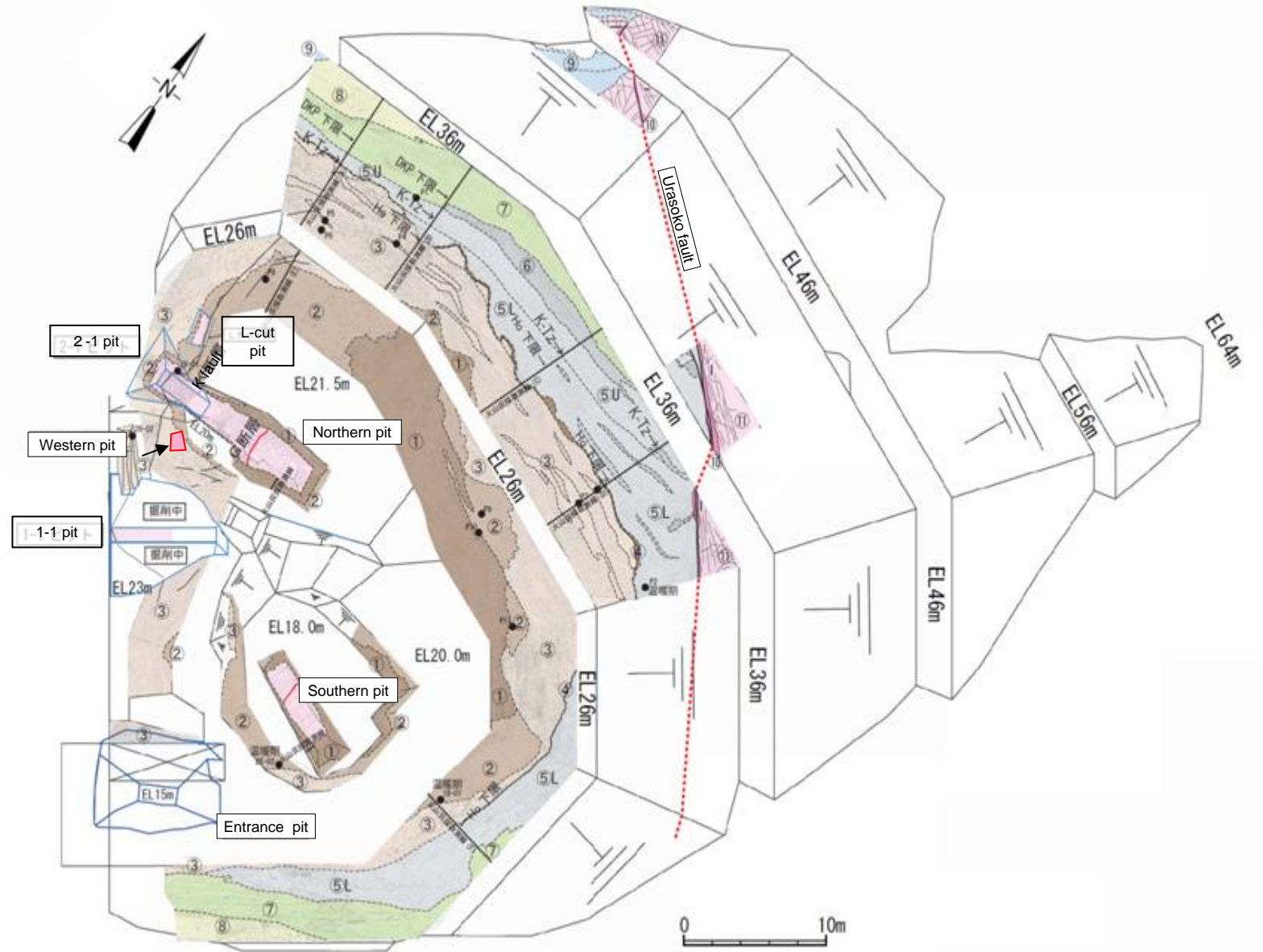
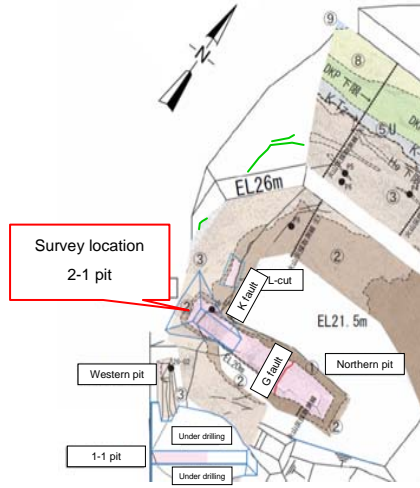


(Draft) EMS's views against JAPC's claim concerning the fault evaluations of Tsuruga PS site, EMS on shatter zones in the site of Tsuruga Power Station		JAPC's opinion	Reference No.
Main texts	Issues		
<p><EMS's views on the claim 2> The evaluation report states that the K fault is 'the structure which continues to the D-1 shatter zone'. The reasons are as follows;</p> <p>(1) As stated in the 'Claim 1', the specialist of geology pointed out as follows, concerning the thin section observations implemented for the G fault and the D-1 shatter zone; - (Skipped) In this way, EMS considers that <u>the evaluation of displacements are not reliable and provides insufficient evidence for the claim that there is no connection between the K fault and the D-1 shatter zone.</u></p>	Same as the Claim 1.	Same as our view on the Claim 1 in the EMS.	—
<p>(2) Especially, the point where the strike of the K fault is bent to the NNW – SSE direction* was <u>recognized mainly in the deposits above the bedrock</u>. In general, the strikes and dips of the faults found in deposits are not constant and they could vary from place to place. Therefore, <u>it is not possible to conclude that the K fault does not head for the direction of the D-1 shatter zone just because the fault in the deposit is bent.</u></p> <p>(3) In addition, <u>faults are not necessarily be extended linearly but turning to the different directions or running parallel after they are once broken, in general. The D-1 shatter zone is considered to have such forms.</u></p> <p>* In the JAPC's report dated April 24, 2003, the direction is described as "NW-SE direction."</p>	<p>1. It has been identified that the K fault was bent in the deposit and the assumption is not credible.</p> <p>2. Because faults are generally bent or running parallel after they are once broken even if they are bent, the D-1 shatter zone is considered to continue to the K fault.</p>	<p>(Outline of today's explanation)</p> <p>1. Forms in the K fault bedrock</p> <ul style="list-style-type: none"> - In the EMS so far, JAPC has repeatedly said that additional surveys are implemented for extension of the K fault to the bedrock. - Based on the EMS's comment that the D-1 shatter zone is not necessarily be extended linearly, surveys have continuously been implemented along the strike of the D-1 shatter zone, considering increasing of the survey points as much as possible. - The pit survey in the D-1 trench confirmed that the strike of the K fault changes to the NW-SE direction also in the bedrock (prompt report). <p>2. Extension of the K fault to the south direction</p> <ul style="list-style-type: none"> - According to the thin section observation of the B14-2 drilling between the unit 2 reactor building and the D-1 trench, there was no shatter zone with reverse fault sense which the K fault has at all. Therefore, the K fault is not extended further south than the B14-2 drilling. <p>(Point to be clarified by EMS)</p> <ul style="list-style-type: none"> - EMS's evidence that 'the D-1 shatter zone is considered to have such forms'. 	46-60



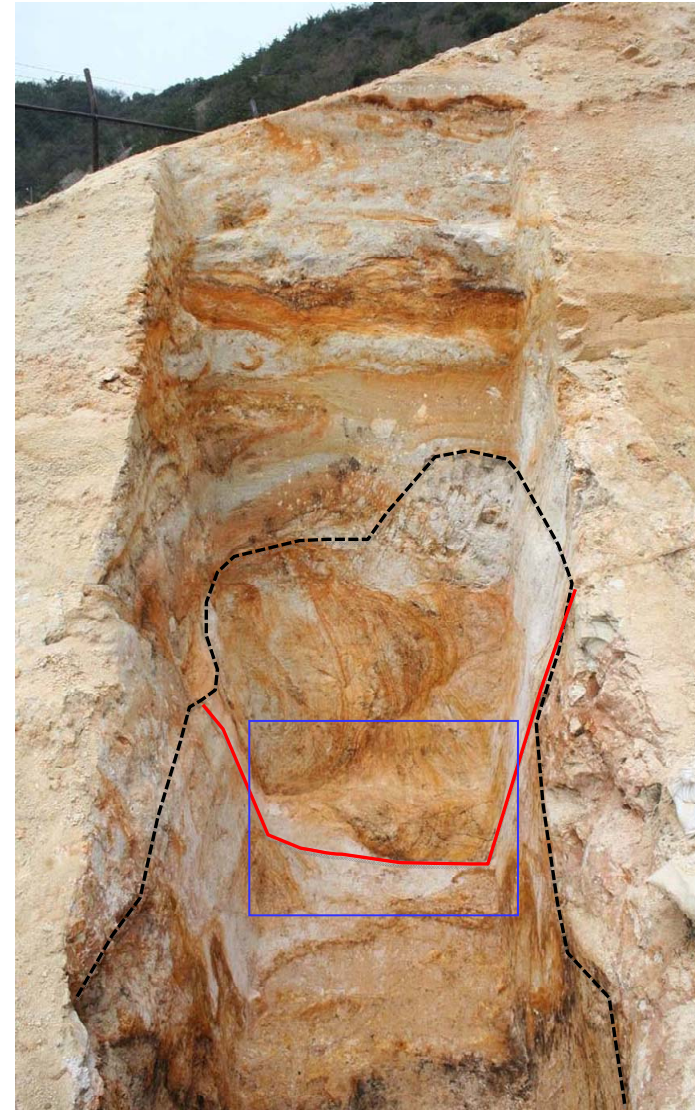
• At D-1 trench, 2-1 and 1-1 pit surveys have been carried out in order to clarify the characteristics, strike, and dip within the basement of the K fault.

Survey on continuity of K fault 2-1 pit



← S

N →



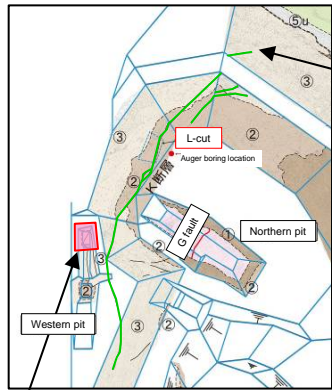
← S

N →



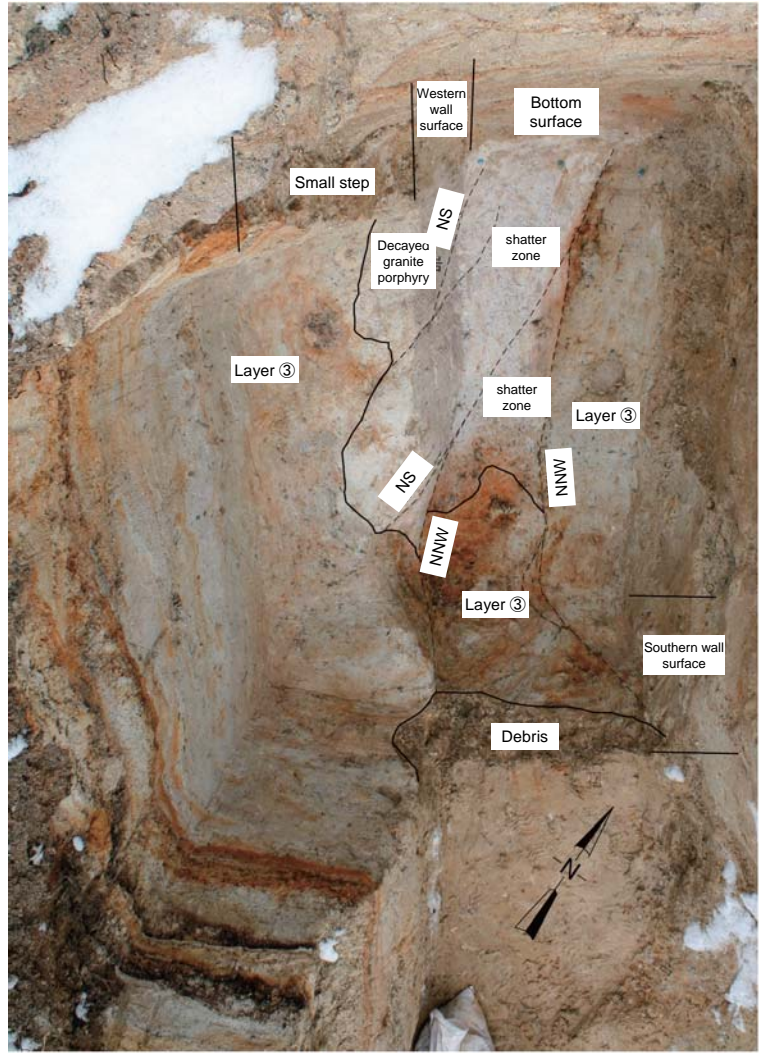
- It is confirmed that the K fault strike is a direction of N-S within the basement based on the result of 2-1pit boring in the side of L-cut pit of D-1 trench.

Survey on continuity of the K fault Northern widening of western pit

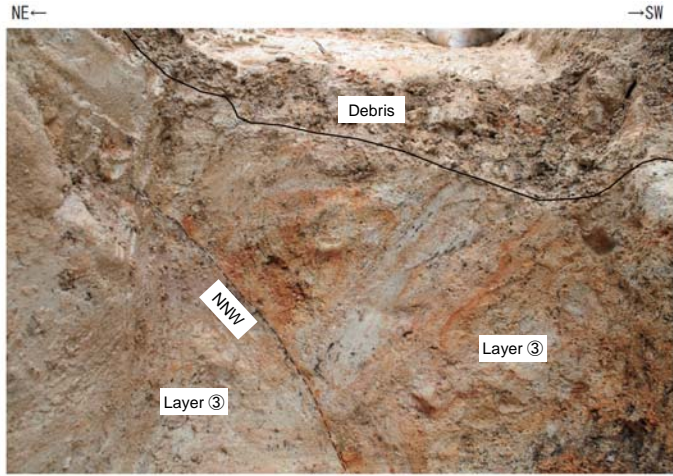


K fault

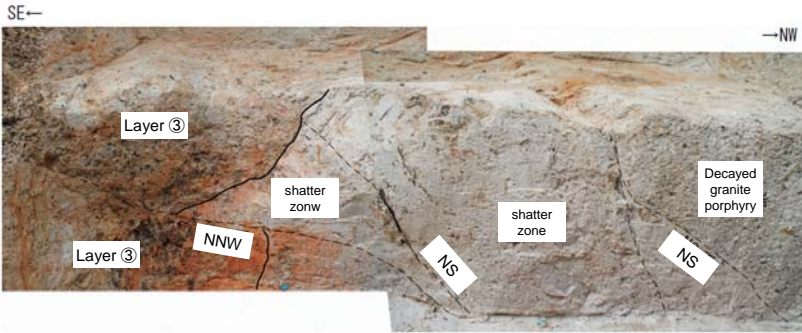
Northern widening of western pit



Northern widening of northern pit

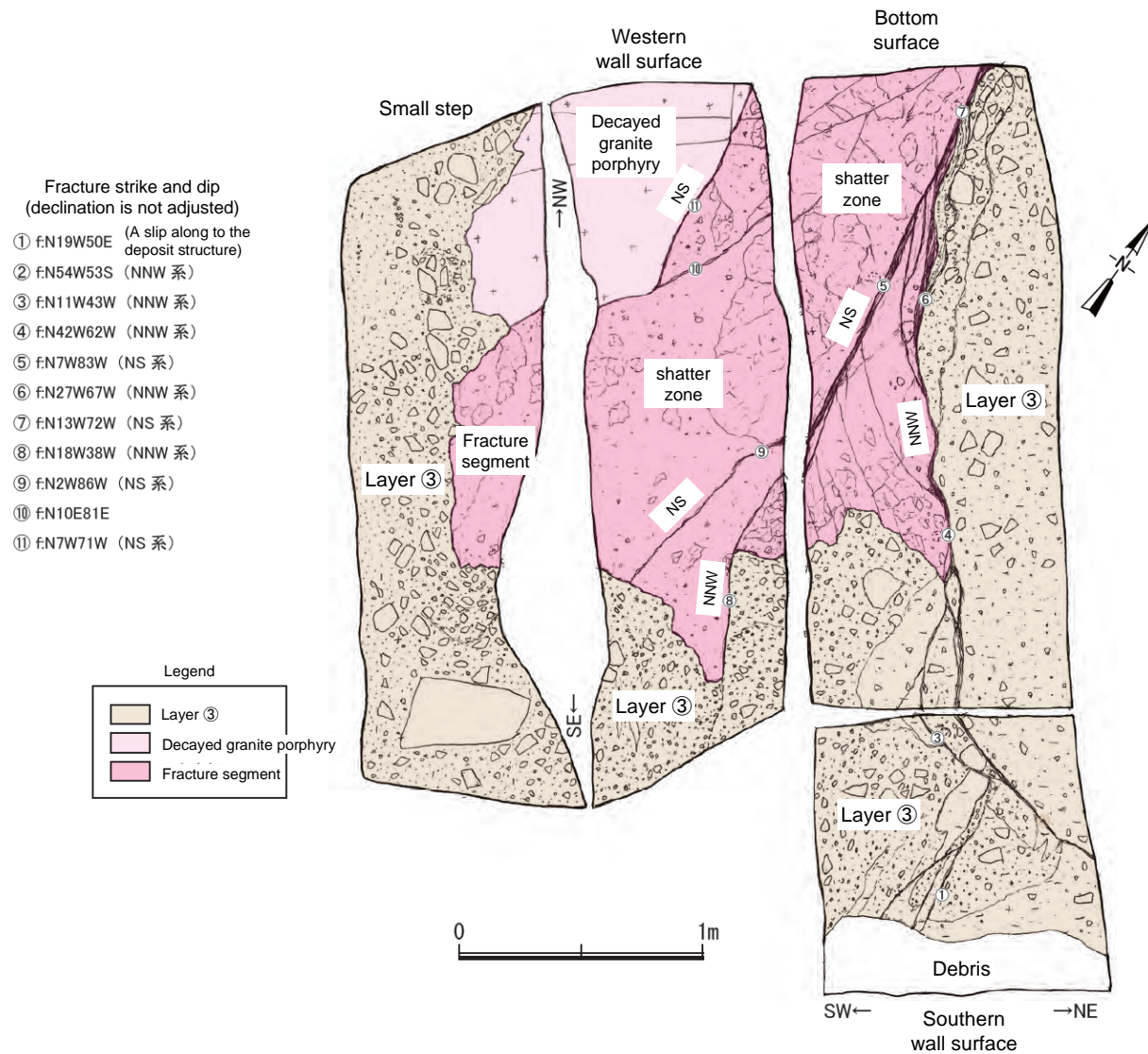


Southern wall surface



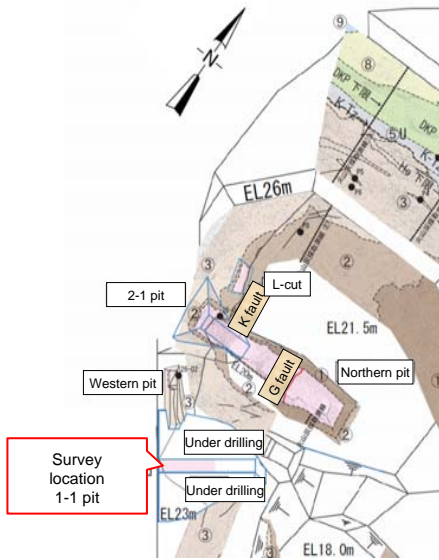
Western wall surface (lower part)

Survey on continuity of the K fault Northern widening of western pit

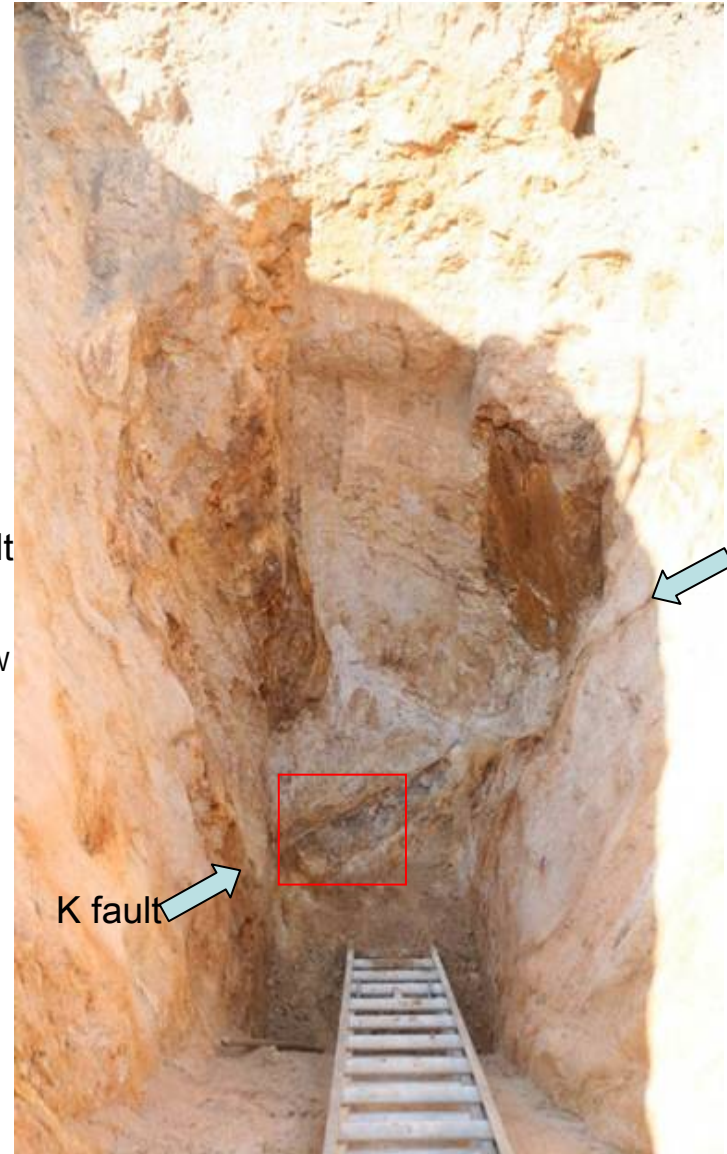


- The shatter zones running to the directions of N-S and NNW-SSW are recognized in the basement rock at the northern widening of western pit.
- The K fault, which displaces and deforms layer ③, has changed its strike directions from N-S to NNW-SSW in the western pit.
- The fracture segment with N-S direction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

Survey on continuity of the K fault 1-1pit (advance report)



SSE ← → NNW



K fault
N56W53SW

K fault

K fault



K fault

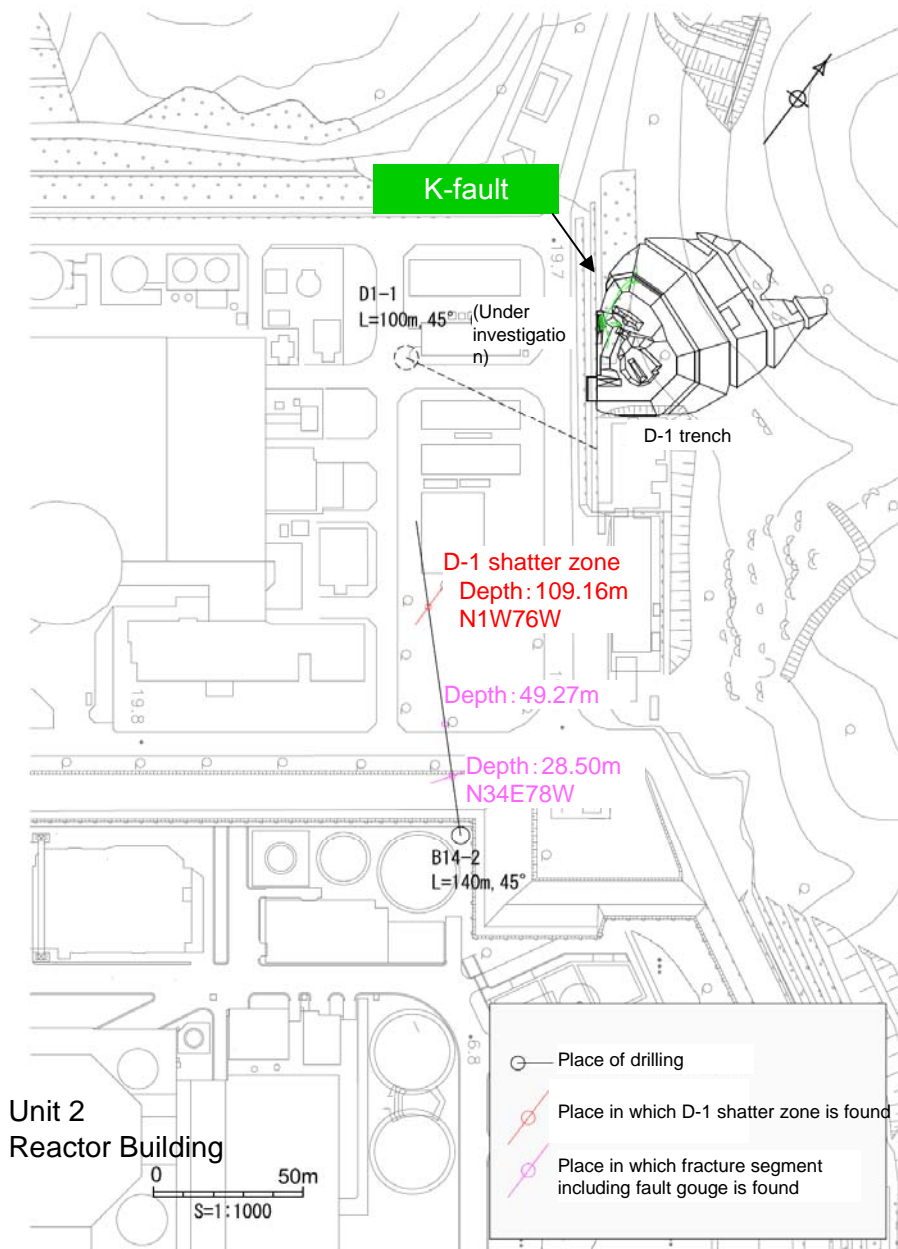
- In the result of 1-1pit boring in the south of western pit of D-1 trench, K fault indicate NW-SE strike in the basement. It is confirmed that the K fault does not extend to the direction of Unit 2 reactor building.

Pit survey plan regarding continuity of the K fault and activity of the G fault

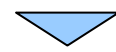


For further clarification of continuity of the K fault, activity of the G fault and so on, additional pit surveys are undergoing now.

Discussion about the K-fault's extension to the southward



- Three fracture segments with fault gouge have been found at B14-2 drilling, that cross the line between Unit 2 reactor building and K-fault.
- Displacement sense of the last slip has normal fault sense at each fracture segments.



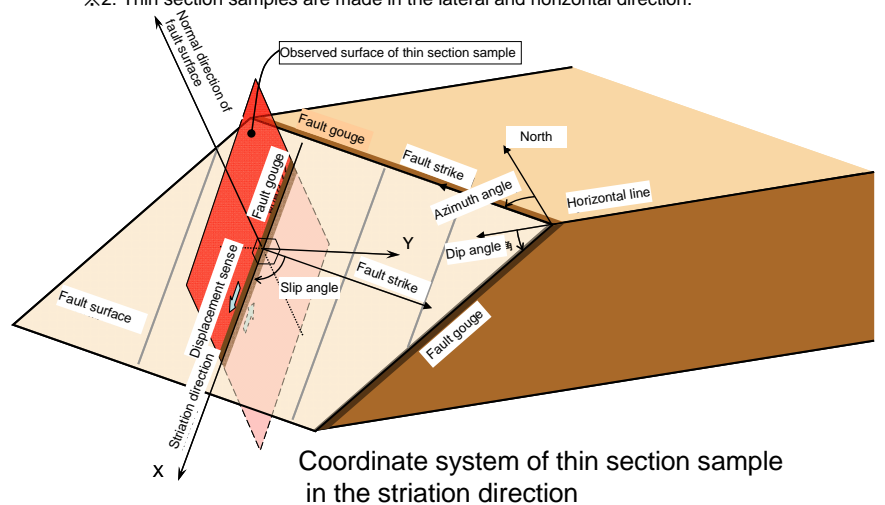
- K-fault, that has reverse fault sense, does not extend to the southward from at least B14-2 drilling place.
- ※To obtain the additional data, drilling at D1-1 is undergoing.

Displacement sense of fracture segment with fault gouge at B14-2

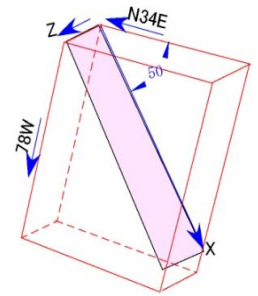
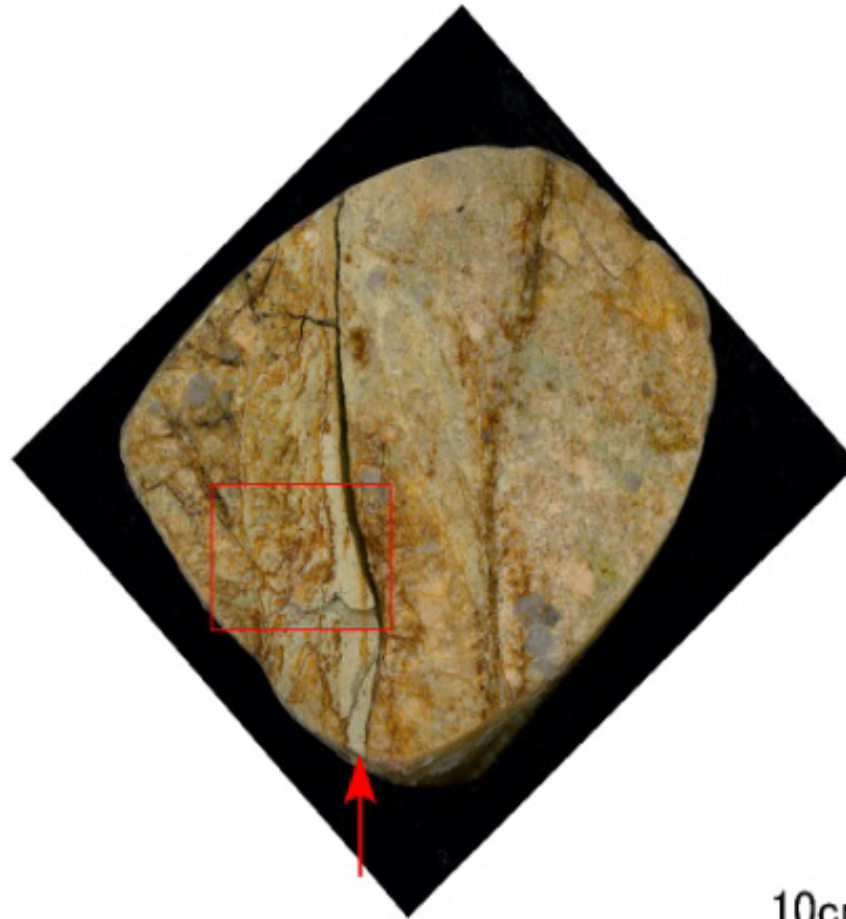
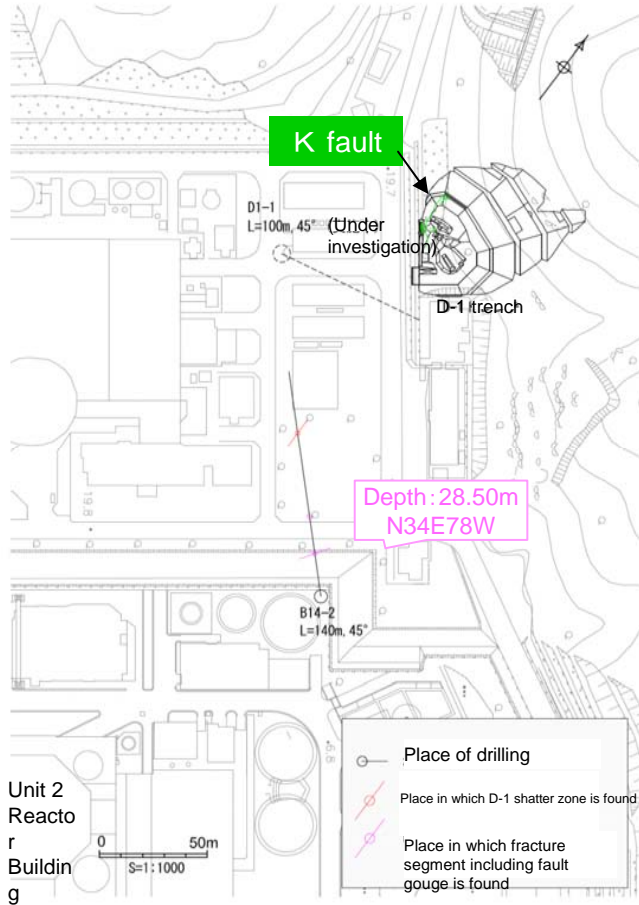
Place	Name of shatter zone	Depth (m)	Strike and dip	Striation direction	Displacement sense (Observation on striation direction of thin section)
B14-2	—	28.50	N34E78W	50S	Normal fault, left-lateral slip
	—	49.27	N44E80SE ※1	75S ※1	Normal fault ※1
	D-1	109.16	N1W76W	—	Normal fault, right-lateral slip ※2

※1: Fault surface is assumed to be high-angle dip like K-fault, because it was impossible to measure strike and dip by bore-hole TV

※2: Thin section samples are made in the lateral and horizontal direction.



[Displacement sense of shatter zone] Observation of polished section of B14-2 depth 28.50m (middle-angle southerly dips components)

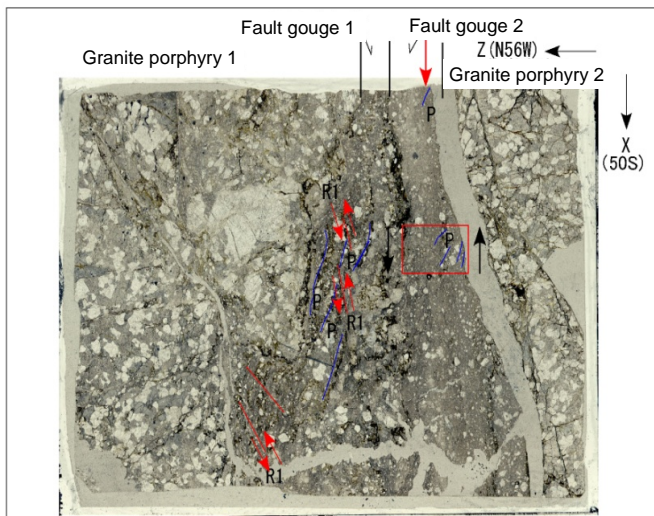
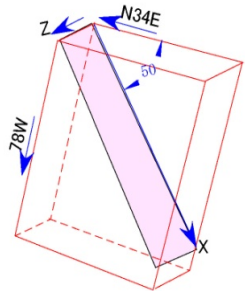
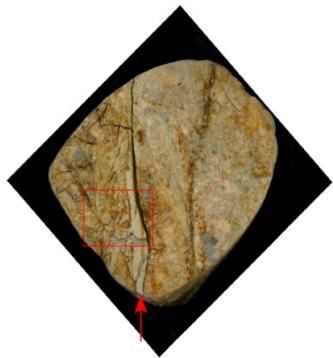


10cm

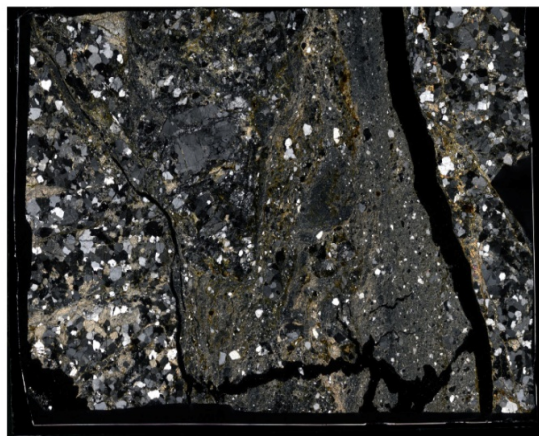
Narrow rectilinear fault gouge has been found in the granite porphyry.

[Displacement sense of shatter zone]

Observation of thin section of B14-2 depth 28.50m (middle-angle southerly dips components)



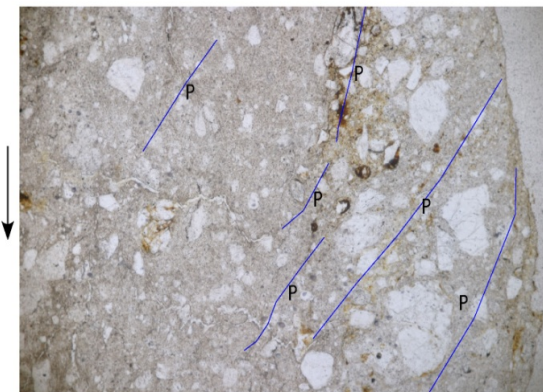
Parallel nicols



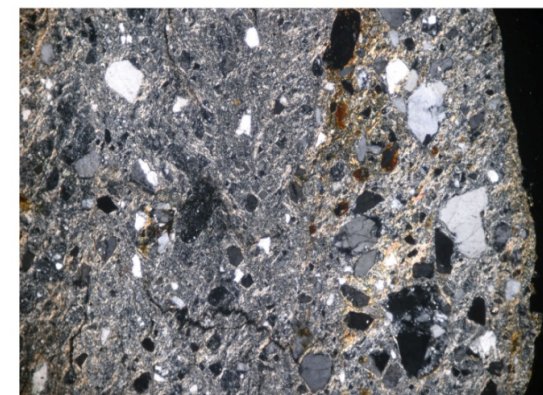
Crossed nicols

1cm

: Area within red frame is enlarged



Parallel nicols



Crossed nicols

1mm

10cm

• Granite porphyry 1

Consist of quartz, potassium feldspar, plagioclase and muscovite with alteration.

• Fault gouge 1

Consists of the brown-gray matrix of fine grain, as well as quartz, feldspar and cataclastic fragments and that are semi-circular or sub-angular gravels with diameters of 0.02 to 3 mm. The matrix contains lots of clay minerals. The displacement sense of westerly dip (normal fault) and left-lateral slip can be recognized from R1 and P.

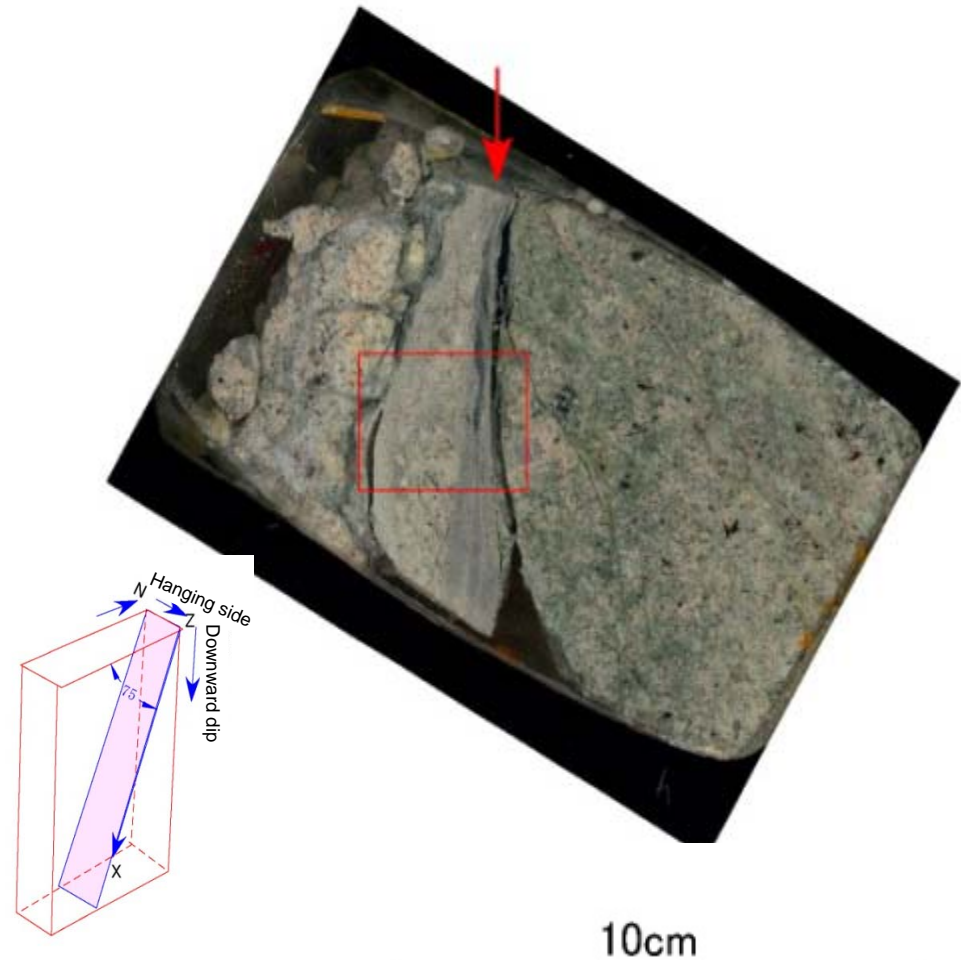
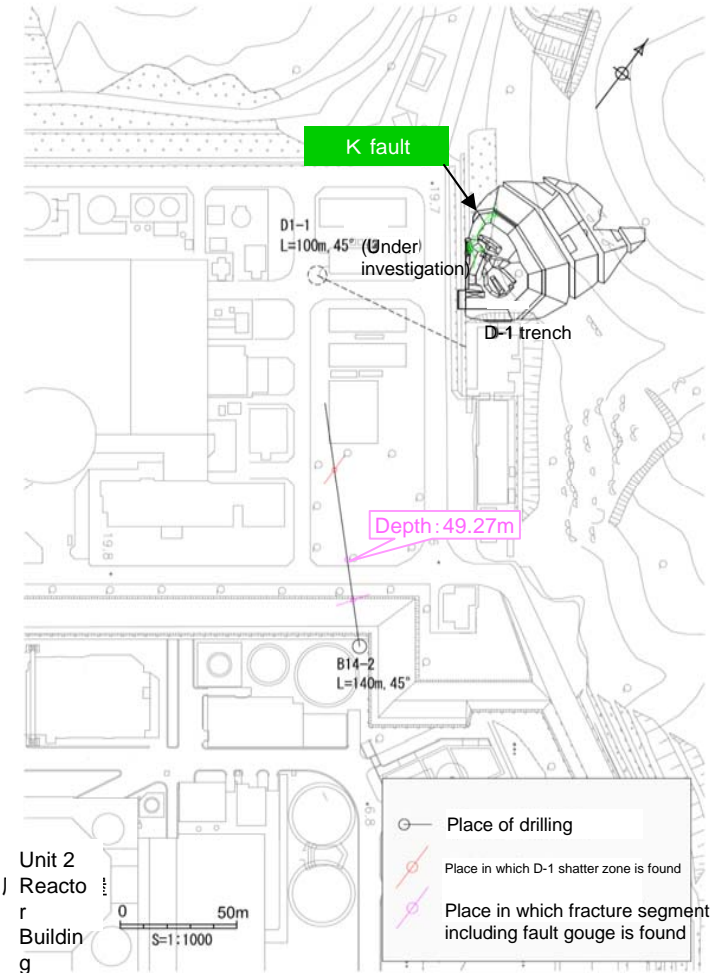
• Fault gouge 2 (last slip)

Consists of the brown-gray matrix of fine grain, as well as quartz, feldspar, granite porphyry and cataclastic fragments and that are semi-circular or sub-angular gravels with diameters of 0.01 to 1 mm. The matrix contains lots of clay minerals. The displacement sense of westerly dip (normal fault) and left-lateral slip can be recognized from P.

• Granite porphyry 2

Consist of quartz, potassium feldspar, plagioclase and muscovite with alteration.

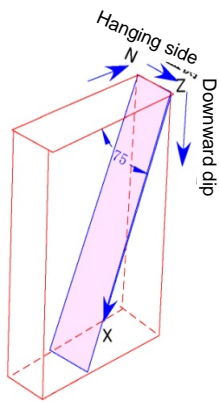
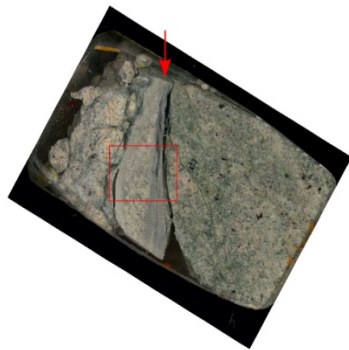
[Displacement sense of shatter zone] Observation of polished section of B14-2 depth 49.27m (high-angle southerly dips components)



※) Fault surface is assumed to be high-angle dip like K-fault, because it was impossible to measure strike and dip by bore-hole TV

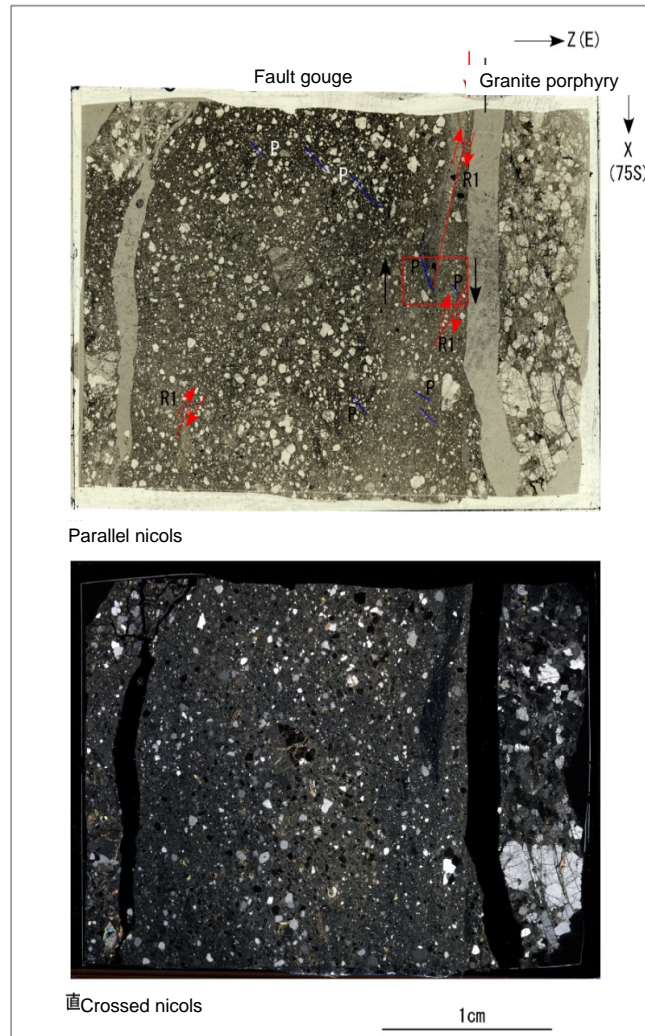
- A few millimeter-breadth of fault gouge has been found in the granite porphyry.
- The fault gouges are segmentalized into two. Foliation is developed in the vicinity of last slip surface.

[Displacement sense of shatter zone] Observation of thin section of B14-2 depth 49.27m
(high-angle southerly dips components)

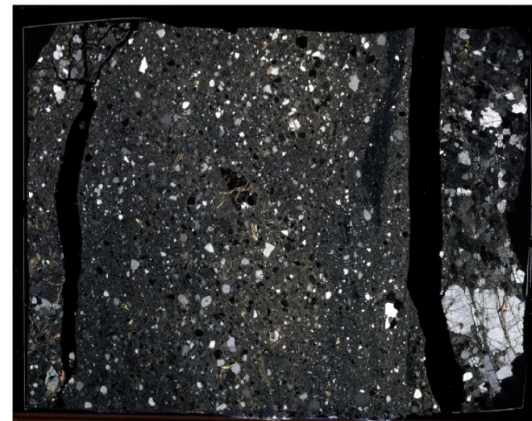


※) Fault surface is assumed to be high-angle dip like K-fault, because it was impossible to measure strike and dip by bore-hole TV

10cm



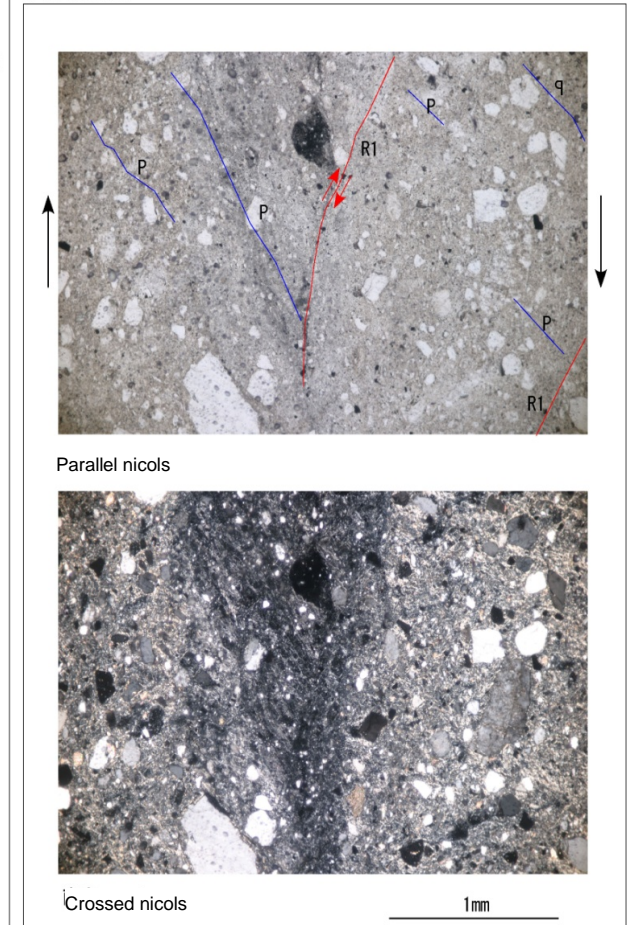
Parallel nicols



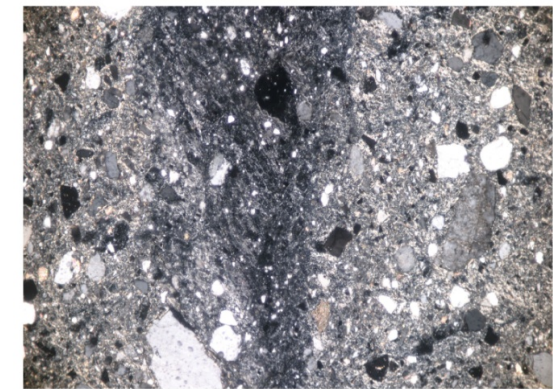
Crossed nicols

1cm

Area within red frame is enlarged



Parallel nicols



Crossed nicols

1mm

• Fault gouge (last slip)

Consists of the brown matrix of fine grain, as well as quartz, feldspar, cataclasite and granite porphyry fragments and that are semi-circular or sub-angular gravels with diameters of 0.02 mm to 5mm. The matrix contains lots of clay minerals and calcite. ~~The displacement sense of easterly dip (normal fault) and right-lateral~~

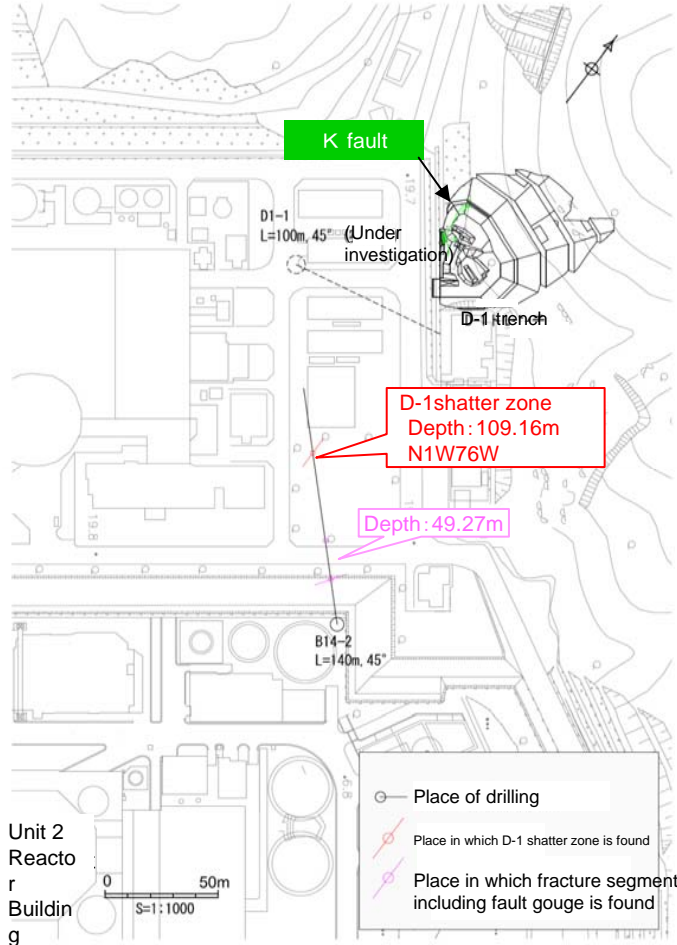
slip can be recognized from R1 and P.

• Granite porphyry

Consist of quarts, potassium feldspar, plagioclase and biotite

B14-2_49.27m_10-1_XZ direction

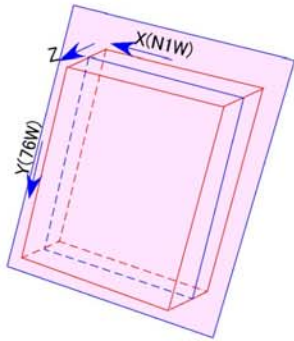
[Displacement sense of shatter zone]
Observation of polished section of B14-2 depth 109.16m (vertical components)



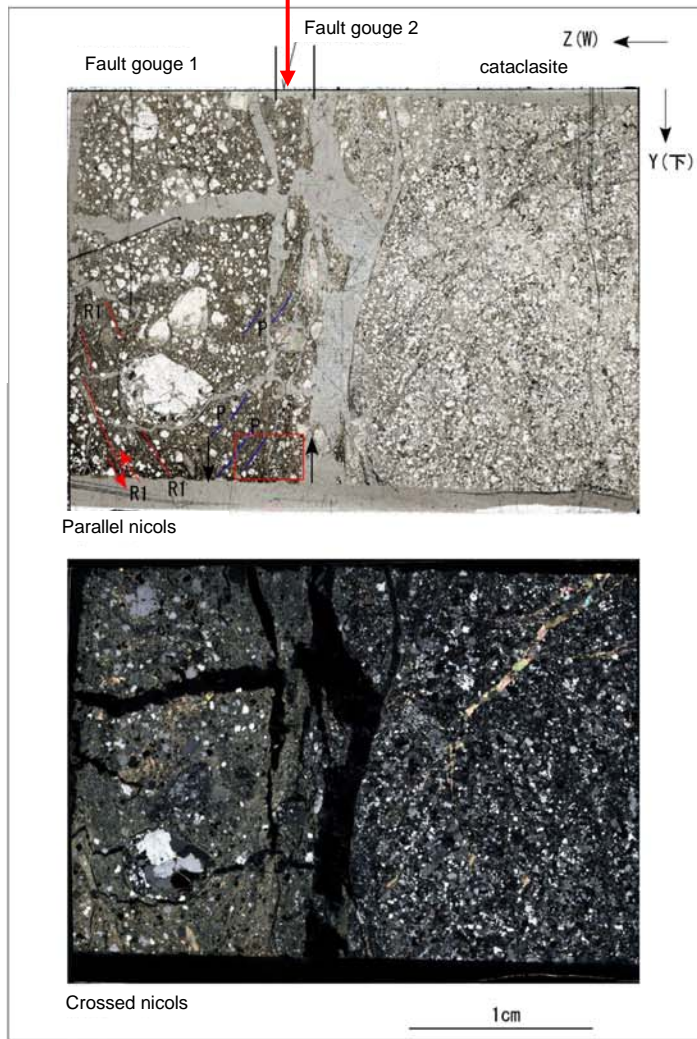
10cm

A few millimeter-breadth of fault gouge has been found in the Cataclasite.

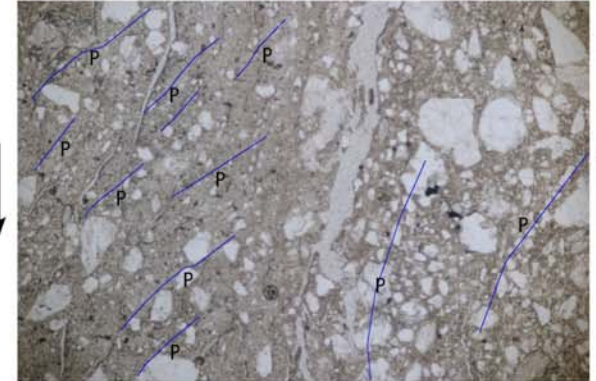
[Displacement sense of shatter zone]
 Observation of thin section of B14-2 depth 109.16m (vertical components)



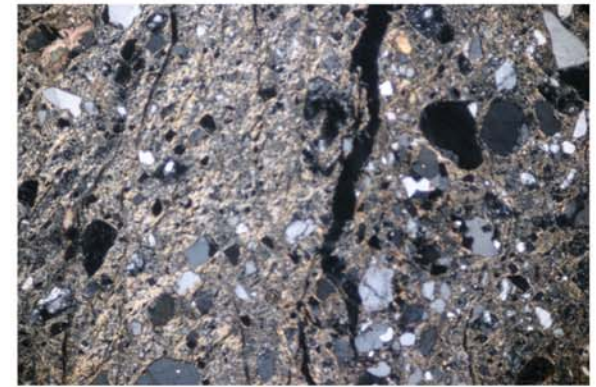
10cm



Area within red frame is enlarged



Parallel nicols



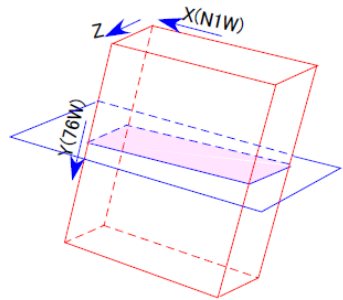
Crossed nicols

• Fault gouge 1
 Consists of the brown matrix of fine grain, as well as quartz, feldspar, granite porphyry and cataclasite fragments and that are semi-circular or sub-angular gravels with diameters of 0.02 mm to 5mm. The matrix contains lots of clay minerals and calcite. The displacement sense of normal fault can be recognized from R1 and P.

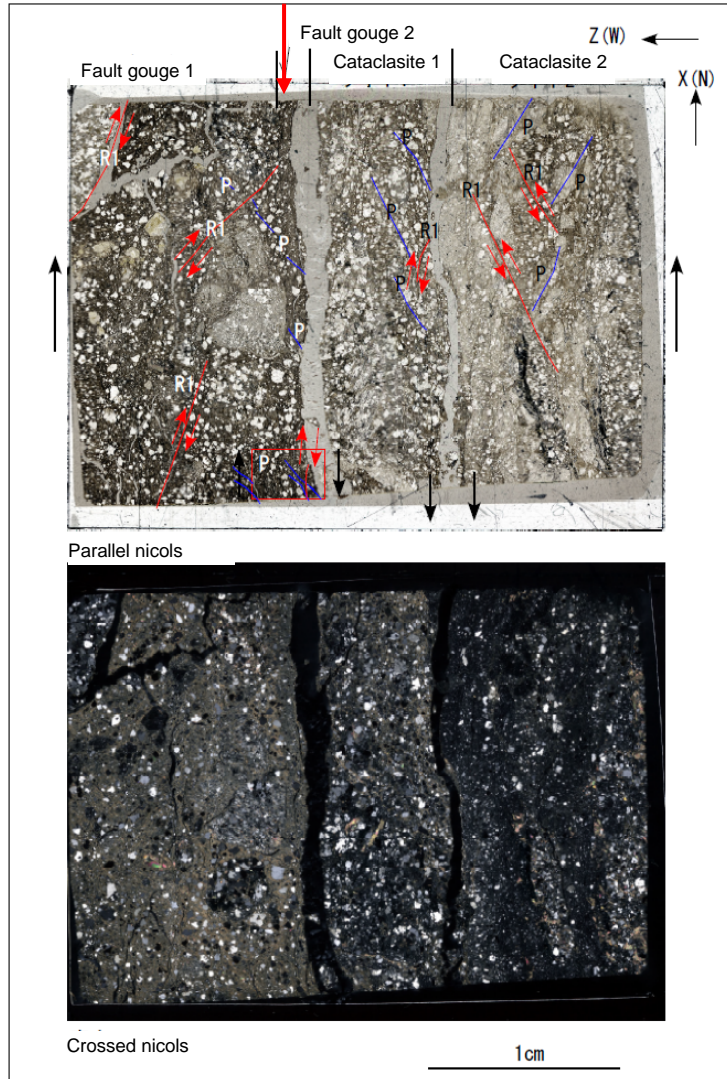
• Fault gouge 2
 Consists of the brown matrix of fine grain, as well as quartz, feldspar, cataclasite fragments and that are semi-circular or sub-angular gravels with diameters of 0.02 mm to 1mm. The matrix contains lots of clay minerals. The displacement sense of normal fault can be recognized from P.

D-1 B14-2 109.16m_2_YZ directio

[Displacement sense of shatter zone]
 Observation of thin section of B14-2 depth 109.16m (horizontal components)



10cm

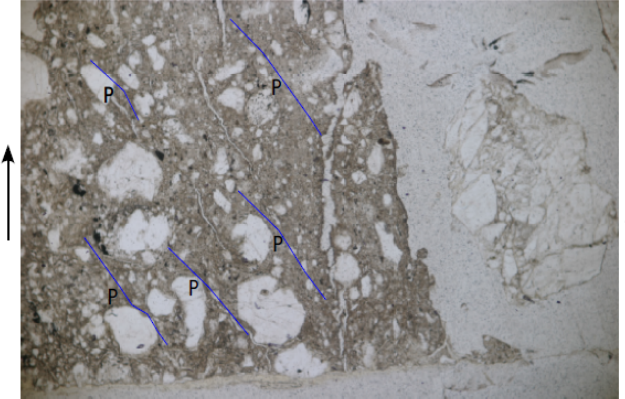


Parallel nicols

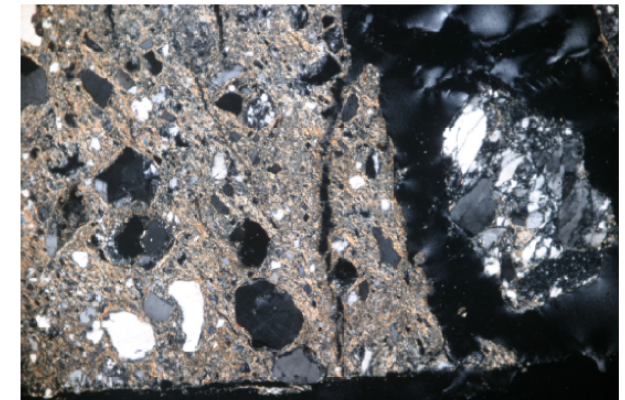
Crossed nicols

1cm

Area within red frame is enlarged



Parallel nicols



Crossed nicols

1mm

- Fault gouge 1
 Consists of the brown matrix of fine grain, as well as quartz, feldspar, apfite and cataclasite fragments and that are semi-circular or sub-angular gravels with diameters of 0.02 mm to 7mm. The matrix contains lots of clay minerals and calcite. The displacement sense of right-lateral slip can be recognized from R1 and P.
- Fault Gauge 2 (last slip)
 Consists of the brown matrix of fine grain, as well as quartz, feldspar, cataclasite fragments and that are semi-circular or sub-angular gravels with diameters of 0.02 mm to 1mm. The matrix contains lots of clay minerals. The displacement sense of right-lateral slip can be recognized from R1 and P.
- Cataclasite 1
 Consists of the brown-gray matrix of fine grain, as well as quartz, feldspar, apfite and cataclasite and that are sub-angular or semi-circular gravels with diameters of 0.1 mm to 8mm. The matrix contains lots of clay minerals and calcite. The displacement sense of right-lateral slip can be recognized from R1 and P.

D-1 B14-2 109.16m_2 XZ direction