

My tentative consideration of The Maurer Force and subduction zone

Maurer Force; the circumferential tensile force caused by the rotation of the Earth will be defined by Robert Maurer in detail

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As Otofujii et al 1985 (Nature 317, 603-604) demonstrated, Japan Arc is composed of two major arcs, which were separated from continent in middle Miocene.

The two Japan arcs might be driven by the Maurer Force

Subduction zone might be formed by oceanward movement of arc crust. It means the subduction zone might be formed by the Maurer Force.

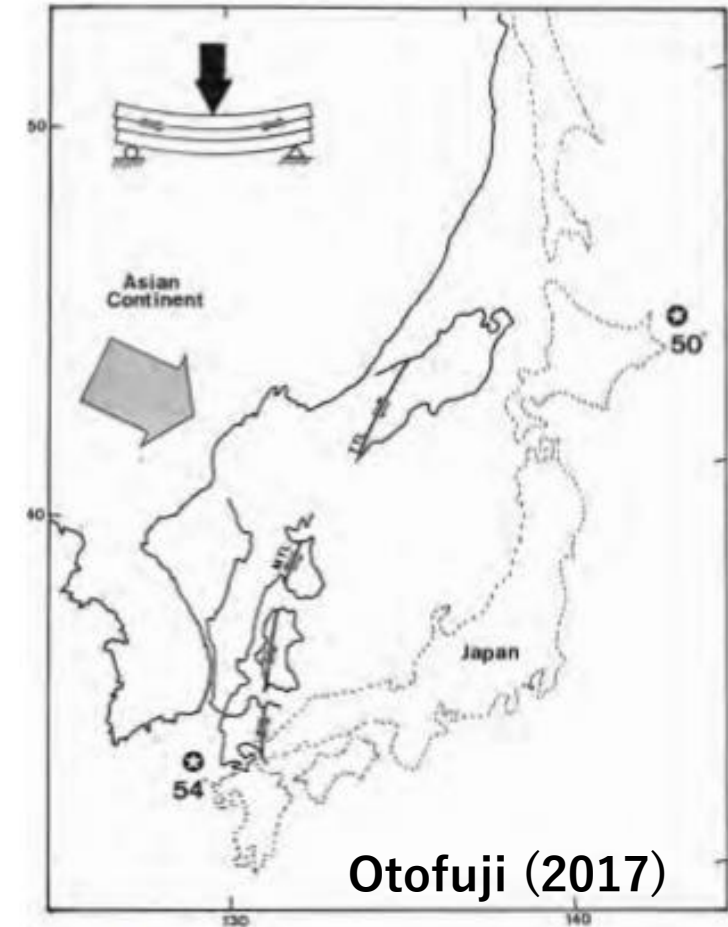
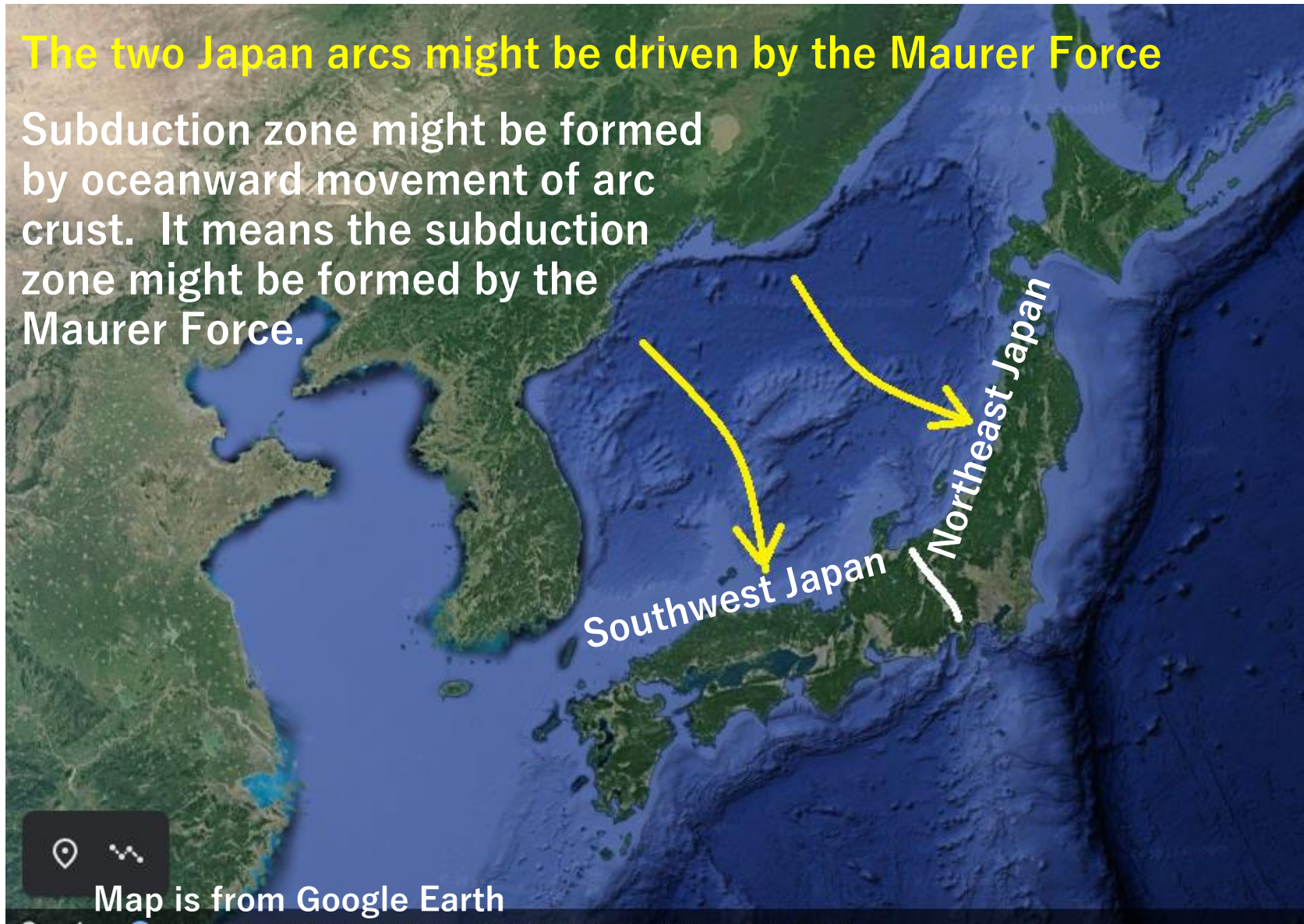
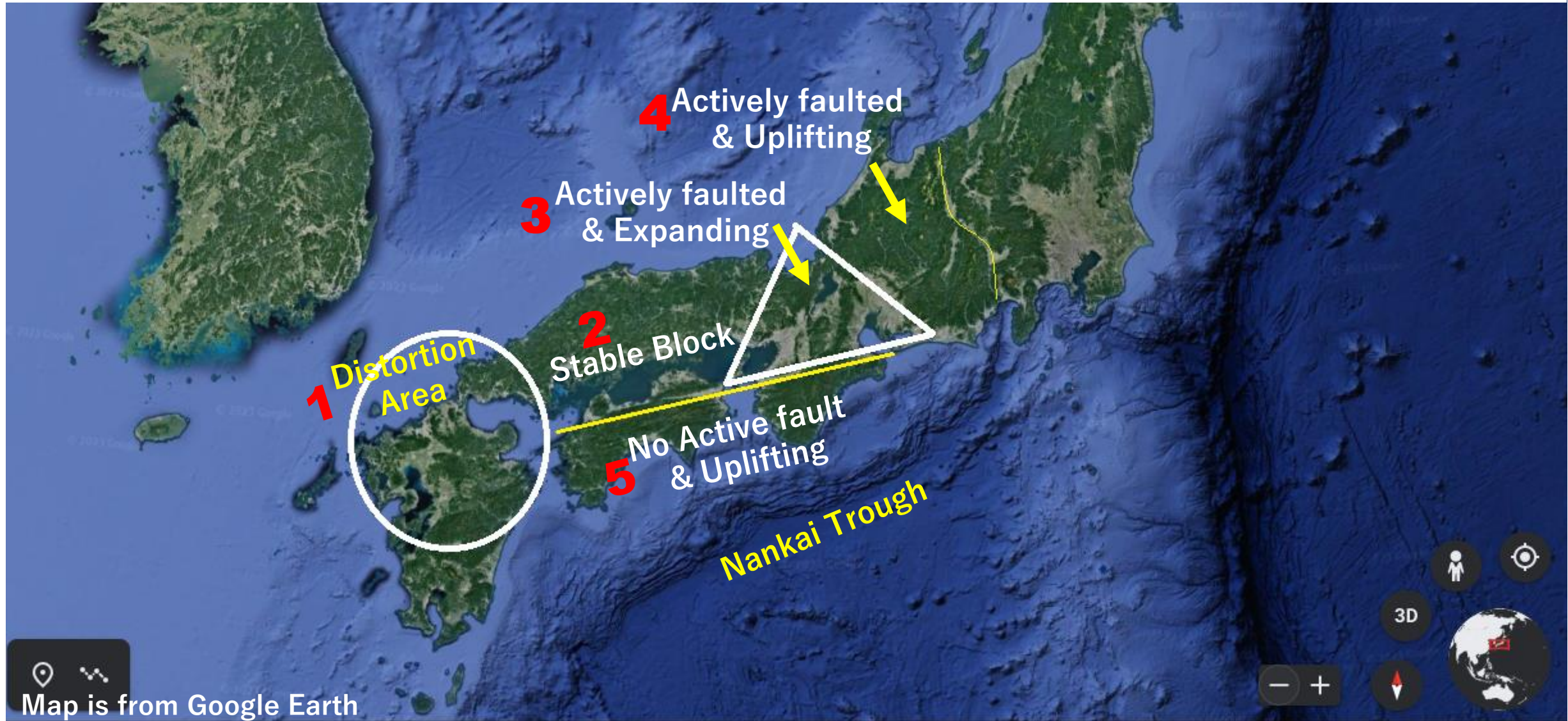
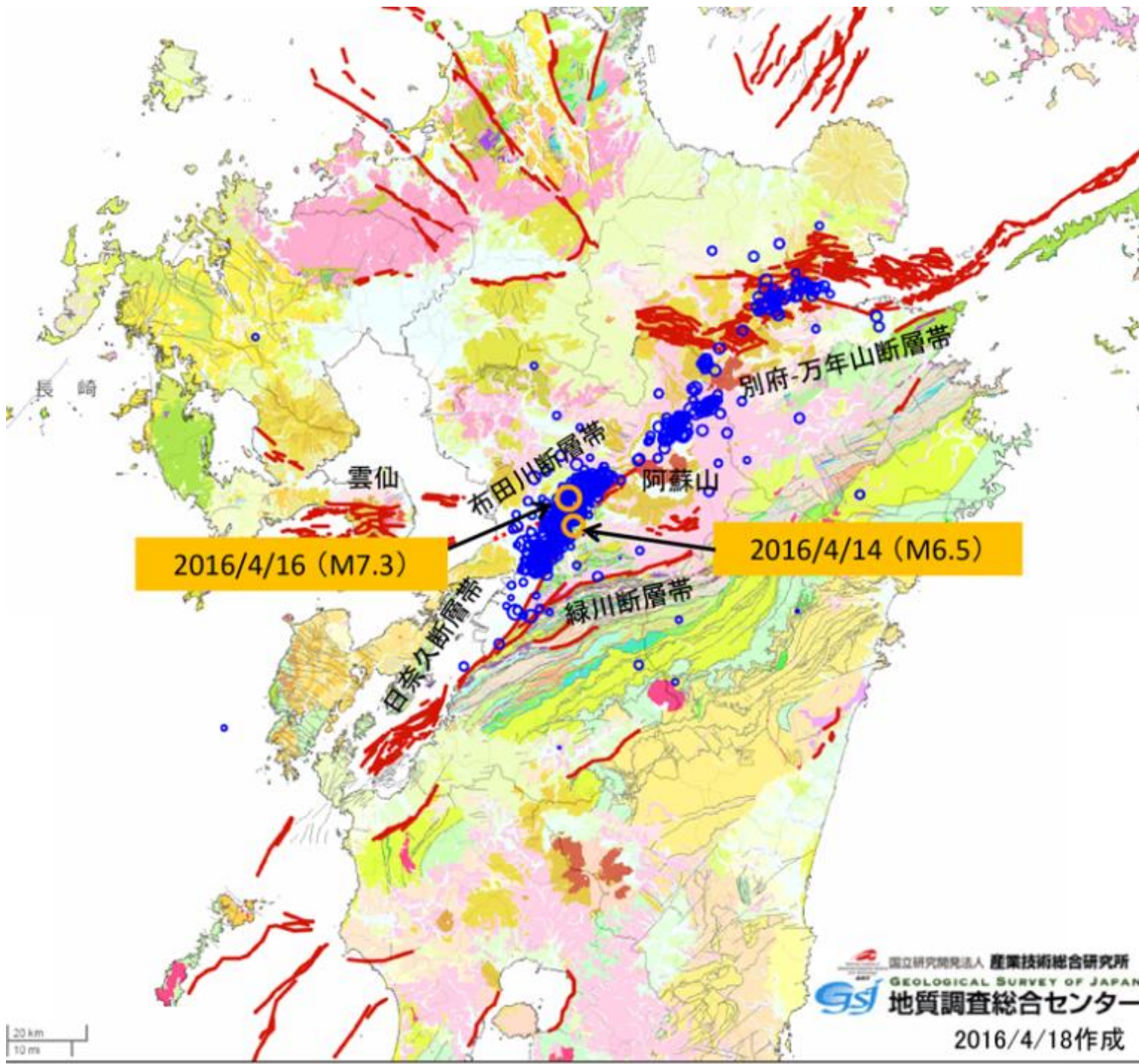


図7 東北日本と西南日本の日本海拡大以前の復元図 (Otofujii et al., 1985b の Fig. 7 による)。日本海の形成は、大陸にあった東北日本と西南日本が、両扉が観音開きするようにして起こった (観音開きモデル)。東北日本は、回転軸 (146° E, 44° N) の回りに反時計回りに 50°, 一方西南日本は (129° E, 34° N) の回りに時計回りに 54° 回転した。観音開き現象に伴って日本海拡大が起こった最盛期は 15Ma であった。TTL: 棚倉構造線, MTL: 中央構造線。

Distribution of active volcanos, active faults and uplifting areas might be influenced by a tectonic environment which characterize the areas.
I subdivided the Southwest Japan Arc into 5 blocks tentatively.
The complex recent geology is not fully interpreted by the subduction system by mantle convection.





No.1 Distortion Area

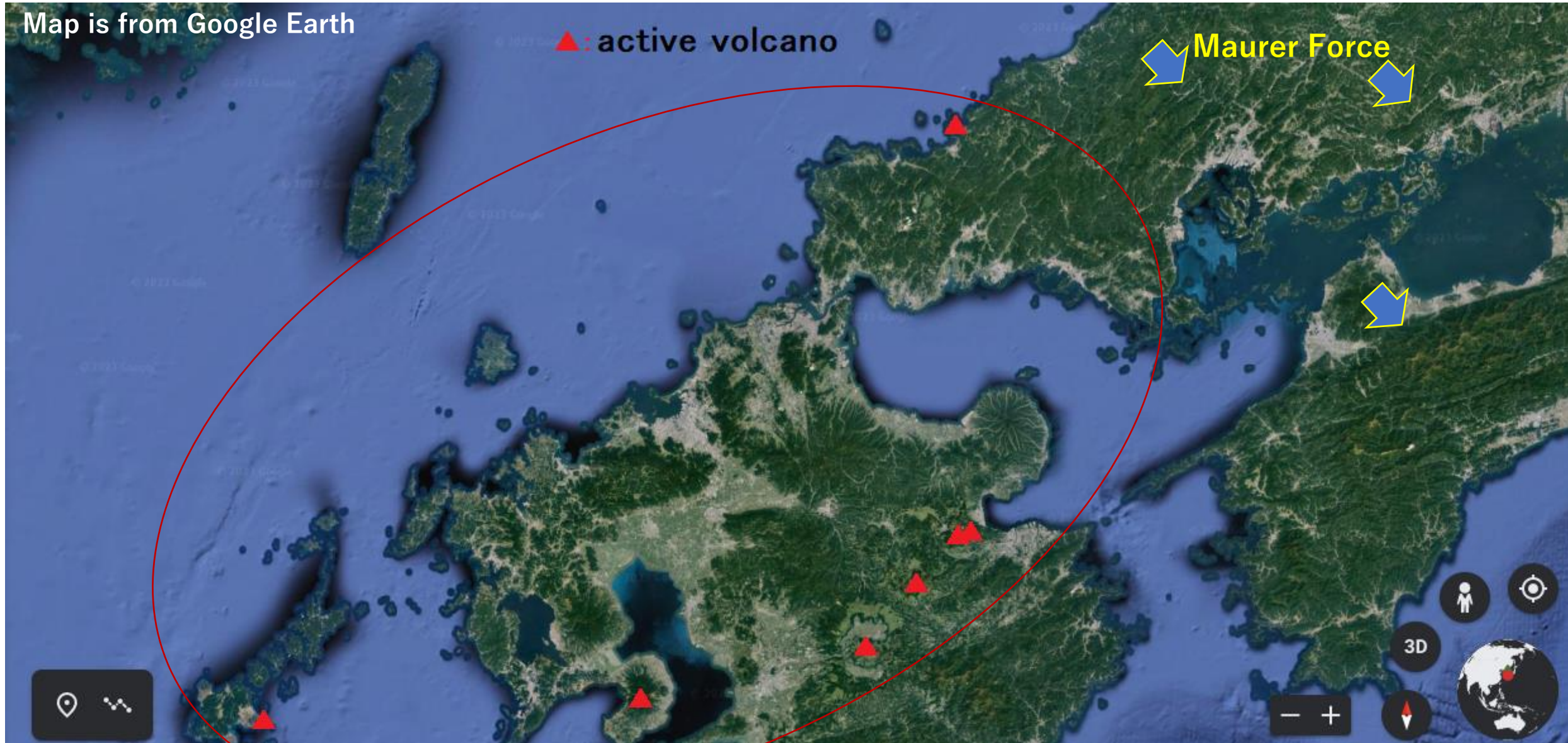
This area is stick together with Korean Peninsula. There is no large displacement but twisted by clockwise rotation of Southwest Japan Arc. Many active faults are distributed but they are short and concentrated in some areas. Active volcanos are thought to be controled by the distorted structure.

The figure is from

[平成28年（2016年）熊本地震及び関連情報
| 災害と緊急調査 | 産総研 地質調査総合セ
ンター / Geological Survey of Japan, AIST
\(gsi.jp\)](#)

2016/4/18作成

The area in red circle moved little from continent. But movement of clockwise rotation of SW Japan arc might form distortions which reach into deep. Neogene volcanic rocks and volcanos might affected by the distortions.



No.2 Stable Block: There are some active faults in Japan Sea side. Height of the central mountain area is about 1000 to 500m. The Kibi Plateau was drifted from the continent but only a few faults moved a little up to recent.

Map is from Google Earth

- ▲ active volcano
- major active fault

Sanbe Volcano ▲

Upwarping Mountain Area

Kibi Plateau Region
Very stable block

Okayama

Median Tectonic Line



Kibi Plateau: Very old plain (associated with sporadic distribution of the Paleogene to Miocene deposits) with some relict mountains were preserved on the Kibi Plateau surface. Looking to the south.

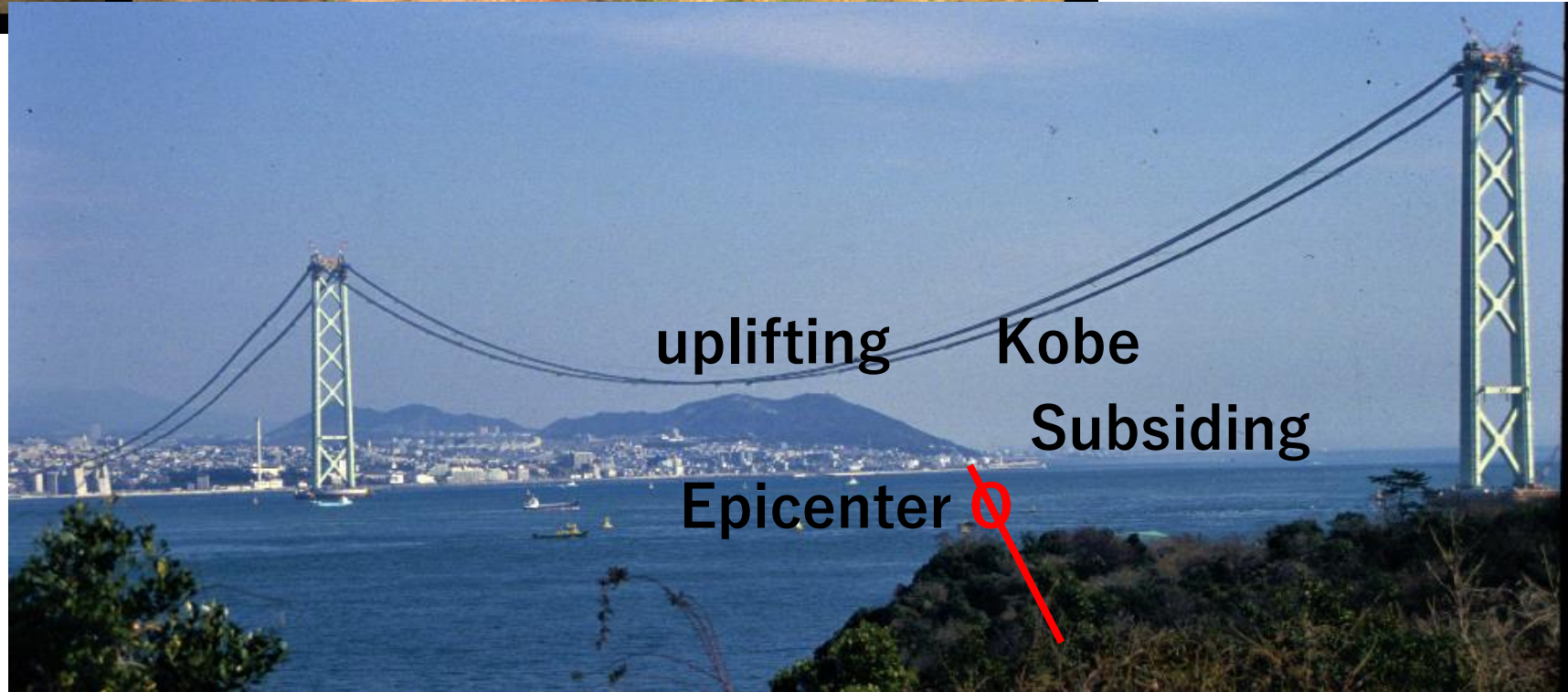
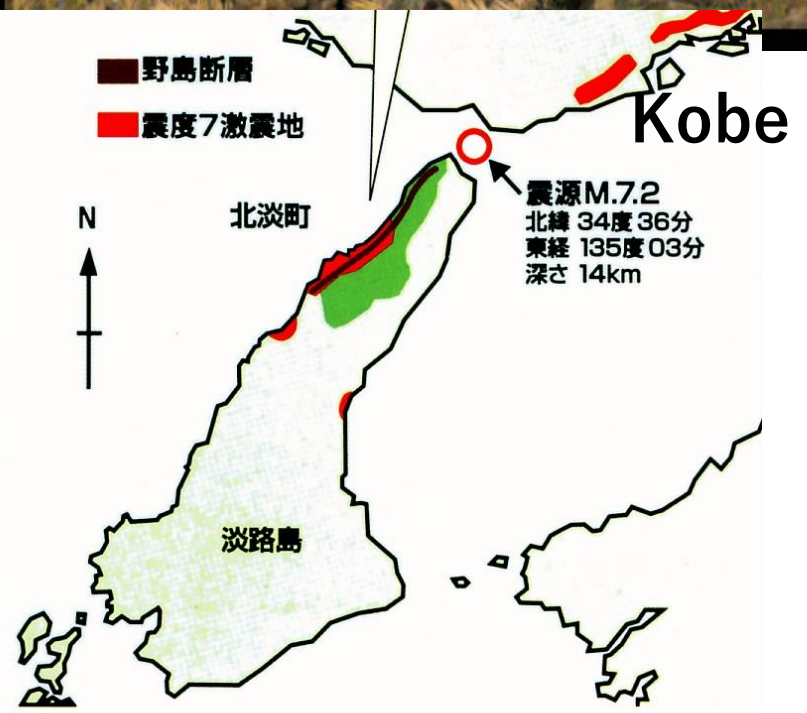


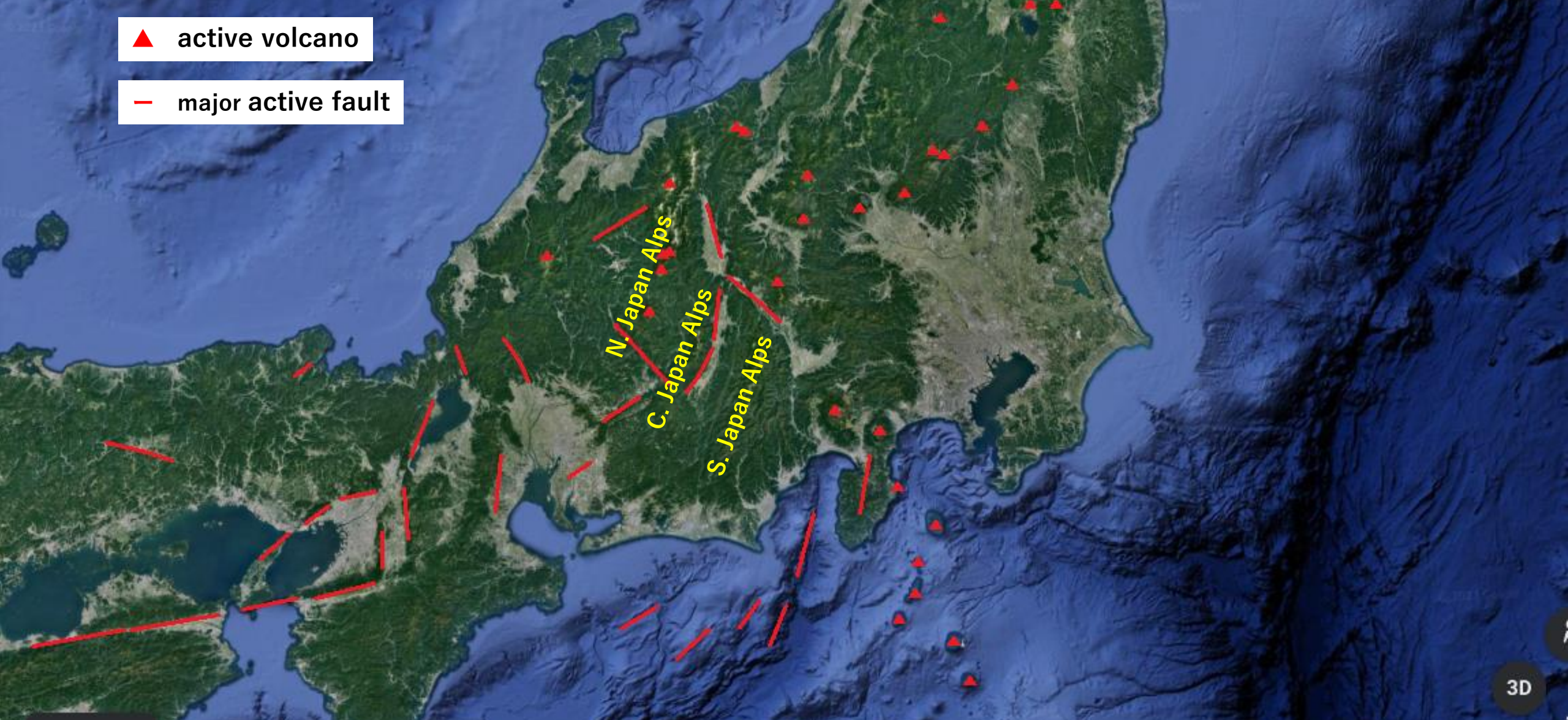
No.3 Actively faulted and expanding area: This area comprise several brocks which are bounded by active faults. Each block is tilting. The tilting activity might make lateral expanding.





Active fault
(Nojima Fault)
of the 1995
Kobe
Earthquake

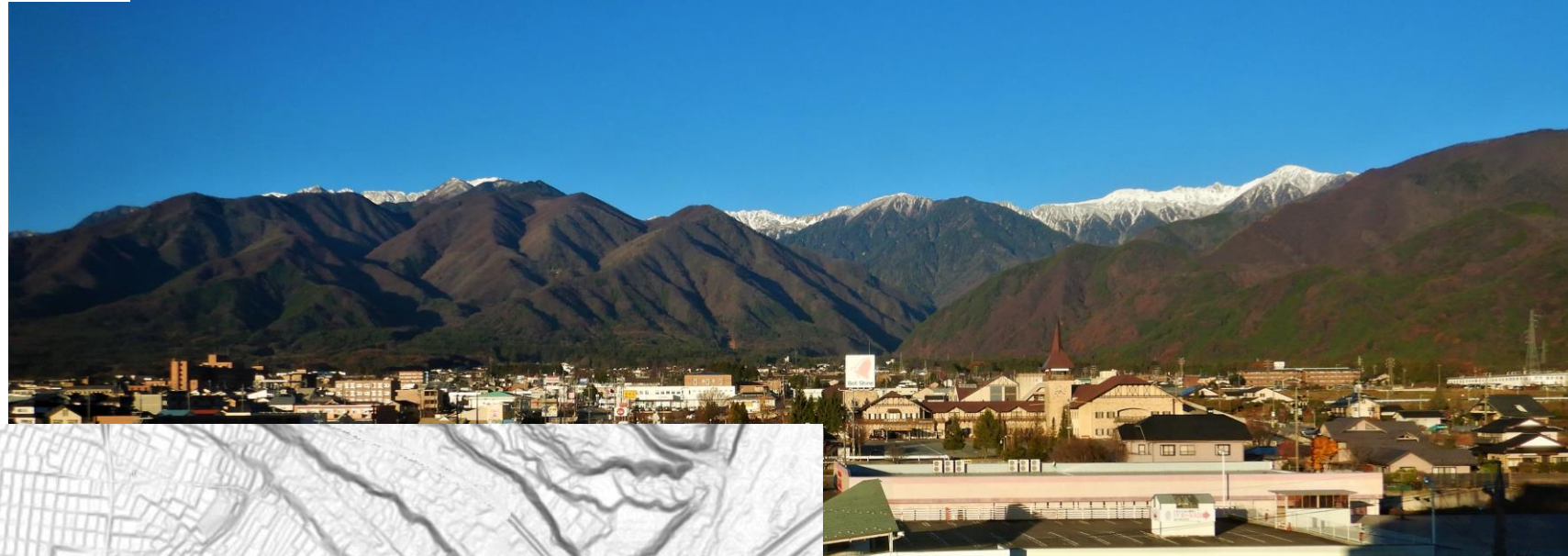
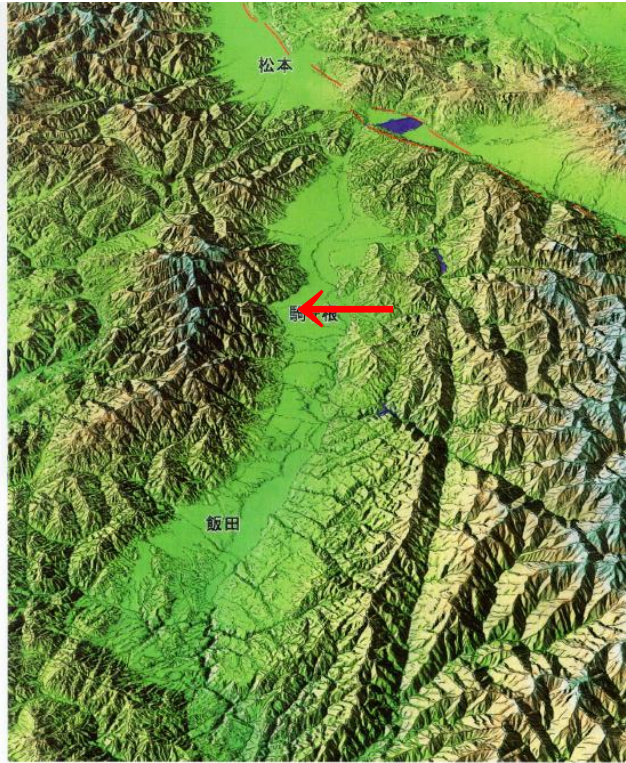




No.4 Actively faulted and uplifting area: There are many obvious active faults and high (3000m) mountains. Active volcanos are also characterize the area.

The Central Japan Alps (around 3000m) has high uplifting rate. Active faults run along the foot of the mountains and cut young (0.1 Ma) fan surfaces.

Matsushima et al (2017) 駒ヶ根市の地形と地質



Komagane, Nagano
Prefecture



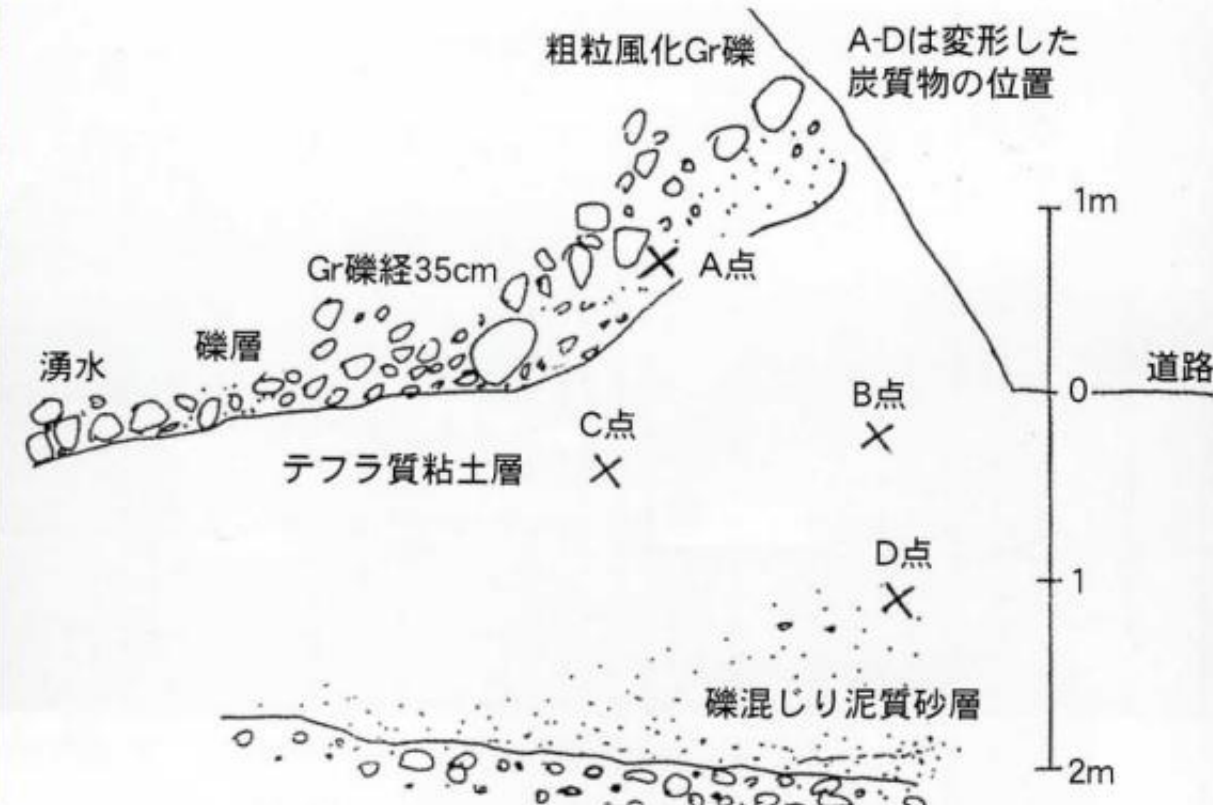
The active fault cuts gravel bed of the fan and succeeded volcanic ash deposits and surface soil.

Matsushima et al (2017)駒ヶ根市の地形と地質



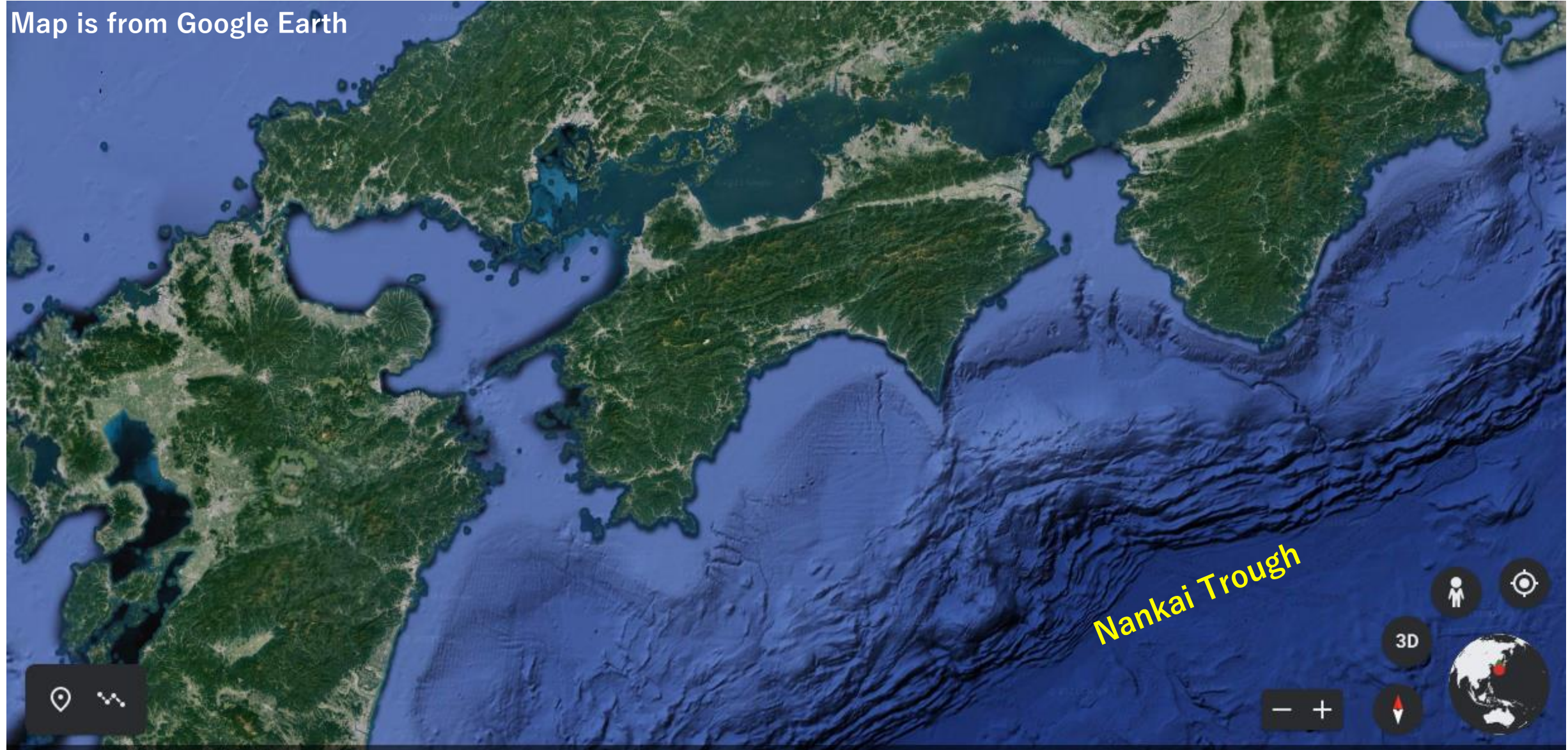
道路面より下へ2m余掘り下げたところ。
礫層Aと同じ礫層が確認できた

Komagane, Nagano Prefecture

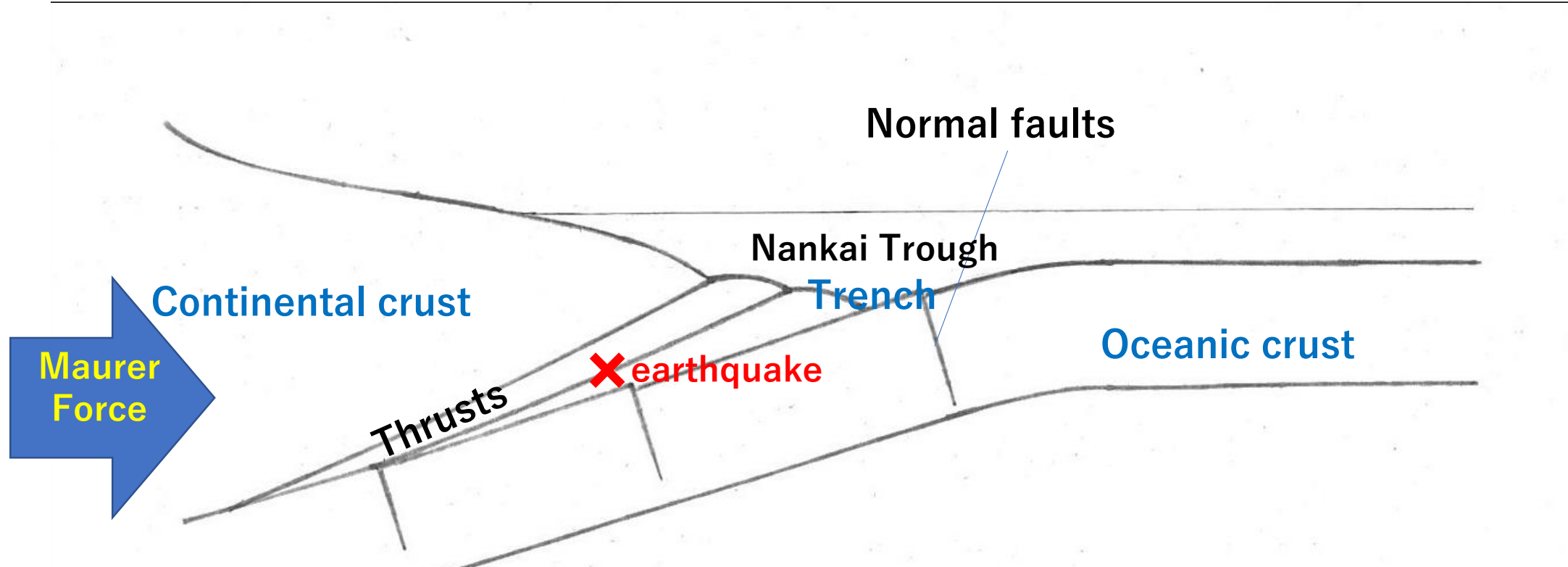


十二天の森断層観察広場 北側側面のスケッチ(1994.8.31)

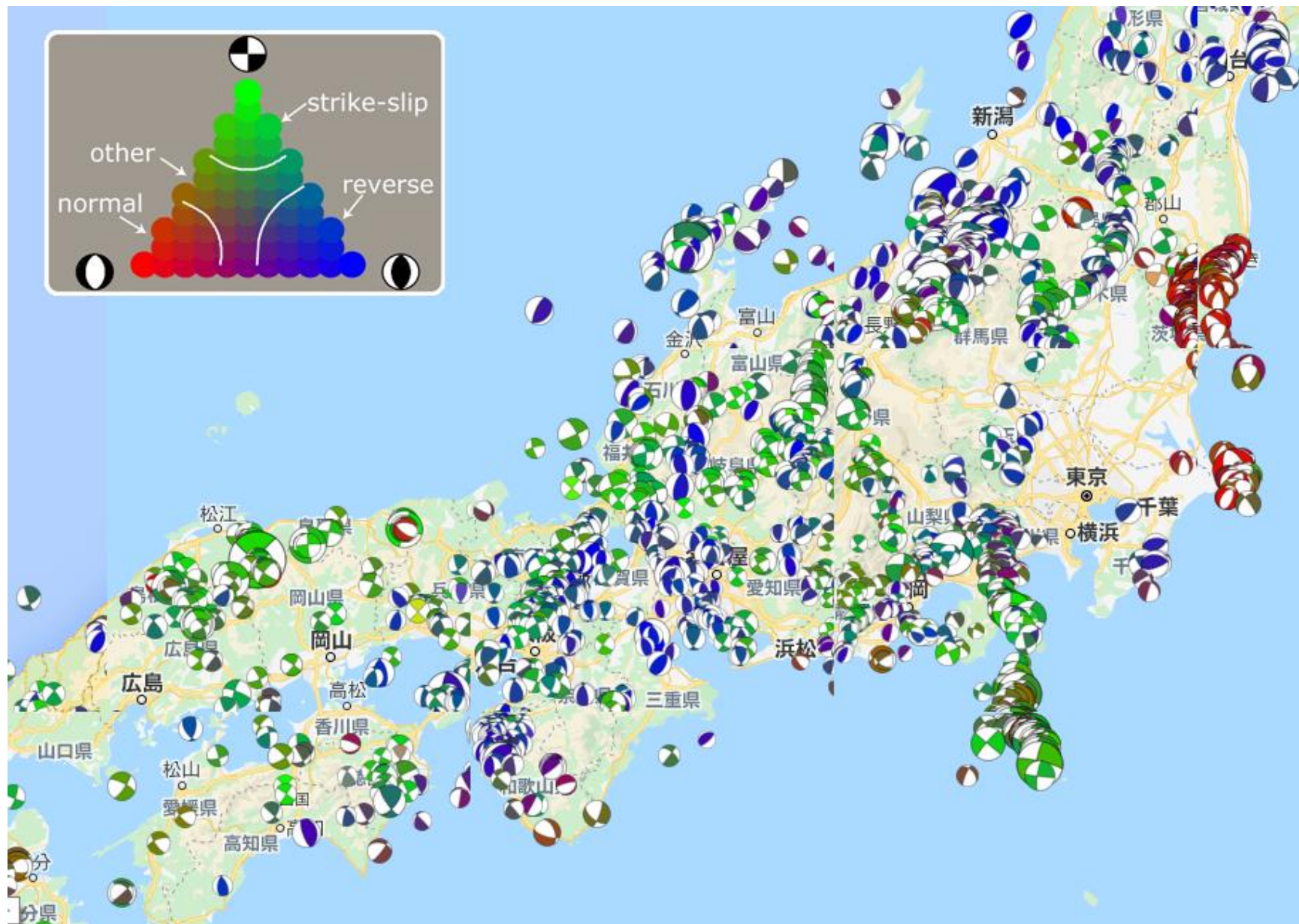
No.5 No active fault and uplifting area: Major active faults(break every 100 years and occur M8 to 9 earthquakes) are along the bottom of the Nankai Trough. But very few active faults on land and mountains are 1000 to 2000m high.



Cause of uplift in the No.5 area



Activity of the thrust faults at the boundary between the Continental and Oceanic crust could be caused by the Maurer Force.
The thickness of the No.5 area is increasing due to accrete oceanic crust.
And the enlarged crust is uplifting to make balance eustasy.



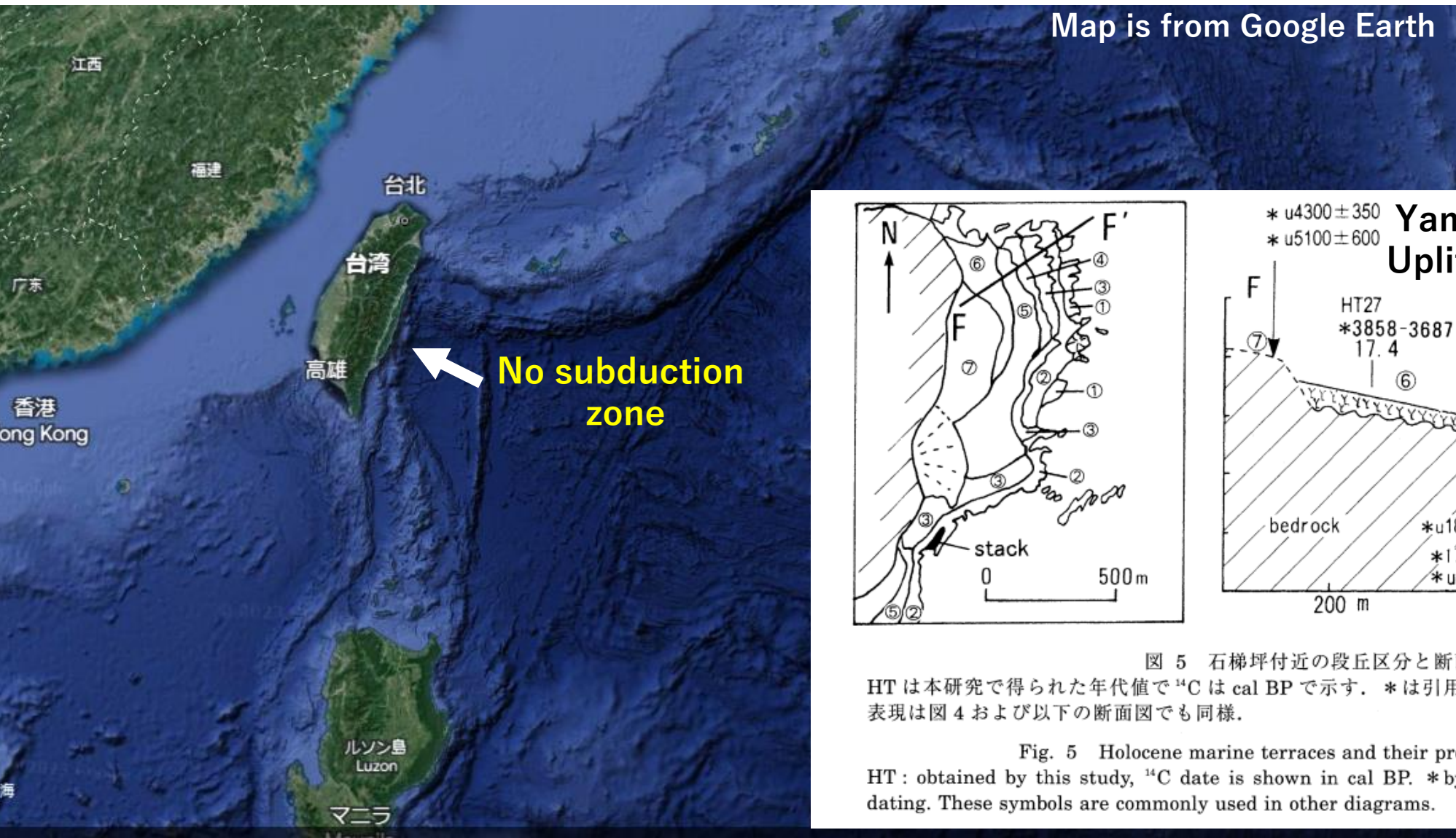
Variety of stress in Japan

Directions of stress which occur earthquakes are too much complex. It is difficult to interpret simple EW compression caused by the Pacific Plate movement. Has each block individual Maurer Force ??

from HP of Geological Survey of Japan (Uchide, T., Shiina, T. & Imanishi, K. 2022)

Obtained from earthquake data from 1997 Oct to 2016 May (Epicenter is shallower than 20km).

Continental crust of Taiwan sticks to oceanic crust and don't have subduction zone. There are frequent big earthquakes in Taiwan. And uplifting rate of Taiwan is high. The Taiwan mountains is higher than the Japan Alps. The activity might be caused by the Maurer Force of Taiwan Crust.



Map is from Google Earth

No subduction zone

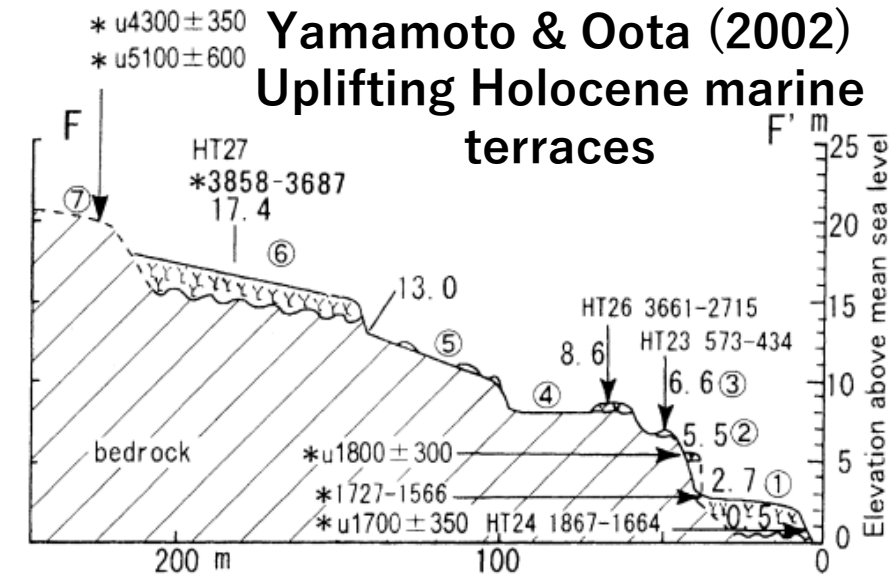
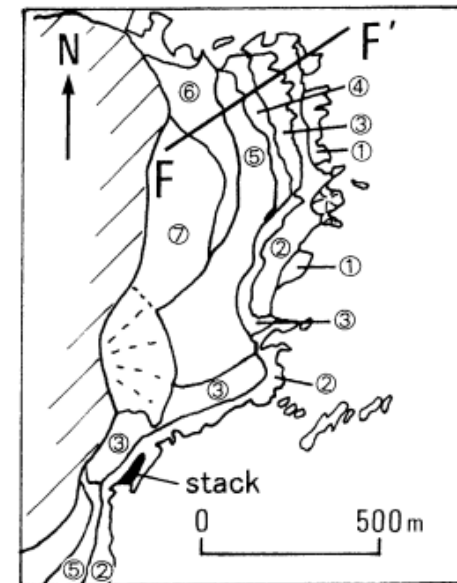


図 5 石梯坪付近の段丘区分と断面図 F-F'.

HT は本研究で得られた年代値で ^{14}C は cal BP で示す. * は引用によるもの, U は Th/U 年代. これらの表現は図 4 および以下の断面図でも同様.

Fig. 5 Holocene marine terraces and their profiles at Shihtiping site.

HT : obtained by this study, ^{14}C date is shown in cal BP. * by previous work, U : by uranium series dating. These symbols are commonly used in other diagrams.

The island Arcs are moving to lighter ward (ocean ward) by the Maurer Force. It suggests that the subduction zone might be formed by the Maurer Force.

The complex recent activity of faults, volcanoes and ground movements are difficult to interpreted by the simple EW oceanic movement by the mantle convection.

Drifting crust could not move as one single large mass. The large mass is separated smaller blocks which move in different manner.

Moving Southwest Japan Arc is composed of smaller blocks.

Has the individual small block own Maurer Force (depend on own mass)?? And is the movement affected by fault plane??