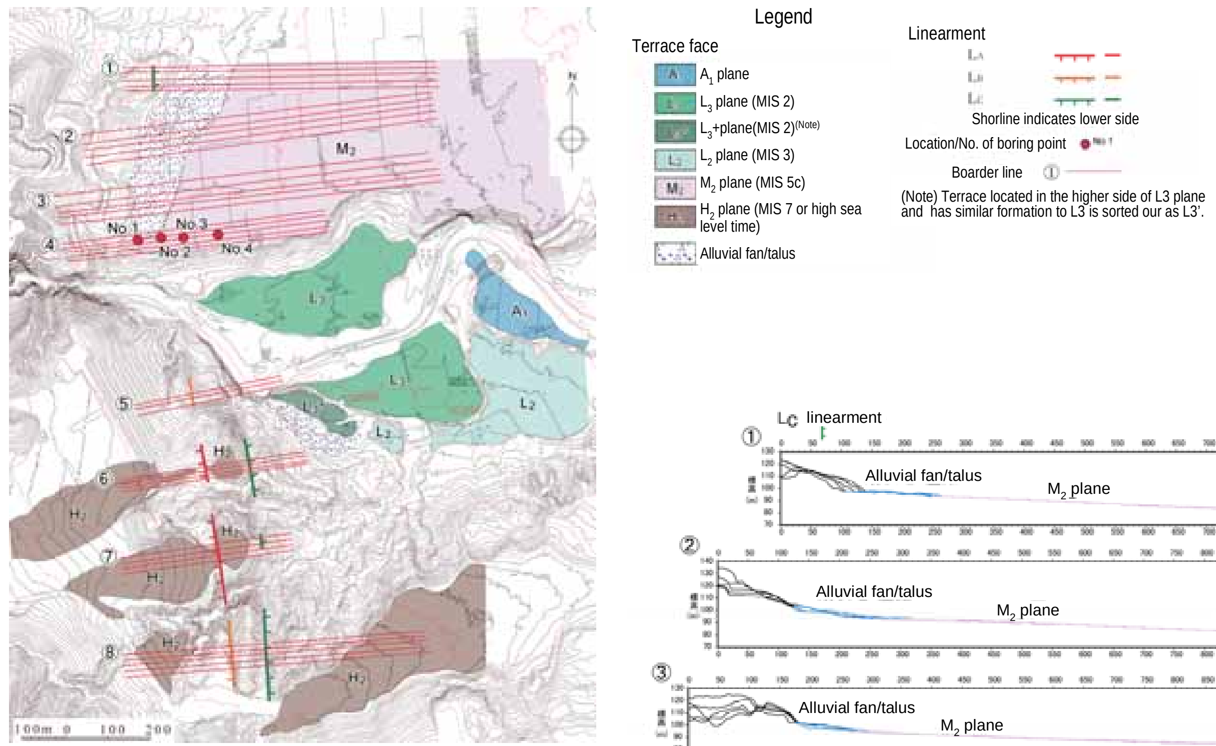
【Southern part of Futaba fault (south of Baba)】



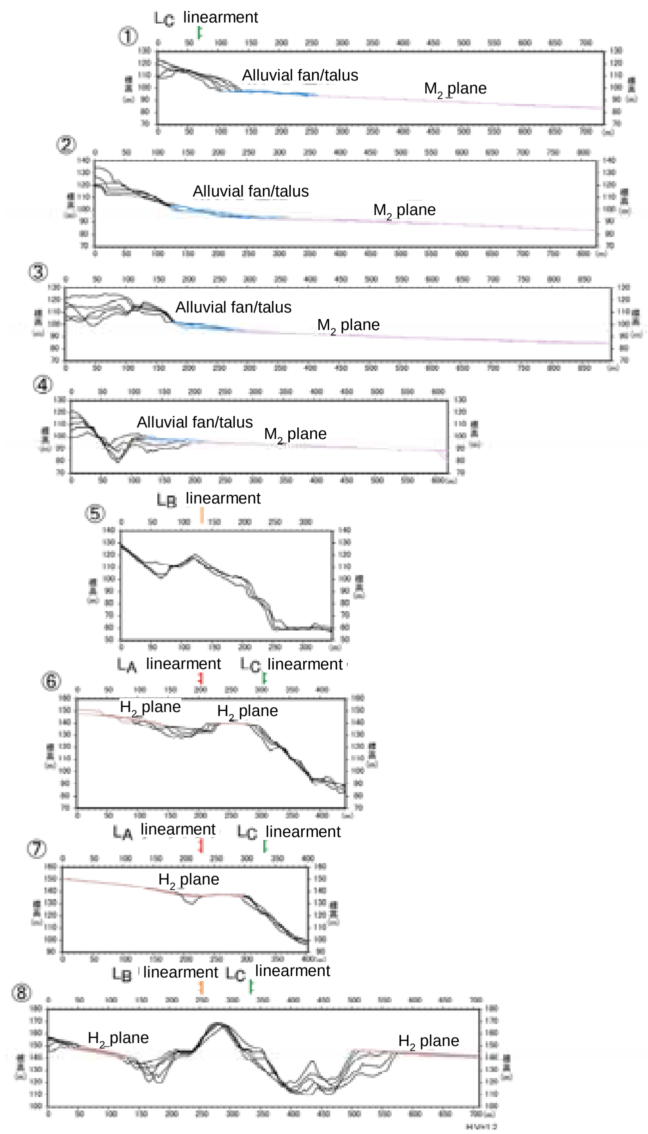
Bird's eye view of Baba, Minami Soma



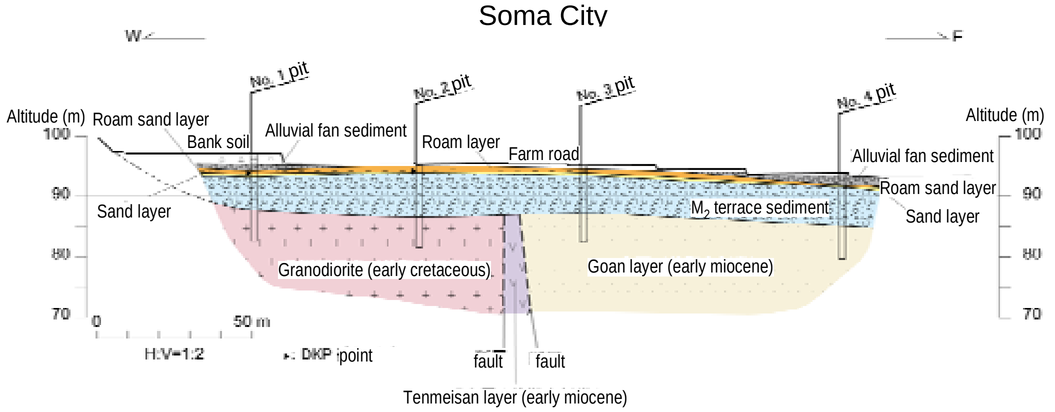
Trend surface analysis (tilt angle) of surface M_2 at Baba, Minami Soma City



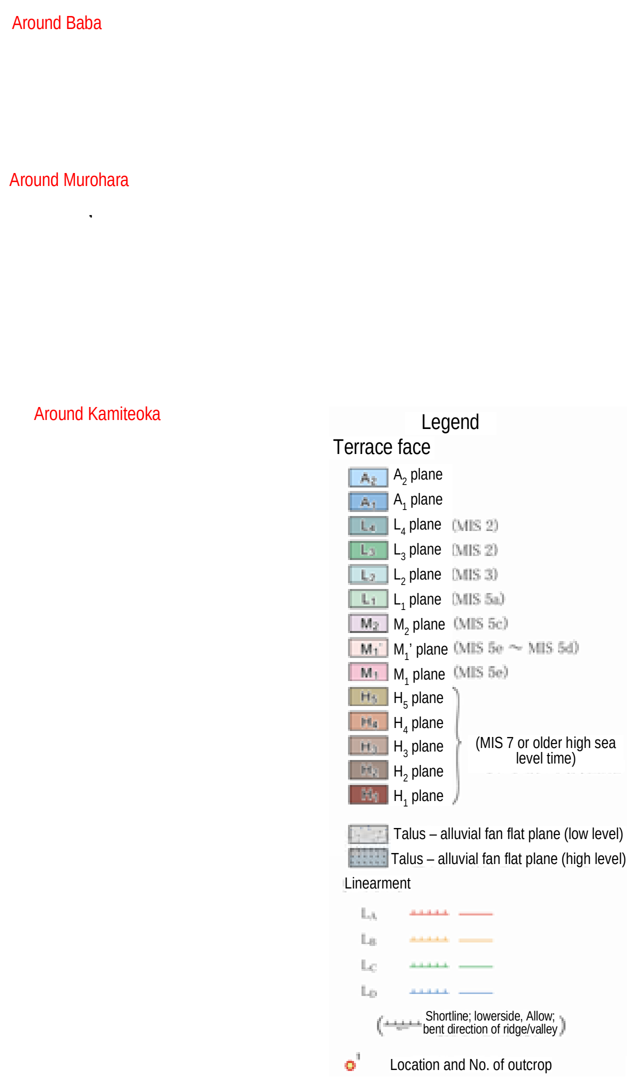
Interpretation drawing of the aerial photo and places of boring exploration at Baba, Minami Soma City



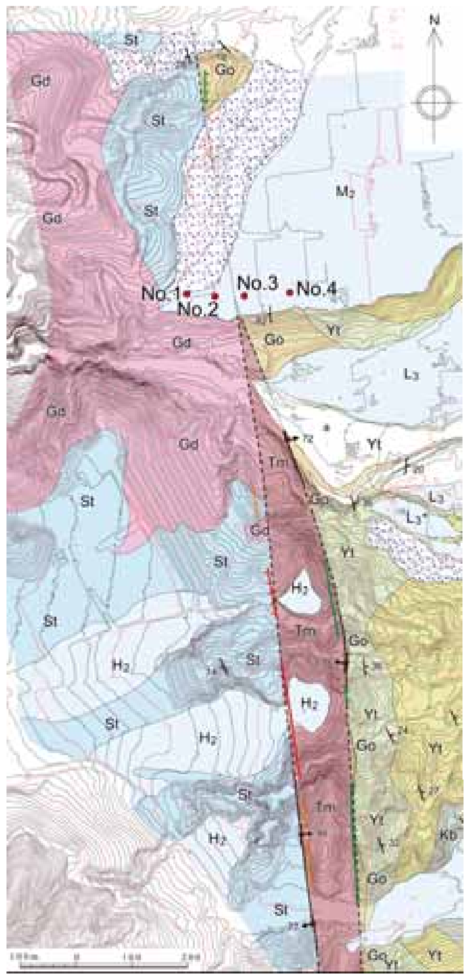
Detailed cross section drawings at Baba, Minami Soma



Boring cross section drawing at Baba, Minami Soma City



Interpretation drawing of the aerial photo around Futaba fault



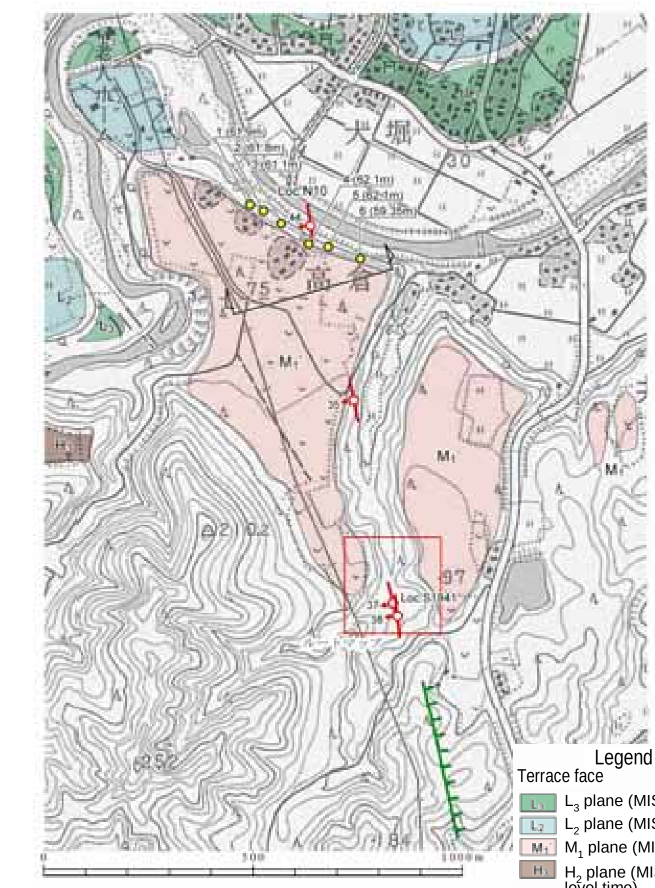
Geological map and boring exploration map of Baba, Minami

The evaluation of Baba, the northern end of the southern part of Futaba fault

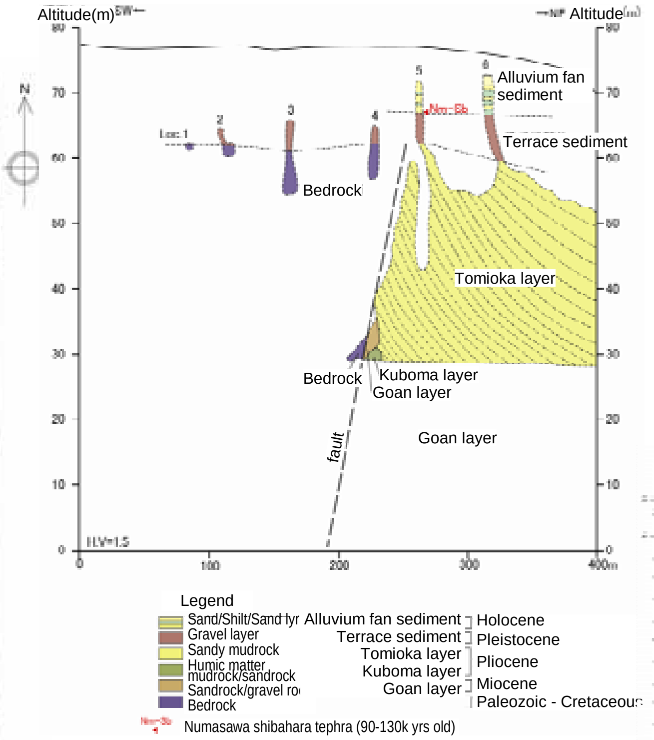
- We did not observe lineament or surface M_2's displacement or deformation at the extension portion of the fault from geomorphic analysis using DEM data.
- We did not observe displacement or deformation at the terrace deposit by boring exploration.

Attachment 1－1 The evaluation of the northern end of the southern part of Futaba fault (south of Baba)

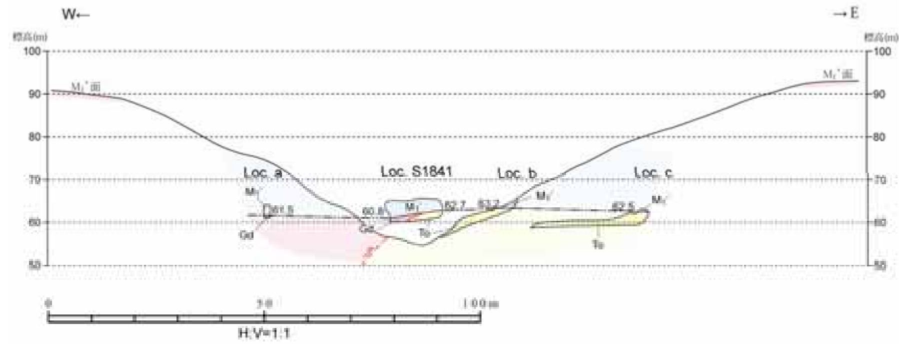
【Southern part of Futaba fault(around Oobori)】



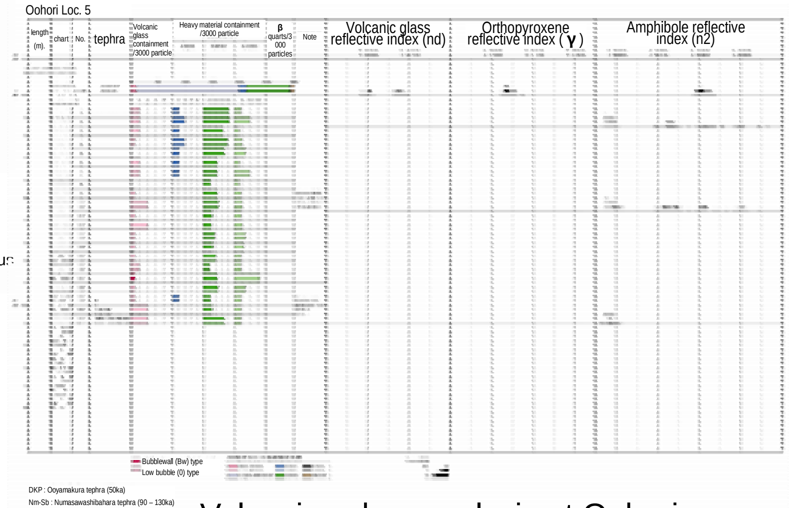
Interpretation drawing of the aerial photo around Oobori



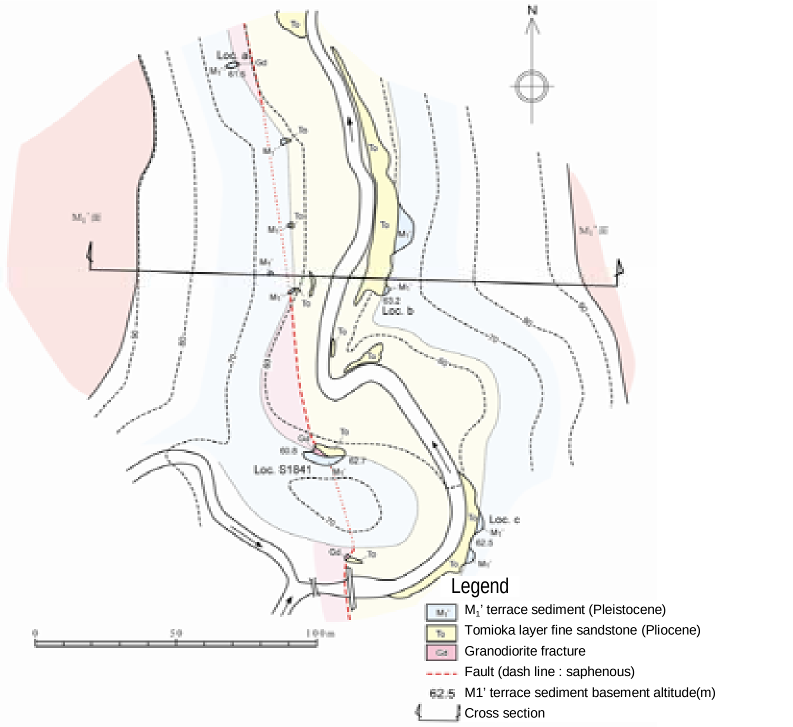
Cross section drawings of the geological condition at Oobori Loc.N10



Cross section drawings of the geological condition at south of Oobori Loc.S1841



Volcanic ashes analysis at Oobori

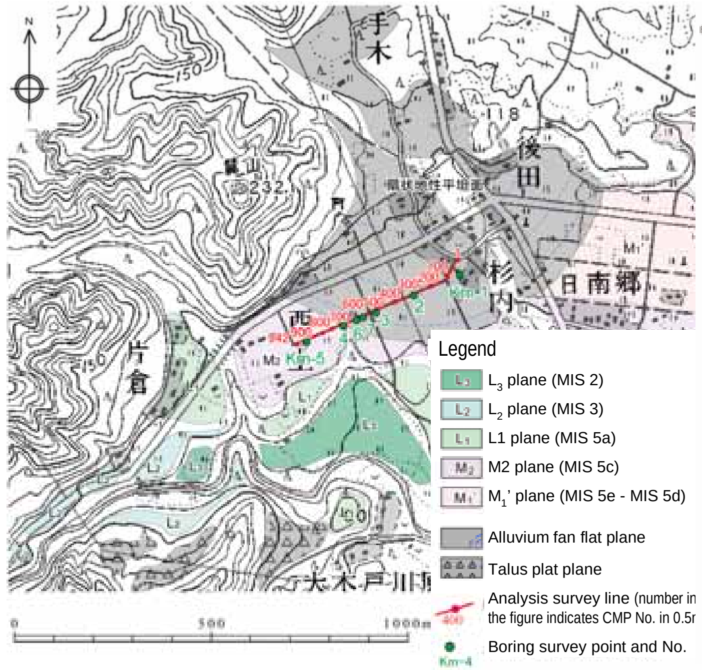


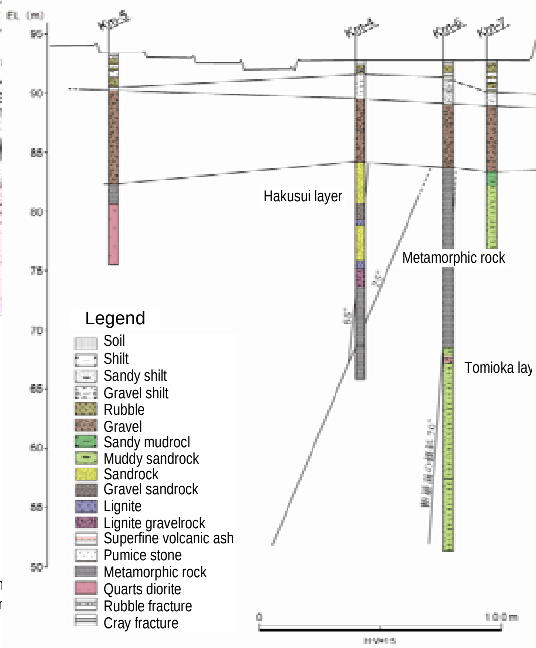
A route map art the south of Oobori

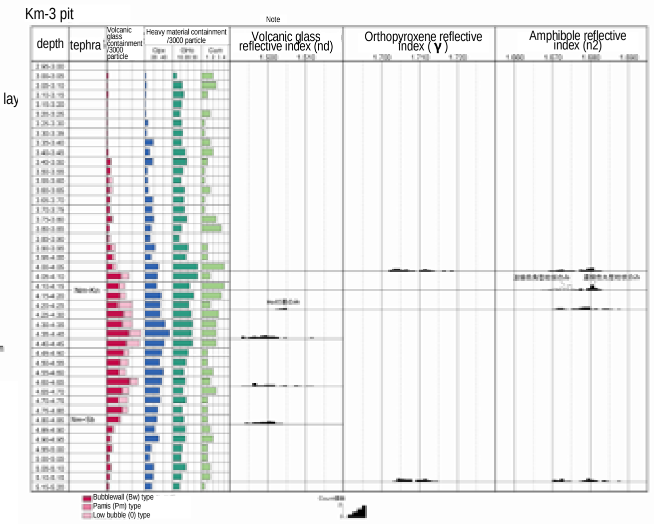
Around Oobori

- On the right bank of Takase river, Oobori, there is Futaba fault. We do not see irregularity of height at the bottom of the terrace deposit M_1 at both sides of the fault.
- At the south of Oobori, Futaba fault does not cause displacement or deformation at the bottom of the terrace deposit M_1'.

【Southern part of Futaba fault(around Kamiteoka)】





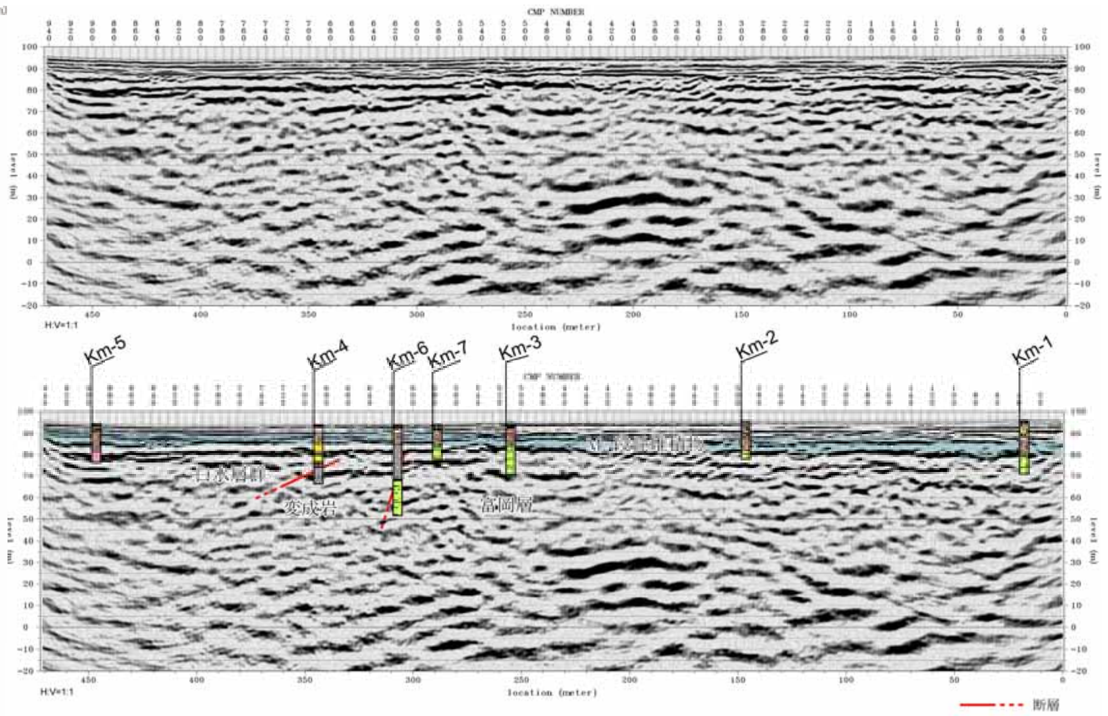


火山ガラスの主成分化学分析結果

試　料	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O
Km-3孔 4.80-4.85m	78.29	0.09	12.45	1.08	0.03	0.16	1.01	3.35	3.55
Nm-Sb（馬場2地点）	78.05	0.03	12.54	0.95	0.02	0.10	0.67	3.71	3.93

（注）単位は重量パーセント

Boring geomorphic cross section drawings at Kamiteoka



Depth section of Kamiteoka survey line(S wave) and its interpretation

Around Kamiteoka

- Futaba fault does not give displacement to the basement of the terrace deposit that constitutes surface M_2

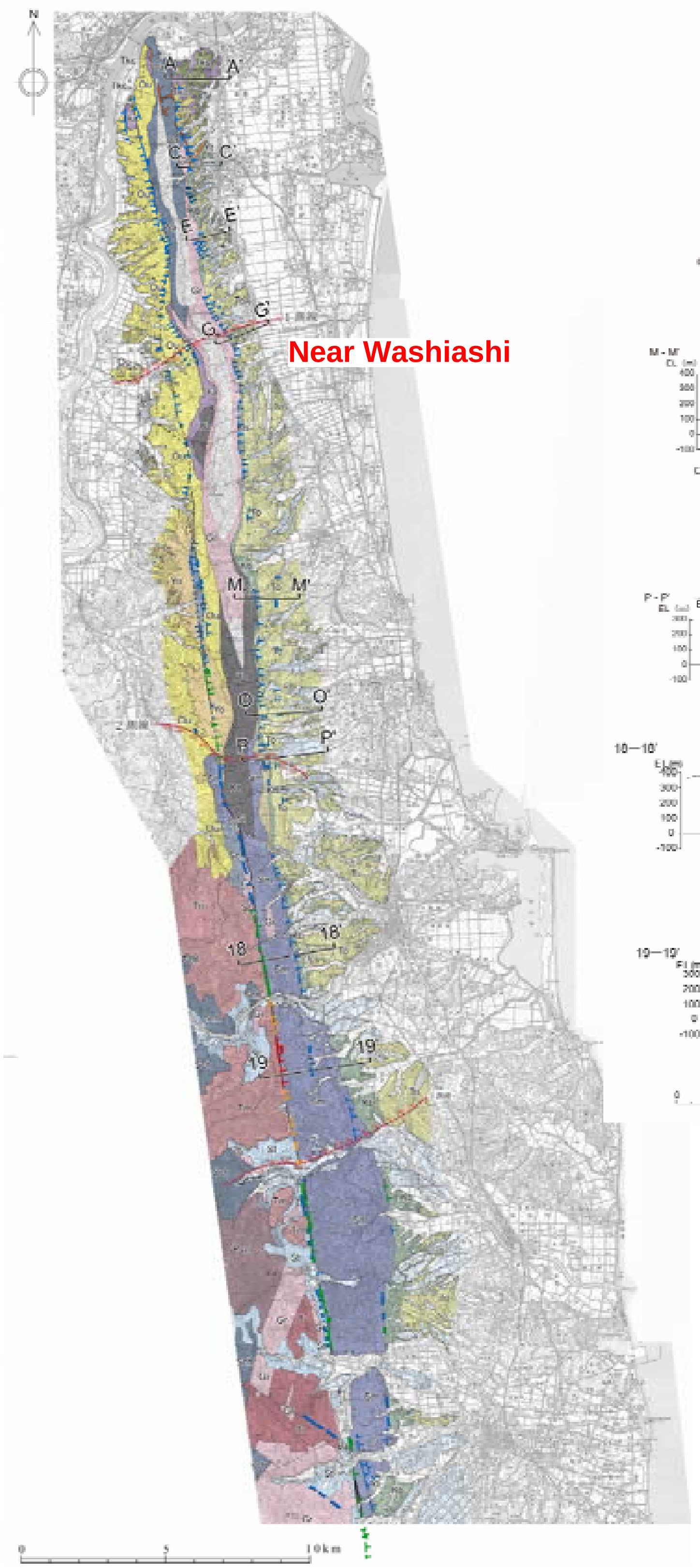
Attachment 1-2: The evaluation of the southern part of Futaba fault (south of Baba)

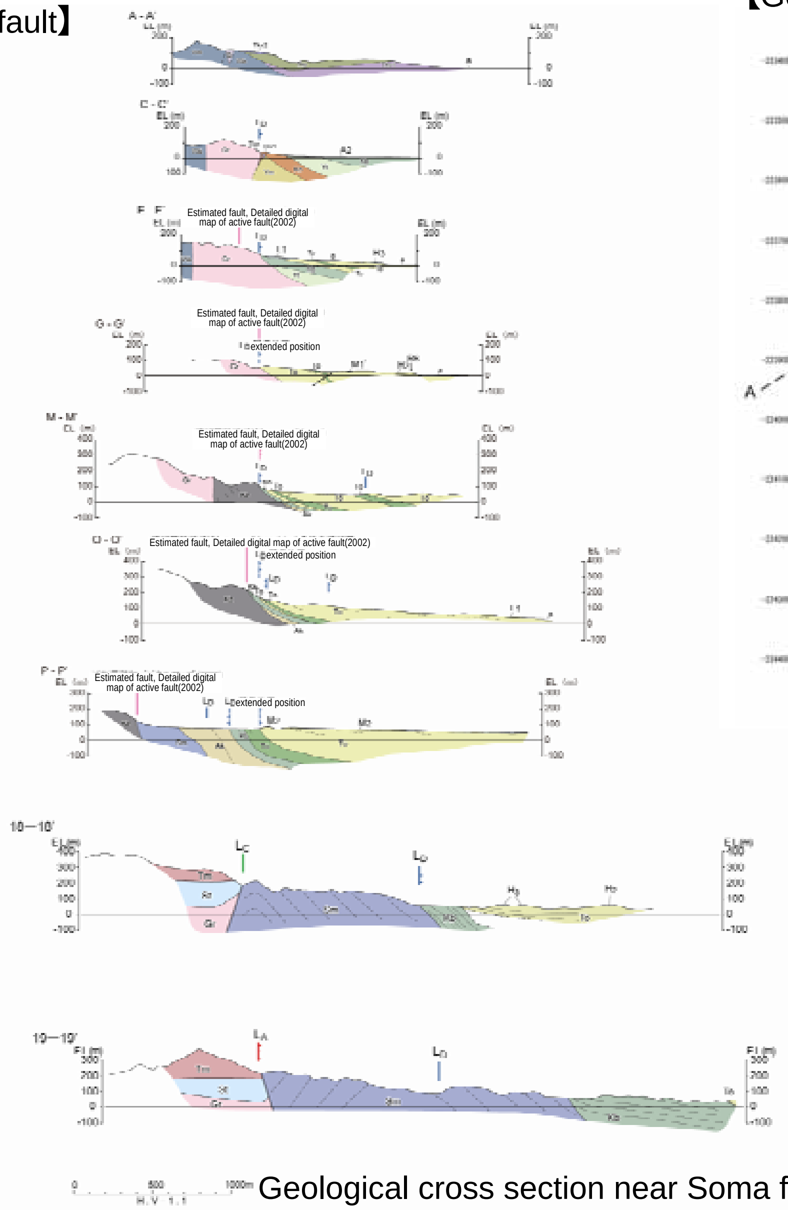
Faults around/near the site

② Soma Faults

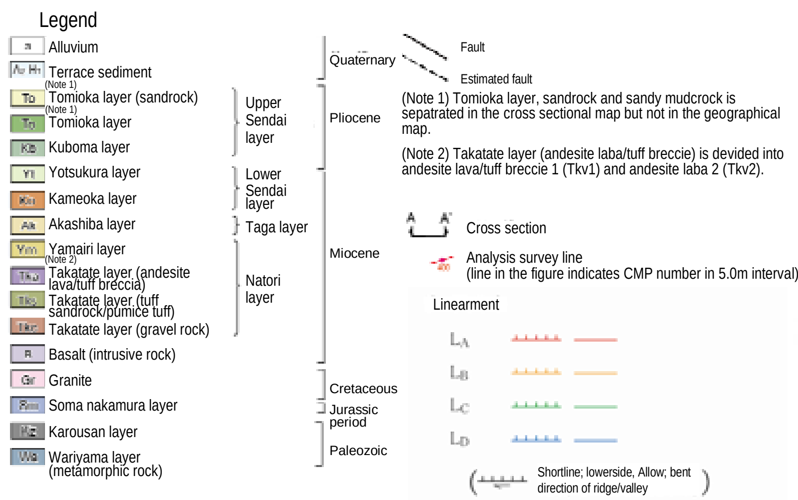
Survey	Method	Result	Note
Literature Survey	—	・[New Edition] Faults in Japan (1991) :Length approx. 2km, Certainty **III**, (no description about activity) ;Length approx. 2km・, Certainty **III**・ (no description about activity) ;Length approx. 2km, Certainty **III**, (no description about activity) ;Length approx. 3km, Certainty **III**, (no description about activity)	
		・Detailed Digital Map of Active Faults (2002) :Length approx. 5km, Estimated Active Faults, (no description about activity) ;Length approx. 12.5km, Estimated Active Faults , (no description about activity)	
		・Active Structure Map ー Niigata (1984) :none	
Tectonic Geomorphologic Survey	Aerial Photograph DEM geomorphic analysis	・Consist of Mountainside, hillside, col and straight valley, NNW-SSE direction, approx. 45km long, lineament L_D recognized.	Figure2ー1
		・No displacement/ deformation was found in M_1 face and M_2 face located in the extended line of the fault in the aerial photo, pre-artificial reform, around Washiashi, Yamamoto town.	Figure2ー2
Surficial geologic Survey	Ground Surface Survey Reflection Survey	・Though fault running toward west was found in the deep underground as a result of reflection survey, upper Miocene series and Pliocene series shows monoclinal fold structure, no displacement/ deformation was found in the upper terrace surface and middle terrace surface which covers above monoclinal fold structure.	Figure2ー1
		・The lineament is judged as a erosional forms reflected difference of lithological character , as lineament along with monoclinal fold structure are each severally corresponds to discordance / conformable border of different lithological character.	Figure2ー2
Evaluation	・Though fault running toward west was found in the deep underground and upper Miocene series and Pliocene series shows monoclinal fold structure, no displacement/ deformation was found in the upper terrace surface and middle terrace surface which covers above monoclinal fold structure, and lineament along with monoclinal fold structure are judged as a erosional forms reflected difference of lithological character, it is judged there is no activity for Soma Fault after the late Pleistocene.		

【Geological condition & structure near Soma fault】



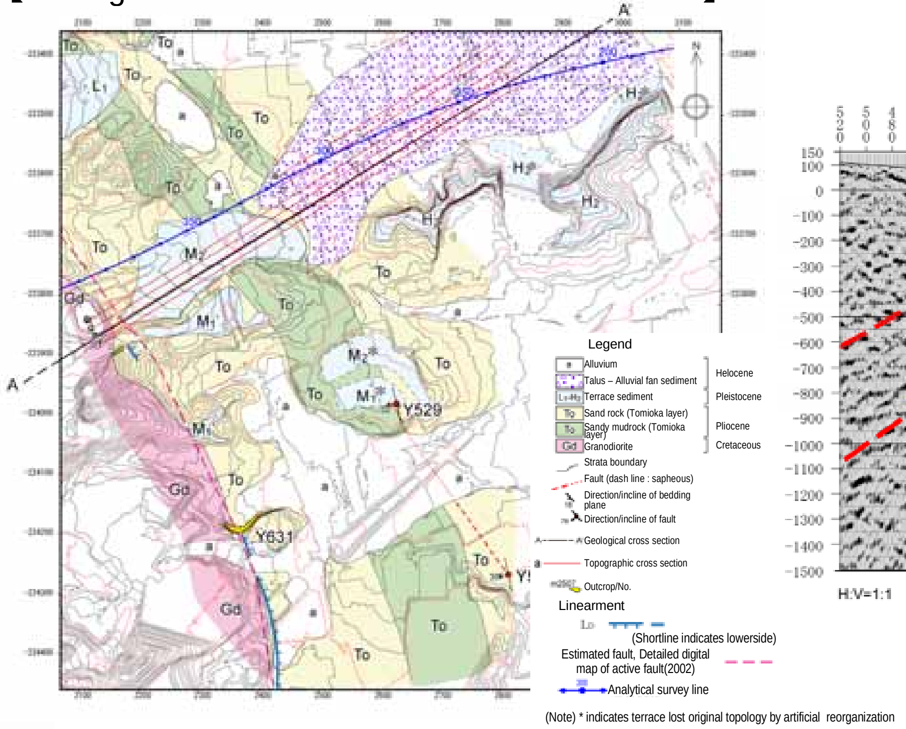


Geological cross section near Soma fault

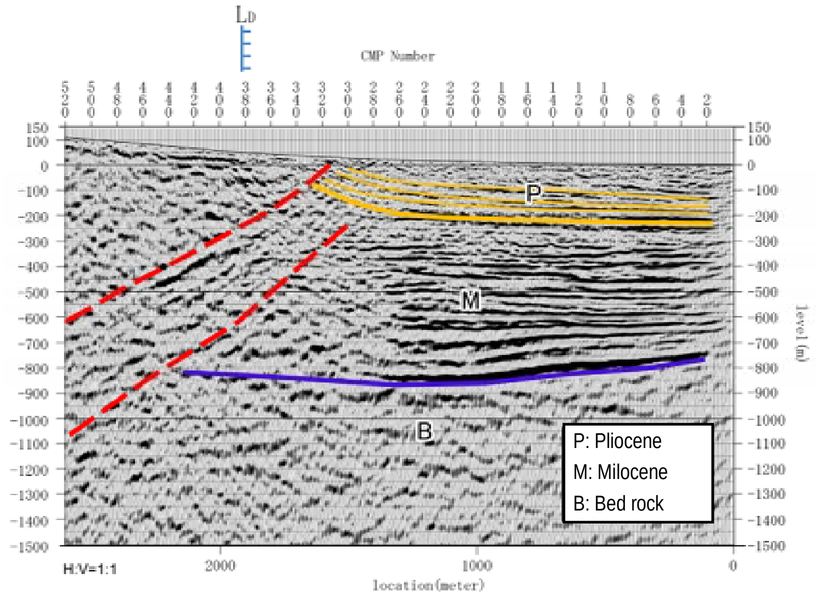


Geological map & lineament distribution map near Soma fault

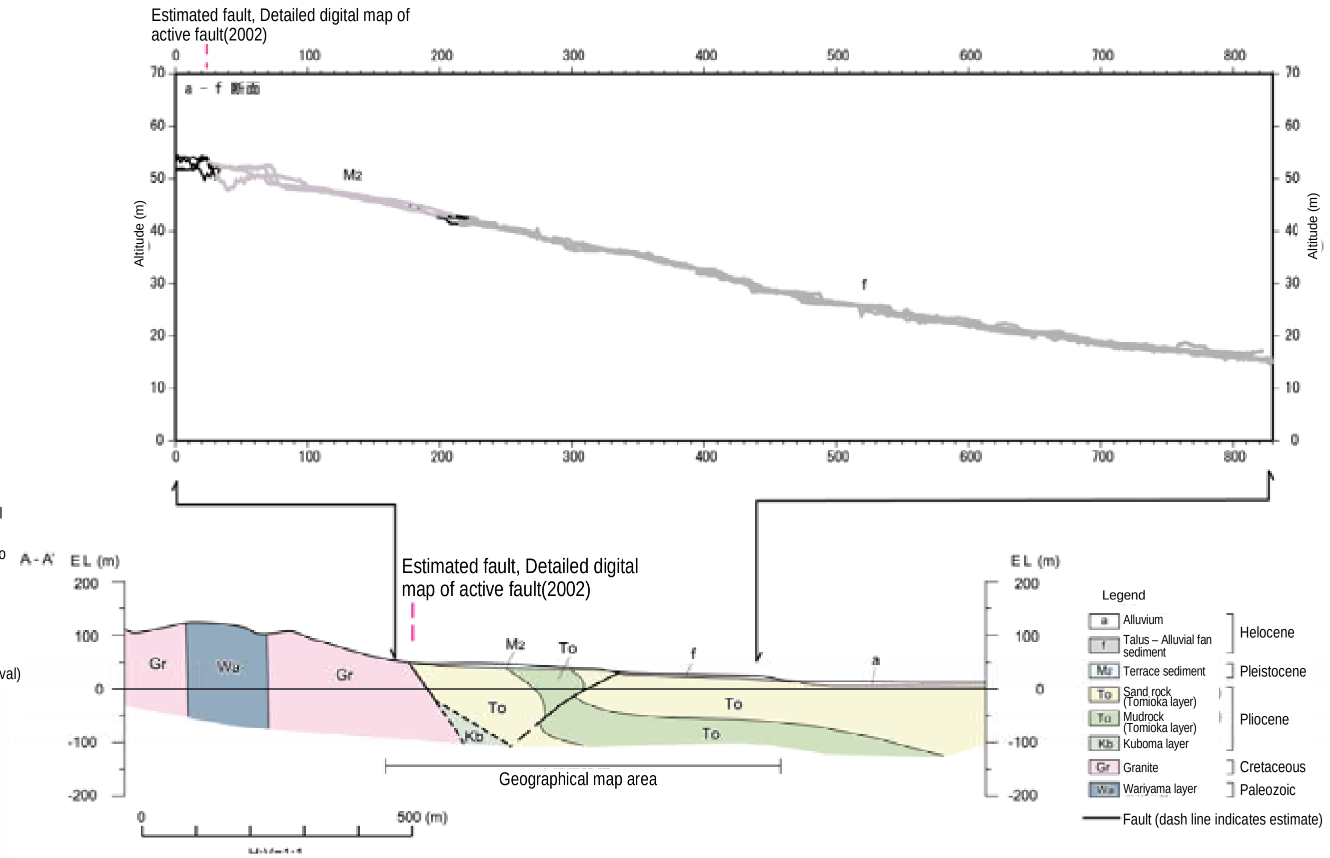
【Geological condition & structure near Washiashi】



Geological map near Yamamoto-cho, Washiashi



Interpretation of survey line 1 near Yamamoto-cho, Washiashi

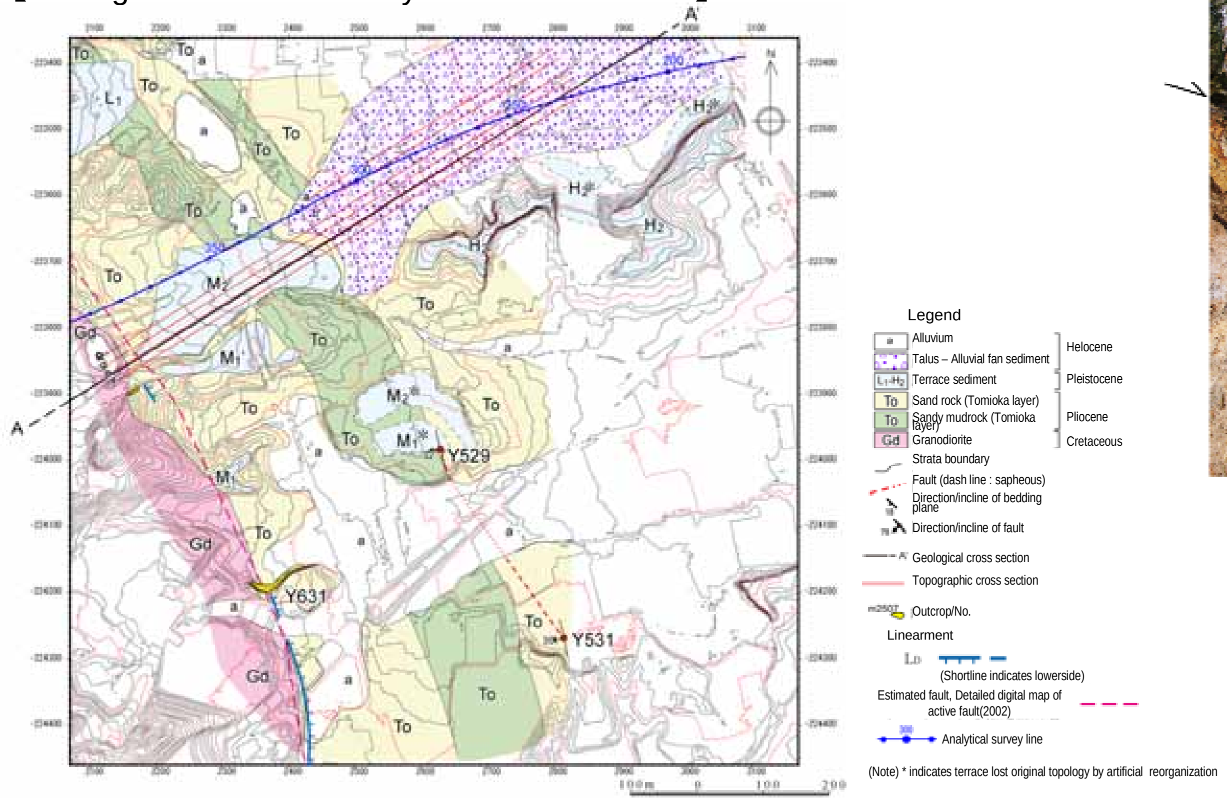


Geological cross section near Yamamoto-cho, Washiashi

The evaluation of Soma fault

- Although we observe a fault high in the west from the result of reflection seismic survey and upper Miocene and Pliocene show flexure structures, we do not observe any displacement or deformation from geomorphic analysis using DEM data either in high and middle terrace plains which cover the flexure structures.

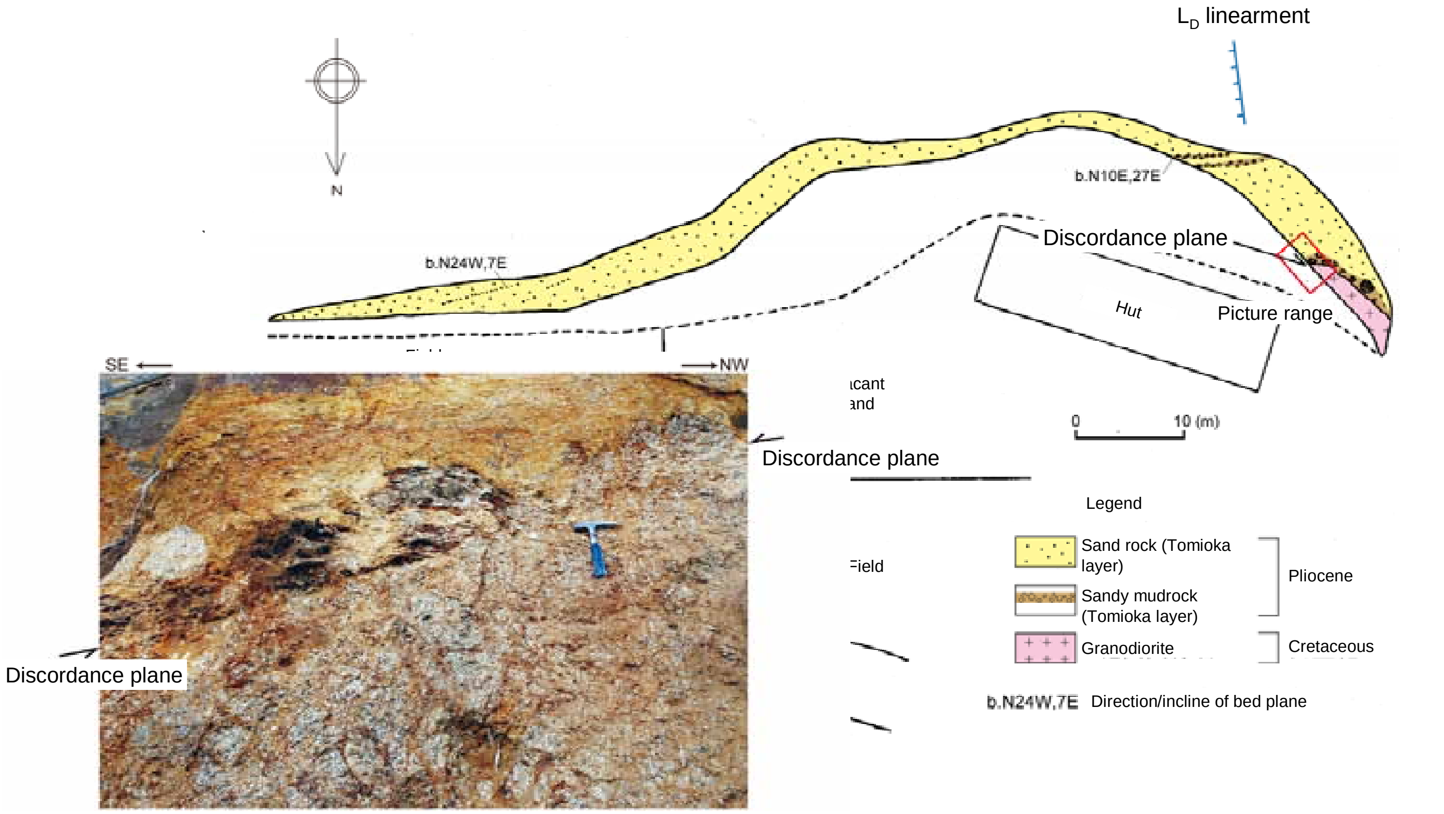
【Geological condition survey result at Washiashi】



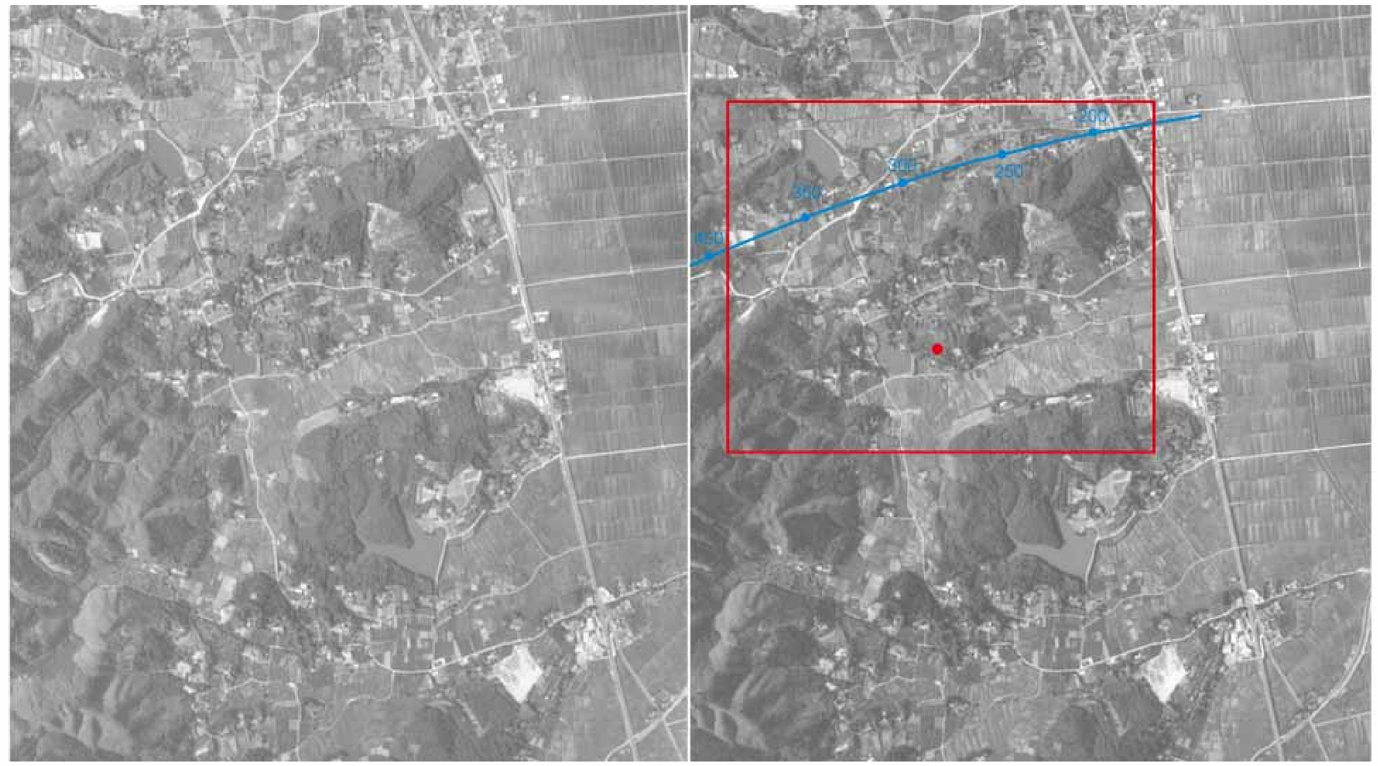
Geological condition drawing at Washiashi, Yamamoto town

Loc.Y529 （Washiashi, Yamamoto town）: low-angle reverse fault (west side up) at Tomioka fault. The fault surface lithified.

Loc.Y531（Washiashi, Yamamoto town）: reverse fault at Tomioka fault. The fault surface conglutinated and merged into surrounding rocks.



Route map and outcrop photo at Washiashi, Yamamoto town (Loc.Y631)



(Geographical Survey Institute: T0-68-8X C1-7,8)

DEM topography survey range
Reflective analysis survey line
Fault outcrop (Y529)

Aerial photo of 1 survey line at Washiashi, Yamamoto town (before artificial change)

The cause of lineament at Soma fault

- All lineaments found along the flexure correspond to disconformable boundary or conformable boundary of different rocks or stratum. As such, lineaments are as a result of erosion because of the difference of lithological character.

Activeness of the fault

- From the aerial photo before artificial change, we do not observe displacement or deformation of surfaces M1 and M2 located at the extension of the fault.

Evaluation of Soma fault

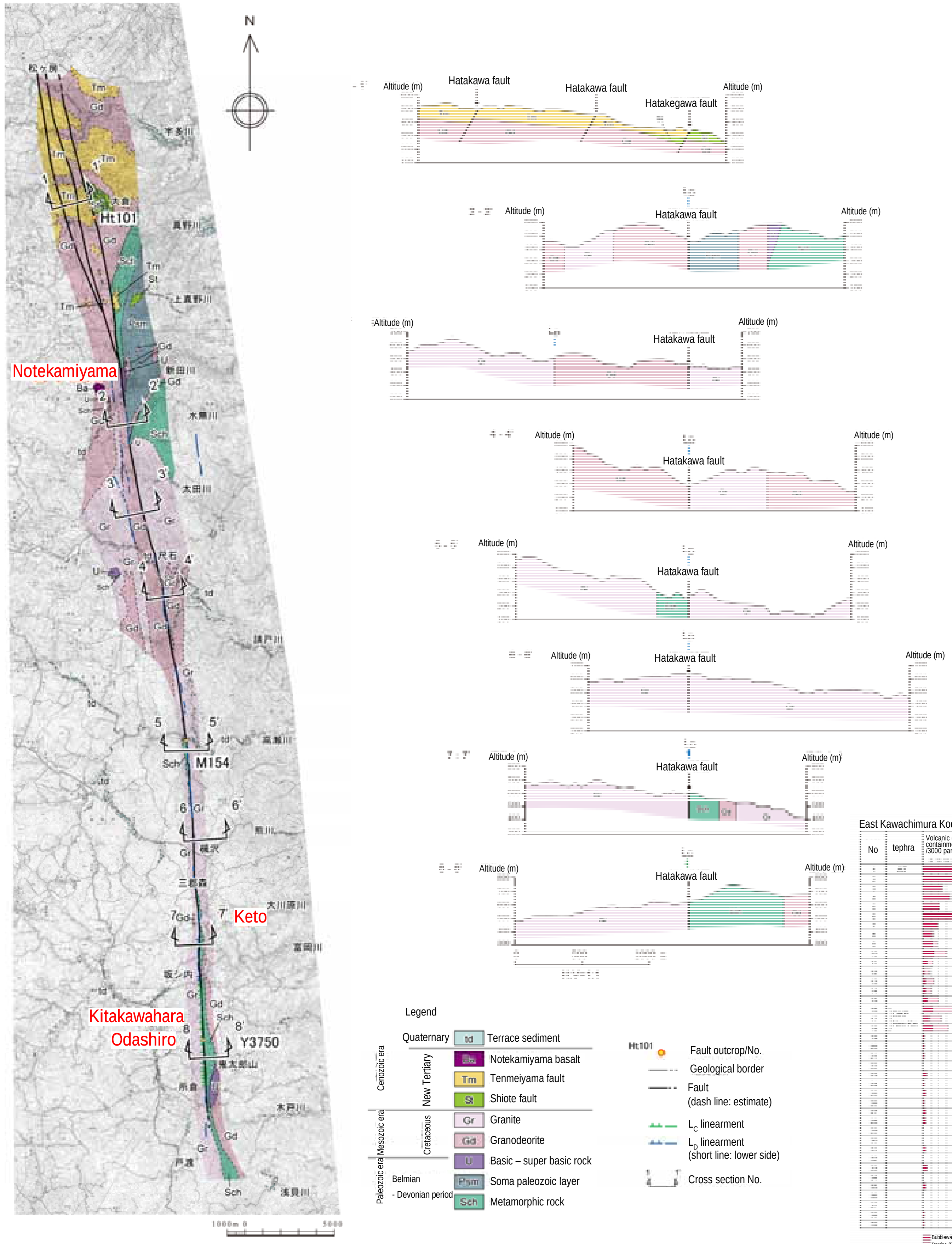
- We do not observe displacement or deformation at the high terrace surface or mid terrace surface covering flexure. As such, lineaments are as a result of erosion. As we do not observe displacement or deformation at the mid surface at the extension of the fault, there is no activity at Soma fault after the Late Pleistocene.

Faults around/near the site

③ Hatakegawa Fault

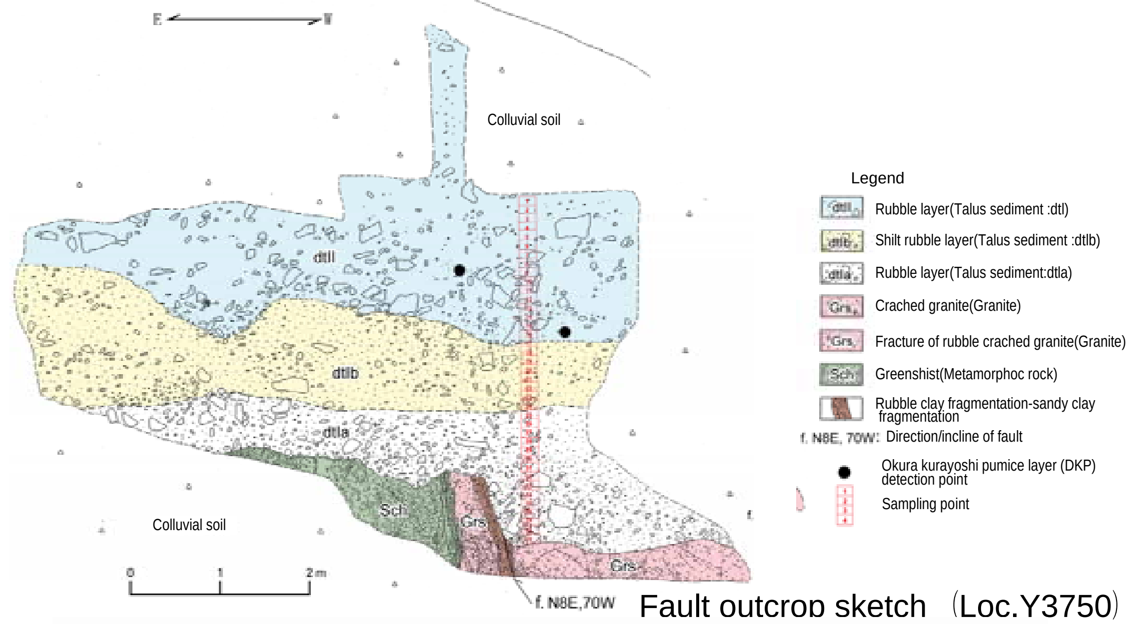
<table>
<tr><th>Survey</th><th>Method</th><th>Result</th><th>Note</th></tr>
<tr><td rowspan="3">Literature Survey</td><td rowspan="3">—</td><td>・[New Edition] Faults in Japan (1991) ; Length approx. 5.5km, Certainty III, (no description about activity) ; Length approx. 15km, Certainty II, Activity B ; Length approx. 6.5km, Certainty III, Activity C</td><td></td></tr>
<tr><td>・Detailed Digital Map of Active Faults (2002) ; none</td><td></td></tr>
<tr><td>・Active Structure Map − Niigata (1984) ; none</td><td></td></tr>
<tr><td>Tectonic Geomorphologic Survey</td><td>Aerial Photograph</td><td>・Consist of cliff, col and straight valley, N-S direction, approx. 43.5km long, lineament L_C・L_D recognized.</td><td>Figure3−1</td></tr>
<tr><td rowspan="4">Surficial geologic Survey</td><td rowspan="4">Ground Surface Survey</td><td>・In the north of Notegamiyama, fracturing west down gravity fault in 3 branches were consolidated and no lineament was recognized corresponding to these fault.</td><td rowspan="2">Figure3−2</td></tr>
<tr><td>・Most of lineament towards Notegamiyama to Keto do not correspond to fault and fault corresponds to certain part locally contain soft portion, as such soft portion do not obtain phosphorite chip with slickenside, it is judged it was softened not by fault movement but by surface water.</td></tr>
<tr><td>・In south Keto, fault face conglutinated, fracture consolidated. No displacement/ deformation found on two layer talus accumulation over the fault. In the basal of upper talus accumulation, Ooyamakurayoshi tefura (approx. 50 thousands yrs ago) is included, lower talus accumulation is suspected older as it contain chain gravel.</td><td>Figure3−1</td></tr>
<tr><td>・In south Keto, lineament is judged as the erosional forms reflecting lithological character of rocks on both side.</td><td>Figure3−2</td></tr>
<tr><td>Evaluation</td><td colspan="3">・At certain portion,L_D lineament corresponds to faults and softened portion was locally recognized along with fault, such portion do not obtain phosphorite chip with slickenside and do not give displacement/ deformation to the approx. 50 thousands yrs old talus accumulation and much older talus accumulation and mostly lineament is judged erosional forms reflecting difference of lithological characters, Hatakegawa Fault is judged there is no activity after the late Pleistocene.</td></tr>
</table>

【Geological condition & structure of Hatakawa fault】

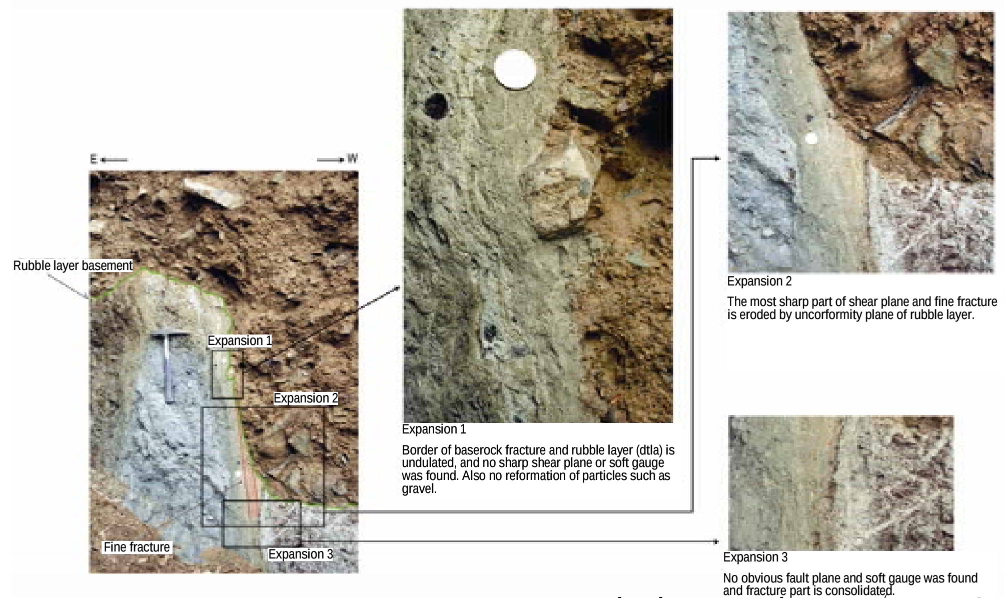


Geological map and lineament distribution map of Hatakawa fault

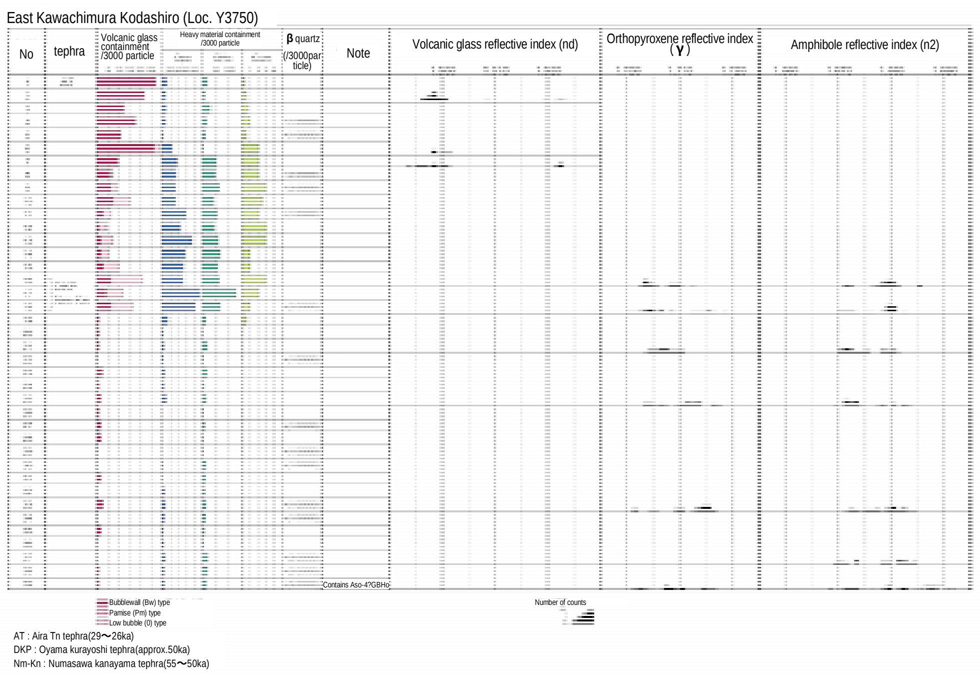
【Nature of Hatakawa fault (south of Moudo)】



Fault outcrop sketch (Loc.Y3750)



Fault closeup picture (Loc.Y3750)



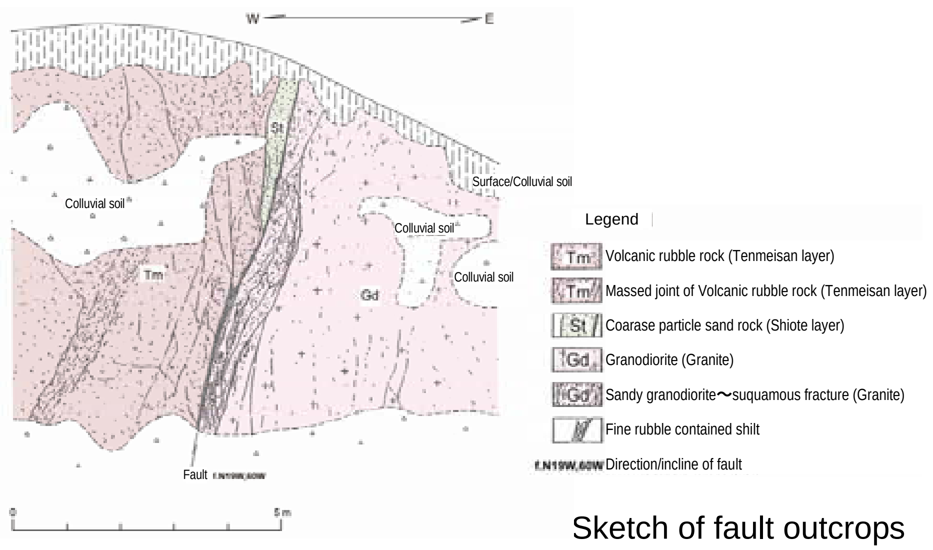
Volcanic ashes analysis result, east of Odashiro

The Evaluation of Hatakawa fault (Loc.Y3750)

- In the east of Kawauchi and Odashiro, upper and lower talus sediments of two layers cover the fault, and elevation difference of approx. 80 cm (high in the east) is observed at the base of lower talus sediment. However, as the base of lower talus sediment is crossed against fractured structures, the elevation difference is considered to be formed by erosion before the sedimentation, and no displacement or deformation by any fault is observed either in the talus sediment s of two layers.
- Daisen-Kurayoshi tephra (approx. 50,000 years ago) is included near the base of upper talus sediment, and decayed conglomerate is included in lower talus sediment, which is considered to be more ancient.

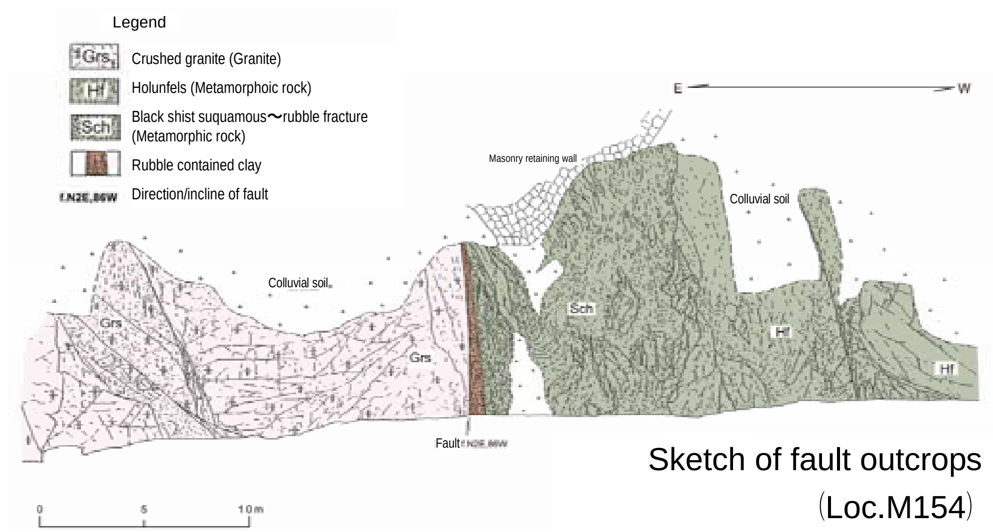
Attachment 3-1: Geological condition & structure of Hatakawa fault

【Character of Hatagawa fault（North of Mount Notegami)】



Sketch of fault outcrops (Loc.Ht101)

【Character of Hatagawa fault（Between Mount Notegami and Moudo)】

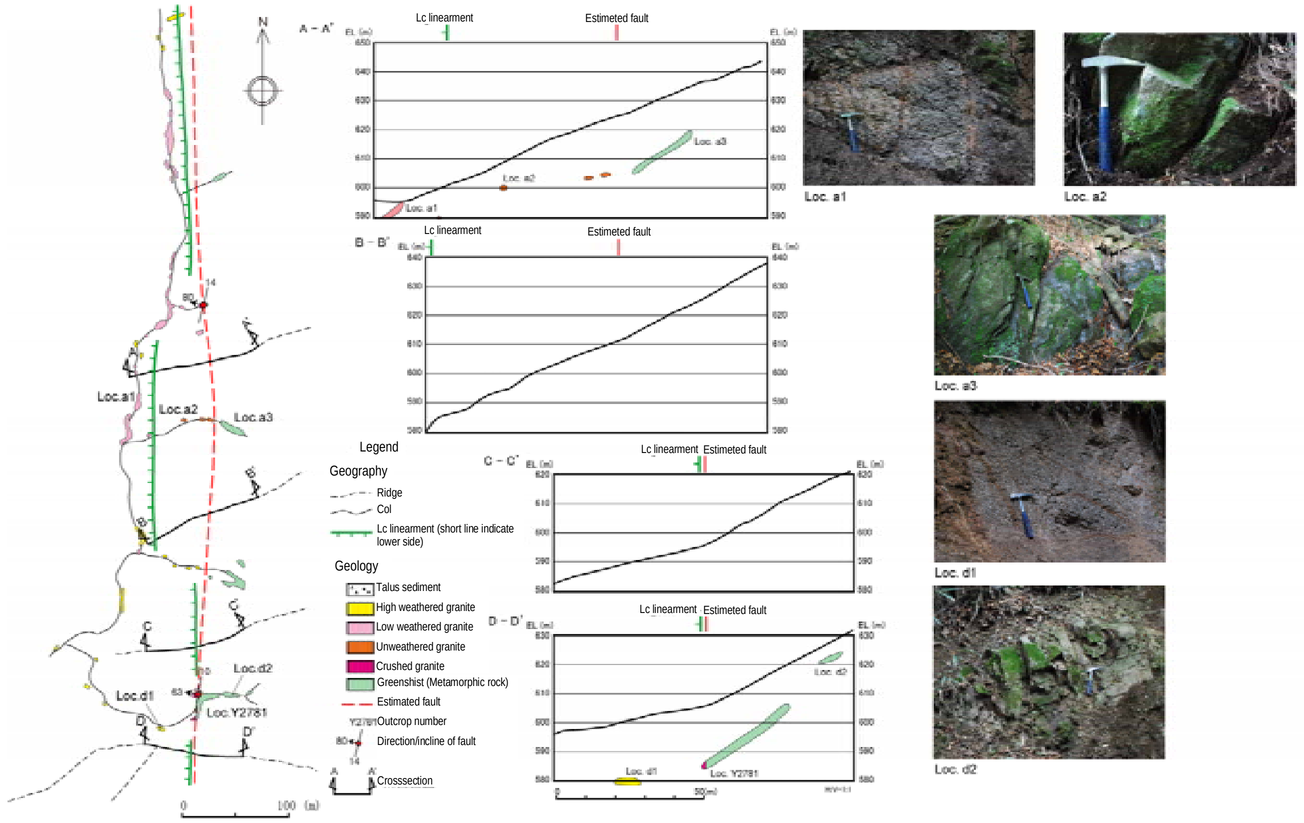


Sketch of fault outcrops (Loc.M154)

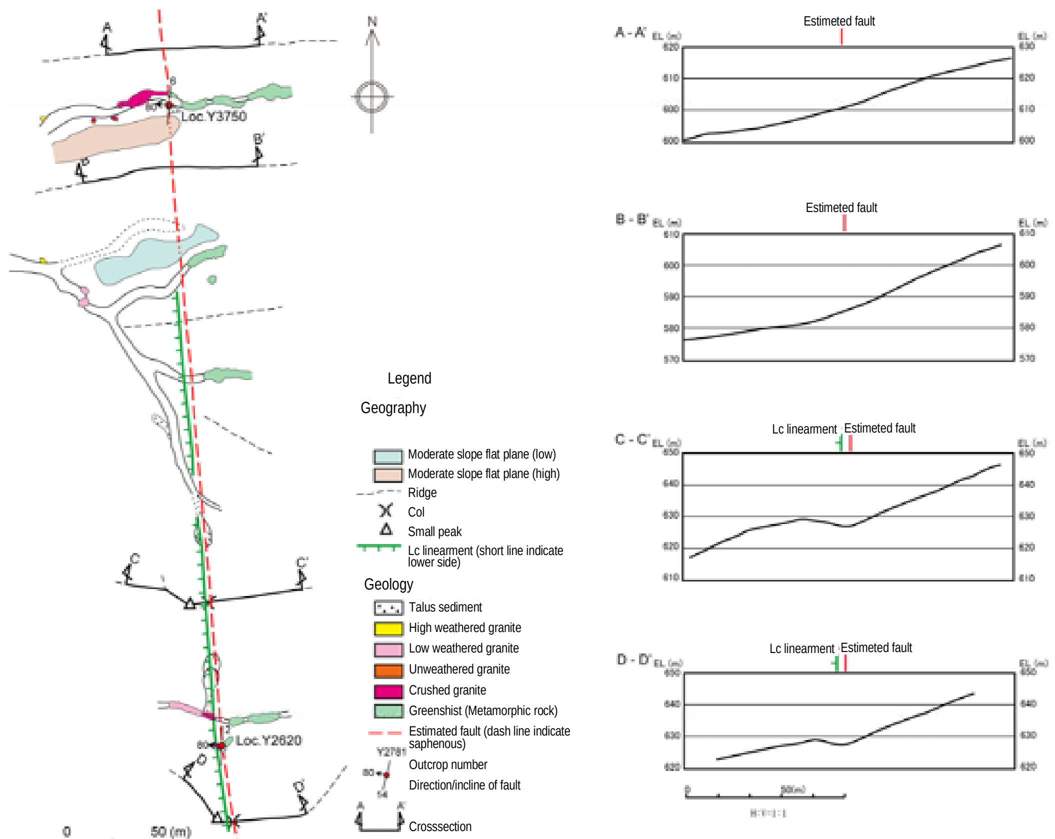
Evaluation of Hatagwa fault

- To the north of Mount Notegami, fractured fault which does not correspond to lineaments, is solidified.
- Between Mount Notegami and Moudo, at parts of fault corresponding to L_D lineament, although there are partly soft areas in line with the fault surface, as there seems to be no fractured structure, it is considered that it is not formed through a fault motion, but was softened by surface water.
- To the south of Moudo, although L_C, L_D lineament is recognized in series, fault surface is adhered at outcrops in this area, and there is no deposition/deformation of talus deposition of 50,000 years before or older.
- Lineament at this area is regarded to be erosional topography, reflecting the difference between the lithological characters of the rocks on both sides.

【Component of lineaments（South of Moudo)】



Relation between lineament and fault (East of Kitagawara)



Relation between lineament and fault (East of Odashiro)

Relation between lineament and Hatagawa fault (South of Moudo)

- To the south of Moudo, eroded granite rocks and hard metamorphic rocks are located side by side at most areas, while at some places with no difference of hardness, lineament is not recognized at faults.

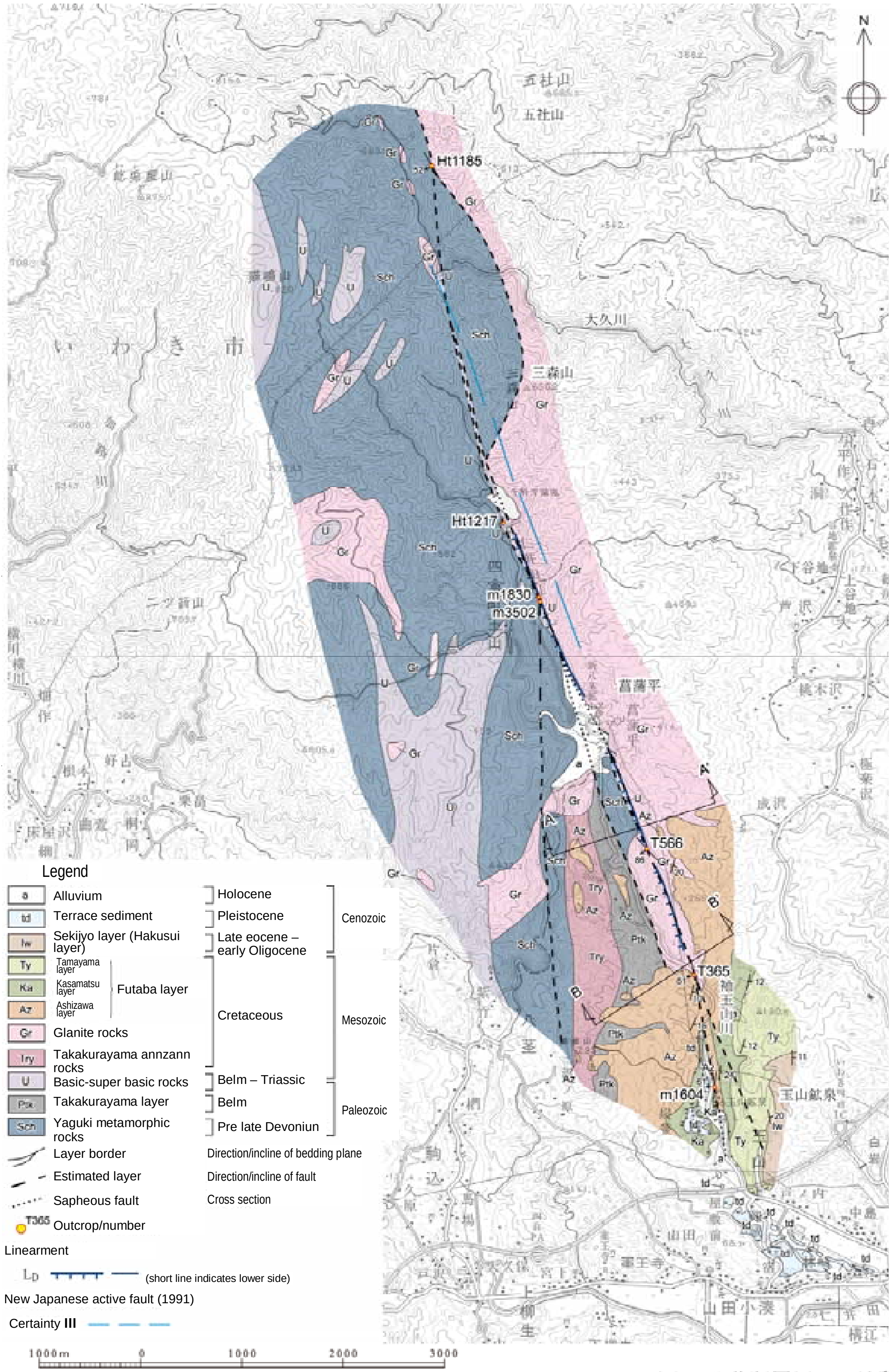
Attachment４

Faults around/near the site

④ Yaguki Fault

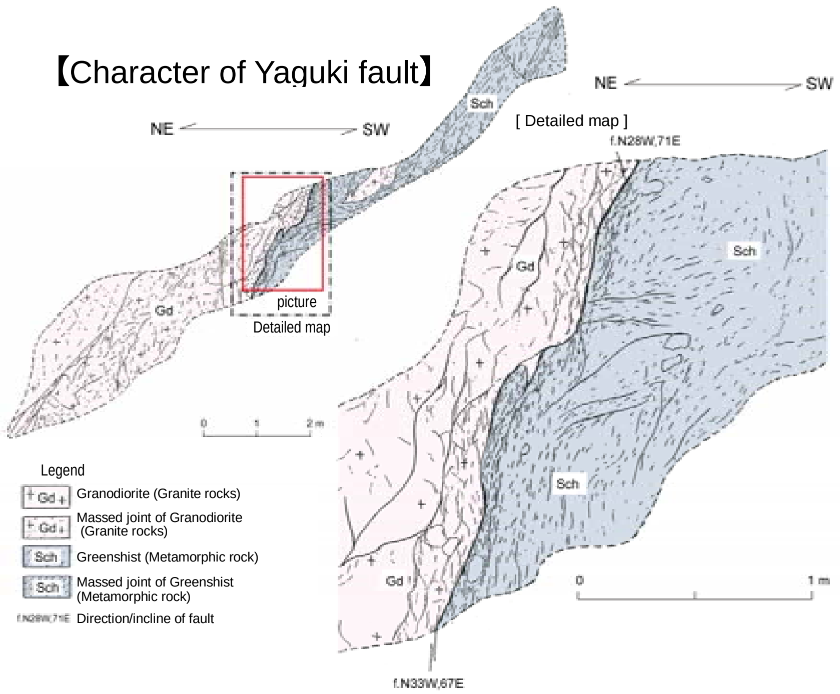
Survey	Method	Result	Note
Literature Survey	—	・[New Edition] Faults in Japan (1991)：Length approx. 4km、, Certainty □ (no description about activity)	
		・Detailed Digital Map of Active Faults (2002)：none	
		・Active Structure Map － Niigata (1984)：none	
Tectonic Geomorphologic Survey	Aerial Photograph	・Consists of straight valley in the mountainside and col, NNW-SSE direction, approx. 4.5km long, lineament L_D recognized.	Figure４－１
Surficial geologic Survey	Ground Surface Survey	・Towards Goshamountain west to Tamayamamineral spring north, continuous fault in the boarder of metamorphic racks and granite rocks, in the metamorphic rocks and in the part of granite rocks. Soft portion where serpentine intruded along with fault, but mostly consolidated for the fracturing part without serpentine intruded.	Figure４－１
		・Towards Goshamountain west to Tamayamamineral spring north, partly lineament corresponding Yaguki Fault recognized, no lineament was recognized for another part.	
		・In the south of Tamayama mineral spring, southern extension of Yaguki Fault, give displacement to Futaba upper Cretaceous group basal surface, but continuity not recognized to Hakusui group basal surface located in its extended line and no displacement recognized to the southern extended M_2 face.	Figure４－２
Evaluation	・Lineament is judged as a erosional forms reflecting difference of lithological character, most fracturing areas where serpentine was not intruded were consolidated, no continuity recognized to the southern extended area of Hakusui group and no displacement on M_2 face, it is judged there is no activity after the late Pleistocene.		

【Geology・Geological structure around Yaguki fault】

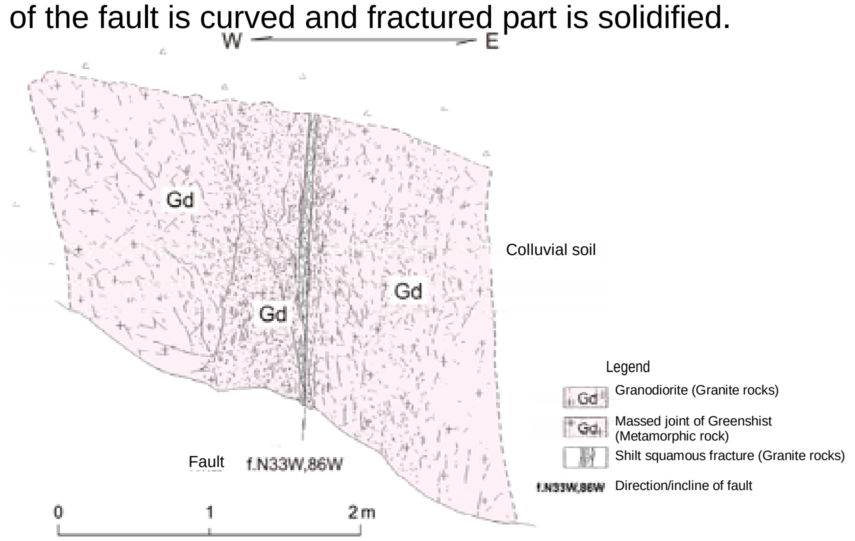


Geological map・lineament distribution map around Yaguki fault

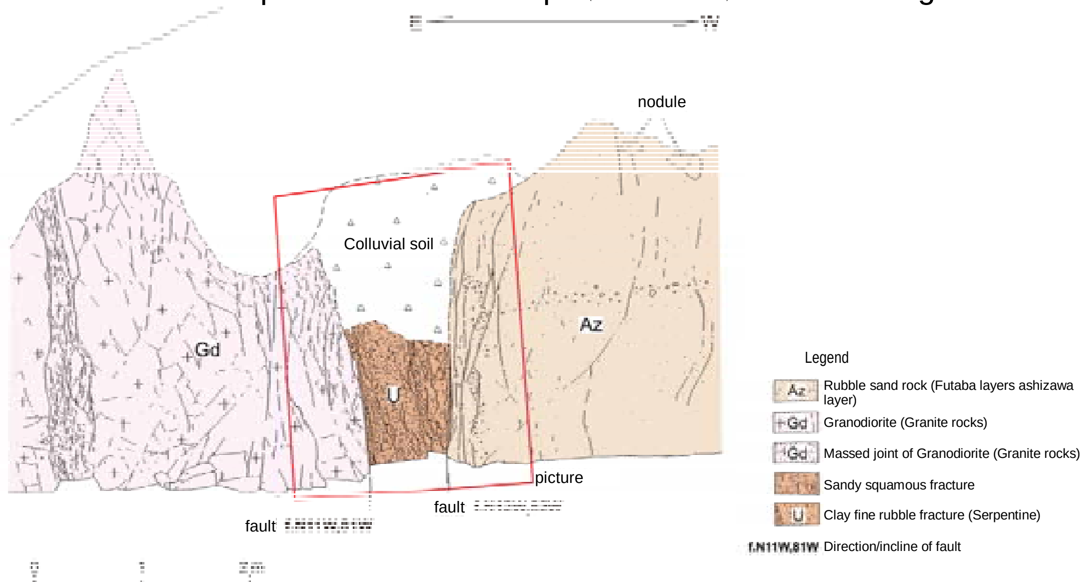
【Character of Yaguki fault】



Sketch・photo of fault outcrops (Loc.m1830) : fault with granite rocks and metamorphic rocks side by side. Surface of the fault is curved and fractured part is solidified.



Sketch・photo of fault outcrops (Loc.T566) : fault within granodiorite. Fractured part of fault is solidified

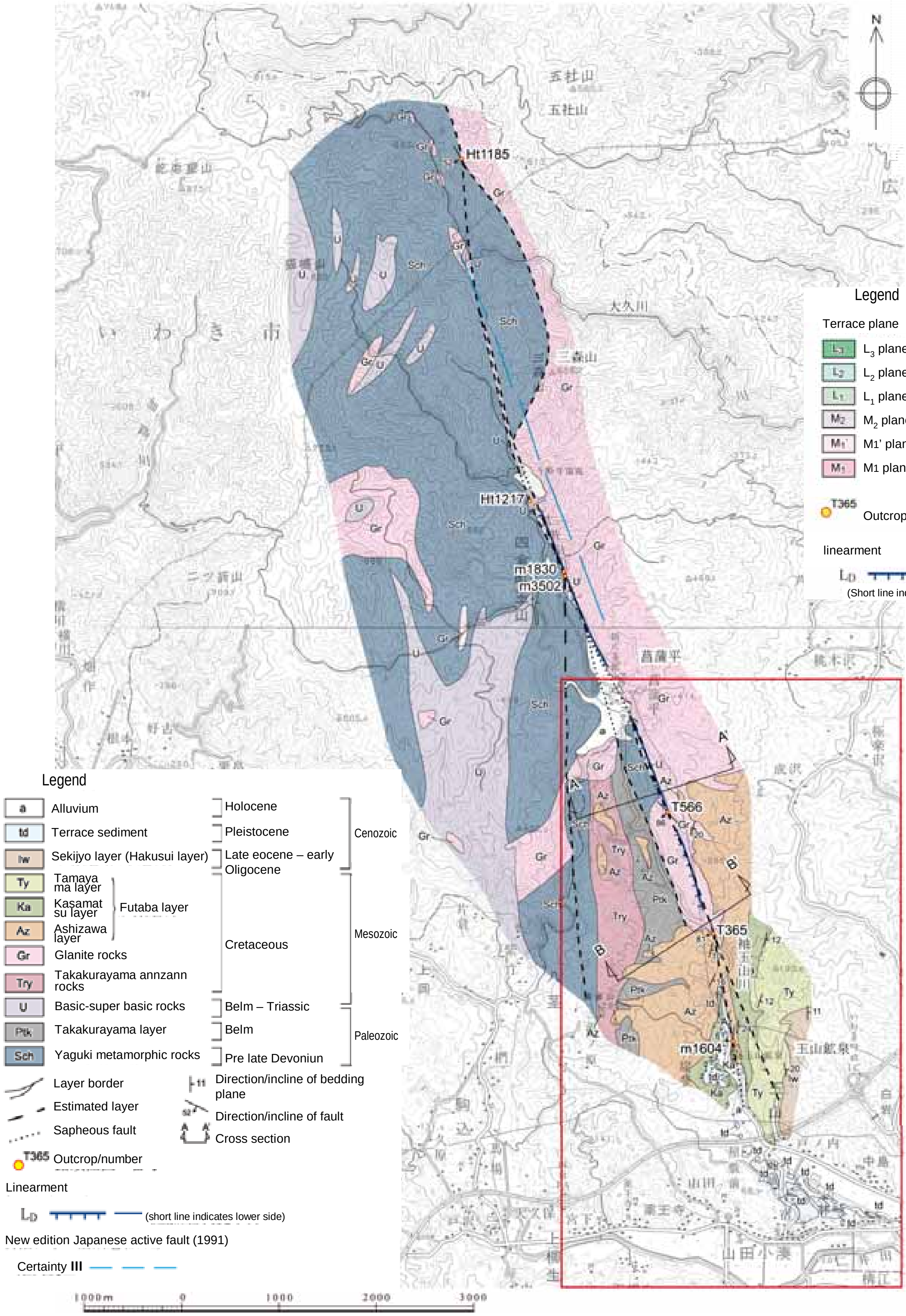


Sketch・photo of fault outcrops (Loc.T365) : Fault with granodiorite and Futaba group Ashiba formation rudaceous grit stone side by side. The part approx. 1m in between the two surfaces is soft clayish fractured part.

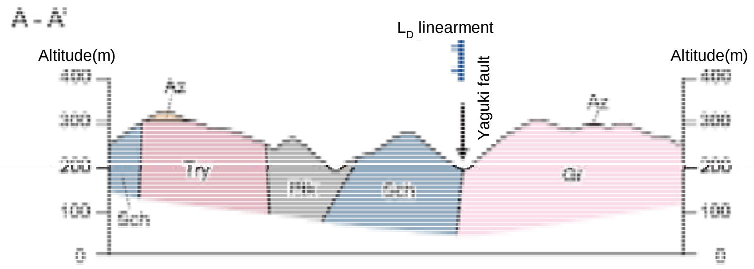
Attachment figure 4-1 Character of Yaguki fault

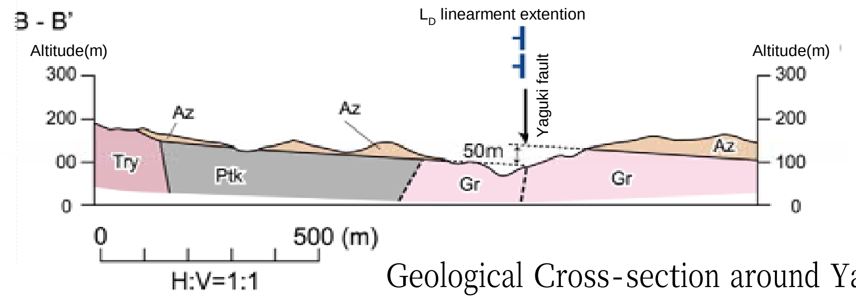
【Evaluation of south end of Yaguki fault】

【Geological conditions and construction around Yagyki fault】

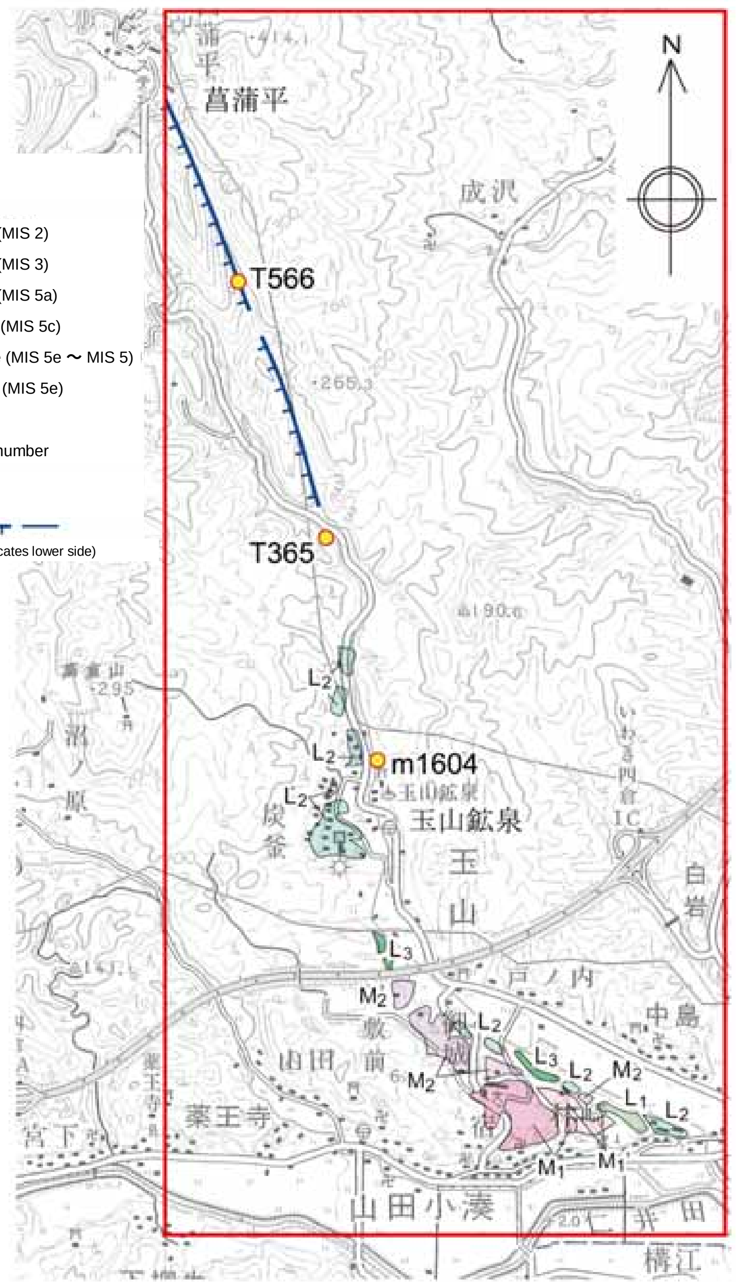


Geological map and lineament distribution around Yaguki fault

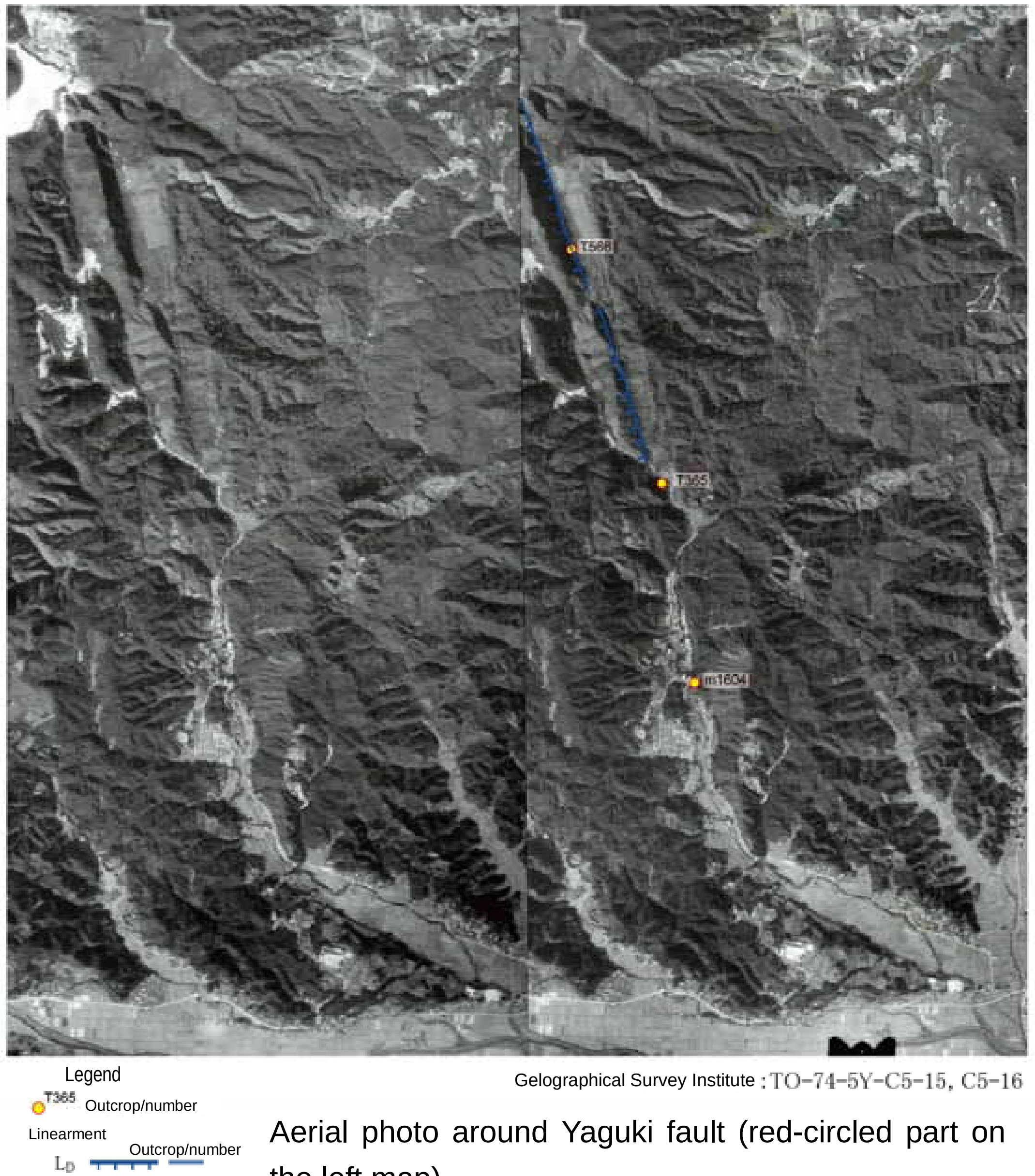




Geological Cross-section around Yaguki fault



Map reading of aerial photo around Yaguki fault (red-circled part on the left)



Aerial photo around Yaguki fault (red-circled part on the left map)

Evaluation of Yaguki fault

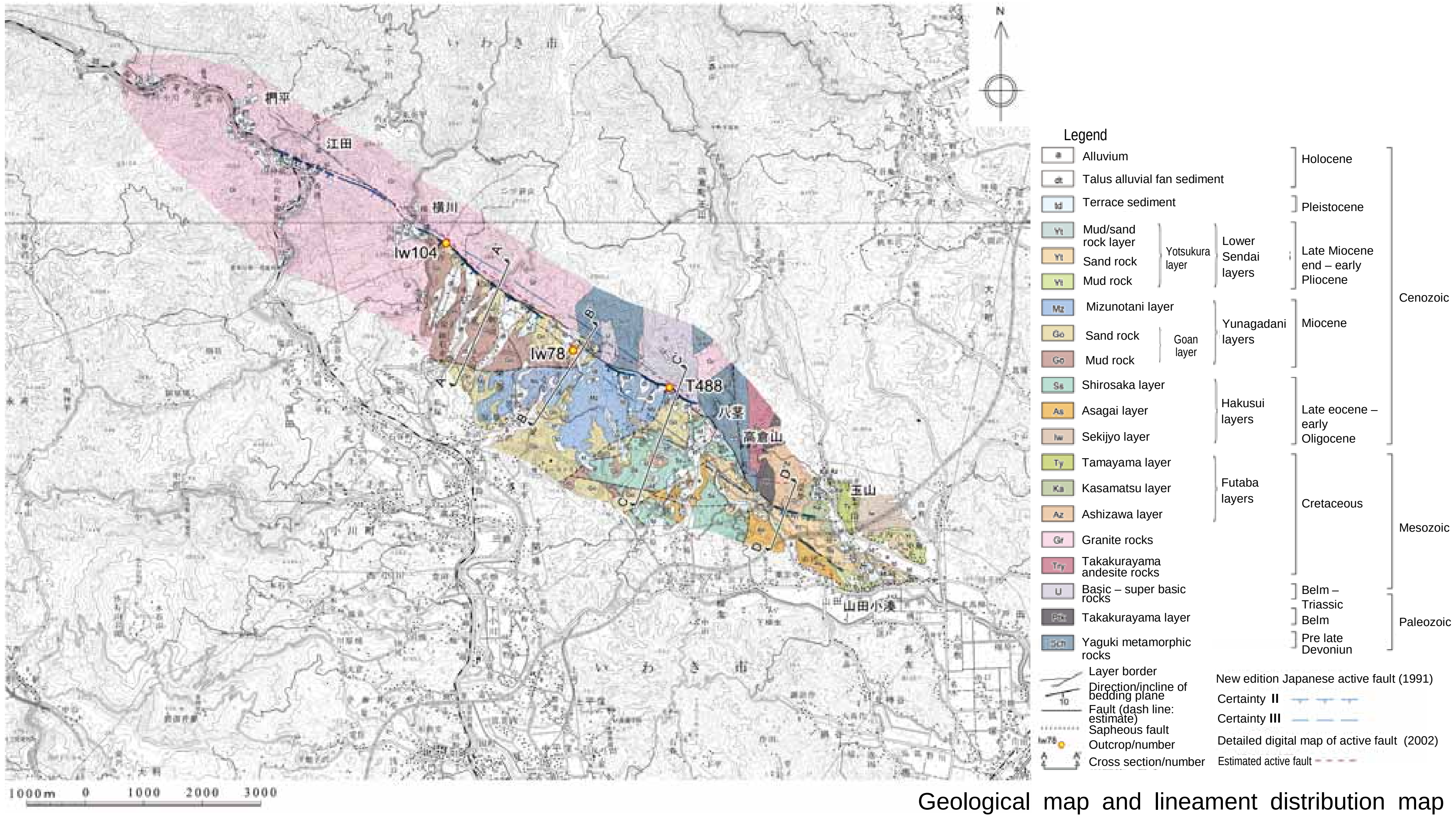
In the most part of Yaguki fault into which serpentine penetrated along the fault, fracturing parts were a little soft. However, in lots of parts into which serpentine did not penetrate, fracturing parts were considered to be firmly-lithified. In areas where the fault was extended to the south, the bottom of Futaba group in the Upper Cretaceous was displaced to the west, but the bottom of group of early Oligocene initiation was distributed at its extended area did not have discontinuous layers which indicated fault displacement and on M_2 side distributed at extended areas to south parts, no displacement was not found. Hence, we conclude that the fault has not been active since at least the later period of the Pleistocene.

Faults around/near the site

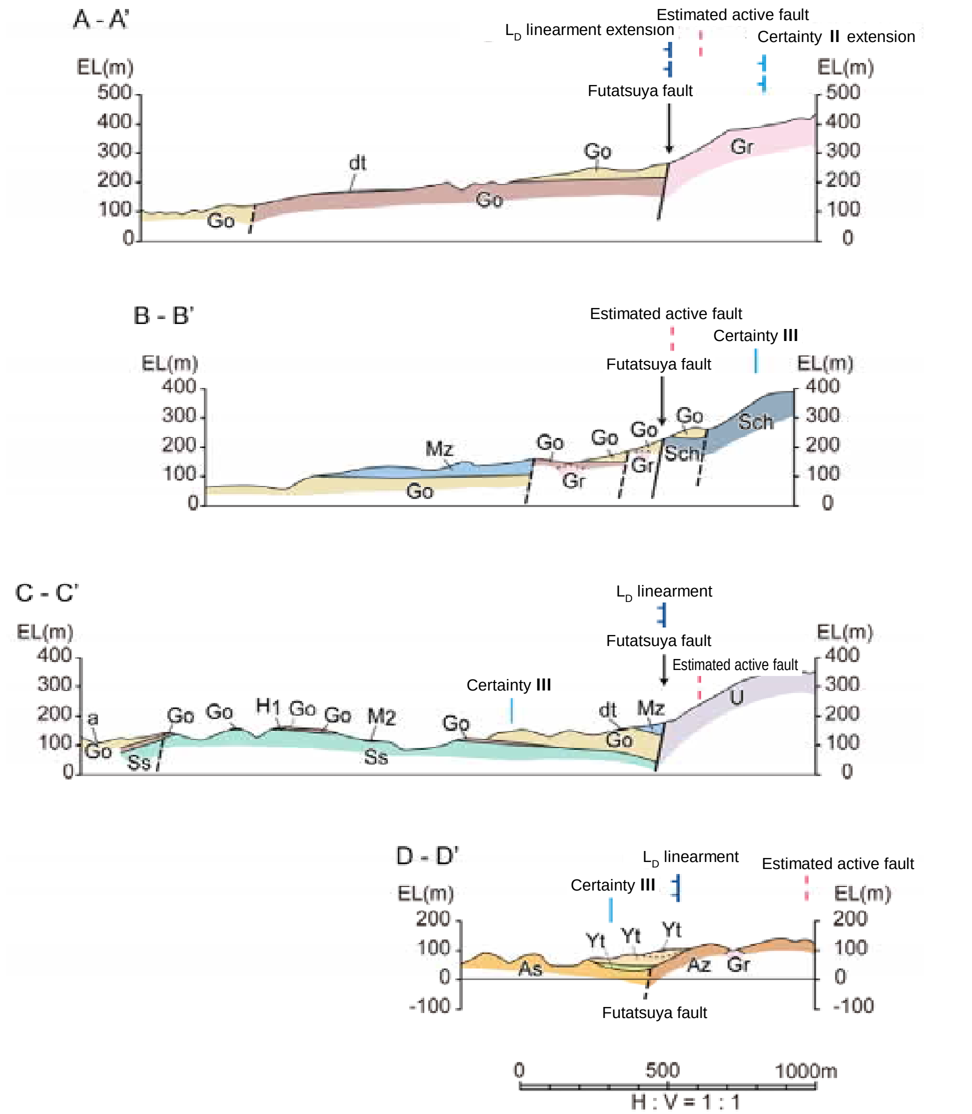
⑤ Futatsuya Fault

Survey	Method	Result	Note
Literature Survey	—	・[New Edition] Faults in Japan (1991) :Length approx. 6km・, Certainty □, Activity B	
		・Detailed Digital Map of Active Faults (2002) :Length approx. 10km・, Estimated Active Faults ・(no description about activity)	
		・Active Structure Map ー Niigata (1984) :Neogene and lower Pleisetocene Fault	
Tectonic Geomorphologic Survey	Aerial Photograph	・Consists of cliff and col, NW- SE direction, approx. 12.5km long, の L_D lineament recognized.	Figure5
Surficial geologic Survey	Ground Surface Survey	・Towards Yokawa to Takakurayama south, fault recognized/estimated as boarder of ancient rocks and tertiary system. All fracturing fault was consolidated for recognized fault outcrops.	
		・In the East of southern Takakurayama, Futatsuya fault are covered by Yotsukura formation in moderate slope.	
		・Lineament was found mostly where ancient rocks and Neogene contact at fault or where plane of unconformity of upper Crateceous system and Neogene, not recognized where ancient rocks and old tertiary system contact at fault or where fault is recognized in the Neogene.	
Evaluation	・Lineament is a erosional forms reflecting difference of lithological character and recognized fault outcrops were all consolidated at its fracturing part and in the east of southern Takkurayama, Futatuya Fault is covered by Yotsukura formation, it is judged there is no activity after late Pleistocene epoch.		

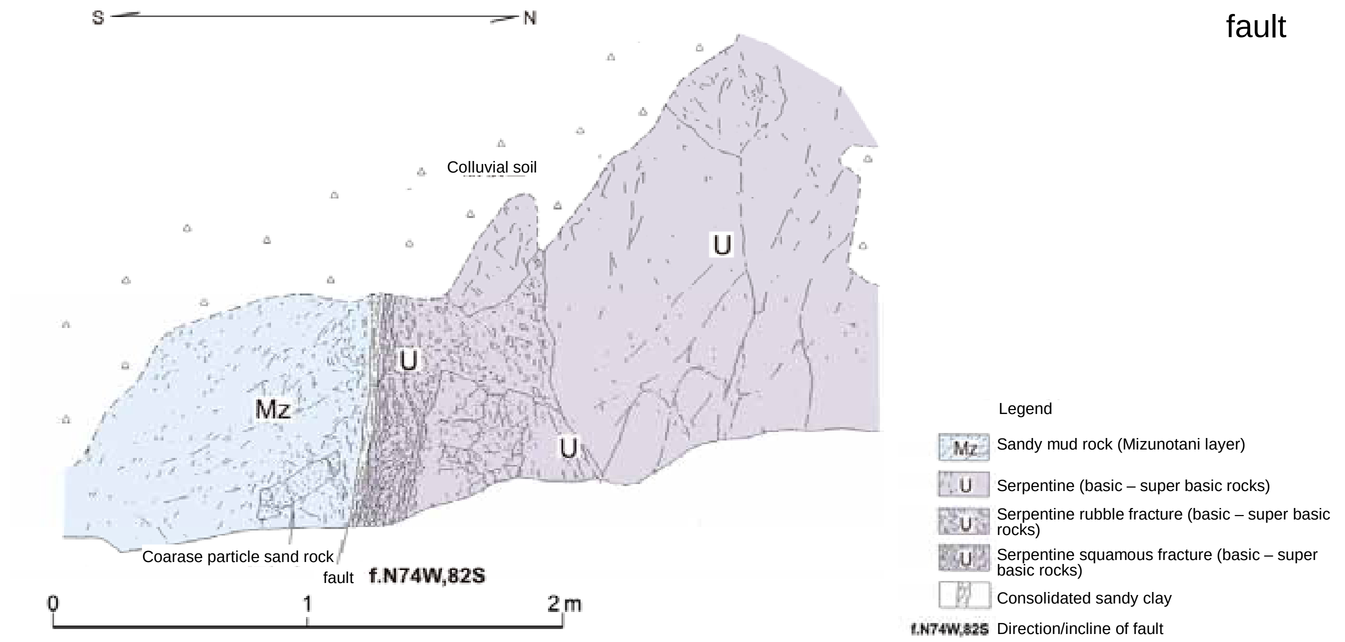
【Geological condition and construction around Futatsuya fault】

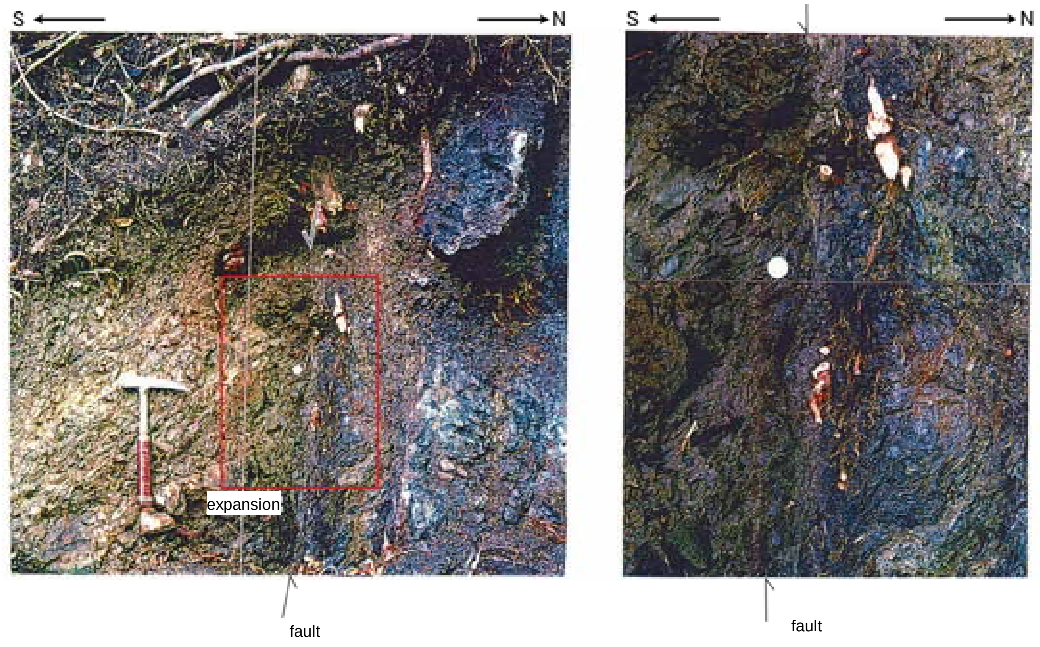


Geological map and lineament distribution map around Futasuya fault



Geological cross-section around Futasuya fault





Sketch and pictures on the outcrops of the fault (Loc. T488): the fault surface plane was curved and unclear. Firmly lithified arenaceous clay was confirmed along the surface of the fault.

Evaluation of Futatsuya fault

- Futasuya fault is confirmed and estimated as a fault located on the boundary of Older Rocks and Tertiary and covered with mildly sloped Yotsukura layer situated in the lower Sendai group at parts east of southern Mt. Takakura. At the confirmed outcrops of the fault any fracturing parts are firmly lithified. Hence, we conclude Futatsuya fault have not been active since at least the later period of the Pleistocene.

Attachment 5 Evaluation of Futasuya fault

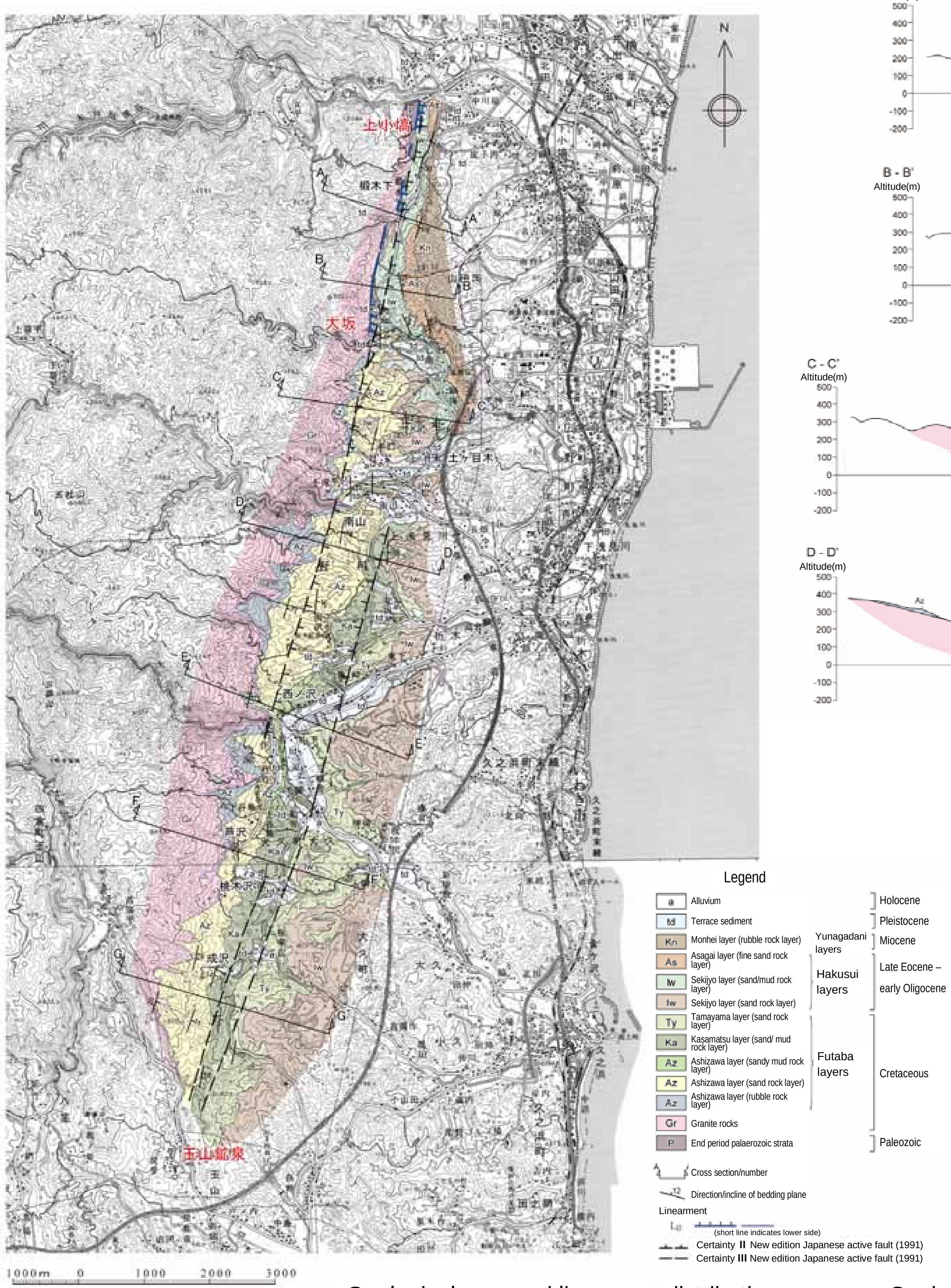
Attachment 6

Faults around/near the site

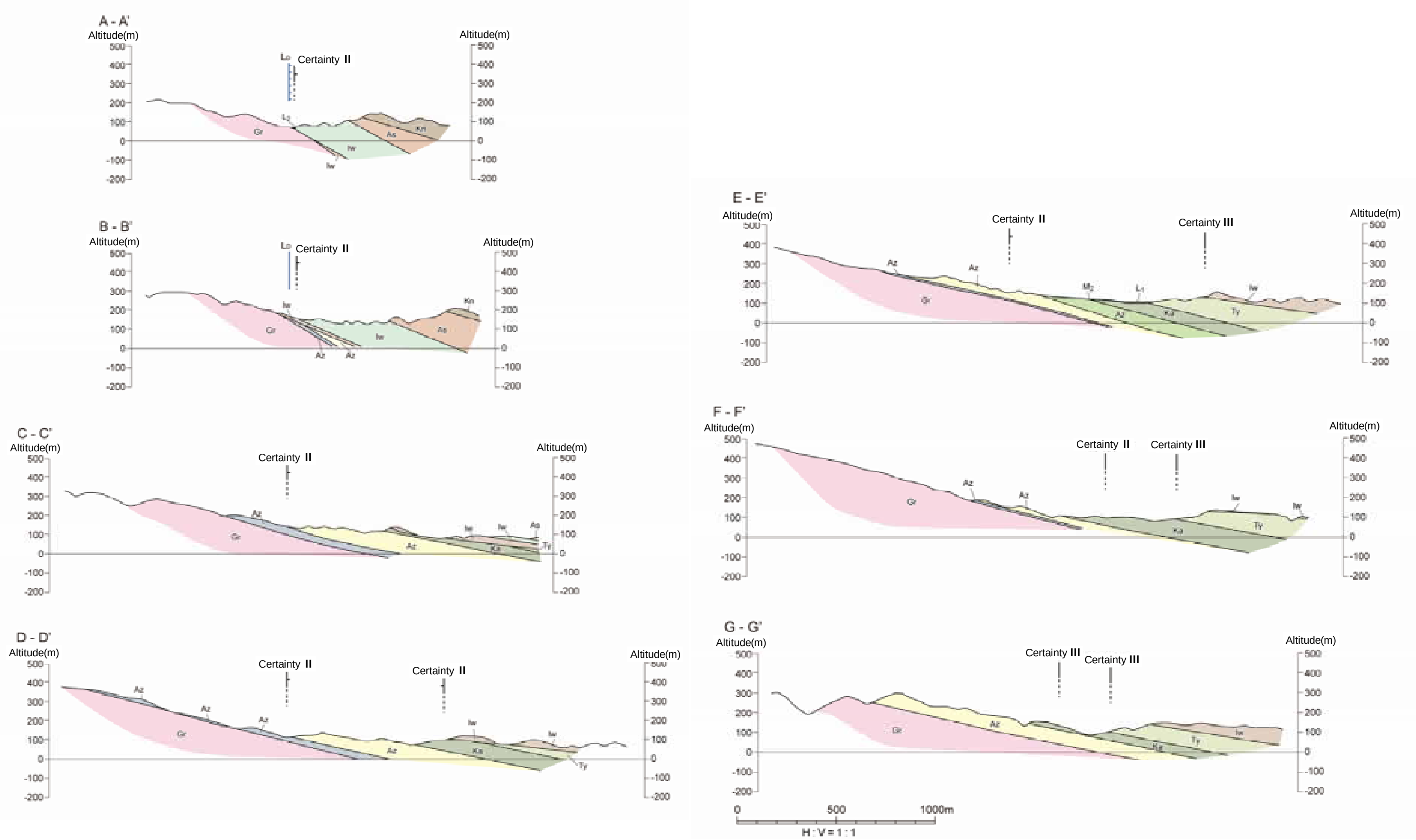
⑥ Osaka-Ashizawa Lineament

Survey	Method	Result	Note
Literature Survey	—	・[New Edition] Faults in Japan (1991):Length approx. 15km・Certainty□〜□・Activity B〜C	
		・Detailed Digital Map of Active Faults (2002):Length approx. 7km・Estimated Active Faults・(no description about activity)	
		・Active Structure Map ー Niigata (1984):none	
Tectonic Geomorphologic Survey	Aerial Photograph	・NNE-SSW direction approx. 4km L_D Lineament, composed of cliffs and cols, is recognized.	Attached Figure 6
Surficial geologic Survey	Geological Reconnaissance	・Lineament is recognized from Kamikobana to Osaka. However, the lineament corresponds to the lithofacies boundaries between paleozoic strata/granites and Iwaki Formation, and no faults were recognized at and around the lineament. Iwaki Formation covers paleozonic strata/granites and shows homoclinal structure.	
		・At the south of Osaka, where "New Edition Faults in Japan" indicates Certainty □ and □, no lineaments were recognized. At that area both Futaba Formation and Iwaki Formation show gentle homoclinal structure, and neither faults nor flexure structures were recognized. Since the lineament roughly corresponds to the lithofacies boundaries, it is judged to be an eroded terrain reflecting the difference of lithological characters of both sides.	
Evaluation	・No corresponding faults to the lineament have been recognized. The lineament is judged to be an eroded terrain reflecting the difference of lithological characters.		

<Geological features and structure near Osaka-Ashizawa lineament>



Geological map and lineament distribution map near Osaka-Ashizawa lineament



Geological cross section map near Osaka-Ashizawa lineament

Evaluation of Osaka-Ashizawa lineament

- L_D lineament is observed in the area from Kamikobana to Osaka.
- The lineament corresponds to lithofacies boundary between paleozoic strata/granite and Hakusui group Iwaki layer. An active fault was not confirmed at the lineament and its vicinity. Iwaki layer covers paleozoic strata/granite in the way of unconformity and shows homocline structure.
- Regarding the south of Osaka, while “Japan’s active fault, new edition (1991)” shows the two active faults with possibility II or III running in parallel to the north of Tamayama mineral spring, the lineament was not observed in such location. Surface geological survey reveals that both Futawa layer and Hakusui group Iwaki layer has east bound gradual homocline structure and that active fault or flexure structure was not observed. The lineament is considered to be erosional ground reflecting the difference of lithologic nature of both side as it almost corresponds to lithofacies boundary.
- It is judged that there is no active fault corresponding to Osaka Ashizawa lineament and that lineament is considered to be erosional ground reflecting the difference of lithologic nature of both side.

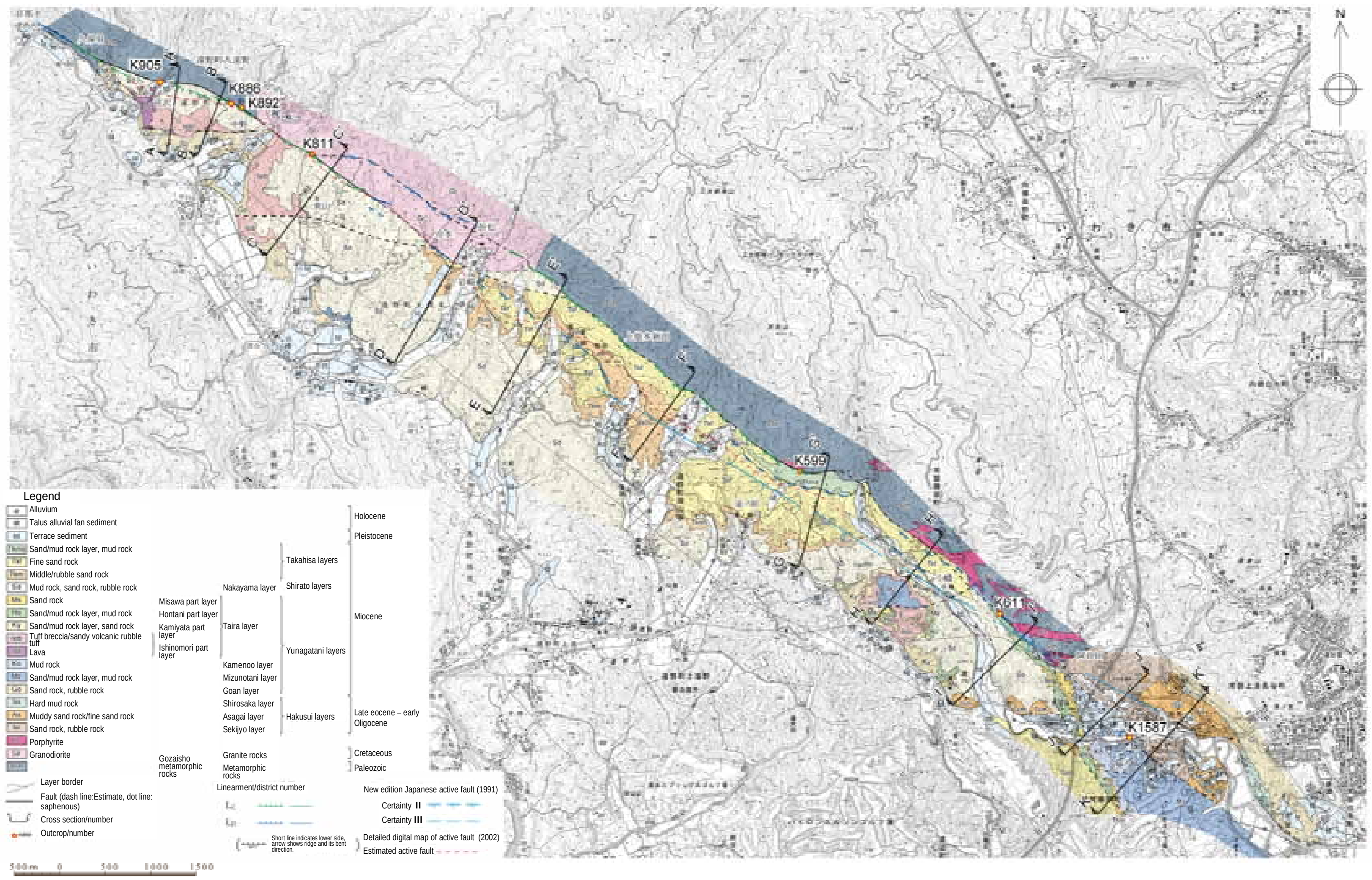
Attachment 7

Faults around/near the site

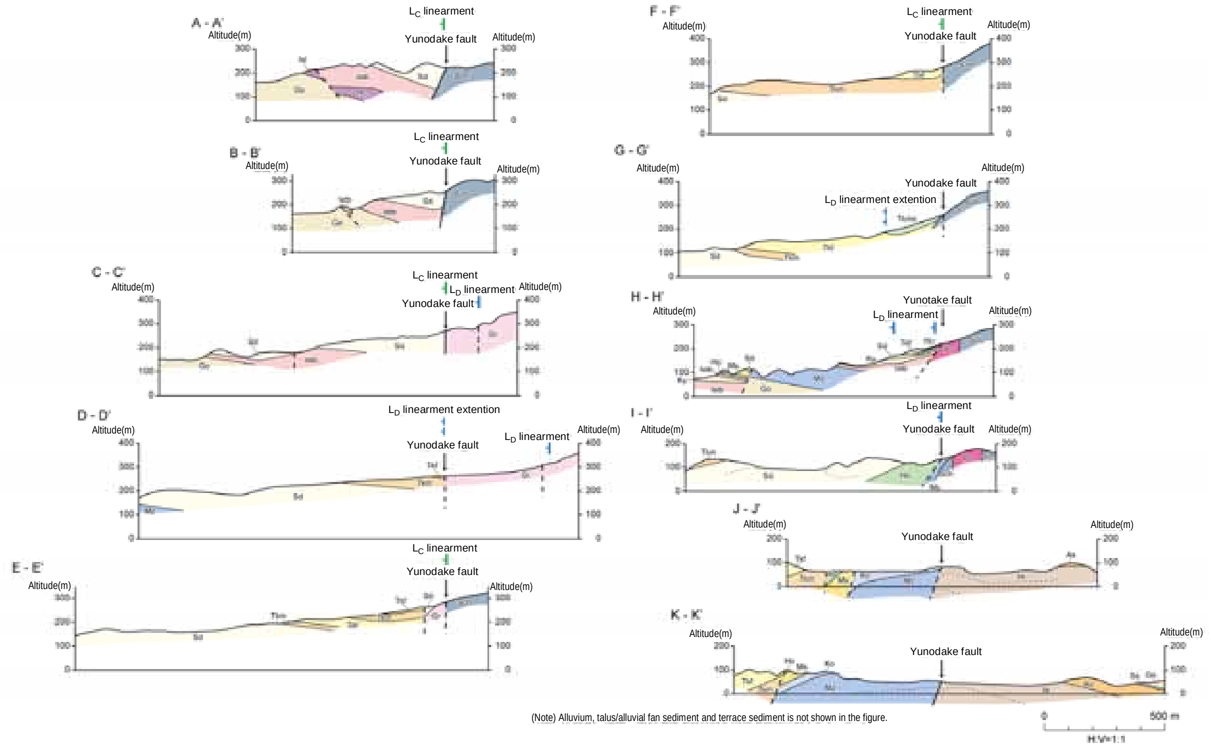
⑦ Yunotake Fault

Survey	Method	Result	Note
Literature Survey	—	・[New Edition] Faults in Japan (1991) : Length approx. 6km, NW-SE direction, Certainty □, Activity B	
		・Detailed Digital Map of Active Faults (2002) : Length approx. 9km, NW-SE direction	
		・Active Structure Map - Niigata (1984) : none	
Tectonic Geomorphologic Survey	Aerial Photograph	・NW-SE direction approx. 13.5km L_C・L_D Lineament, composed of steep cliffs and cols on the edge of southwestern mountain side and cliffs and cols in hills is recognized.	Attached Figure 7-1
Surficial geologic Survey	Geological Reconnaissance	・While a normal faults is recognized from around Kubome, Tinomachi-Iritono, Iwaki City to around Arata, Joban-Fujiwaramachi, Iwaki City, every broken part is consolidated and the surfaces of faults are conglutinate.	Attached Figure 7-1 Attached Figure 7-2
		・Neither displacement nor deformation is recognized at Surface M_1 covering the southern extension of the faults.	Attached Figure 7-2
		・Every lineament that does not correspond to any fault corresponds to different geological stratum boarder of lithological character.	Attached Figure 7-1
Evaluation	○ It has been judged that Yunotake Fault had had no activity since the Late Pleistocene because the lineament is considered to be an eroded terrain reflecting the difference of lithological characters and because neither displacement nor deformation is recognized at Surface M_1 covering the southern part of the faults, based on the fact that at every exposed part of fault the broken parts are consolidated and the surface of faults are conglutinate. ○ It is thought that the seismic activity at the southern part of Hamadori, Fukushima Prefecture became active by the tectonics resulted from the earthquake on March 11. In such a situation, another magnitude 7.0 earthquake occurred on April 11 at around Idosawa Fault. Investigation conducted by Earthquake Research Institute of the University of Tokyo and The National Institute of Advanced Industrial Science and Technology proved that the surface earthquake fault emerged at Idosawa Fault and Yunotake Fault thereafter. On the other hand, considering it is pointed out that the surface earthquake fault of Yunotake Fault could be a secondary fault generated by the activity of Idosawa Fault, the cause of the earthquake this time cannot be identified. The Japan Meteorological Agency indicated the earthquake location at around Idosawa Fault. Considering the earthquake this time, we are in the process of the investigation with regard to the relationship between the earthquake source fault and the surface earthquake fault of Idosawa Fault and Yunotake Fault. We will also keep paying attention to the investigation results from other institutions. (Please refer to Attached Figure 7-3 for examples of the investigation results from other institutions after the earthquake on April 11.)		

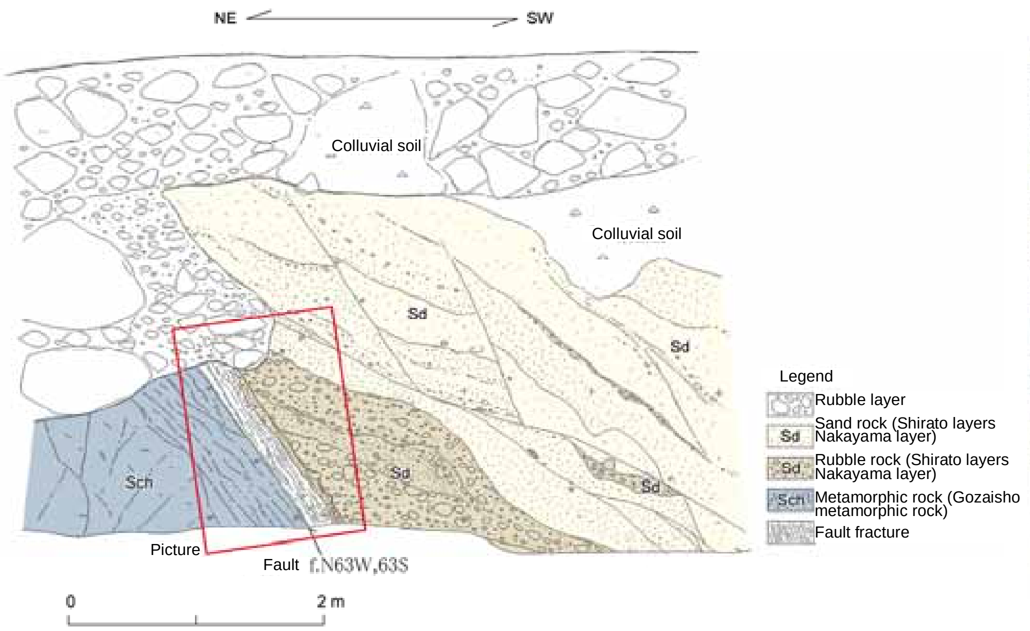
【Yunodake Fault Area's Geological Condition and Structure】

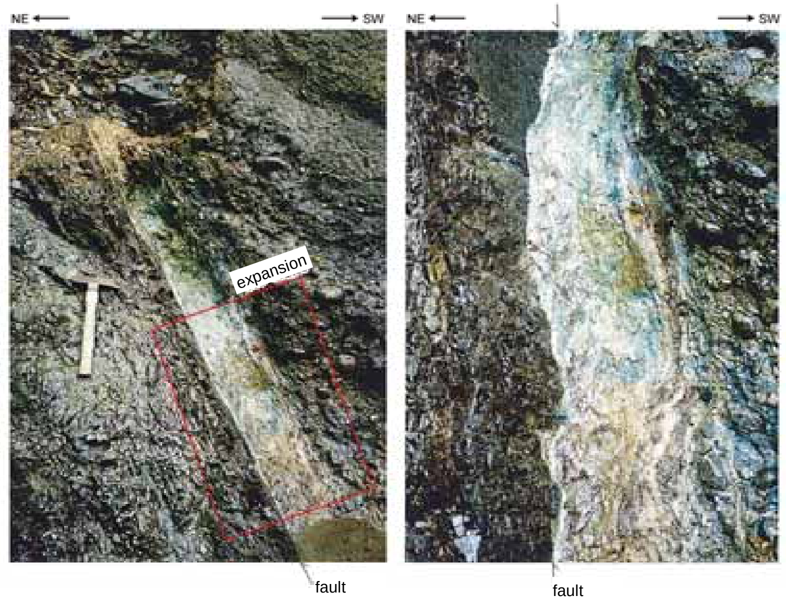


Yunodake Fault Area's Geological Map and Lineament Distribution Map



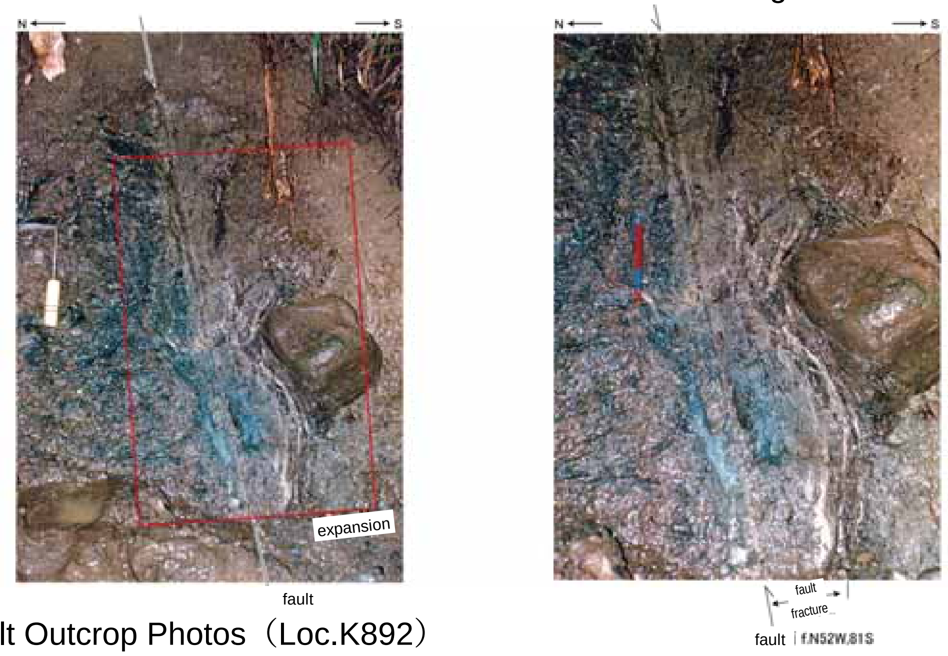
Yunodake Fault Area's Cross Sectional Diagrams





Fault which Borders Metamorphic Rocks and Miocene Nakayama Formation. Fractured Parts of the Fault are Consolidated.

Fault Outcrop Sketch/Photos (Loc.K905)



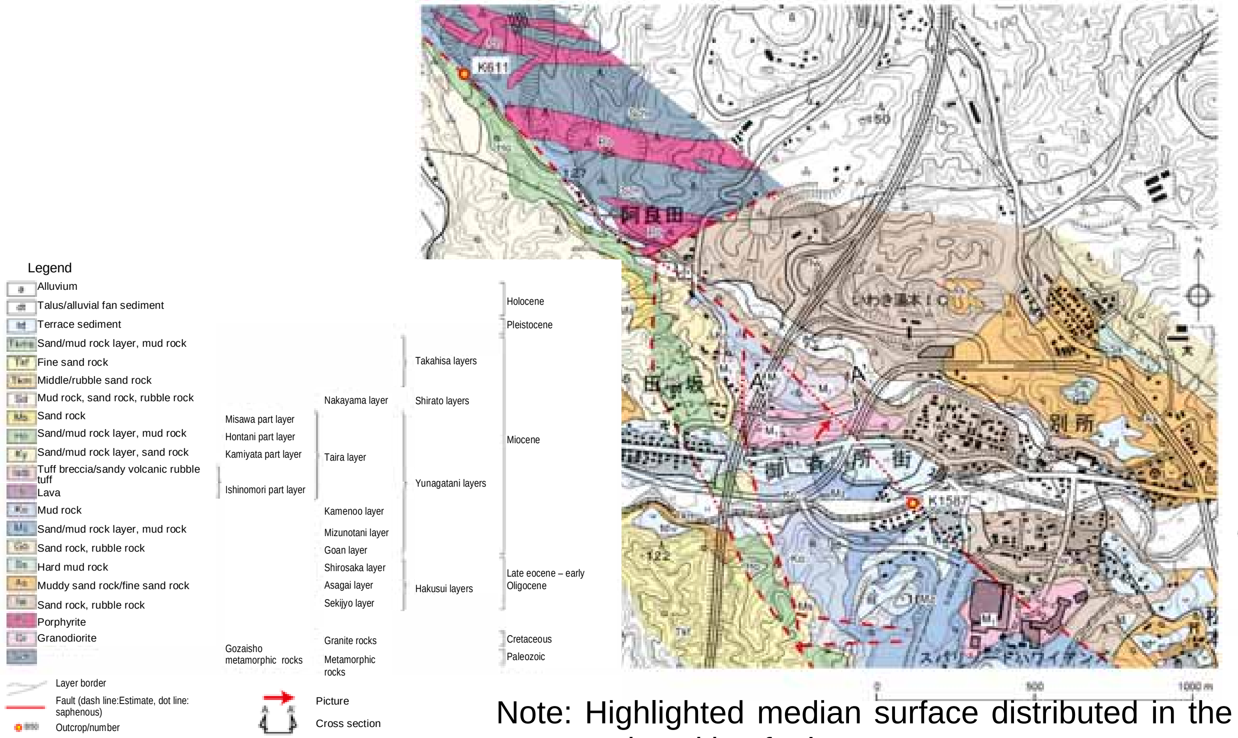
Fault Outcrop Photos（Loc.K892）

Fault which Borders Metamorphic Rocks and Miocene. Fractured Parts of the Fault are Consolidated.

Evaluation of the Yunodake Fault

- Gravity Fault can be confirmed at the northern part of the metamorphic rocks or at the gravity fault bordering granodiorite and the Miocene, each corresponding to the lineament.
- Lineament that is not corresponding to the fault corresponds to the variant lithological characters at the geological formation border, leading to the conclusion that these are the erosional landforms reflecting the variant lithological characters.

【Southeast extension area of Yunodake fault】

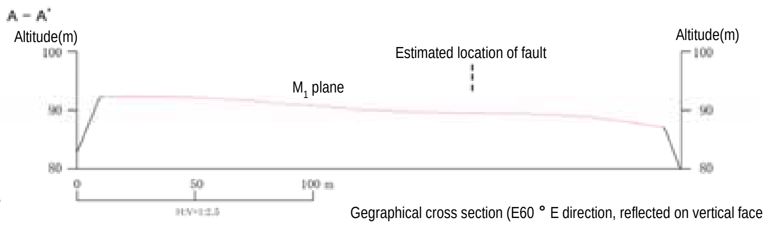


Note: Highlighted median surface distributed in the supposed position fault

Geological map around south area of Yunodake

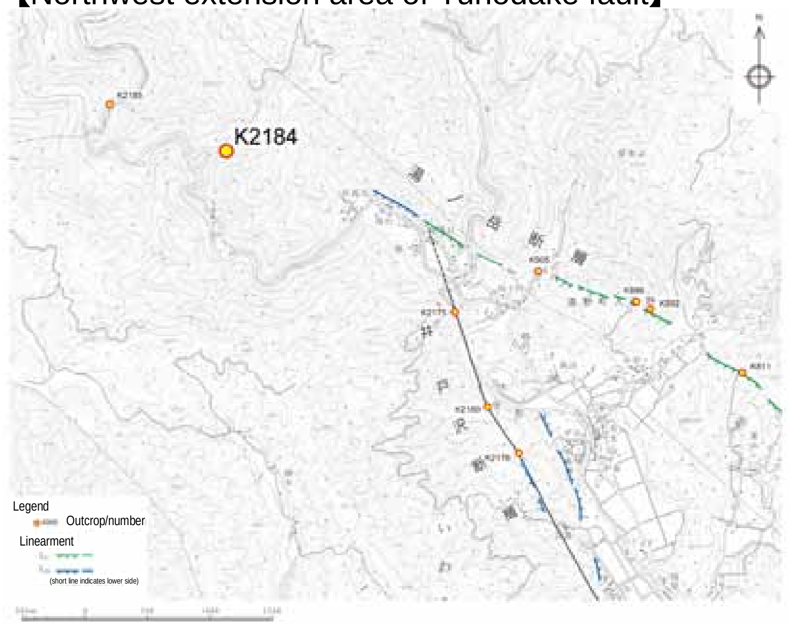
M1 plane around Yunodake fault

Flat and no geological displacement was found.

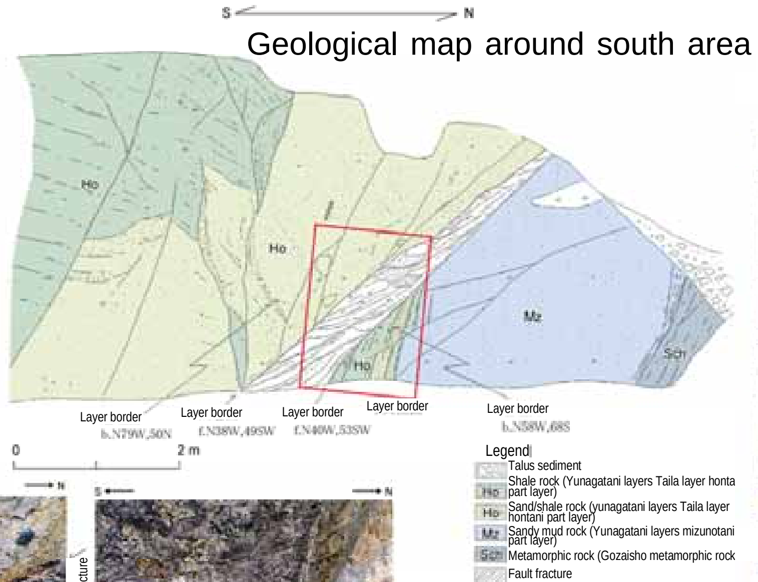


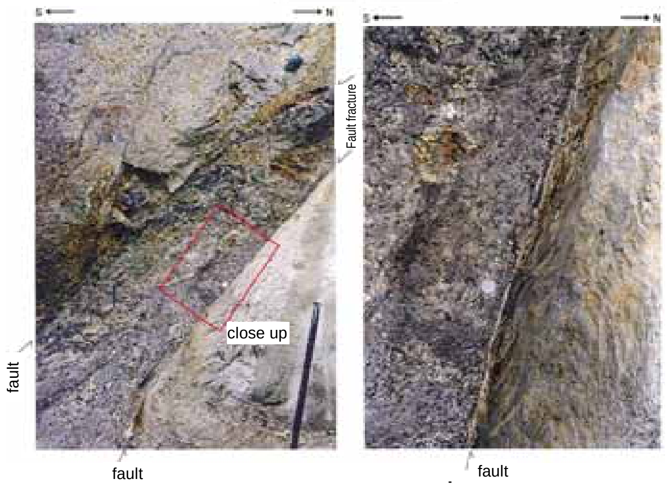
Sectional view of south area of Yunodake fault

【Northwest extension area of Yunodake fault】



Lineament distribution map around northwest extension area of Yunodake fault

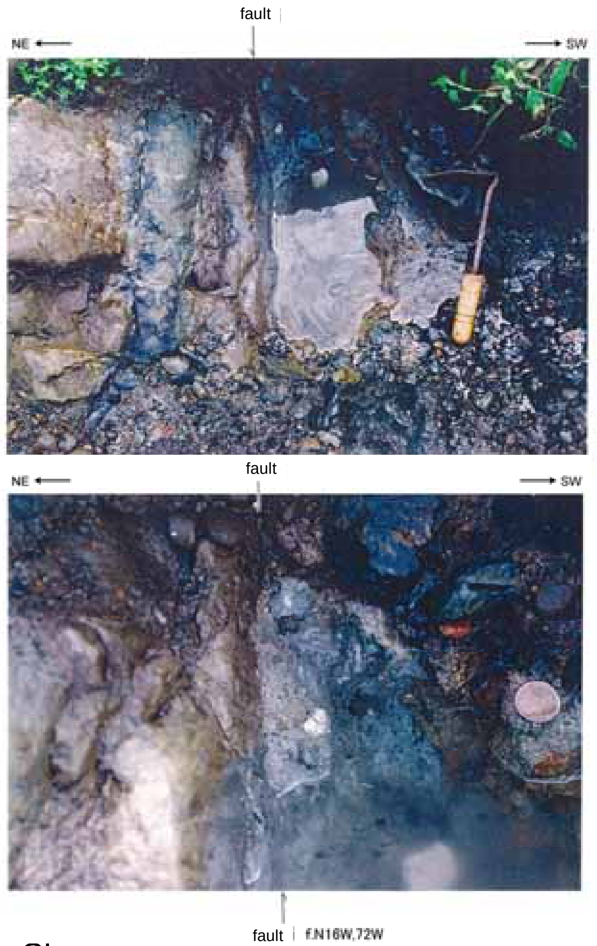




Fault that connects Horizontal layer and Mizunoya layer

Crush part of the fault is solidified.

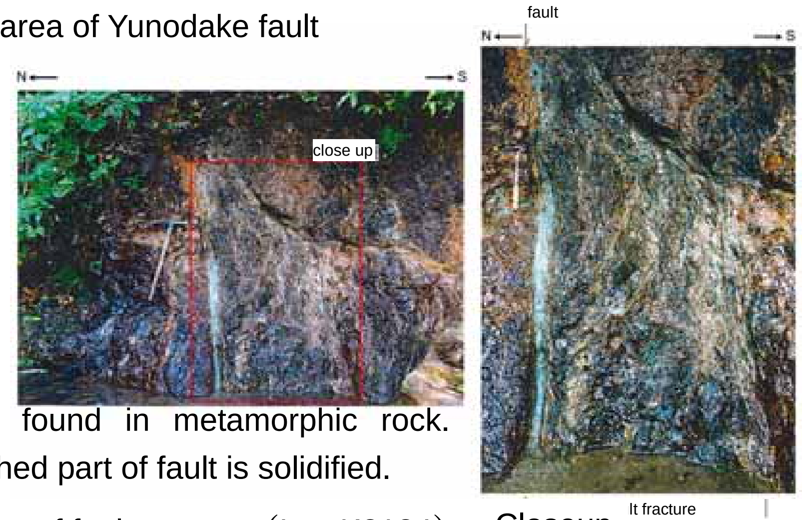
Drawing / picture of fault outcrop (Loc.K611)



Closeup

Picture of fault crop (Loc.K1587)

Fault that divide Iwaki Layer and Mizunoya layer



Fault found in metamorphic rock. Crushed part of fault is solidified.

Picture of fault outcrop (Loc.K2184) Closeup

Evaluation of northwest extension area of Yunodake fault

・Though Yunodake fault is consecutive as fault in metamorphic rock and runs in northwest direction with lineament unread, crushed part of fault is solidified.

Evaluation of southeast extension area of Yunodake fault

・Though Yunodake fault runs in southeast direction with lineament unread, is consecutive as fault and connects the old third line and middle new series, crushed part of fault is solidified. There is no sign of displacement / deformation on the M_1 stage that distributes covering the fault.

Evaluation of Yunodake fault

・Yunodake fault's position overlaps the lineament but the crushed part of any fault outcrop is solidified and the fault plane is conglutinated. Also, since in the south area of the fault no displacement / deformation on the M_1 stage that distributes and cover the fault is found, it is judged that there has been no activity of the fault at least since the Late Pleistocene.

【The survey result by the National Institute of Advanced Industrial Science and Technology: The ground surface displacement vector of Yunotake and Fujiwara Fault following the earthquake at Fukushima Hamadori on April 11th, 2011 (preliminary report) http://unit.aist.go.jp/actfault-eq/Tohoku/report/fukushima.html】

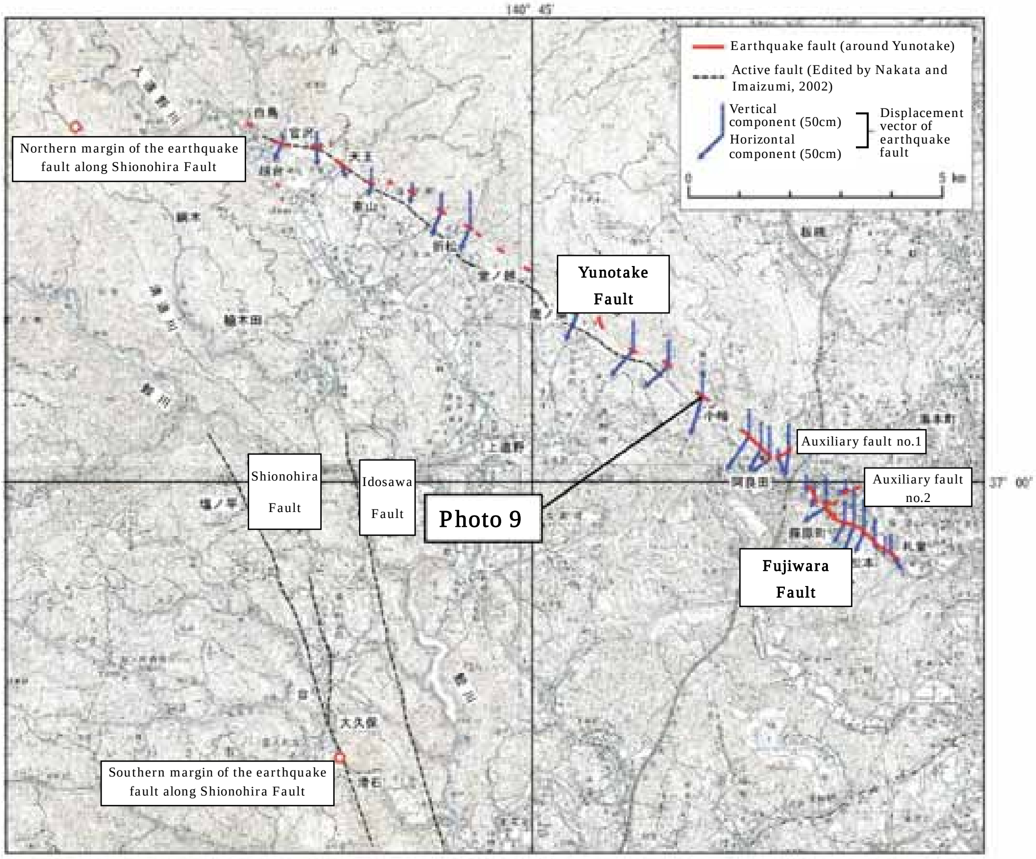


Figure 1: Distribution of the earthquake fault and the ground surface displacement vector along Yunotake and Fujiwara Fault following the earthquake at Fukushima Hamadori on April 11th, 2011 (the point of the photo added)

Photo 9: 0.7km northwest of Kobata, Jobanfujiwara Town

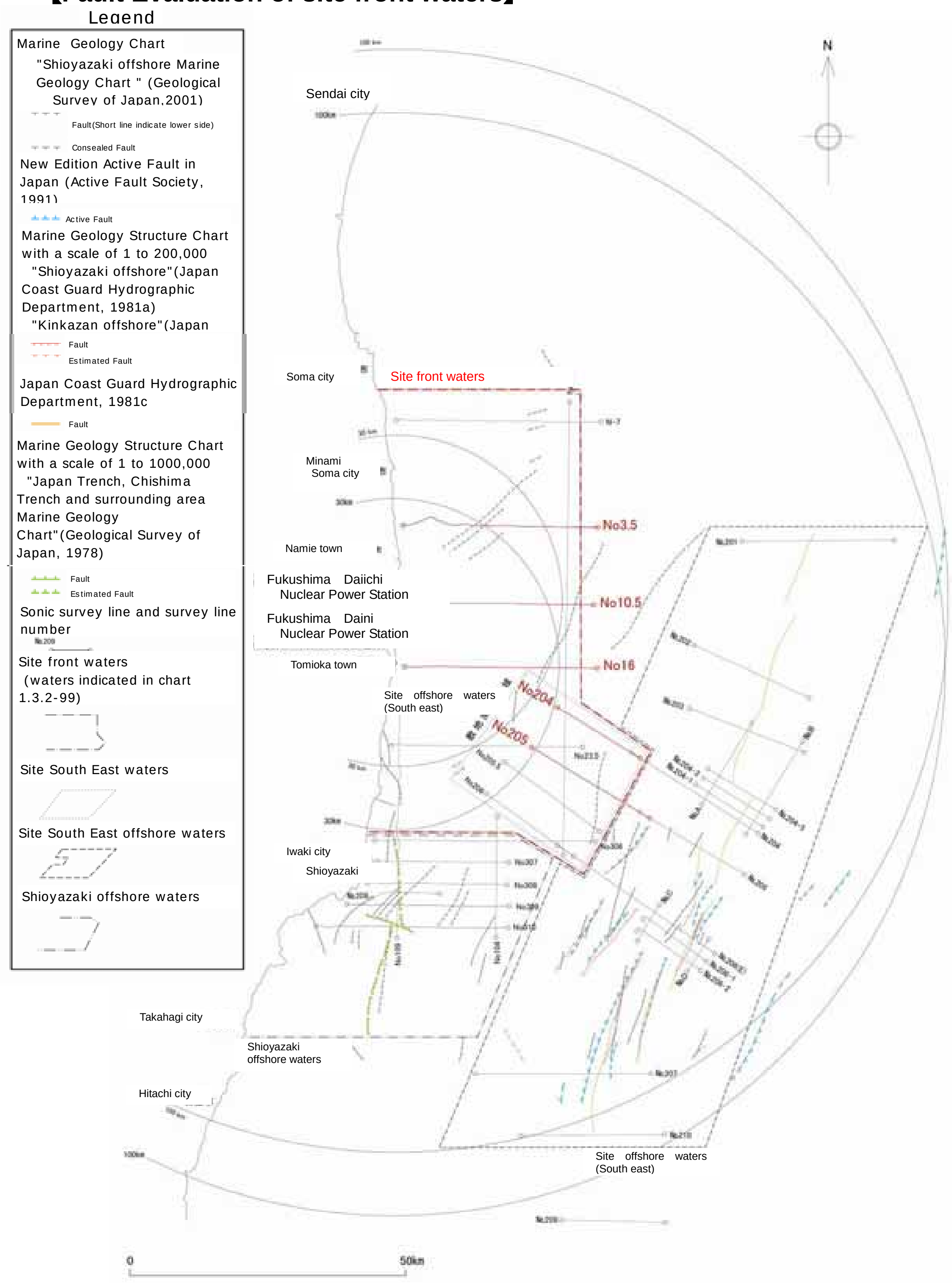
Attached figure 7-3 The survey result by the National Institute of Advanced Industrial Science and Technology

Faults around/near the site

⑧ Faults at offshore area in front of the site

Survey	Method	Result	Note
Literature Survey	—	･Marine Geological Map “Ocean Bottom Geological Map of the offshore of Shioyazaki” (2001): NE-SW direction, 3 saphenous faults	
Sonic Survey from Sea	Multichannel Digital Survey using air guns (GI guns) as sound generator	･While NW/SE normal faults that roughly correspond to saphenous faults seen in literature are recognized at offshore area in front of the site (offshore of Namie Town), no faults caused displacement or deformation to Layer C and Layer C_2.	Attached Figure 8-1
		･While it can be estimated that there is an eastward deep reverse fault at sea area in front of the site (offshore of Tomioka Town) based on the deformation of the reflector, neither displacement nor deformation is recognized at Layer C_1.	
		･While a number of normal faults that cause a few meters to tens of meters of deformation to Layer B and C are recognized at sea area in front of the site (southeastern sea area), most of these faults disappear in Layer B or C, the upper extension of the faults.	Attached Figure 8-2
		･A part of faults located at the sea area reach almost the surface of the sea bottom, and a part of which cause displacement to the sea bottom. However, these faults cause no displacement or deformation to layers below the foundation of Layer C. No accumulation of displacement can be recognized.	
		･Because the type of the faults at sea area in front of the site (southeastern sea area) is normal faults with regard to the faults whose deep part of the structure are not clear and because neither displacement nor deformation by inversion is recognized to Pleistocene, we have judged that it is unlikely for these faults to cause earthquake at the current compressive stress field.	
Evaluation	• While it can be estimated that there is a fault at the places indicated in literatures, no faults cause displacement or deformation to Layer C or C_2. Reverse faults, estimated by the deformation of the reflector, cause neither displacement nor deformation to Layer C_1. • Most of faults recognized at sea area in front of the site (southeastern sea area) disappear in Layer B or C, or cause no displacement or deformation to layers below the foundation of Layer C. Because the type of the faults is normal faults with regard to the faults whose deep part of the structure are not clear and because neither displacement nor deformation by inversion is recognized to Pleistocene, we have judged that it is unlikely for these faults to cause earthquake at the current compressive stress field.		

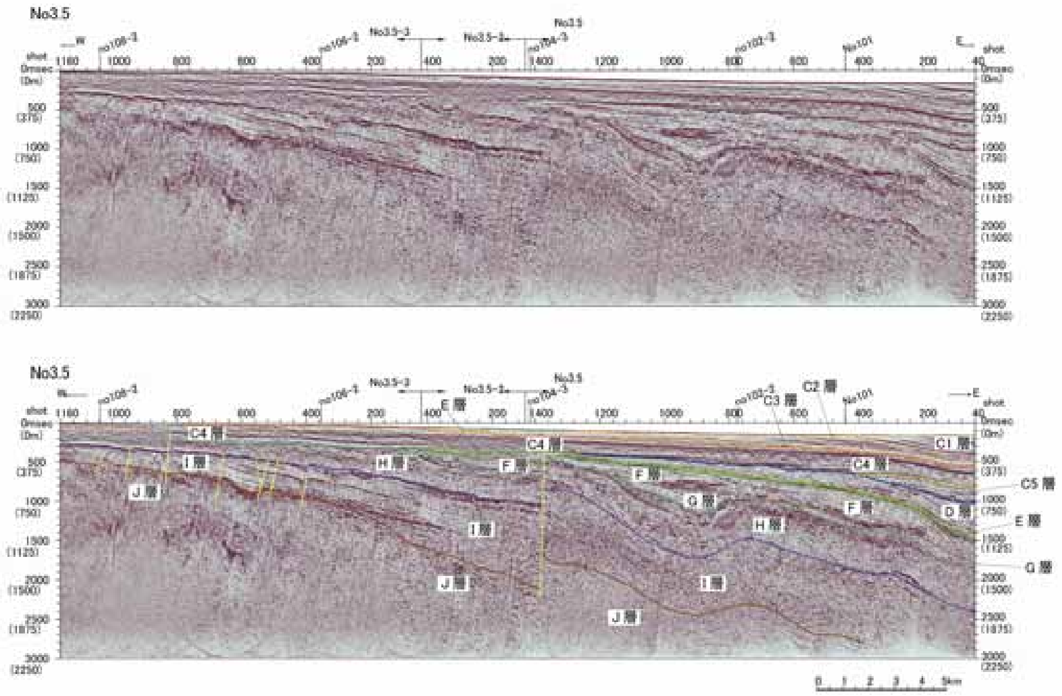
【Fault Evaluation of site front waters】



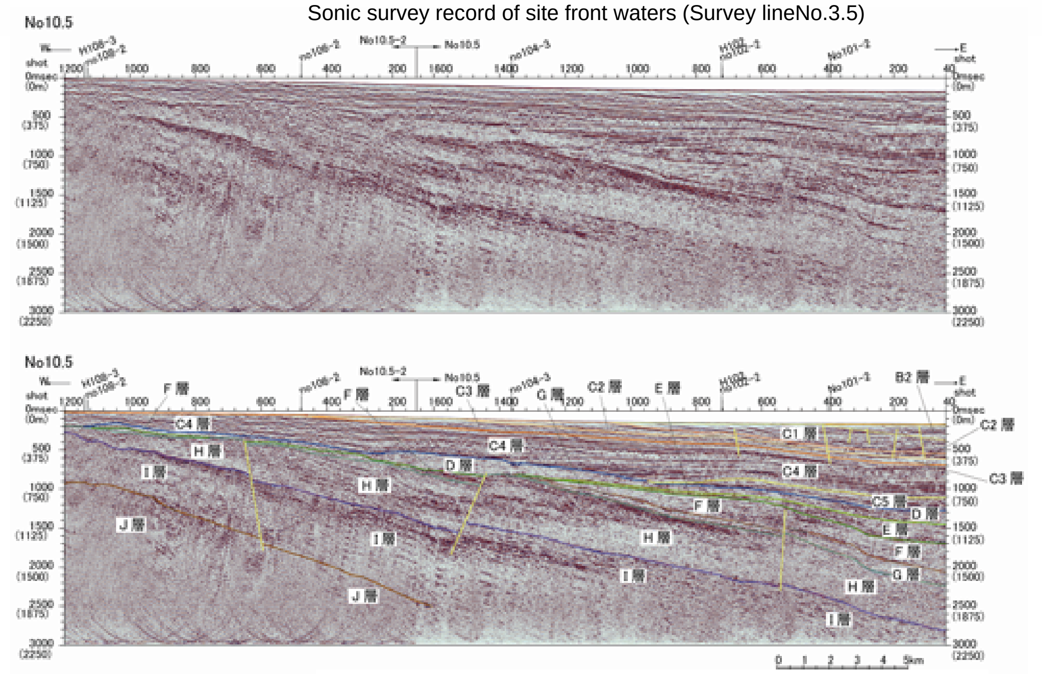
Literature-based Chart of Distribution and Sonic Survey line of waters surrounding sites

Fault Evaluation of Site front Waters

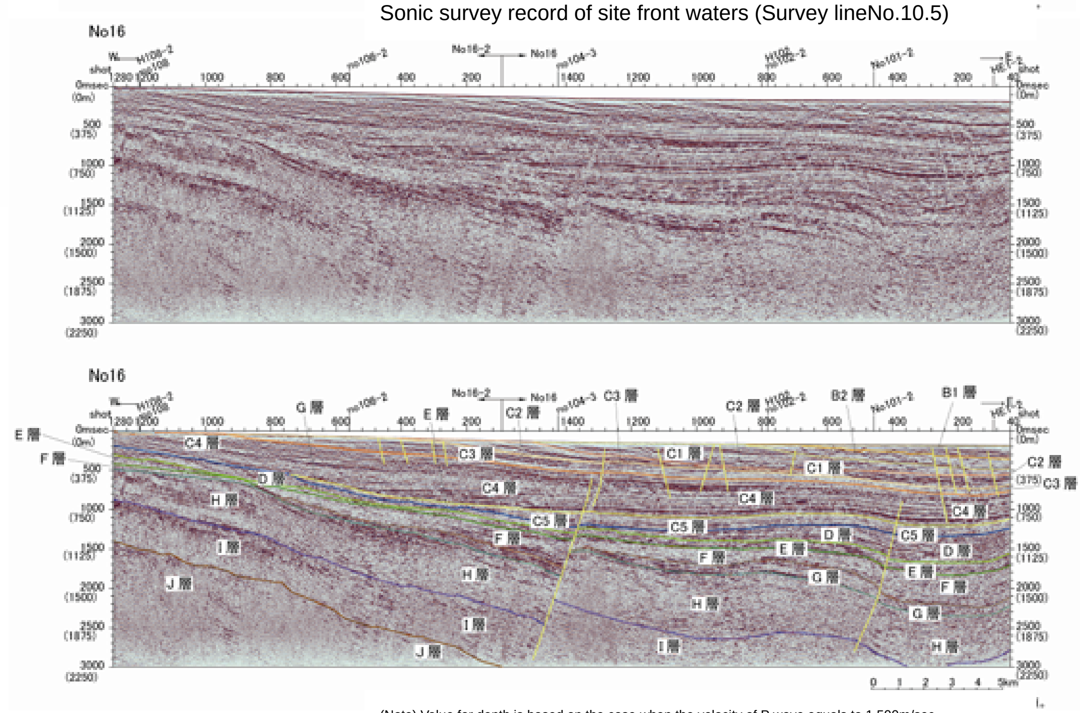
- Each stratum C and C_2 are not made displacement and deformation in spite of the normal fault of dropping to northwest or southeast is confirmed corresponding to concealed faults described in literature at the deep part of Namie offshore.
- The displacement and/or deformation are not confirmed at least stratum C_1 although east up reverse fault around 30km offshore from Tomioka town could be expected based on deformation of reflecting surface.



Sonic survey record of site front waters (Survey lineNo.3.5)

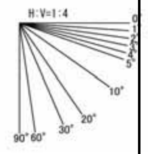


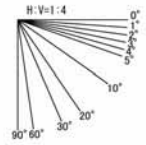
Sonic survey record of site front waters (Survey lineNo.10.5)

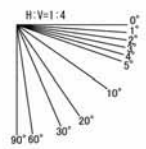


(Note) Value for depth is based on the case when the velocity of P wave equals to 1,500m/sec

Sonic survey record of site front waters (Survey lineNo.16)







Geologocal Time			Soil stratigraphy (Ocean area)		Category for soil stratigraphy (Land area)
Quaternary	Holocene		Stratum A		Alluvium
Quaternary	Pleistocene	upper	Stratum Q		Terrace deposit
Quaternary	Pleistocene	middle	Stratum Q		Terrace deposit
Quaternary	Pleistocene	lower	Stratum Q		
Quaternary	Pleistocene	lower	Stratum B	B1	
Quaternary	Pleistocene	lower	Stratum B	B2	
Quaternary	Pleistocene	lower	Stratum C	C1	
Neogene	Pliocene	upper	Stratum C	C2	
Neogene	Pliocene	upper	Stratum C	C3	Sendai Upper: Tomioka
Neogene	Pliocene	upper	Stratum C	C4	Sendai Upper: Tomioka
Neogene	Pliocene	lower	Stratum C	C5	Sendai Upper: Kuboma
Neogene	Pliocene	lower	Stratum D		Sendai Lower: Shikura
Neogene	Miocene	upper	Stratum E		Taga strata
Neogene	Miocene	middle	Stratum F		Taga strata
Neogene	Miocene	lower	Stratum G		Takaku strata / Shirato strata
Neogene	Miocene	lower	Stratum H		Yunagaya strata
Paleogene	Oligocene	upper			
Paleogene	Oligocene	lower	Stratum I		Shirouzu strata
Paleogene	Eocene	upper	Stratum I		Shirouzu strata
Paleogene	Eocene	lower			
Paleogene	Paleocene				
Upper Cretaceous			Stratum J		Futaba strata

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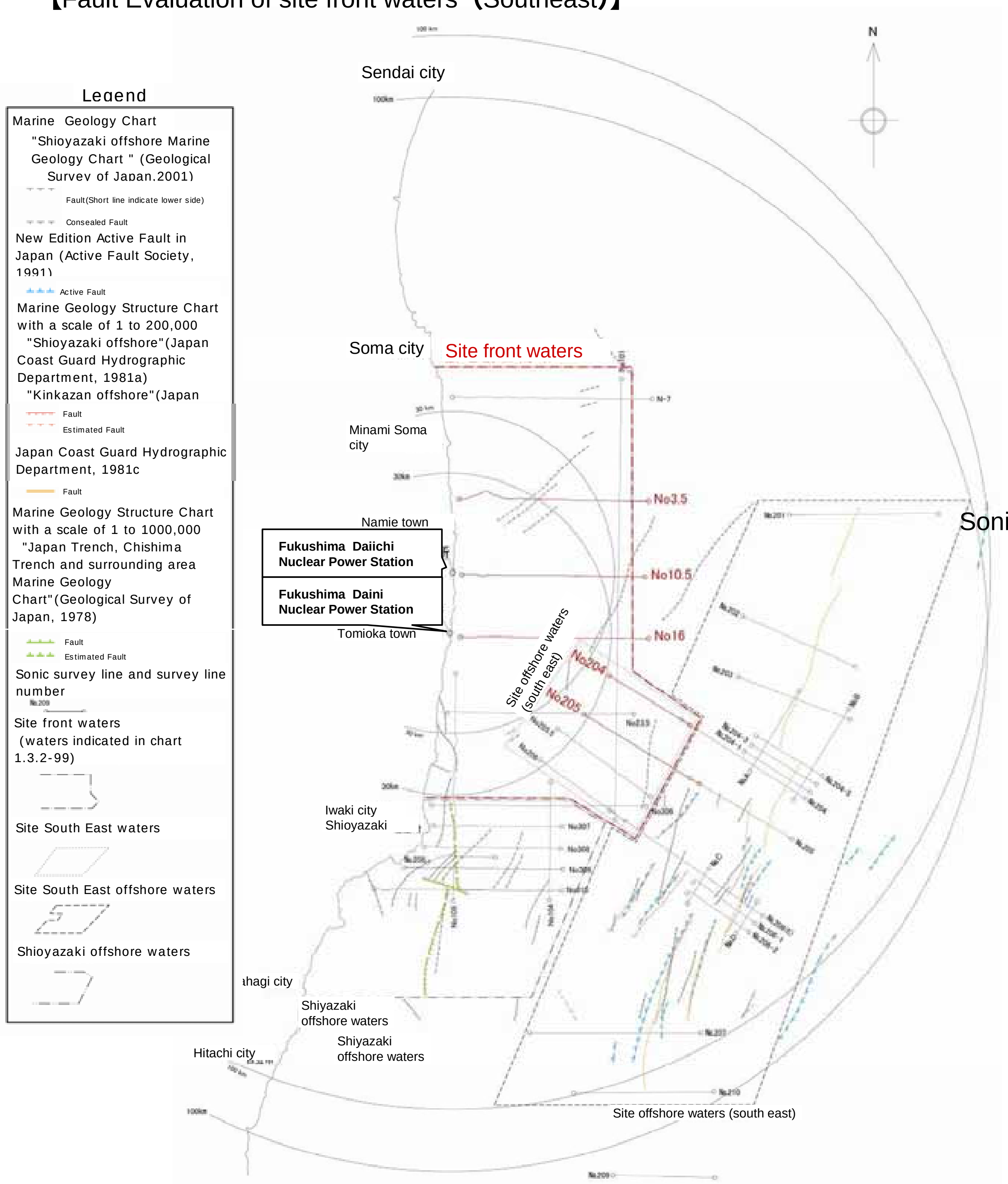
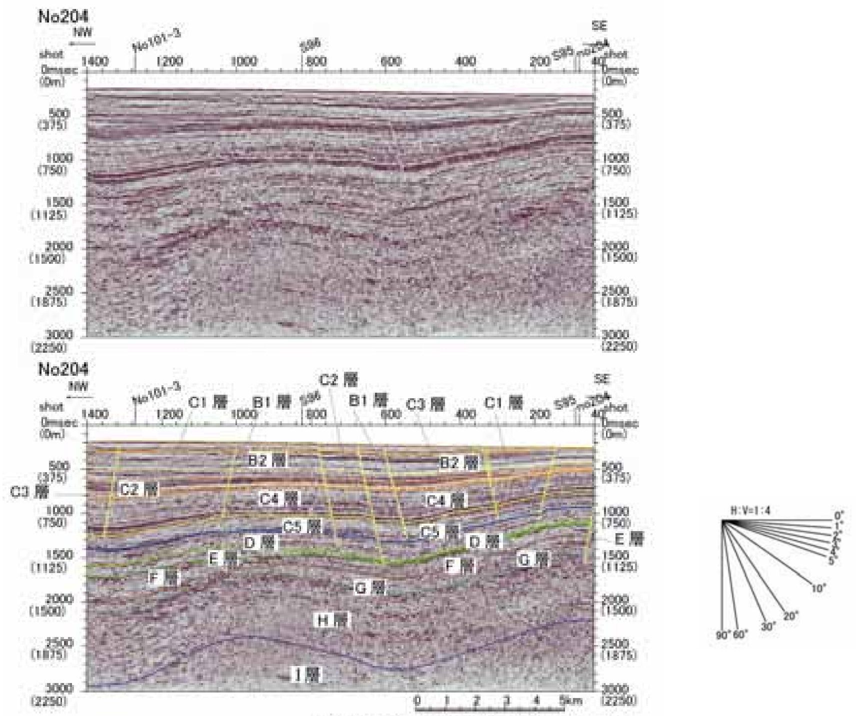
Attachment chart 8-1

Fault Evaluation of site front waters

【Fault Evaluation of site front waters（Southeast)】



Literature-based chart of fault distribution and sonic survey line of site surrounding waters



(Note) Value for depth is based on the case when the velocity of P wave equals to 1,500m/sec.

Sonic survey record of site front waters（Southeast)（Survey line No204）

Geologocal Time			Soil stratigraphy (Ocean area)		Category for soil stratigraphy (Land area)	
Quaternary	Holocene		Stratum A		Alluvium	
	Pleistocene	upper	Stratum Q		Terrace deposit	
		middle				
		lower	Stratum B	B1		
				B2		
Neocene	Pliocene	upper	Stratum C	C1		
				C2		
				C3	Sendai Upper	Tomioka
				C4		
				C5		Kuboma
		lower	Stratum D		Sendai Lower	Shikura
	Miocene	upper	Stratum E		Taga strata	
		middle	Stratum F			
		lower	Stratum G		Takaku strata	
					Shirato strata	
			Stratum H		Yunagaya strata	
Paleogene	Oligocene	upper				
		lower	Stratum I		Shirouzu strata	
	Eocene	upper				
		lower				
	Paleocene					
Upper Cretaceous			Stratum J		Futaba strata	

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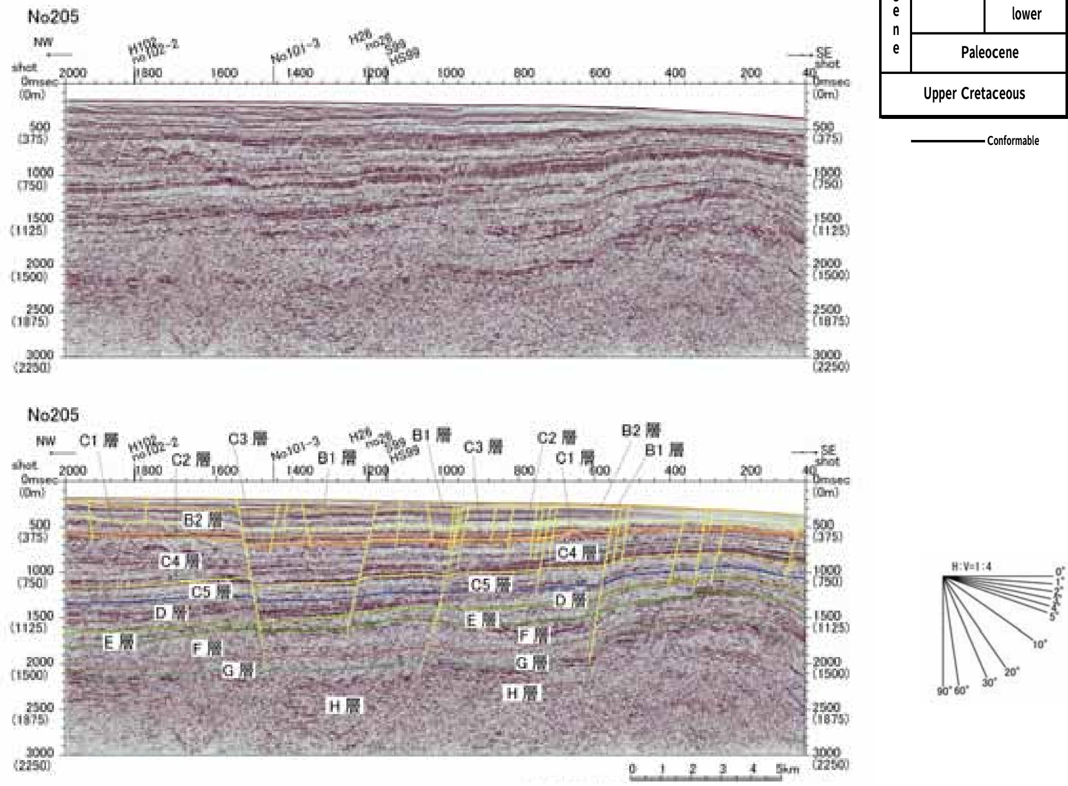


(Note) Value for depth is based on the case when the velocity of P wave equals to 1,500m/sec.

Sonic survey record of site front waters（Southeast)（Survey line No205）

Fault evaluation for site front waters (Southeast)

- Many normal faults are confirmed to make displacement to stratum B and C in range of a few to a few dozen meters.
- No activity in upper Pleistocene can be confirmed since most of these faults have disappeared within upper extended part of stratum B and C.
- Some faults have reached near sea bed and few of them are causing displacement to sea bed. Along with those faults that disappear within upper extended part of stratum B and C, these faults are not making displacement or deformation to the stratum lower than the bottom of stratum C. Therefore, no cumulativeness of displacement is confirmed.
- Those faults of which deep underground structure is not confirmed are normal faults, and no displacement or deformation caused by inversion can be confirmed in the Pleistocene. Therefore, we could conclude that those faults would not act as reverse faults in present compressed stress area.
- As described above, it can be concluded that small normal faults confirmed in southeast waters are not active faults.

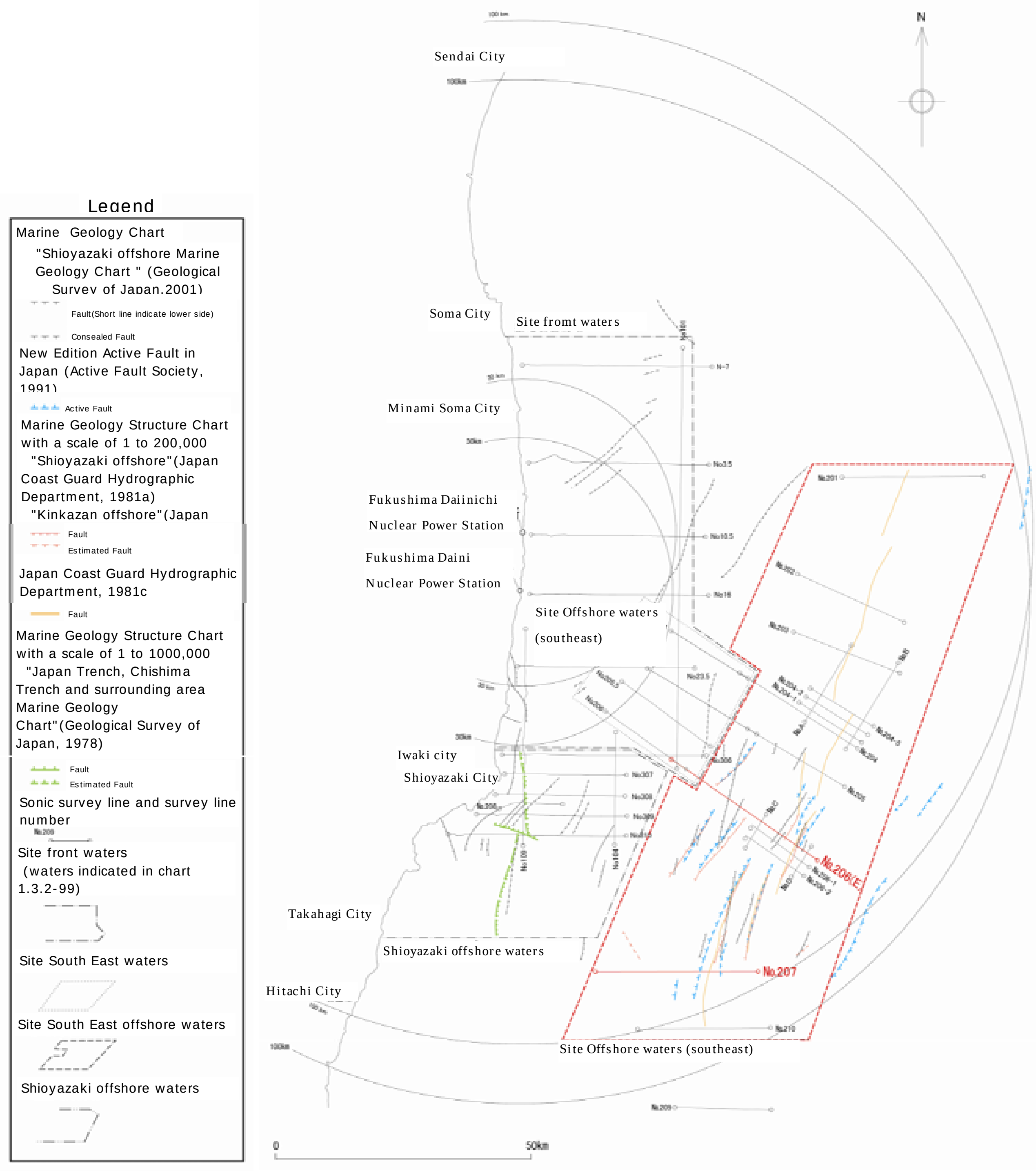
Attached Fig.８－２　Fault evaluation for site front waters (Southeast)

Faults around/near the site

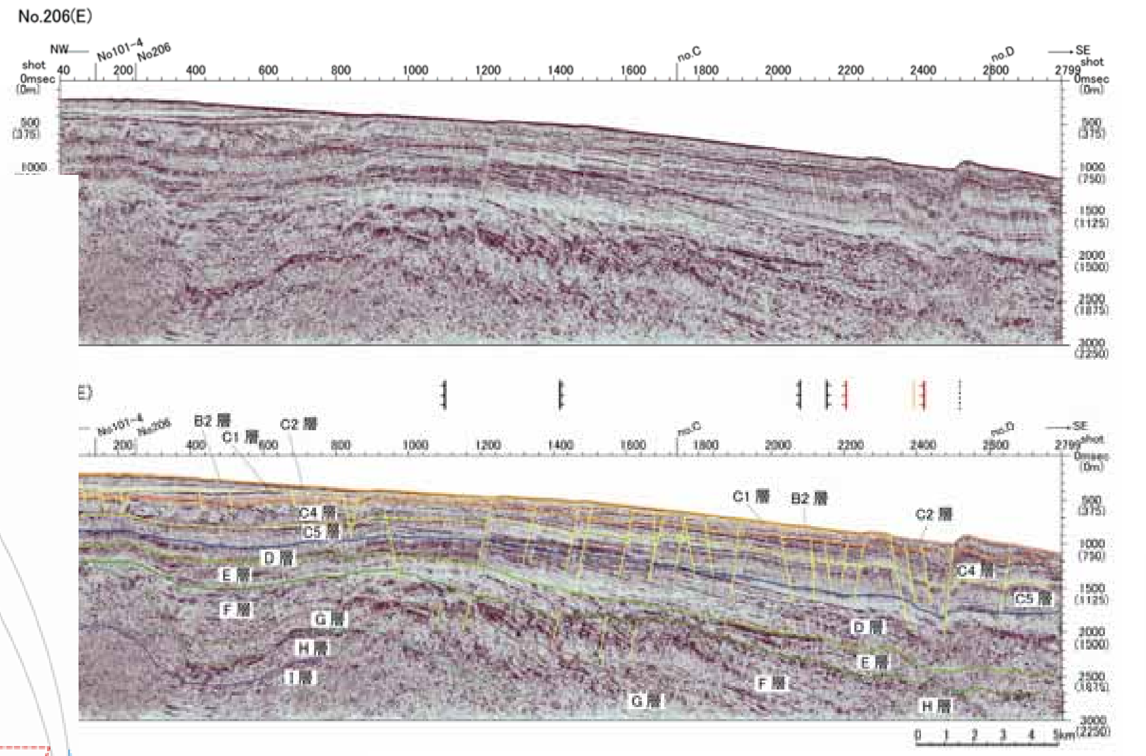
⑨ Faults at offshore area southeast from the site

Survey	Method	Result	Note
Literature Survey	—	･Structure Map of Ocean Bottom Geology "Offshore of Shioyazaki" (1981a), [New Edition] Faults in Japan (1991)、Japan Coast Guard (1981c)、Marine Geological Map "Ocean Bottom Geological Map of the offshore of Shioyazaki" (2001) etc.: NNE-SSW direction, many faults	
Sonic Survey from Sea	Multichannel Digital Survey using air guns (GI guns) as sound generator	･Most faults disappear in Layer B or C, the upper extension of the faults or cause no displacement or deformation to layers below the foundation of Layer C. No accumulation of displacement can be recognized.	Attached Figure 9
		･At the places indicated in literatures, the structure of the upper part of the faults whose deep part of the structure can not be confirmed is normal fault. The faults cause no displacement or deformation to layers below the foundation of Layer C. No accumulation of displacement can be recognized.	
Evaluation	• Most faults disappear in Layer B or C, the upper extension of the faults or cause no displacement or deformation to layers below the foundation of Layer C. No accumulation of displacement can be recognized. • At the places indicated in literatures, the structure of the upper part of the faults whose deep part of the structure can not be confirmed is normal fault. The faults cause no displacement or deformation to layers below the foundation of Layer C. No accumulation of displacement can be recognized. Based on that, it is estimated that no deep faults exist and they are not active faults.		

【Fault Evaluation of Site Offshore Waters(Southeast)】

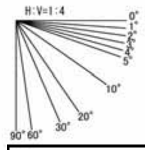


Literature-based chart of fault distribution and sonic survey line of site offshore waters



(Note) Value for depth is based on the case when the velocity of P wave equals to 1,500m/sec.

Sonic survey record of site front waters（Southeast）（Survey line No206（E)）



Geologocal Time			Soil stratigraphy (Ocean area)		Category for soil stratigraphy (Land area)	
Quaternary	Holocene		Stratum A		Alluvium	
	Pleistocene	upper	Stratum Q		Terrace deposit	
		middle				
		lower	Stratum B	B1		
				B2		
Neogene	Pliocene	upper	Stratum C	C1		
				C2		
				C3	Sendai Upper	Tomioka
				C4		
				C5		Kuboma
		lower	Stratum D		Sendai Lower	Shikura
	Miocene	upper	Stratum E		Taga strata	
		middle	Stratum F			
		lower	Stratum G		Takaku strata	
					Shirato strata	
			Stratum H		Yunagaya strata	
Paleogene	Oligocene	upper	Stratum I		Shirouzu strata	
		lower				
	Eocene	upper				
		lower				
	Paleocene					
Upper Cretaceous			Stratum J		Futaba strata	

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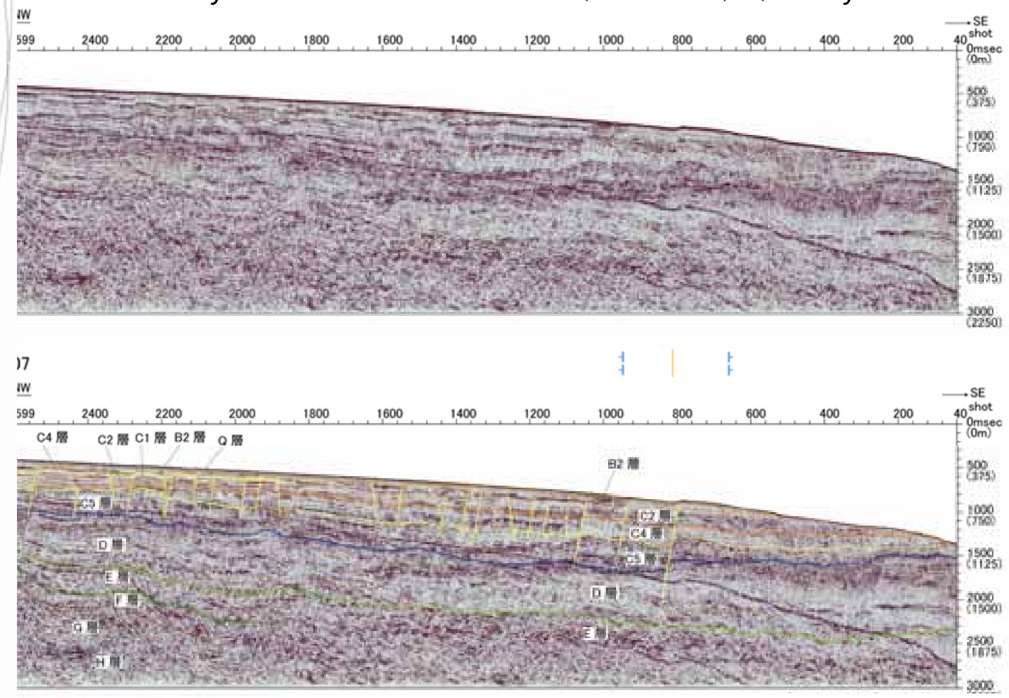
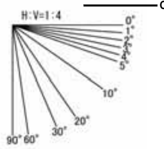




(Note) Value for depth is based on the case when the velocity of P wave equals to 1,500m/sec.

Legend
Marine Geology Chart "Shioyazaki offshore Marine Geology Chart" (Geological Survey of Japan, 2001)
Fault (Short line indicate lower side)
Marine Geology Structure Chart with a scale of 1 to 200,000 "Shioyazaki offshore"(Japan Coast Guard Hydrographic Department,1981a)
"Kinkazan offshore"(Japan Coast Guard Hydrographic Department,1981b)
Fault
Japan Coast Guard Hydrographic Department (1981a)
New Edition Active Fault in Japan (Active Fault Society,1991)
Active Fault

Sonic survey record of site offshore waters(southeast))（Survey line No207）

Fault evaluation for site offshore waters (Southeast)

- Most of the faults have disappeared within upper extended part of stratum B and C. Those faults are not making displacement or deformation to the stratum lower than the bottom of stratum. Therefore, no cumulativeness of displacement is confirmed.
- According to the fault location based on literature, shallow structure of those faults of which deep underground structure is not confirmed is normal faults. Therefore, no cumulativeness of displacement is confirmed. At the sonic survey record of extended part of stratum, those faults are not making displacement or deformation to the stratum lower than the bottom of stratum. Hense, it can be estimated that there is no fault in the deep underground.

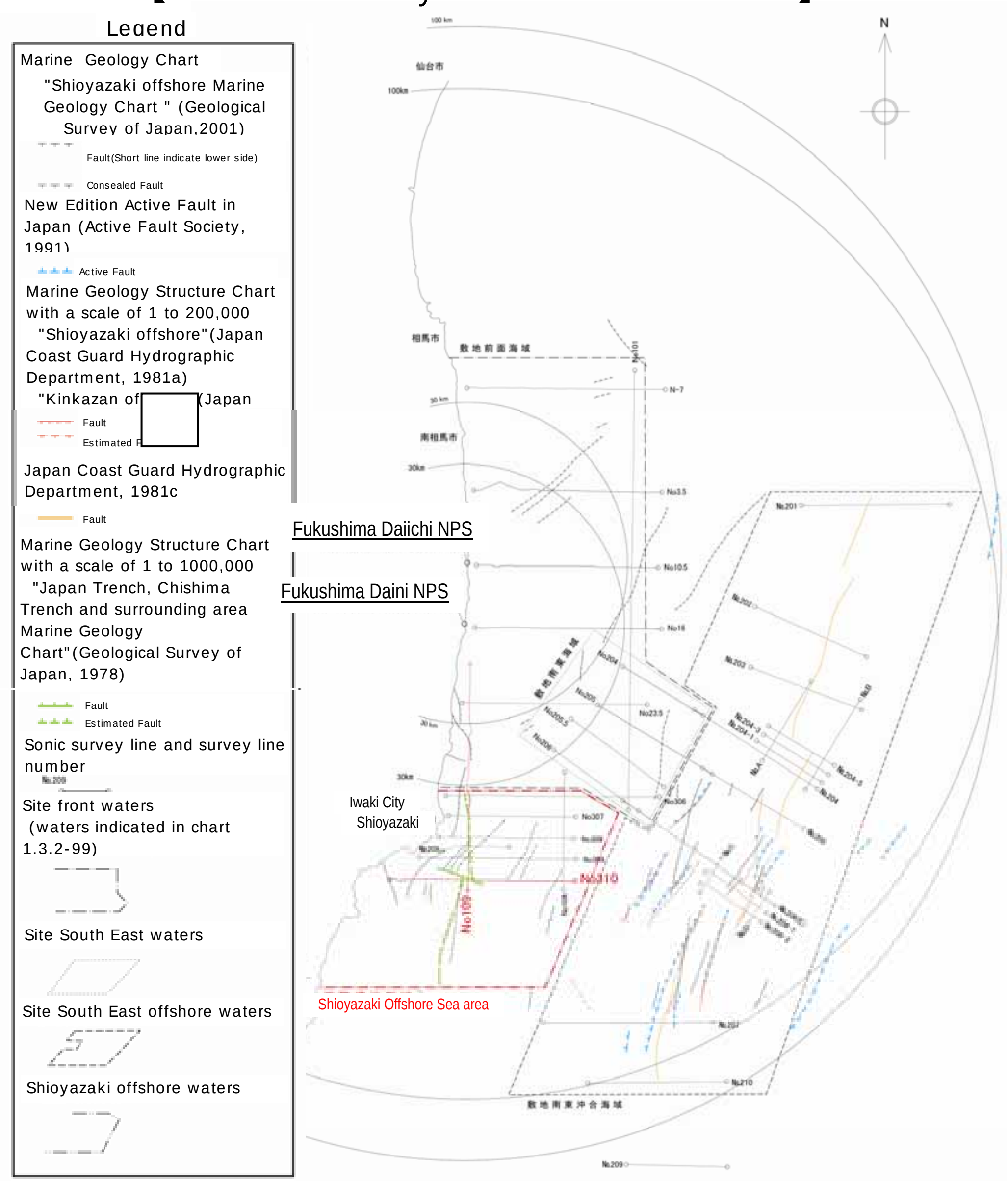
Attached Figure 9　Fault evaluation for site offshore waters (Southeast)

Faults around/near the site

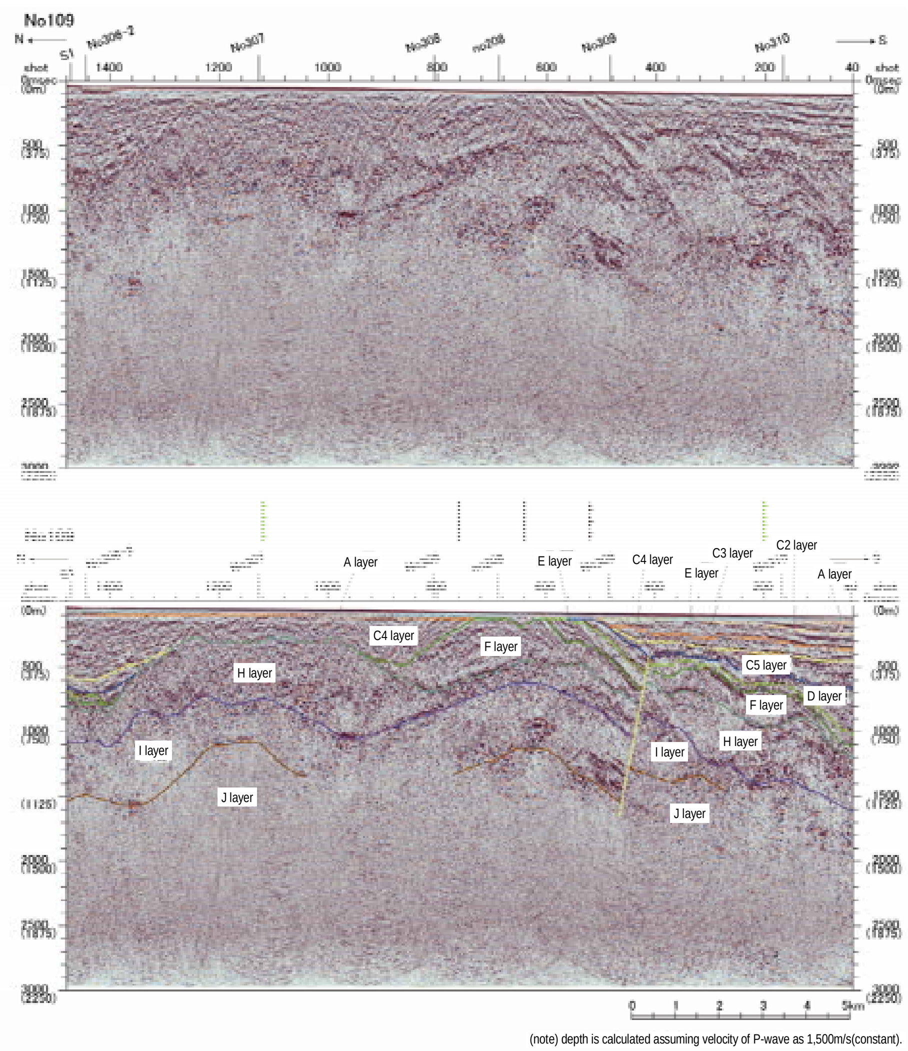
⑩ Faults at offshore area from Shioyazaki

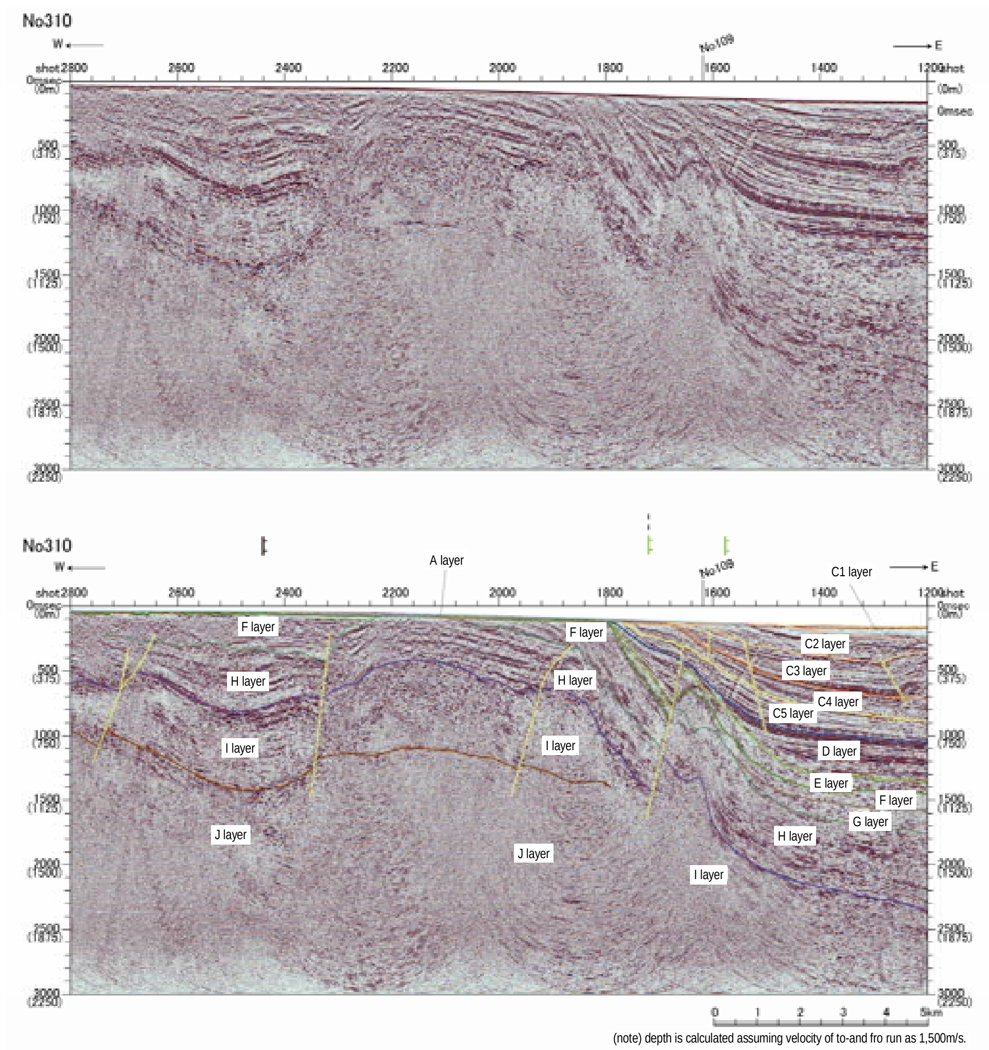
Survey	Method	Result	Note
Literature Survey	—	･Marine Geological Map “Ocean Bottom Geological Map of the offshore of Shioyazaki” (2001), Millionth Marine Geological Map “Extensive Ocean Bottom Geological Map of the Japan Trench, south part of the Chishima Trench and their surrounding area” (1978)：Mainly N-S direction faults	
Sonic Survey from Sea	Multichannel Digital Survey using air guns (GI guns) as sound generator	･Some have no faults and some are estimated to have faults at their deep parts. Neither displacement nor deformation is recognized in Layer C2 with regard to the latter ones.	Attached Figure 10
Evaluation	･It is judged that there are no active faults that need to be considered about their activities at offshore area from Shioyazaki, because it is recognized that some do not have a series of faults and some are estimated to have faults at their deep parts and neither displacement nor deformation is recognized in Layer C2 with regard to the latter ones.		

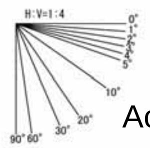
【Evaluation of Shioyasaki-Oki ocean area fault】



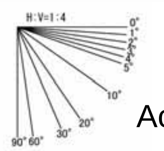
Fault distribution map and location diagram of acoustic profiling measuring line based on the literatures on ocean area around the nuclear power stations







Acoustic profiling records of Shioyasaki-Oki ocean area (No.109) *Note: The records are only reflective of water-colored line in the figure as shown below.



Acoustic profiling records of Shioyasaki-Oki ocean area (No.310)*Note: The records are only reflective of water-colored line in the figure as shown below.

Geologocal Time			Soil stratigraphy (Ocean area)		Category for soil stratigraphy (Land area)	
Quaternary	Holocene		Stratum A		Alluvium	
	Pleistocene	upper	Stratum Q		Terrace deposit	
		middle				
		lower	Stratum B	B1		
				B2		
			Stratum C	C1		
Neocene	Pliocene	upper		C2		
				C3	Sendai Upper	Tomioka
				C4		
		lower		C5		Kuboma
			Stratum D		Sendai Lower	Shikura
	Miocene	upper	Stratum E		Taga strata	
		middle	Stratum F			
		lower	Stratum G		Takaku strata	
					Shirato strata	
			Stratum H		Yunagaya strata	
Paleogene	Oligocene	upper				
		lower	Stratum I		Shirouzu strata	
	Eocene	upper				
		lower				
	Paleocene					
Upper Cretaceous			Stratum J		Futaba strata	

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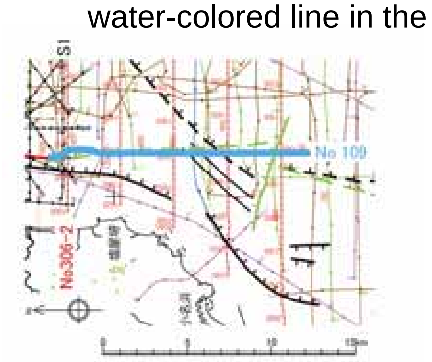


Legend

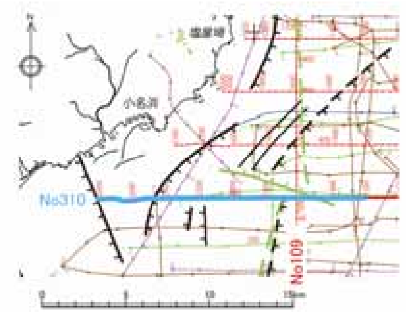
Ocean geological map "Geological map of offshore of Shioyazaki"(Geological Survey Center, 2001)

Fault (dash line indicates extension)

Sapheous fault

1/1,000,000 Ocean geological map "Geological map of Kapan trench/south of Chishima trench and srounding area"(Geological Survey Center, 1978)

Fault



Evaluation of Shioyasaki-Oki ocean area fault

- Although a fault was estimated to be situated in some deep portions, any displacement or deformation was not confirmed at C_2 layer.

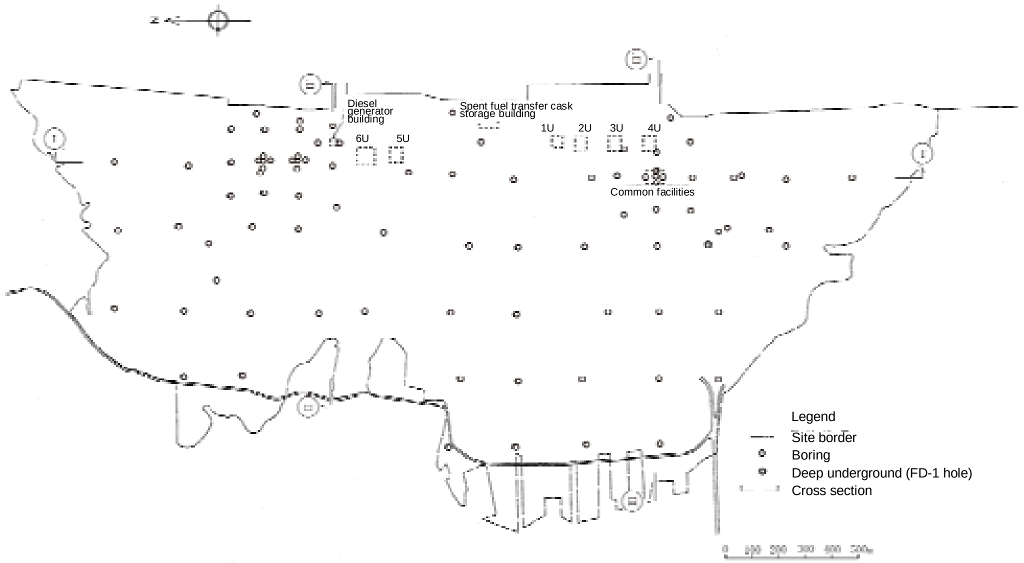
Attachment 11

Faults within the site

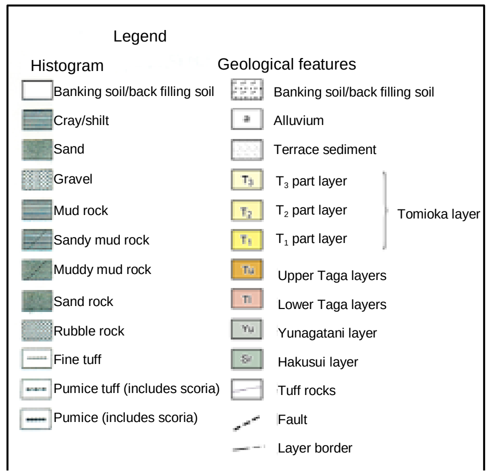
⑪ (No Name)

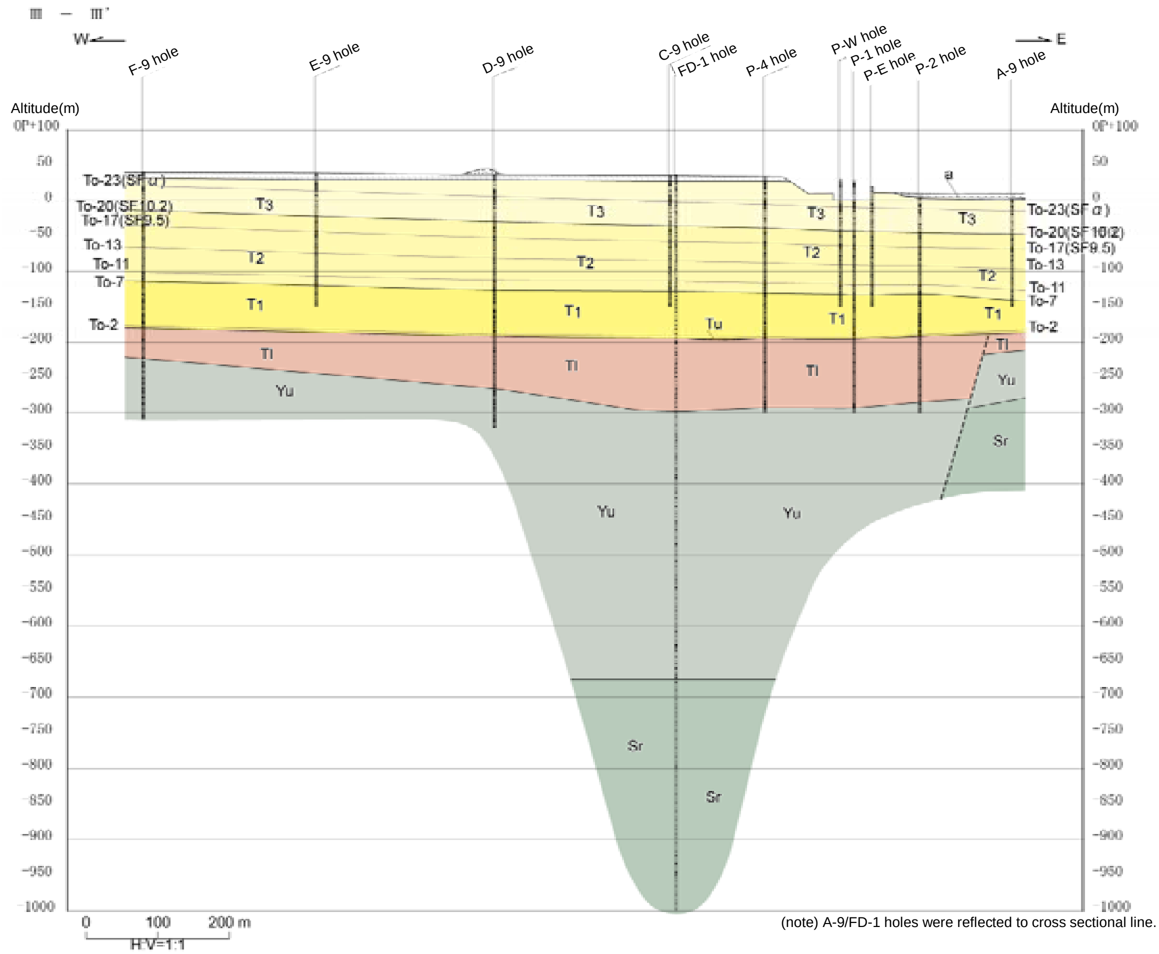
Survey	Method	Result	Note
Surficial geologic Survey	Ground Surface Survey Boring Survey	• While westward normal faults that can cause displacement to the layers under Taga Formation Group, Tomioka Formation has no displacement. • Tomioka Formation extends with leveled thickness and constitutes horizontal homoclinal structure in the north-south direction and homoclinal structure tilted eastward by 2° in the east-west direction. Each key bed of Tomioka Formation exists in series and no discontinuity is recognized.	Attached Figure 11
Evaluation	•Based on that each key bed of Tomioka Formation exists in series and no discontinuity is recognized, it is judged that there have been no activities since the accumulation of Tomioka Formation.		

【Fault Evaluation of Fukushima Daiichi Nuclear Power Station

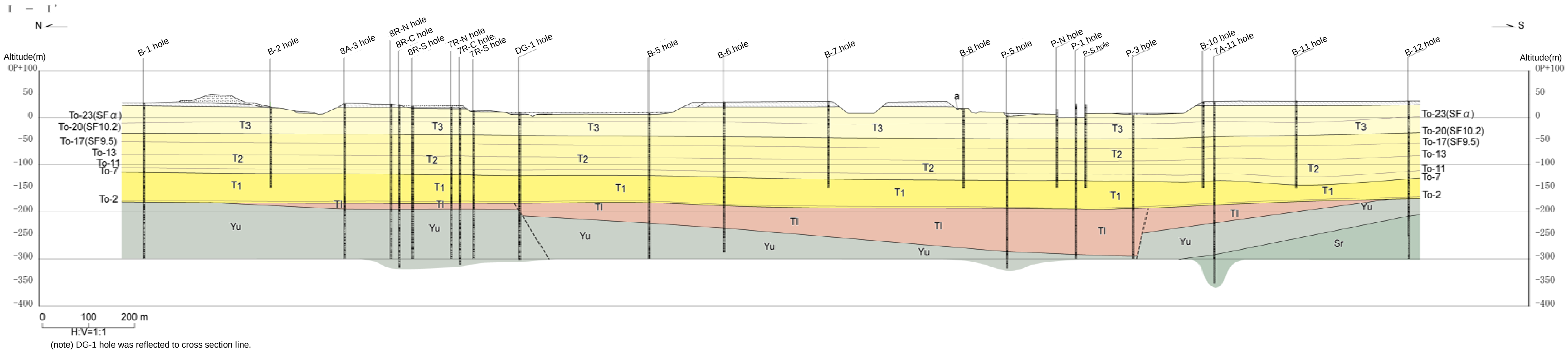


Survey Point at Fukushima Daiichi Nuclear Power Station





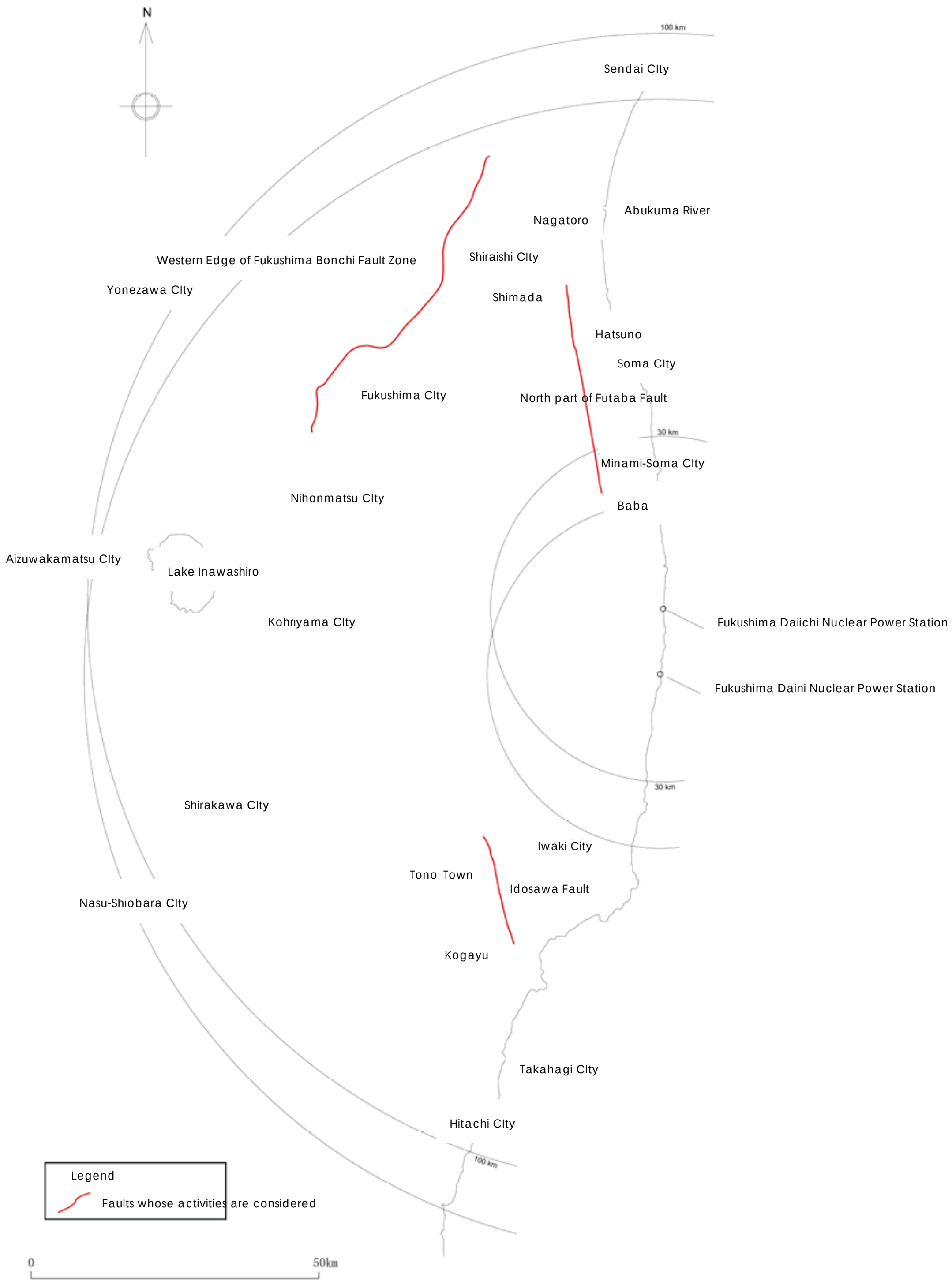
Geological Cross-section of Site (□ー□' section)



Fault Evaluation of Fukushima Daiichi Nuclear Power Station

・A normal fault which affects the level of layers below Taga layers is recognized around south-east area of the site. The fault has not affected the level of Tomioka layer.

Reference 1



Map of Faults considered in the seismic design around Fukushima Daiichi and Daini Nuclear Power Stations