Photo of D-1 trench

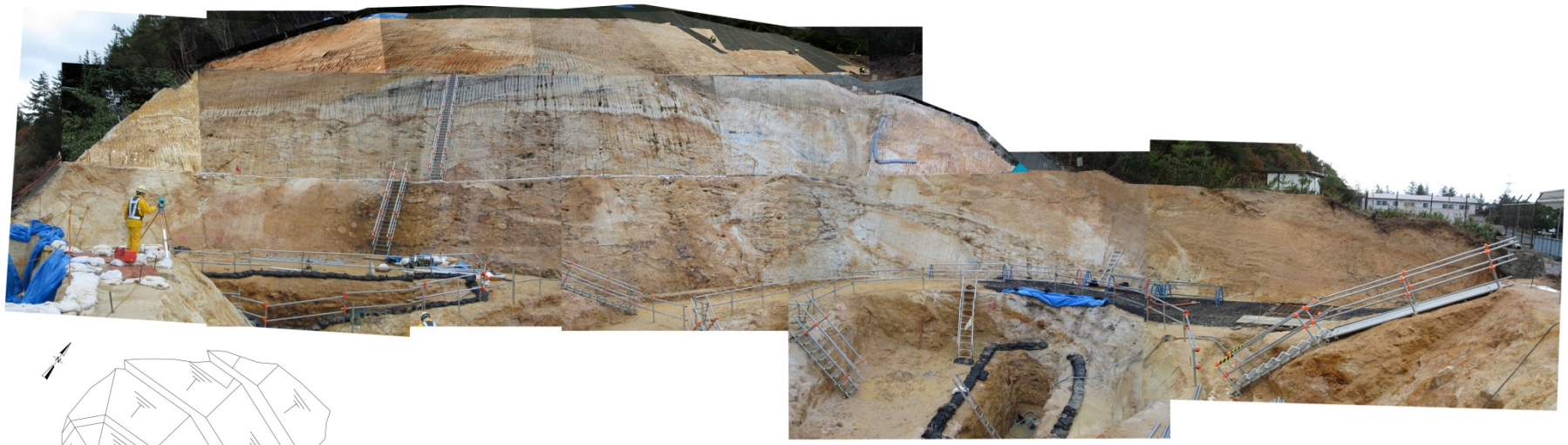
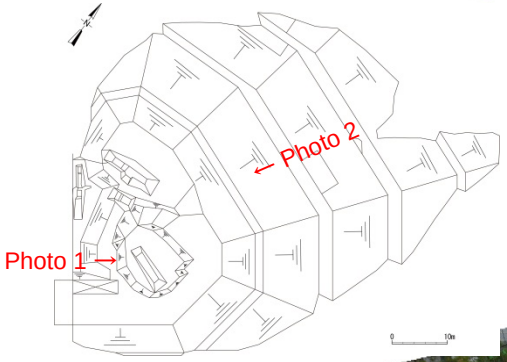


Photo 1

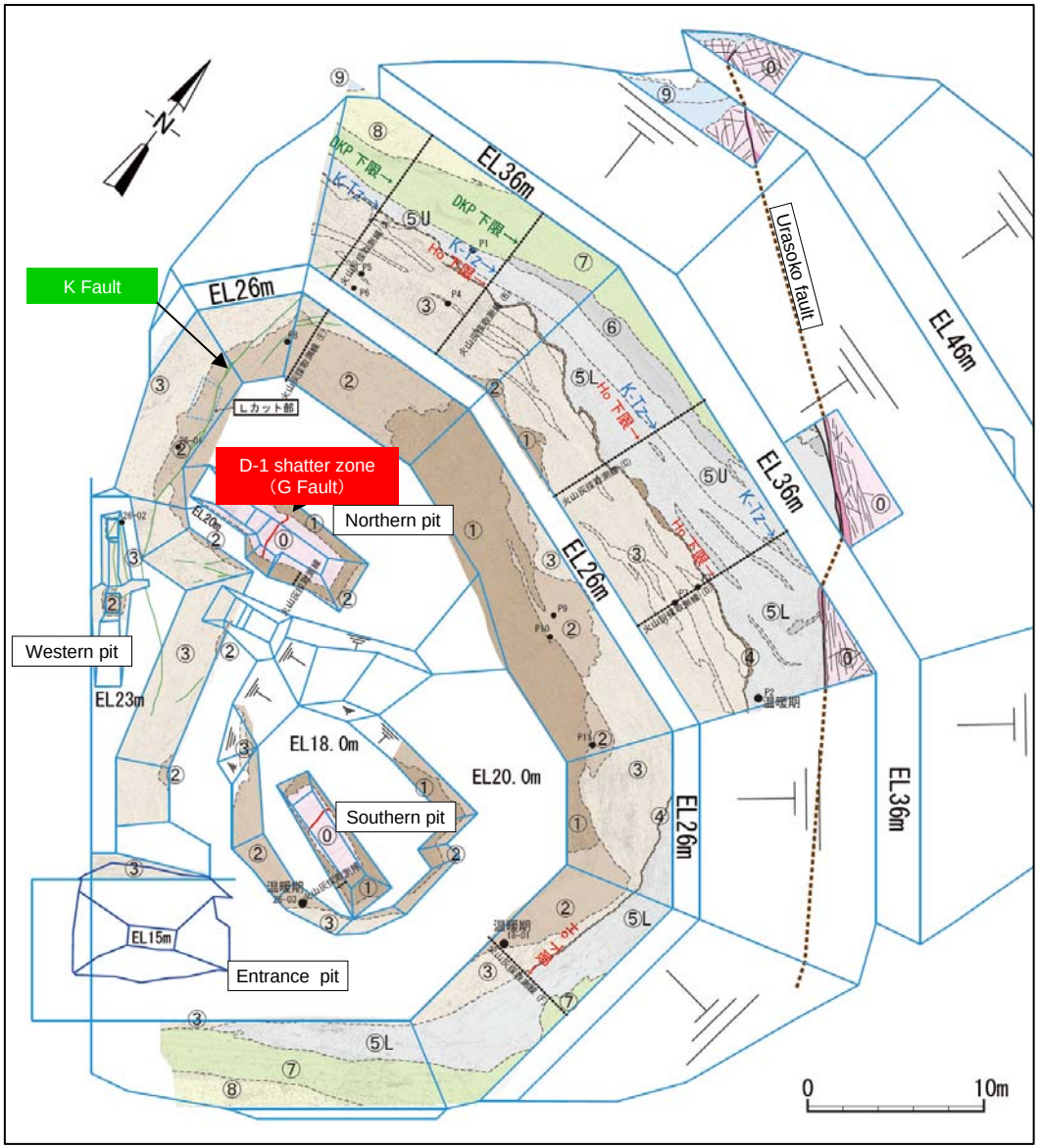


Trench shape diagram

Photo 2

Plan drawing of D-1 trench

Newly obtained data after February 5, 2013



- K Fault has displaced lower part of layer ③ but has not displaced upper part of layer ③ and layer ⑤ that is located above layer ③.

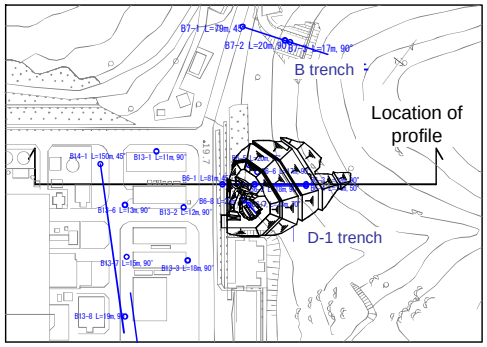
- A tephra consist of hornblende is recognized at lower part of layer ⑤.
- That tephra has a correlation with Mihama-tephra from refractive index and ingredient composition.
- Accordingly, the depositional age of lower part of layer⑤can be considered stage5e.

- K-fault was not been active at least in and after the Late Pleistocene (about 120,000-130,000 years ago).

Layer name		Color tone	Facies
Layer ⑨		Brown -darkish yellow brown	Sandy silt with gravel. Contact with lower layer in the horizontal unconformity surface.
Layer ⑧		Brown -yellow orange	Mainly composed of gravel. Matrix is silty sand. Stratification structure is partly seen. Contact with lower layer in the horizontal unconformity surface.
Layer ⑦		Brown -brownish gray	Sandy silt with gravel - Silty sand with gravel. Contact with lower layer in the horizontal unconformity surface.
Layer ⑥		Gray-dark gray	Humic sandy silt-silty sand Contains lots of wood chips. Contact with lower layer in the horizontal unconformity surface.
Layer ⑤	U (Upper part)	Ash gray -slight yellow orange	Mainly composed of silty gravel.
	L (Lower part)	Ash gray -slight yellow orange	Mainly composed of silty gravel. Silty gravel layer and silt layer present discontinuous alteration. Erode layer ③ and contact with it in the unconformity surface
Layer ③	Layer ④※	Brown	Mainly composed of oxidized gravel. Distributed just beneath unconformity surface with undulation and denudation.
		Slight yellow orange -orange	Mainly composed of gravel. Silt layer and sand layer occur in a lenticular and laminae form. Contact with unconformity surface denuding lower layer.
Layer ②		Darkish orange-ash gray	Sandy silt-silty sand that is massive structure and contains lots of decayed gravel
Layer ①		Darkish red brown -bright brownish yellow	Mainly composed of gravel. Insufficient sorting and very tight
Layer ⓪ Kojaku granite		Ash gray- Brown	Rock mass that constitutes basement. Consist of biotite granite, granite porphyry and aplite.

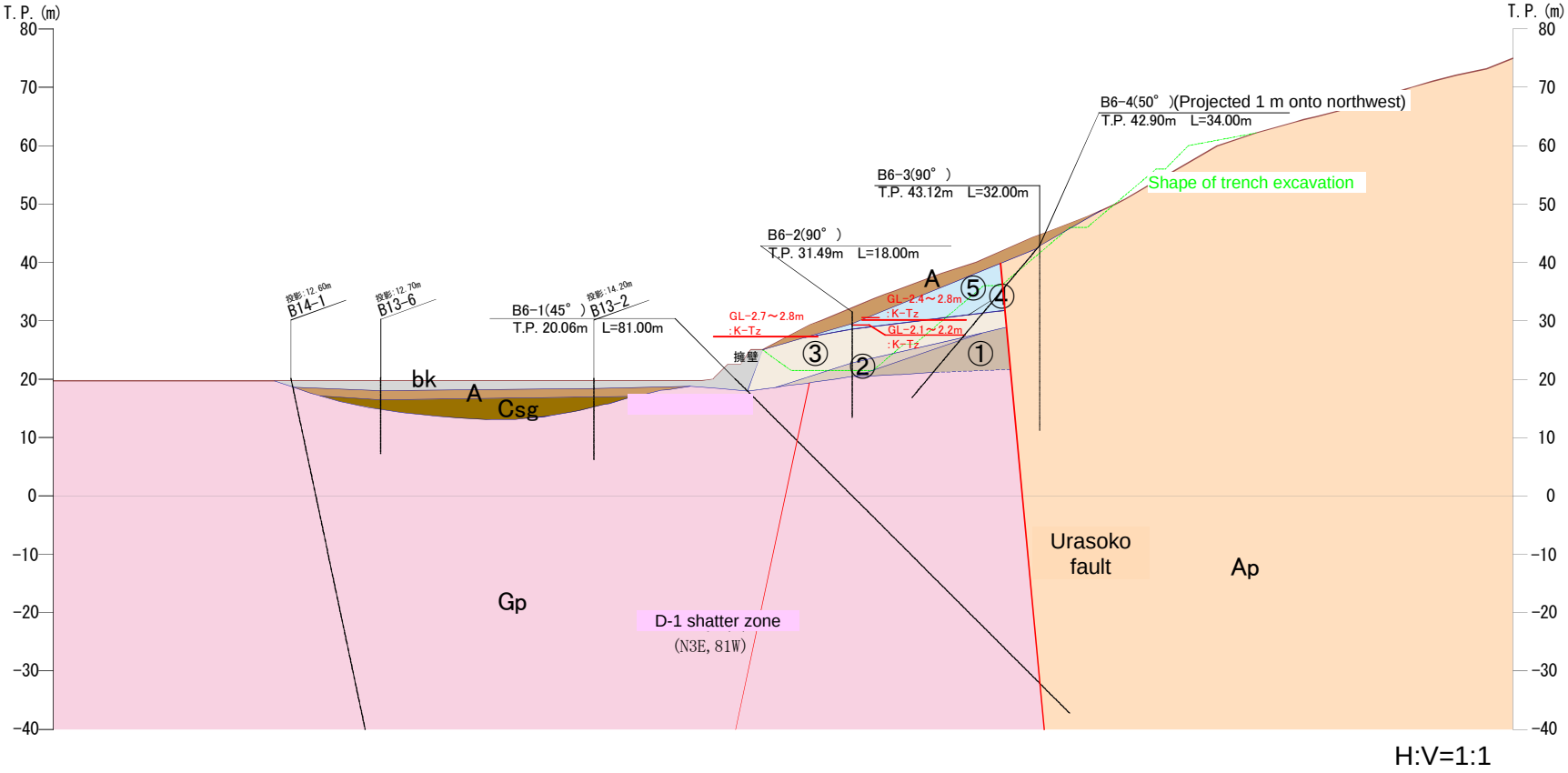
※ Oxidized zone of upper end of layer ③ located just beneath unconformity surface.

D-1 trench (geological profile)



Geological classification legend

- bk: Filling soil
- A: A layer: Alluvial lowland deposit, fan deposit and talus deposit (that may contain sand, gravel, silt, humus and humic matters)
- Csg: Csg layer: Fan deposit (that may contain gravel, coarse sand, medium sand and humus)
- Gp: Granite porphyry
- Ap: Aplite
- ⑤: Layer ⑤: Mainly composed of silty gravel. Silty gravel layer and silt layer present discontinuous alteration. Contains Kikai-Kuzuhara (K-Tz) tephra horizon. Produces pollen in warm period from the bottom.
- ③ ④: Layer ③: Mainly composed of gravel. Silt layer and sand layer occur in a lenticular and laminae form. Layer ④: oxidized zone
- ②: Layer ②: Mainly composed of sandy silt with gravel-silty sand that is massive structure.
- ①: Layer ①: Mainly composed of gravel with characteristics of insufficient sorting and very tight
- shatter zone
- Geological boundary



Geologic stratigraphic sequence of D-1 trench

Newly obtained data after February 5, 2013

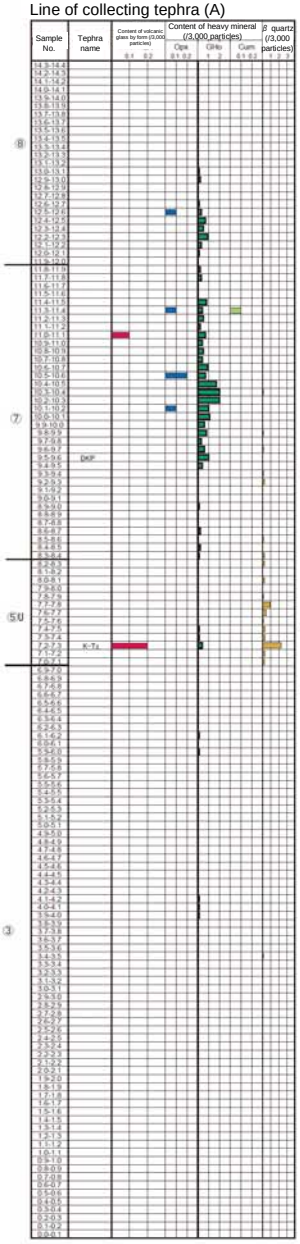
Layer name	Color tone	Facies	Chronometric indicator		depositional age
			Tephra	Pollen	
Layer ⑨	Brown -darkish yellow brown	Sandy silt with gravel. Contact with lower layer in the horizontal unconformity surface.	–	–	After stage 4
Layer ⑧	Brown -yellow orange	Mainly composed of gravel. Matrix is silty sand. Stratification structure is partly seen. Contact with lower layer in the horizontal unconformity surface.	–	–	
Layer ⑦	Brown -brownish gray	Sandy silt with gravel - Silty sand with gravel. Contact with lower layer in the horizontal unconformity surface.	Including DKP	–	
Layer ⑥	Gray-dark gray	Humic sandy silt-silty sand Contains lots of wood chips. Contact with lower layer in the horizontal unconformity surface.	–	–	Stage 5b
Layer ⑤ U (Upper part)	Ash gray -slight yellow orange	Mainly composed of silty gravel.	Including K-Tz	–	Stage 5c
Layer ⑤ L (Lower part)	Ash gray -slight yellow orange	Mainly composed of silty gravel. Silty gravel layer and silt layer present discontinuous alteration. Erode layer③ and contact with it in the unconformity surface	Including Mihama-tephra		Stage 5e
Layer ④※	Brown	Mainly composed of oxidized gravel. Distributed just beneath unconformity surface with undulation and denudation.	–	–	Stage 6
Layer ③	Slight yellow orange -orange	Mainly composed of gravel. Silt layer and sand layer occur in a lenticular and laminae form. Contact with unconformity surface denuding lower layer.			
Layer ②	Darkish orange-ash gray	Sandy silt-silty sand that is massive structure and contains lots of decayed gravel	–		Stage 7
Layer ①	Darkish red brown -bright brownish yellow	Mainly composed of gravel. Insufficient sorting and very tight	–	–	Before stage 7
⓪ Kojaku granite	Ash gray- Brown	Rock mass that constitutes basement. Consist of biotite granite, granite porphyry and aplite.	–	–	Late Cretaceous -Paleogene

※ Oxidized zone of upper end of layer ③ located just beneath unconformity surface.

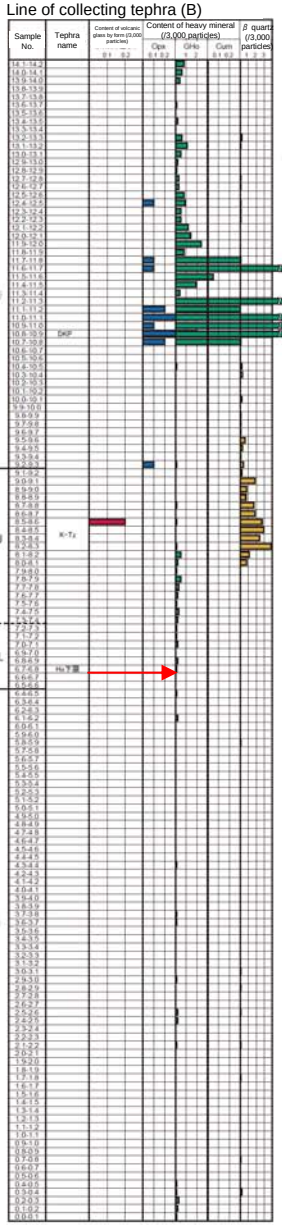
D-1 trench (result of tephra analysis)

Newly obtained data after February 5, 2013

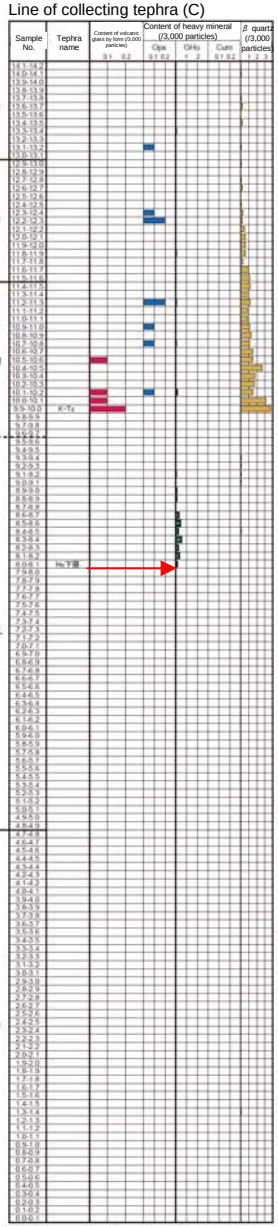
Line of collecting tephra (A)



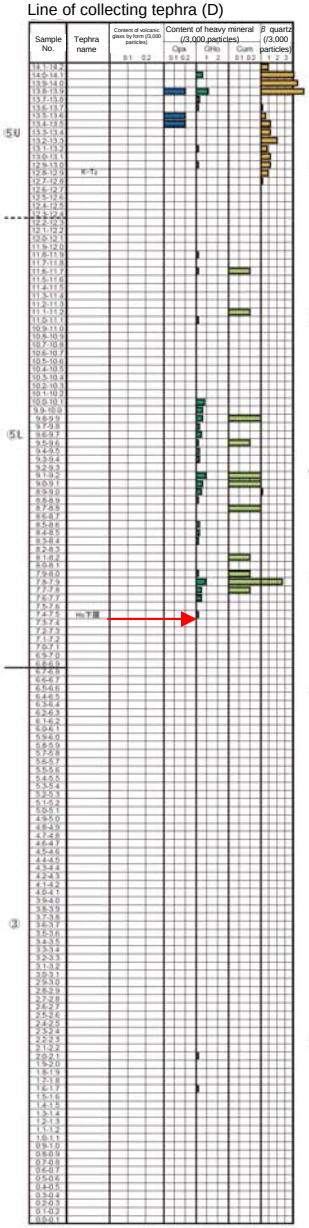
Line of collecting tephra (B)



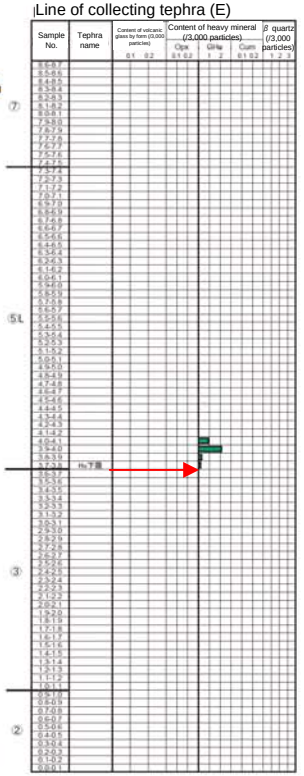
Line of collecting tephra (C)



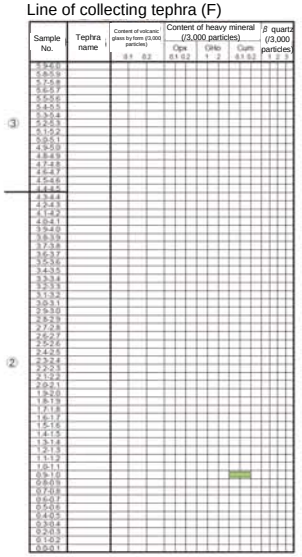
Line of collecting tephra (D)



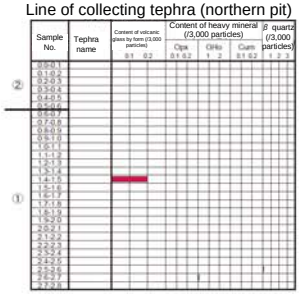
Line of collecting tephra (E)



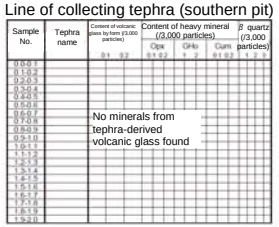
Line of collecting tephra (F)



Line of collecting tephra (northern pit)



Line of collecting tephra (southern pit)



Refractive index and main ingredient analysis

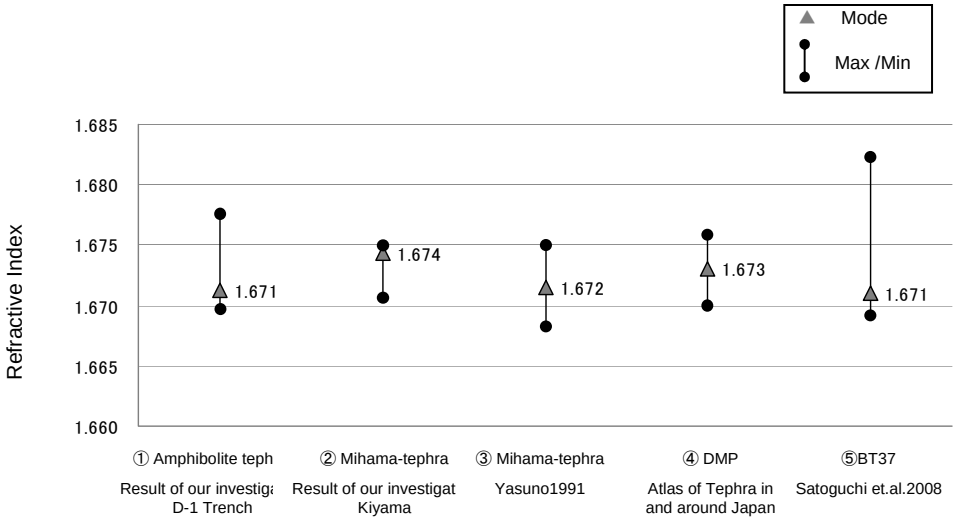
Newly obtained data after February 5, 2013

・Refractive index of hornblende tephra that is detected from lower part of layer⑤ beneath K-Tz ash fall layer is 1.670-1.678.

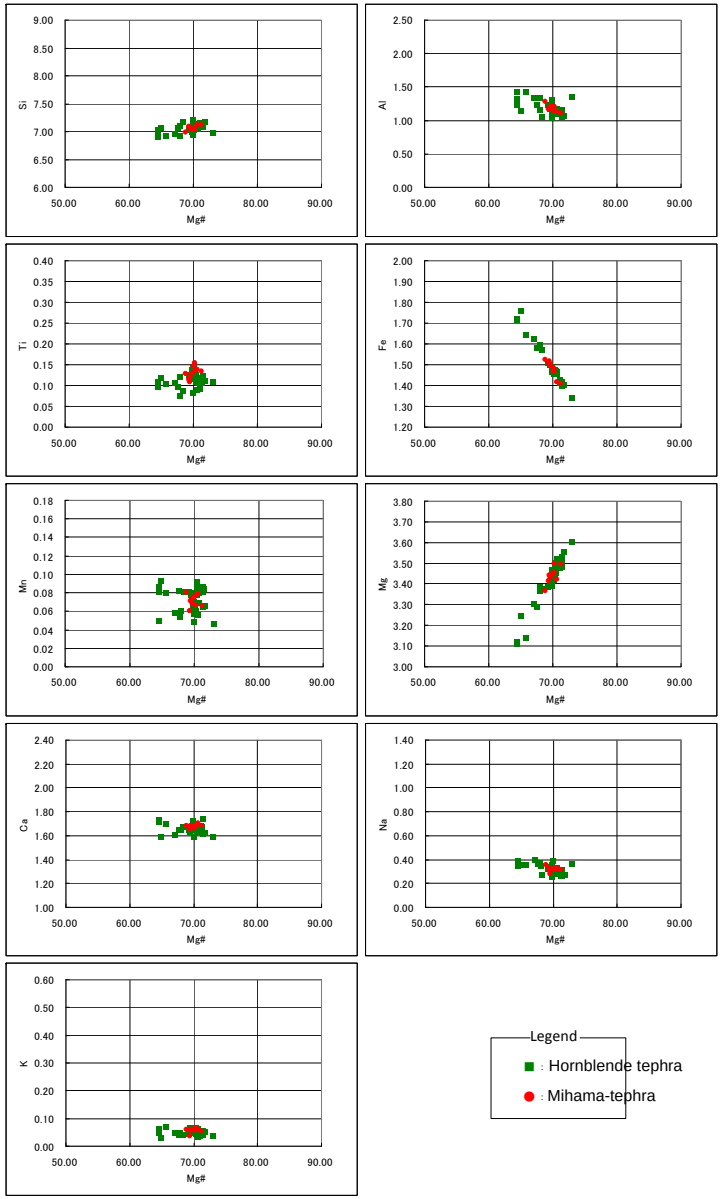
・From the data of refractive index, there is a possibility that the hornblende tephra has a correlation with the following three tephras:
- Mihama-tephra (located in lower part of median terrace marine deposit beneath SK (Sanbe-Kisuki, 110-115ka [Atlas of Tephra in and around Japan])[Yasuno1991])
- DMP (Daisen-Matsue, <130ka [Atlas of Tephra in and around Japan])
- BT37 (Lake Biwa-Takasima oki boring, 127.6ka [Nagahasi, et al.])

・The main ingredient component of the hornblende tephra is almost same as that of Mihama-tephra, which occurs around power station.

・Because a hornblende tephra of lower part of layer⑤ has a correlation with Mihama-tephra, the depositional age of lower part of layer⑤ can be considered stage5e.



Comparison of Refractive Index



Comparison of main ingredient component between hornblende tephra and Mihama-tephra

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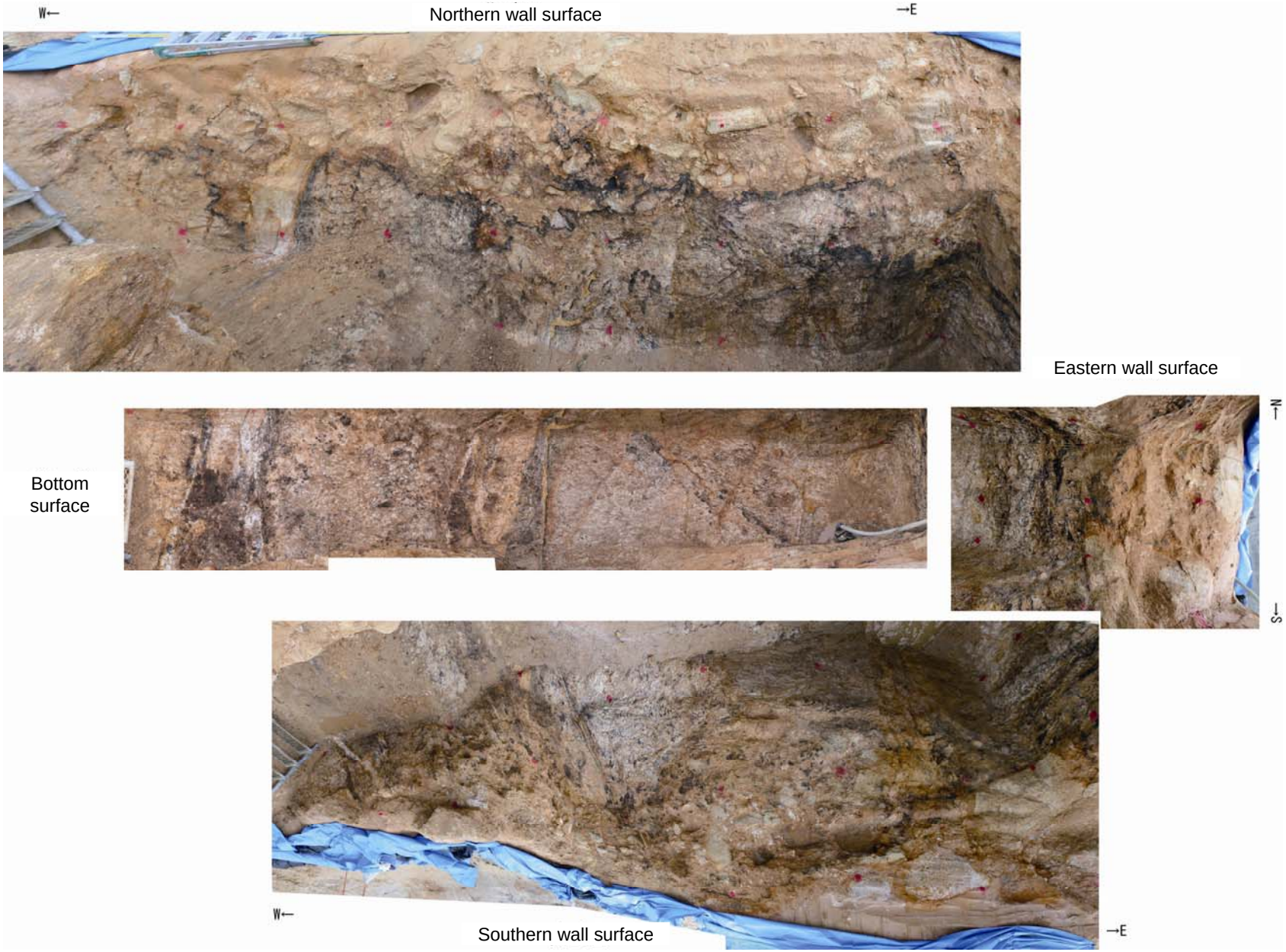
・Yasuno. T, 1991, Discovery of Molluscan Fossils and a Tephra Layer from the Late Pleistocene Kiyama Formation in West of Fukui Prefecture, Central Japan, Bull.Fukui Mus. Nat.Hist., No.38:9-14

・Satoguchi. Y, et.al., 2008, The Middle Pleistocene to Holocene tephrostratigraphy of the Takashima-oki core from Lake Biwa, central Japan, Journal of Geosciences, Osaka City University, Vol.51, Art. 6, p.47-58

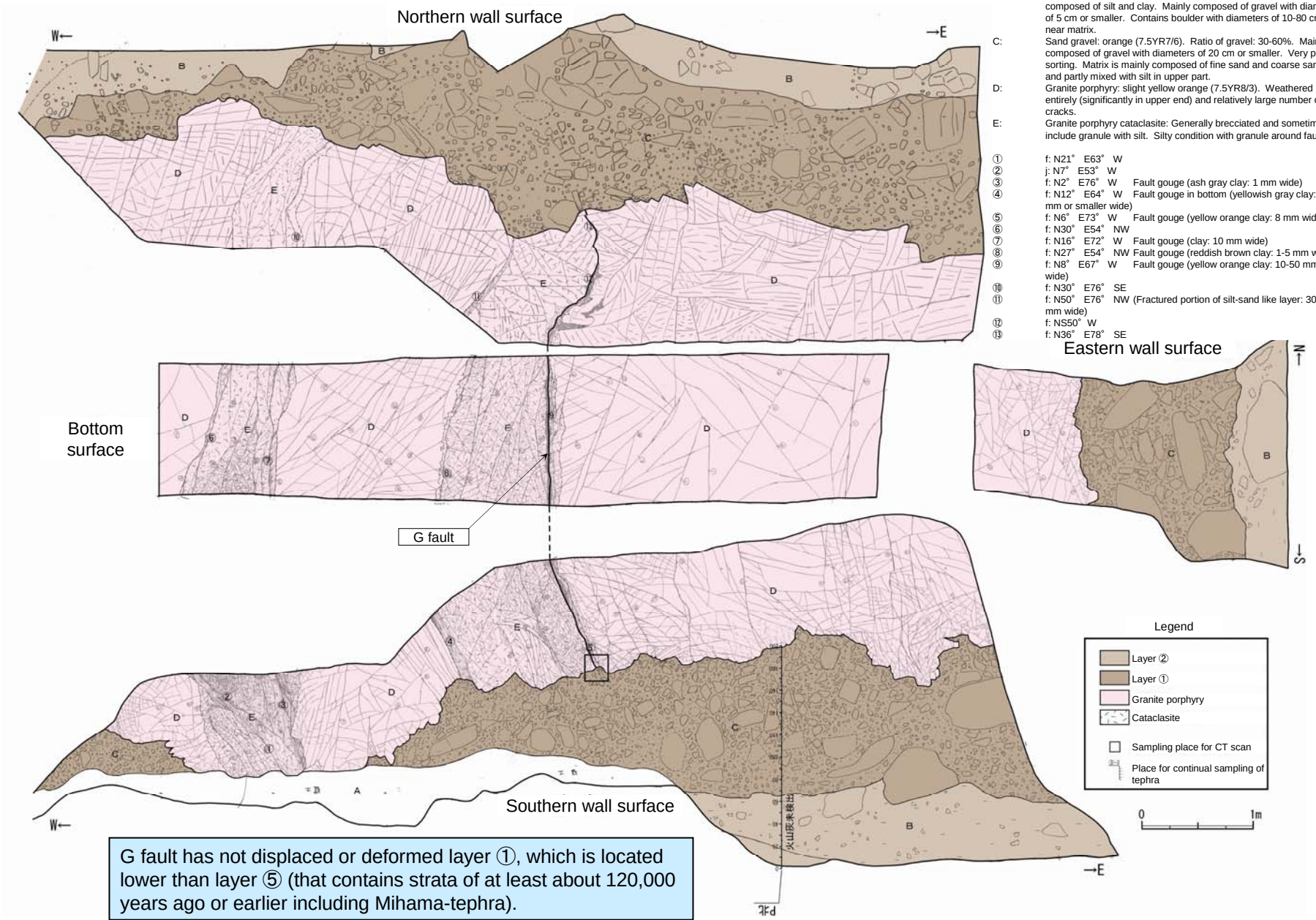
・Machida. H, and Arai. F, 2003, Atlas of Tephra in and around Japan. Univ. Tokyo Press, Tokyo

・Nagahasi. Y, et al., 2004, 近畿地方および八ヶ岳山麓における過去43万年間の広域テフラの層序と編年 －EDS分析による火山ガラス片の主要成分化学組成－, 第四紀研究, 43, 15-35

D-1 trench (photo of northern pit)



D-1 trench (sketch of northern pit)



A: Embankment

B: Silt and clay with gravel and sand: Orange (7.5YR6/6). Mainly composed of silt and clay. Mainly composed of gravel with diameters of 5 cm or smaller. Contains boulder with diameters of 10-80 cm near matrix.

C: Sand gravel: orange (7.5YR7/6). Ratio of gravel: 30-60%. Mainly composed of gravel with diameters of 20 cm or smaller. Very poor sorting. Matrix is mainly composed of fine sand and coarse sand, and partly mixed with silt in upper part.

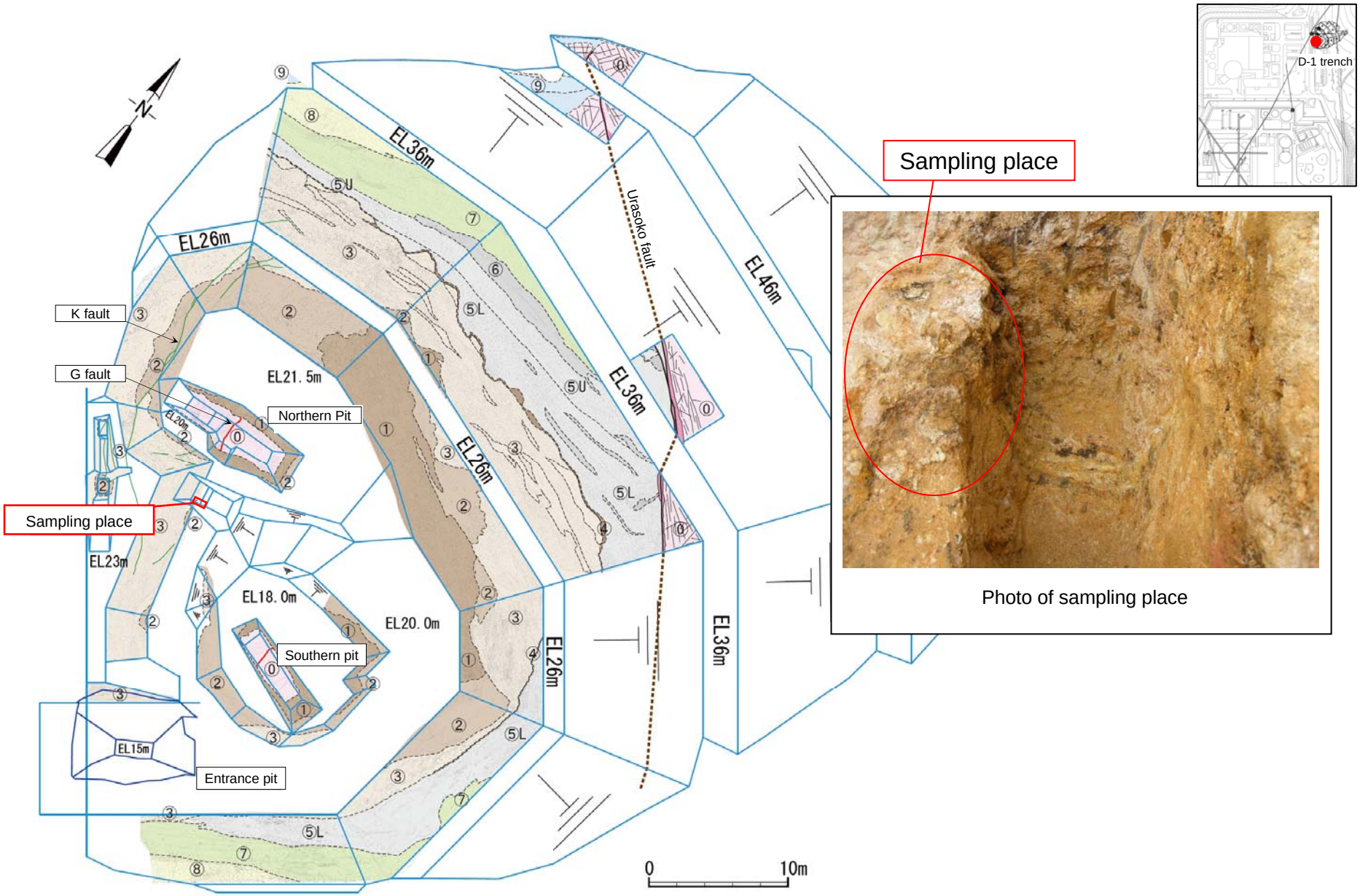
D: Granite porphyry: slight yellow orange (7.5YR8/3). Weathered entirely (significantly in upper end) and relatively large number of cracks.

E: Granite porphyry cataclasite: Generally brecciated and sometimes include granule with silt. Silty condition with granule around fault.

① f: N21° E63° W
② j: N7° E53° W
③ f: N2° E76° W Fault gouge (ash gray clay: 1 mm wide)
④ f: N12° E64° W Fault gouge in bottom (yellowish gray clay: 15 mm or smaller wide)
⑤ f: N6° E73° W Fault gouge (yellow orange clay: 8 mm wide)
⑥ f: N30° E54° NW
⑦ f: N16° E72° W Fault gouge (clay: 10 mm wide)
⑧ f: N27° E54° NW Fault gouge (reddish brown clay: 1-5 mm wide)
⑨ f: N8° E67° W Fault gouge (yellow orange clay: 10-50 mm wide)
⑩ f: N30° E76° SE
⑪ f: N50° E76° NW (Fractured portion of silt-sand like layer: 30-60 mm wide)
⑫ f: NS50° W
⑬ f: N36° E78° SE

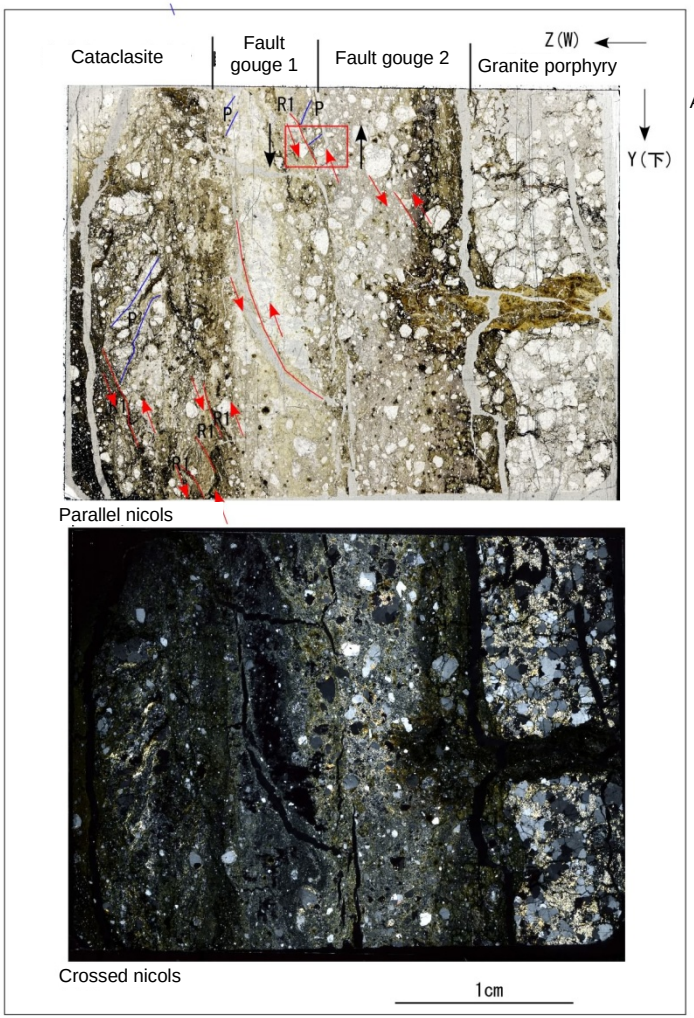
G fault has not displaced or deformed layer ①, which is located lower than layer ⑤ (that contains strata of at least about 120,000 years ago or earlier including Mihama-tephra).

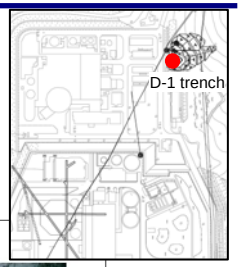
[Displacement sense of shatter zone] Location of collecting thin section from G fault in the south of northern pit of D-1 trench



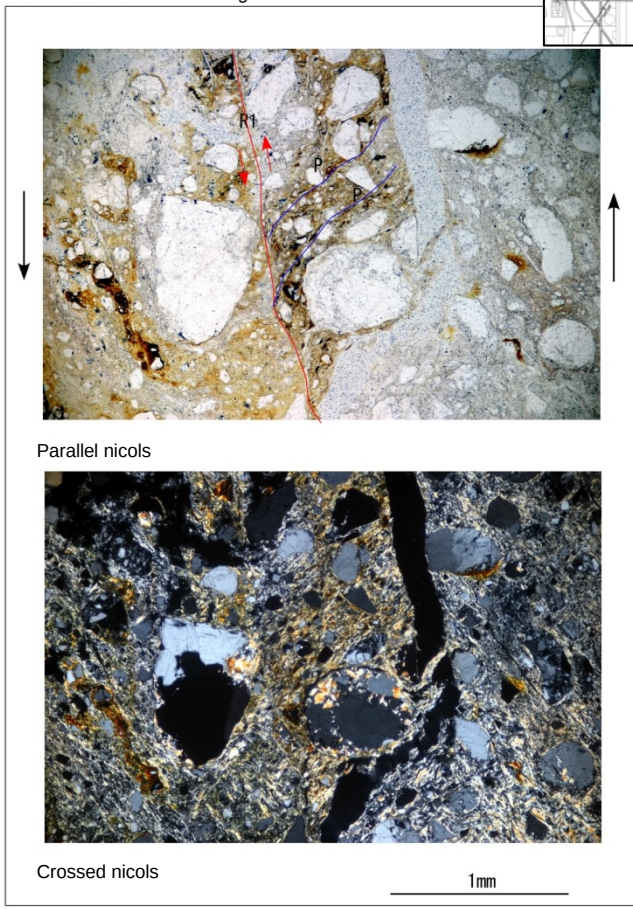
[Displacement sense of shatter zone] Observation results of thin section from G fault in the south of northern pit of D-1 trench (vertical components)

D-1 trench YZ direction





Area within red frame is enlarged

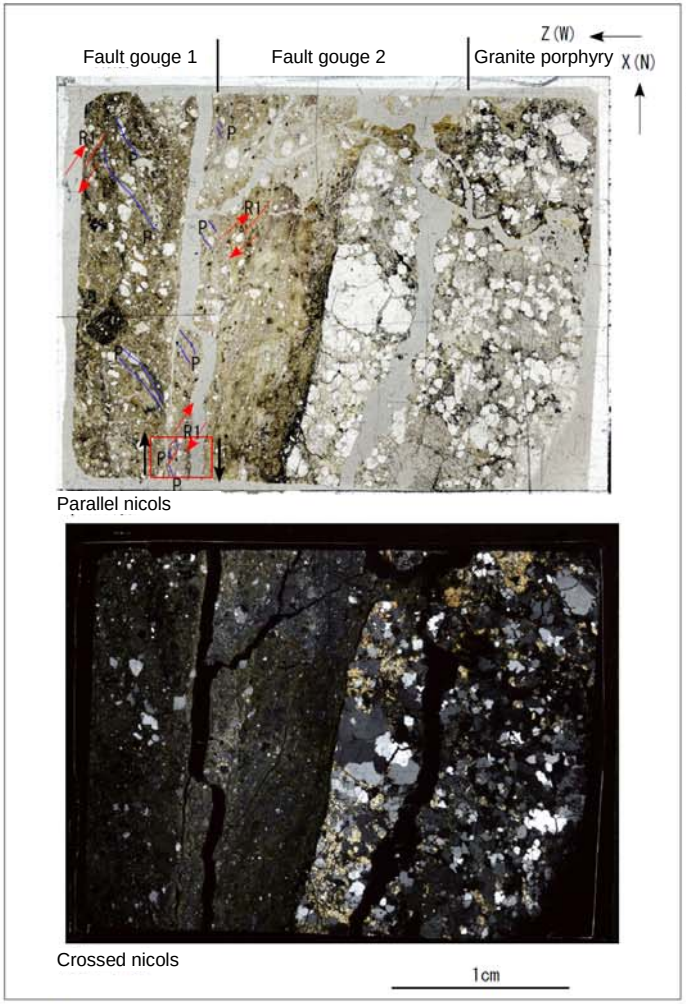


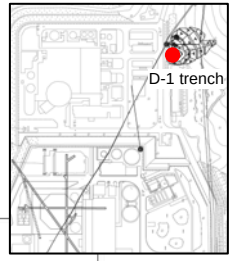
10cm

- Cataclasite
  Consists of the brown-gray matrix of fine grain, as well as quartz, feldspar and cataclasite fragments that are sub-angular or semi-circular gravels with diameters of 0.1 to 3 mm. The matrix contains less clay minerals. The displacement sense of normal fault can be recognized from R1 and P.
- Fault gouge 1 (last slip)
  Consists of the brown-gray matrix of fine grain, as well as quartz, feldspar and cataclasite fragments that are semi-circular or sub-angular gravels with diameters of 0.1 to 10 mm. The matrix contains lots of clay minerals. The displacement sense of normal fault can be recognized from R1 and P.
- Fault gouge 2
  Consists of the brown-gray matrix of fine grain, as well as quartz, feldspar and cataclasite fragments that are semi-circular or sub-angular gravels with diameters of 0.1 to 2 mm. Ratio of fragments is lower than in fault gouge 1. The matrix contains lots of clay minerals. The displacement sense of unclear normal fault can be recognized from R1.
- Granite porphyry
  Consists of granite porphyry, quartz and feldspar fragments with diameters of 0.1 to 2 mm.

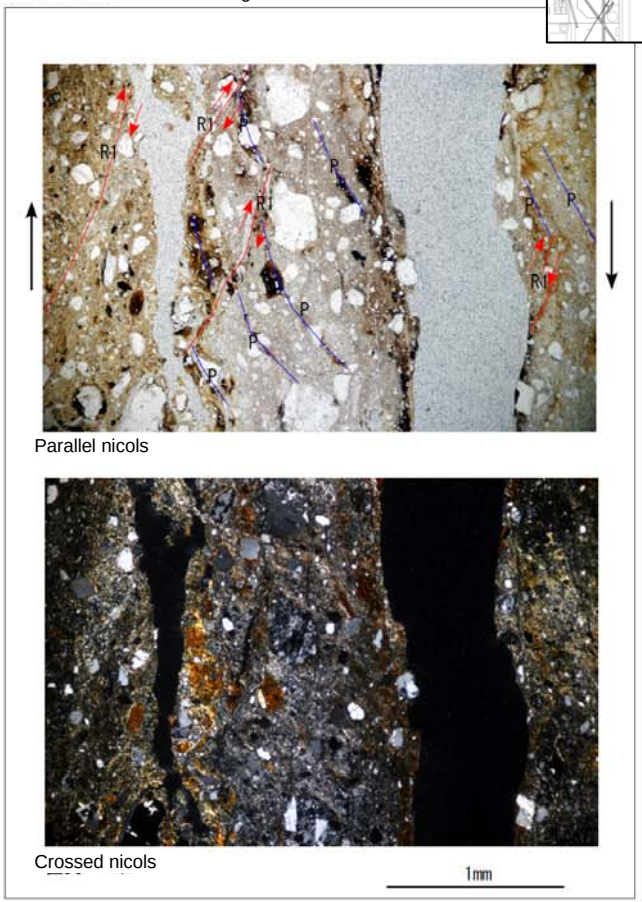
[Displacement sense of shatter zone] Observation results of thin section from G fault in the south of northern pit of D-1 trench (horizontal components)

D-1 trench XZ direction





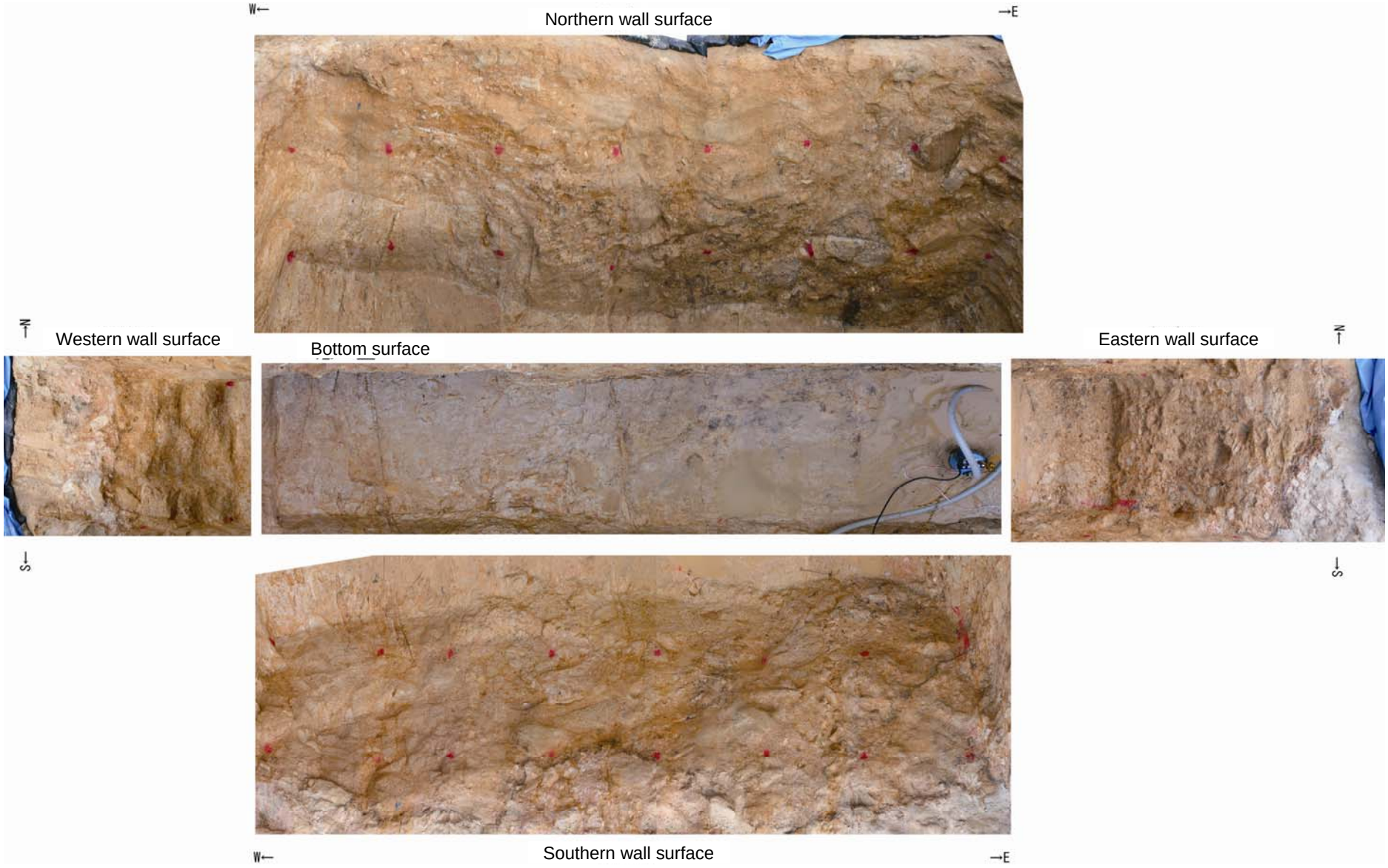
Area within red frame is enlarged



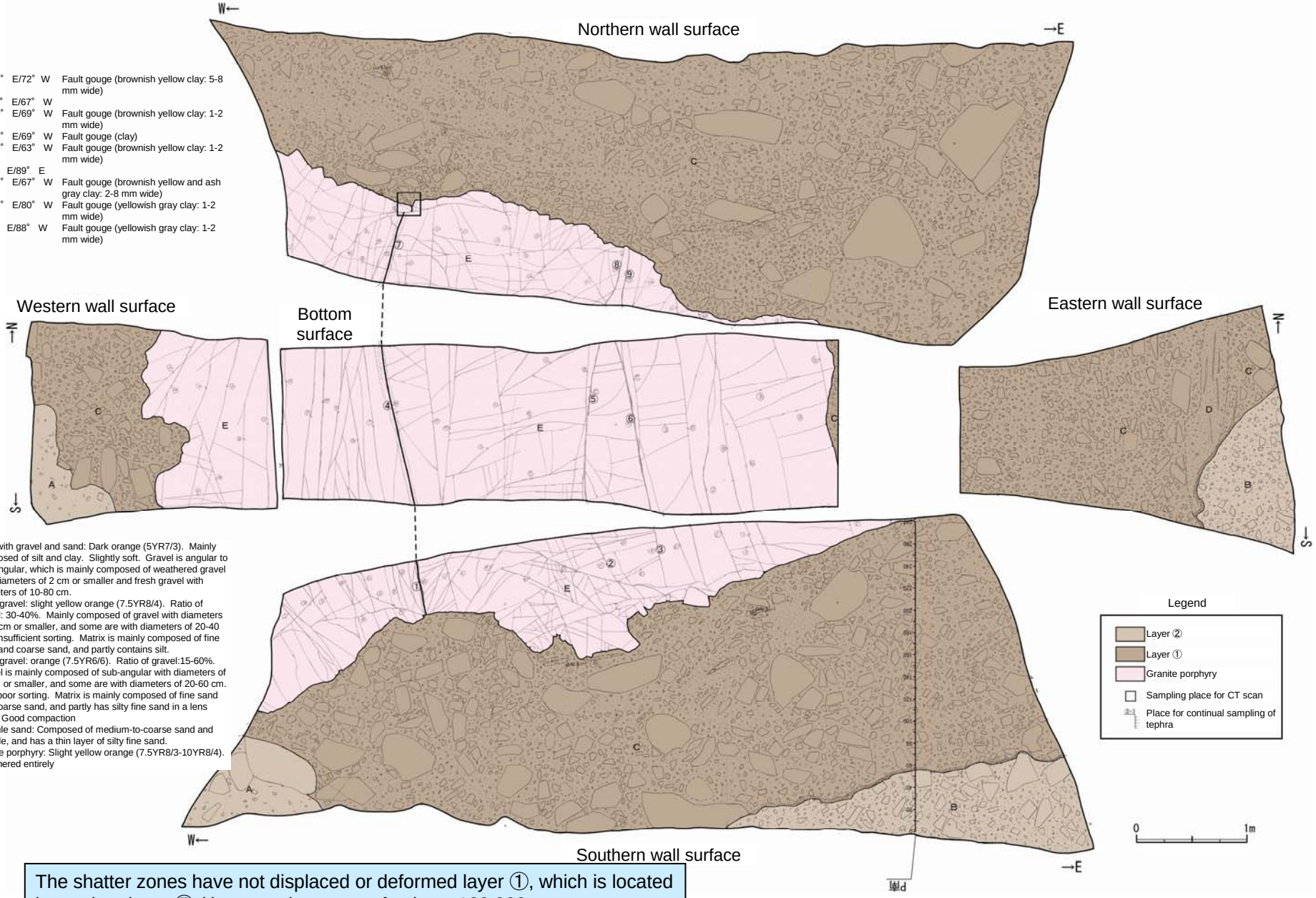
10cm

- Fault gouge 1
  Consists of the brown-gray matrix of fine grain, as well as quartz, feldspar and cataclasite fragments that are sub-angular or semi-circular gravels with diameters of 0.1 to 3 mm. The matrix contains lots of clay minerals. The displacement sense of right-lateral slip can be recognized from R1 and P.
- Fault gouge 2 (last slip)
  Consists of the brown-gray matrix of fine grain, as well as quartz, feldspar and cataclasite fragments that are semi-circular or sub-angular gravels with diameters of 0.1 to 2 mm. Ratio of fragments is lower than in fault gouge 1. The matrix contains lots of clay minerals. The displacement sense of right-lateral slip can be recognized from R1 and P.
- Granite porphyry
  Consists of granite porphyry, quartz and feldspar fragments with diameters of 0.1 to 2 mm.

D-1 trench (photo of southern pit)



D-1 trench (sketch of southern pit)



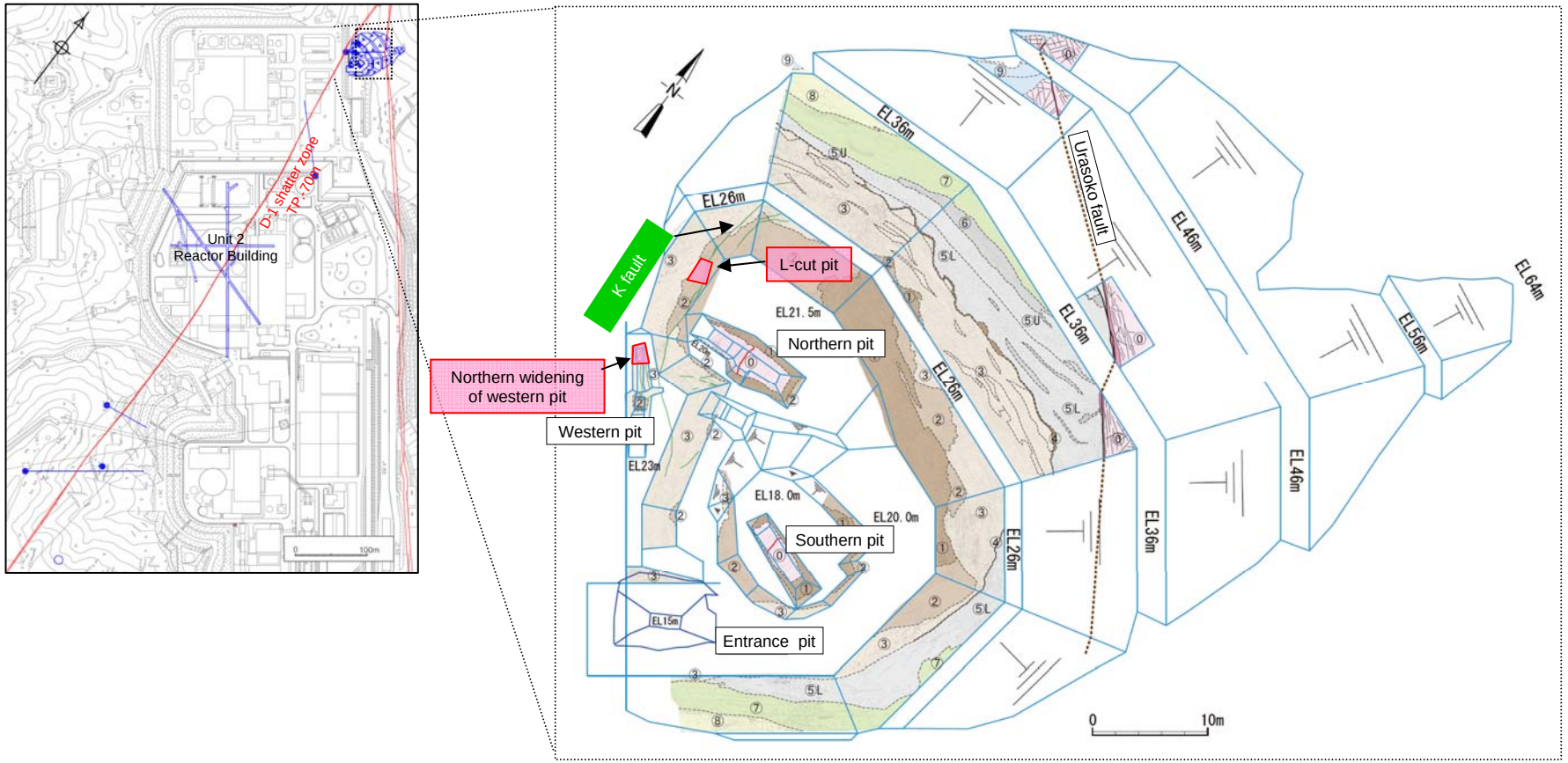
① f: N13° E/72° W Fault gouge (brownish yellow clay: 5-8 mm wide)
② j: N24° E/67° W
③ f: N10° E/69° W Fault gouge (brownish yellow clay: 1-2 mm wide)
④ f: N13° E/69° W Fault gouge (clay)
⑤ f: N20° E/63° W Fault gouge (brownish yellow clay: 1-2 mm wide)
⑥ f: N9° E/89° E
⑦ f: N13° E/67° W Fault gouge (brownish yellow and ash gray clay: 2-8 mm wide)
⑧ f: N21° E/80° W Fault gouge (yellowish gray clay: 1-2 mm wide)
⑨ f: N7° E/88° W Fault gouge (yellowish gray clay: 1-2 mm wide)

A: Clay with gravel and sand: Dark orange (5YR7/3). Mainly composed of silt and clay. Slightly soft. Gravel is angular to sub-angular, which is mainly composed of weathered gravel with diameters of 2 cm or smaller and fresh gravel with diameters of 10-80 cm.
B: Sand gravel: slight yellow orange (7.5YR8/4). Ratio of gravel: 30-40%. Mainly composed of gravel with diameters of 20 cm or smaller, and some are with diameters of 20-40 cm. Insufficient sorting. Matrix is mainly composed of fine sand and coarse sand, and partly contains silt.
C: Sand gravel: orange (7.5YR6/6). Ratio of gravel:15-60%. Gravel is mainly composed of sub-angular with diameters of 20 cm or smaller, and some are with diameters of 20-60 cm. Very poor sorting. Matrix is mainly composed of fine sand and coarse sand, and partly has silty fine sand in a lens form. Good compaction
D: Granule sand: Composed of medium-to-coarse sand and granule, and has a thin layer of silty fine sand.
E: Granite porphyry: Slight yellow orange (7.5YR8/3-10YR8/4). Weathered entirely

The shatter zones have not displaced or deformed layer ①, which is located lower than layer ⑤ (that contains strata of at least 120,000 years ago or earlier including Mihama-tephra).

Evaluation on continuity of K fault

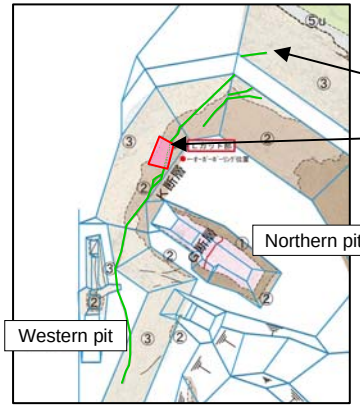
Newly obtained data after February 5, 2013



- At the K fault, a reverse fault, which is located between basement rock and deposit, can be recognized from observation of L-cut pit and northern widening of western pit.
- It can be recognized that fault strike is a direction of N-S in L-cut pit but it changes to a direction NNW-SSE in northern widening of western pit. It is suggested that the K fault does not extend to the direction of Unit 2 rector building.
- Additional drilling and pit investigation are undergoing now. To study continuity and cause of K fault, additional data is being obtained.

Photographs of L-cut pit

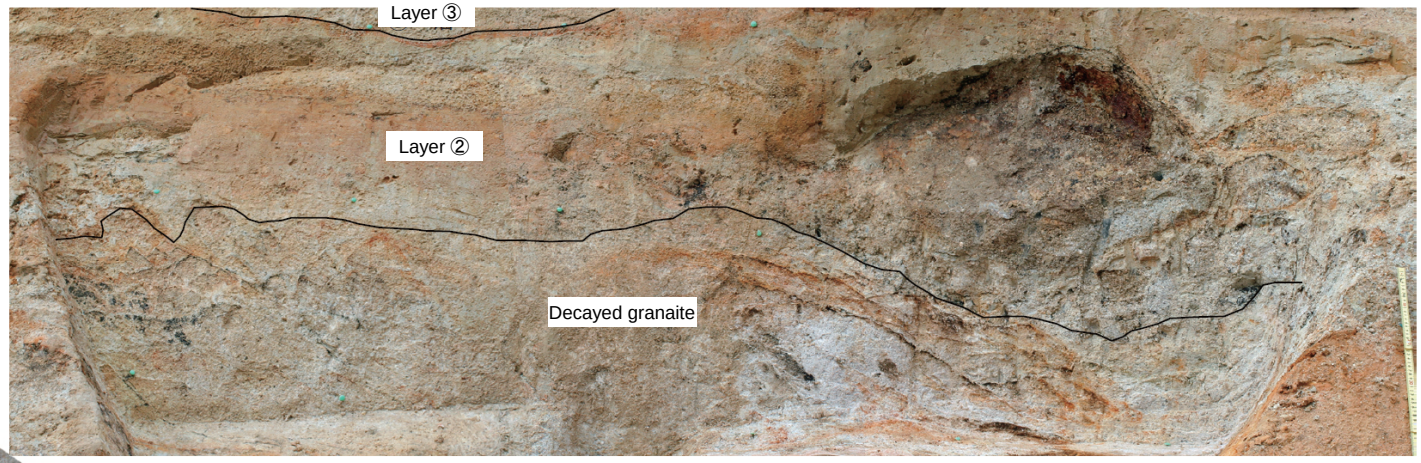
Newly obtained data after February 5, 2013

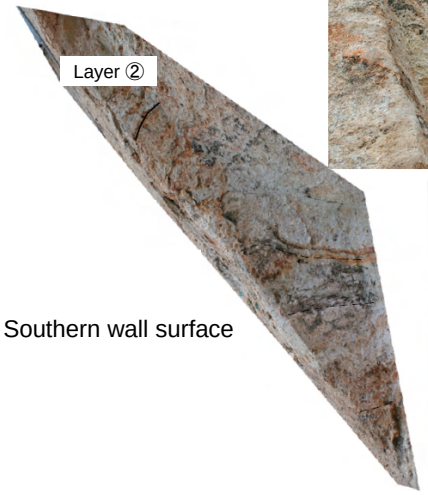


S←

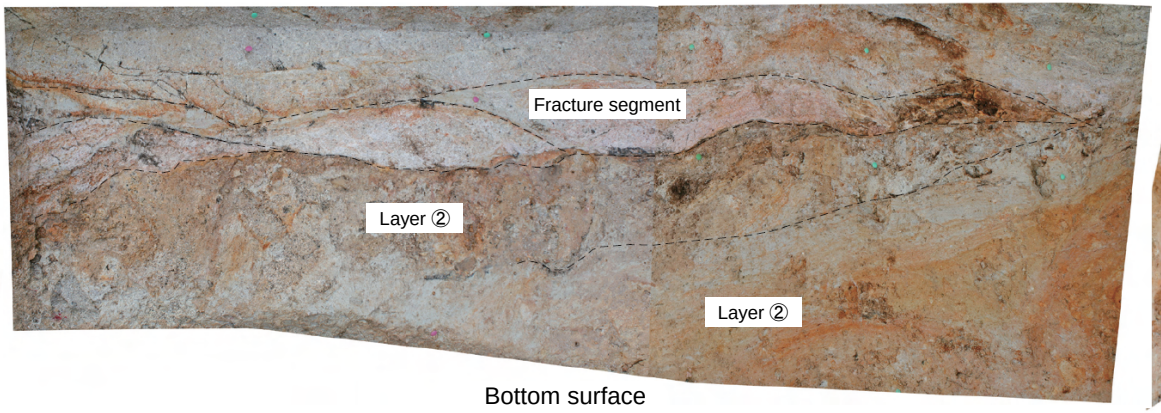
Western wall surface

→N

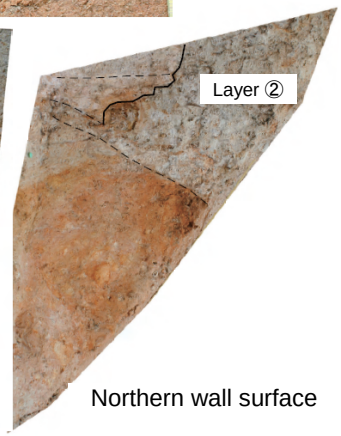




Southern wall surface



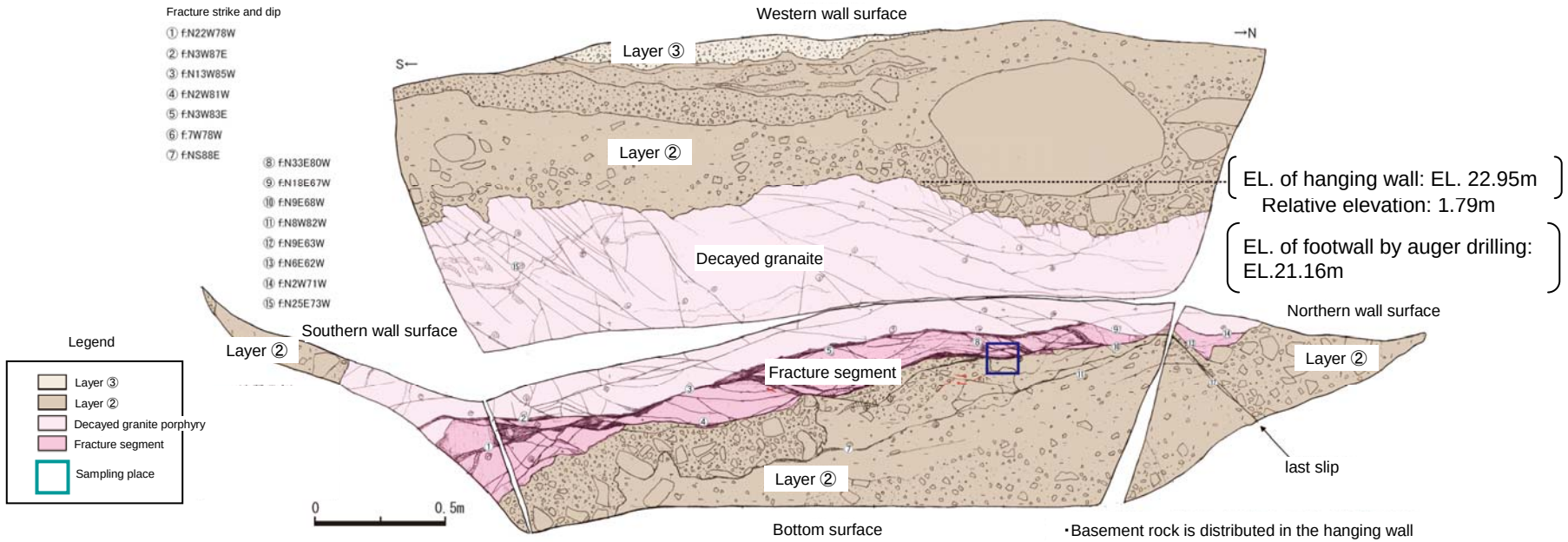
Bottom surface



Northern wall surface

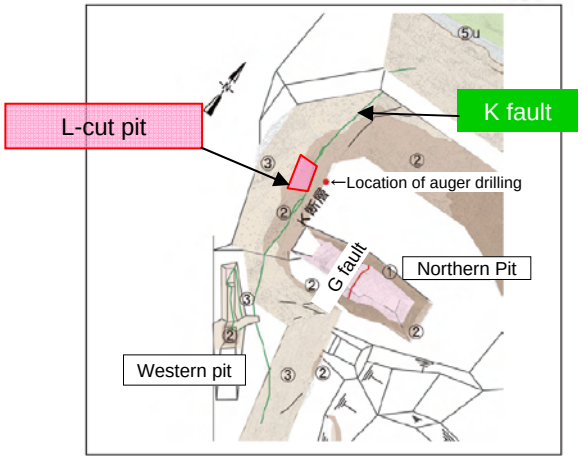
Sketch of L-cut pit

Newly obtained data after February 5, 2013

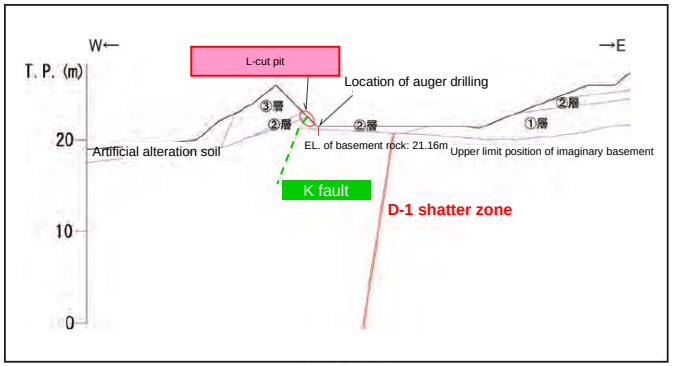


EL. of hanging wall: EL. 22.95m
Relative elevation: 1.79m

EL. of footwall by auger drilling: EL.21.16m



Plain view



Cross-section view

・Basement rock is distributed in the hanging wall of the shear plane, deposit is distributed in the footwall.

・In the hanging wall above a shear plane, 10-30cm width fracture segment is distributed. In the deposit (Layer ②), fracture and shear structure is developing along the line of a boundary plane with the basement. A linear fault gouge is not recognized. The R1 planes with a few centimeters displacement finely slips the shear planes.

・At the R1 plane in the fracture segment and the deposit (Layer ②), right-lateral slips are observed.

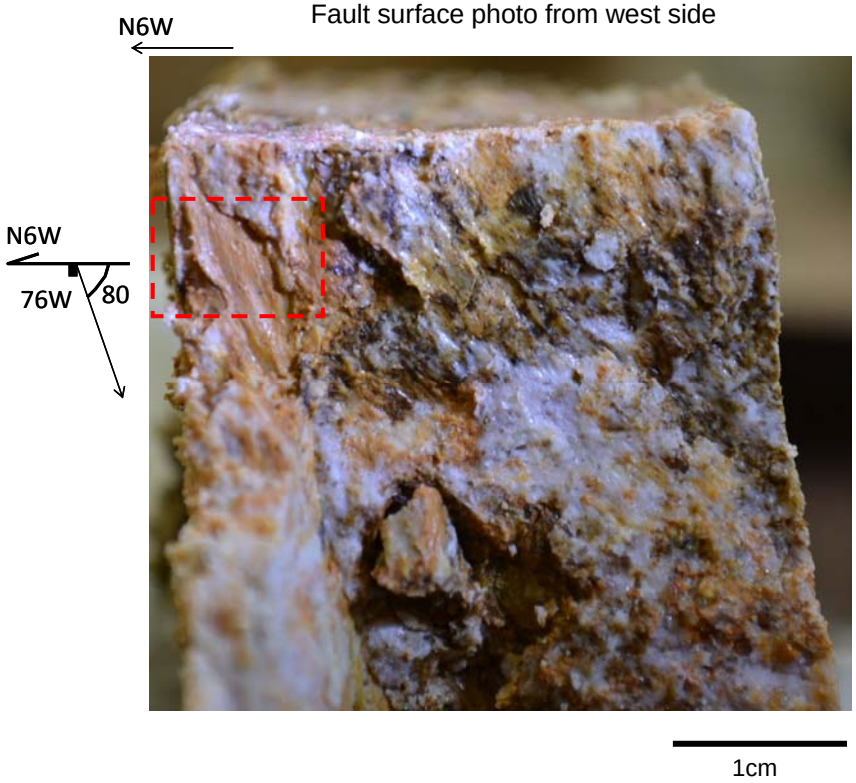
・The relative vertical is 1.79m, that is calculated from the upper limit surface of the hanging wall and auger boring close to the footwall.

・K fault was recognized between decayed granite porphyry and layer ② at L-cut pit.
・Strike and dip of K fault is a direction of N-S and high-angle westerly dip. K fault consist of gray fracture segments with hydrothermal alteration.
・K fault is a reverse fault with right-lateral slip. Relative vertical displacement of basement rock is about 1.8m.

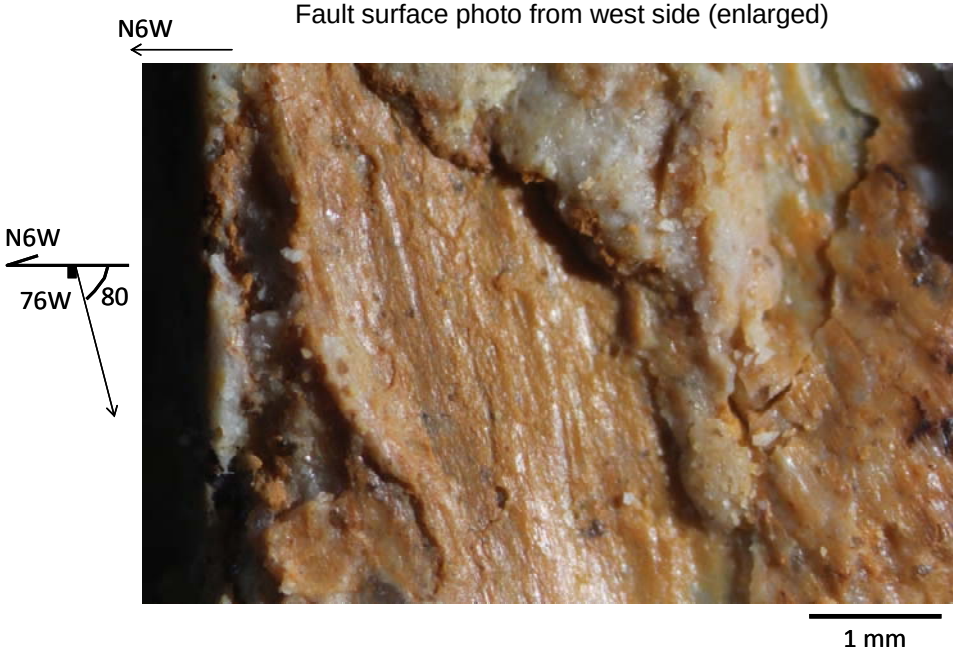
The slickenline of K fault in the L-cut pit (photo)

Newly obtained data after February 5, 2013

Fault surface photo from west side



Fault surface photo from west side (enlarged)



・At the L-cut pit, a block of K-fault (N-S strike) was sampled and slickenline of the last slip was observed.

・In the result, it is confirmed that the reverse fault displacement component is dominant.

D-1 trench (photo of western pit)

Western wall

Northern wall (north)

Western wall (south)

Northern wall (south)

Eastern wall (south)

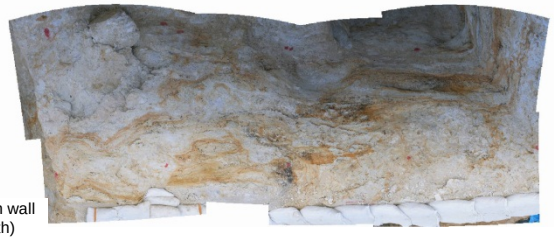
Bottom surface (north)

Berm

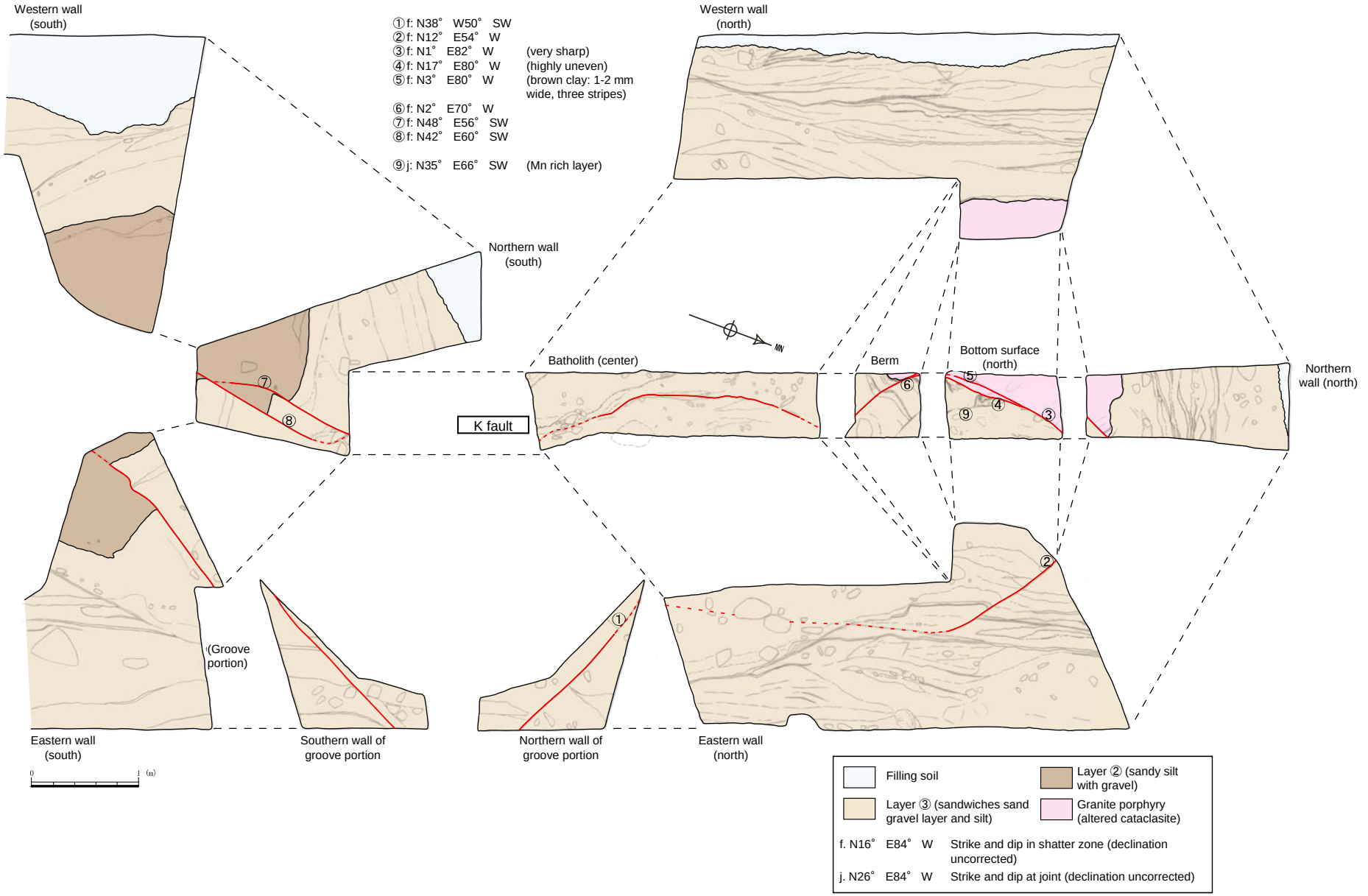
Southern wall of groove portion

Northern wall of groove portion

Eastern wall (north)

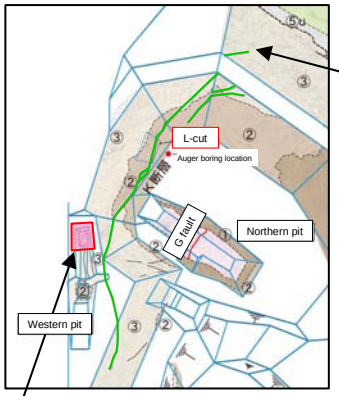


D-1 trench (sketch of western pit)



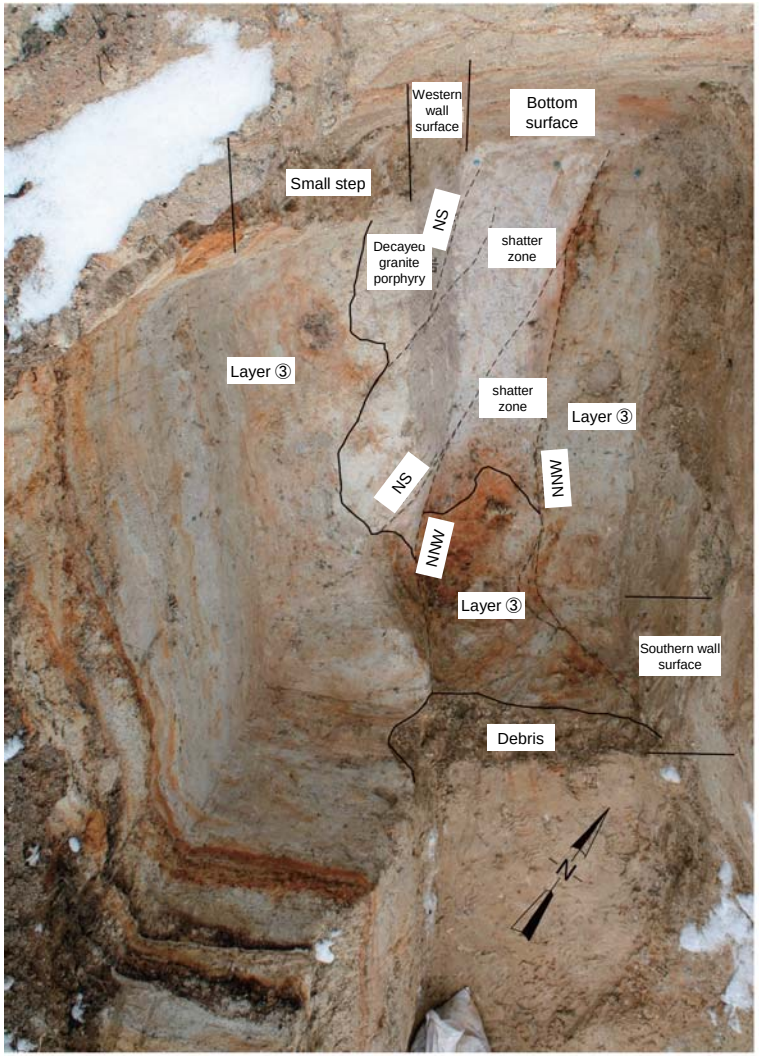
Northern widening of western pit（photo）

Newly obtained data after February 5, 2013

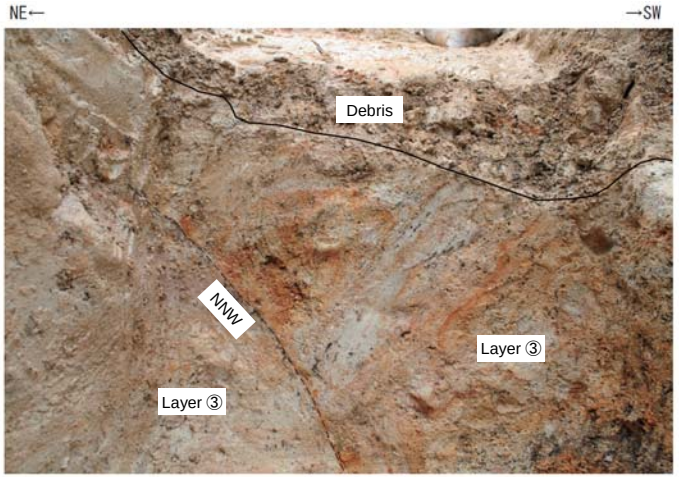


K fault

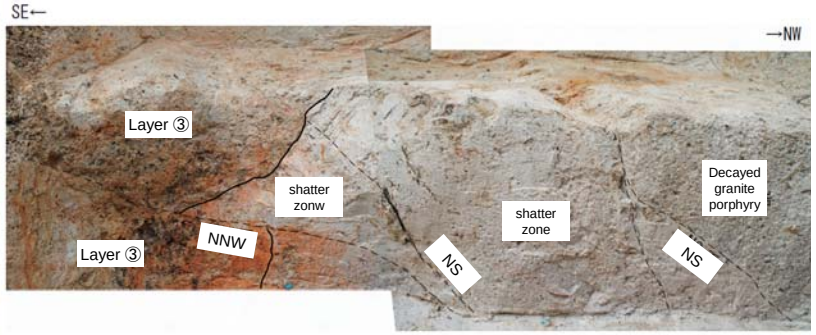
Northern widening of western pit



Northern widening of northern pit



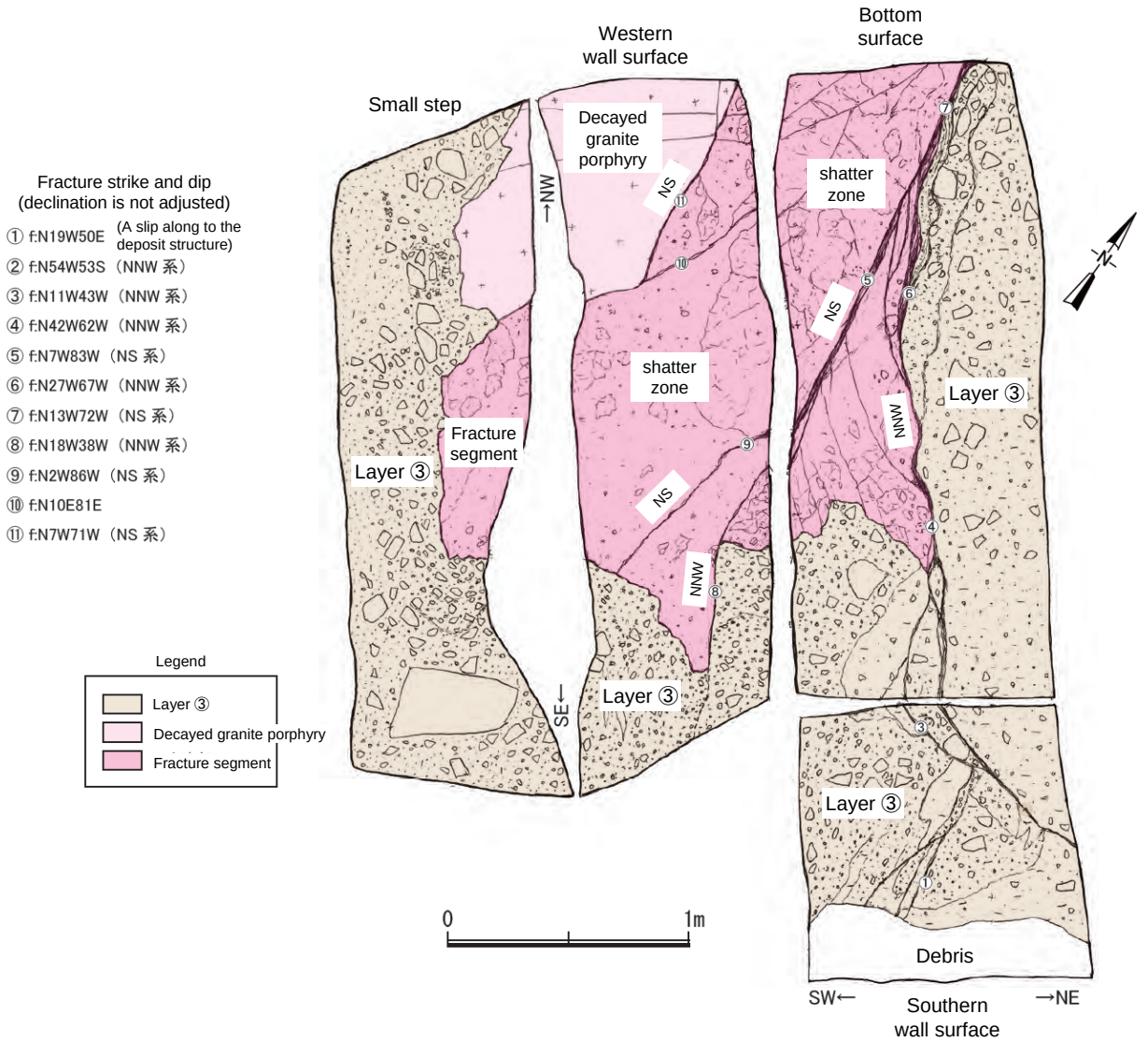
Southern wall surface



Western wall surface (lower part)

Northern widening of western pit（sketch）

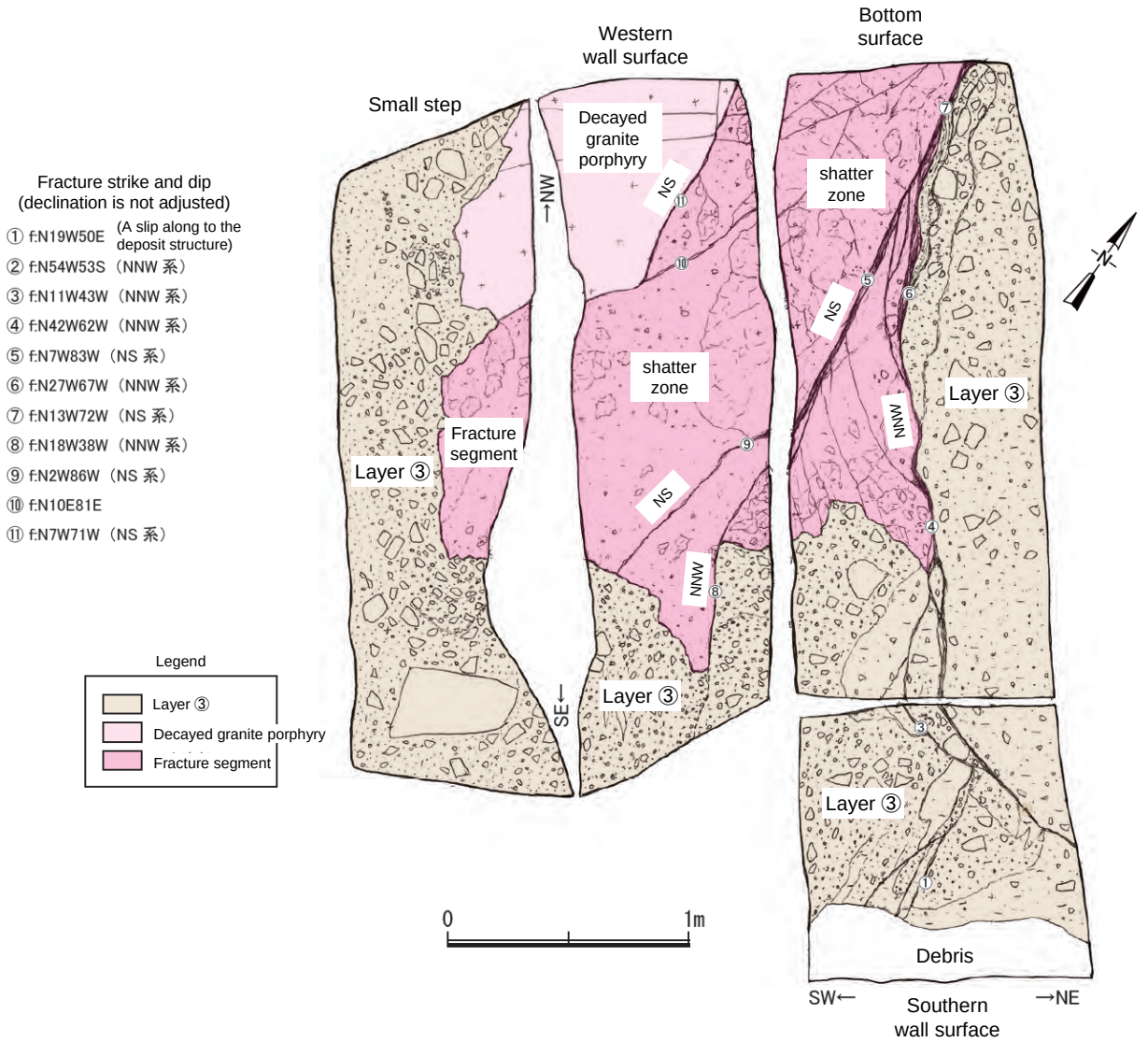
Newly obtained data after February 5, 2013



- The shatter zones running to the directions of N-S and NNW-SSW are recognized in the basement rock at the northern widening of western pit.
- The K fault, which displaces and deform layer ③, has N-S direction strike in the basement rock at the northern widening of western pit. The strike changes its direction to NNW-SSW in the western pit.
- The fracture segment with N-S direction strike does not displace and deform layer ③ in the south part from the bend.

Northern widening of western pit（sketch）

Newly obtained data after February 5, 2013



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