Guide to Yamanashi Sake Based on Results from Geological Survey

Geologist Discusses Yamanashi's Water as a Source of Sake

Aim of this Survey

Raw ingredients of sake

Sake is 80% water

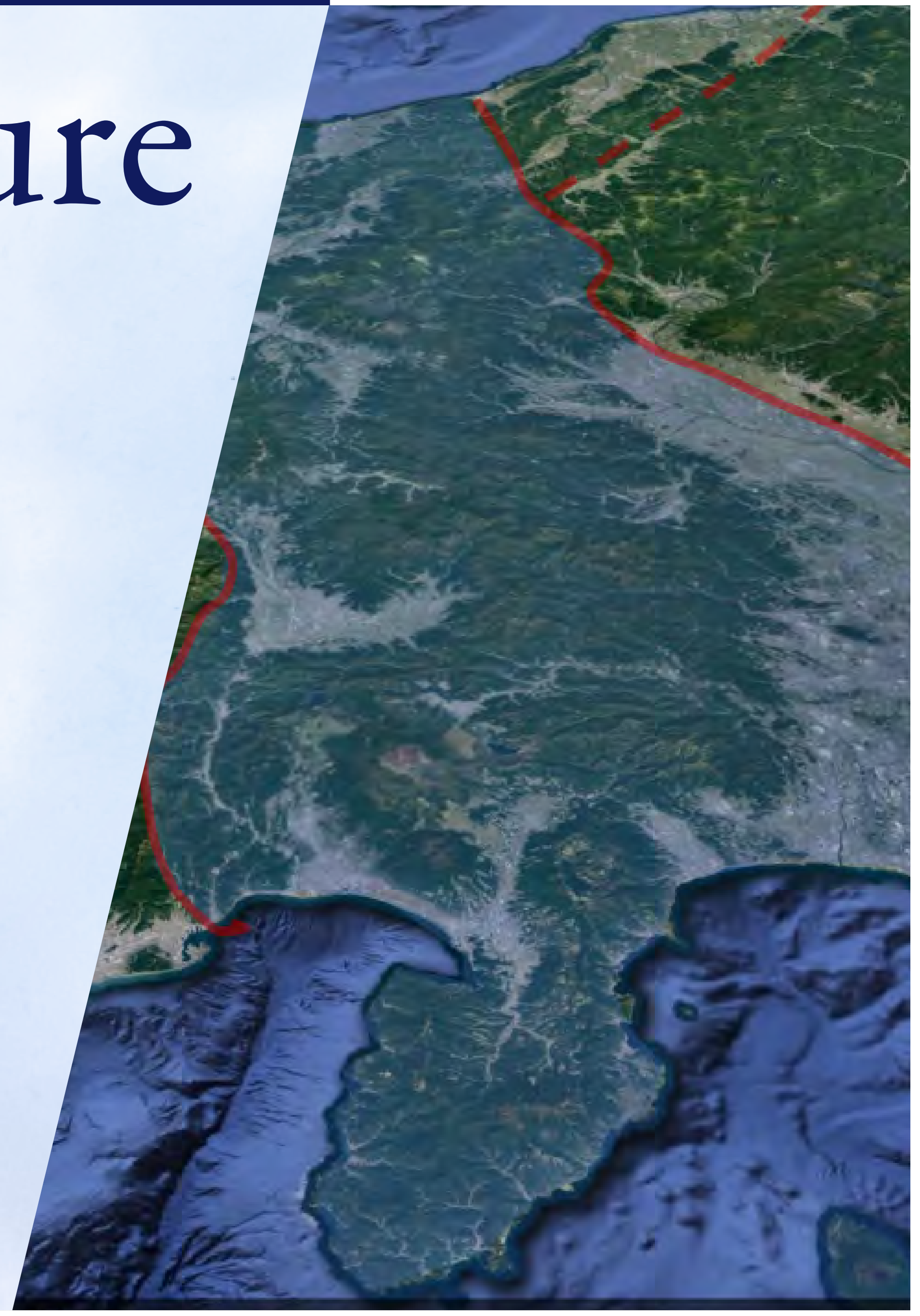
There are few reports about terroir that dive into the effects of geology on water

This project marks the first-ever attempt to decipher the local brewing waterfrom the geological features of Japan.

Survey Team Leader

Dr. Kenichiro Hisada (Geologist)

Born in Tokyo in 1954, Dr.Hisada graduated from the Tokyo University of Education, the Faculty of Science in 1977 and earned a PhD in Geosciences at the University of Tsukuba. After working as an assistant at Osaka University of Education, he was a Professor at the University of Tsukuba until his retirement in 2020. He specializes in geosphere transition science. His research sites include various parts of the Japanese archipelago, Thailand, and Laos. He has recently been engaged in archaeological geology, surveying West and Central Asia. He has also served as Vice President of the Geological Society of Japan (2010-2012), President of the NPO Japan Earth Science Olympiad Committee (2014-2016), President of the Education and Science Division of the Mt.Tsukuba Regional Geopark Promotion Council (2016-2020), and President of the Japanese Society for Earth Science Education (2016-2022). He is a part-time lecturer at Bunkyo University and Chiba Institute of Technology and has appeared as a lecturer in the NHK High School Course Earth Science (1995-present).

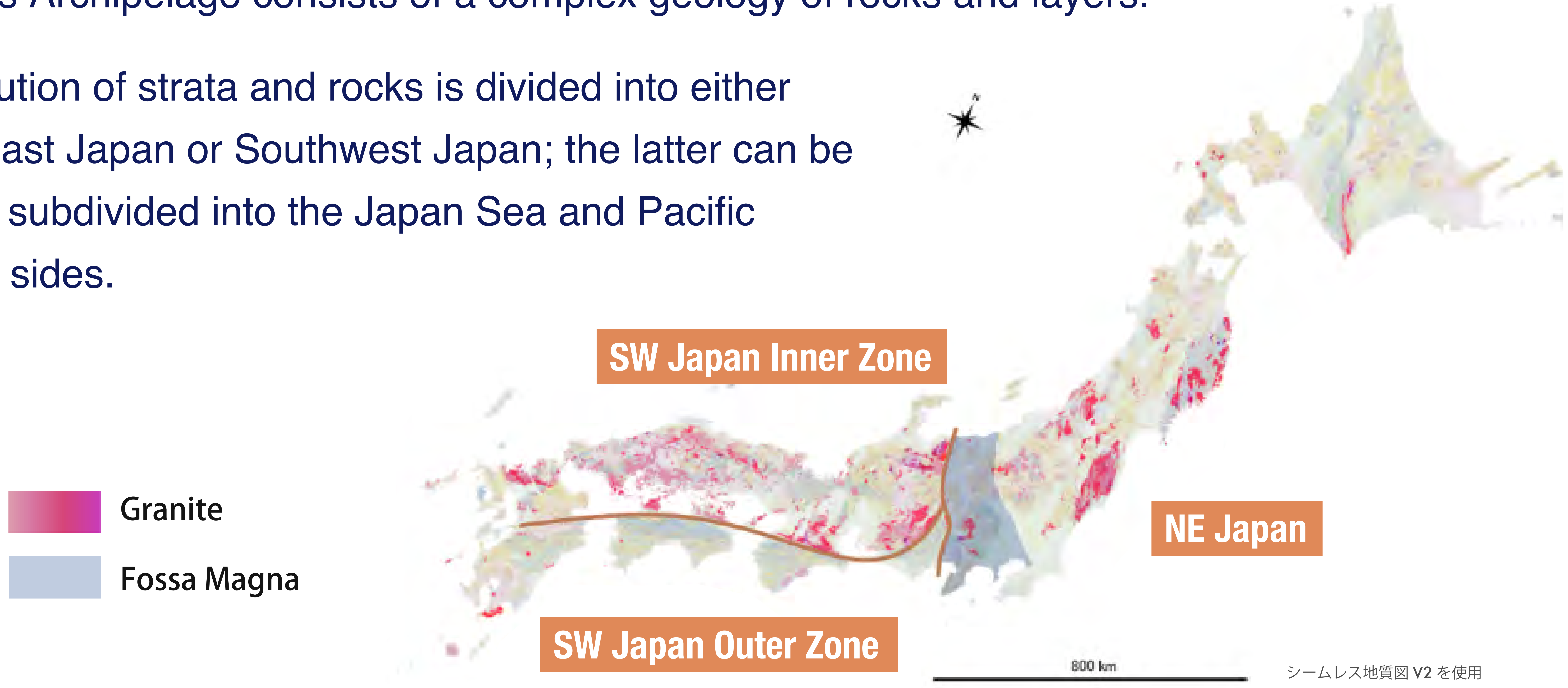


1 Yamanashi:

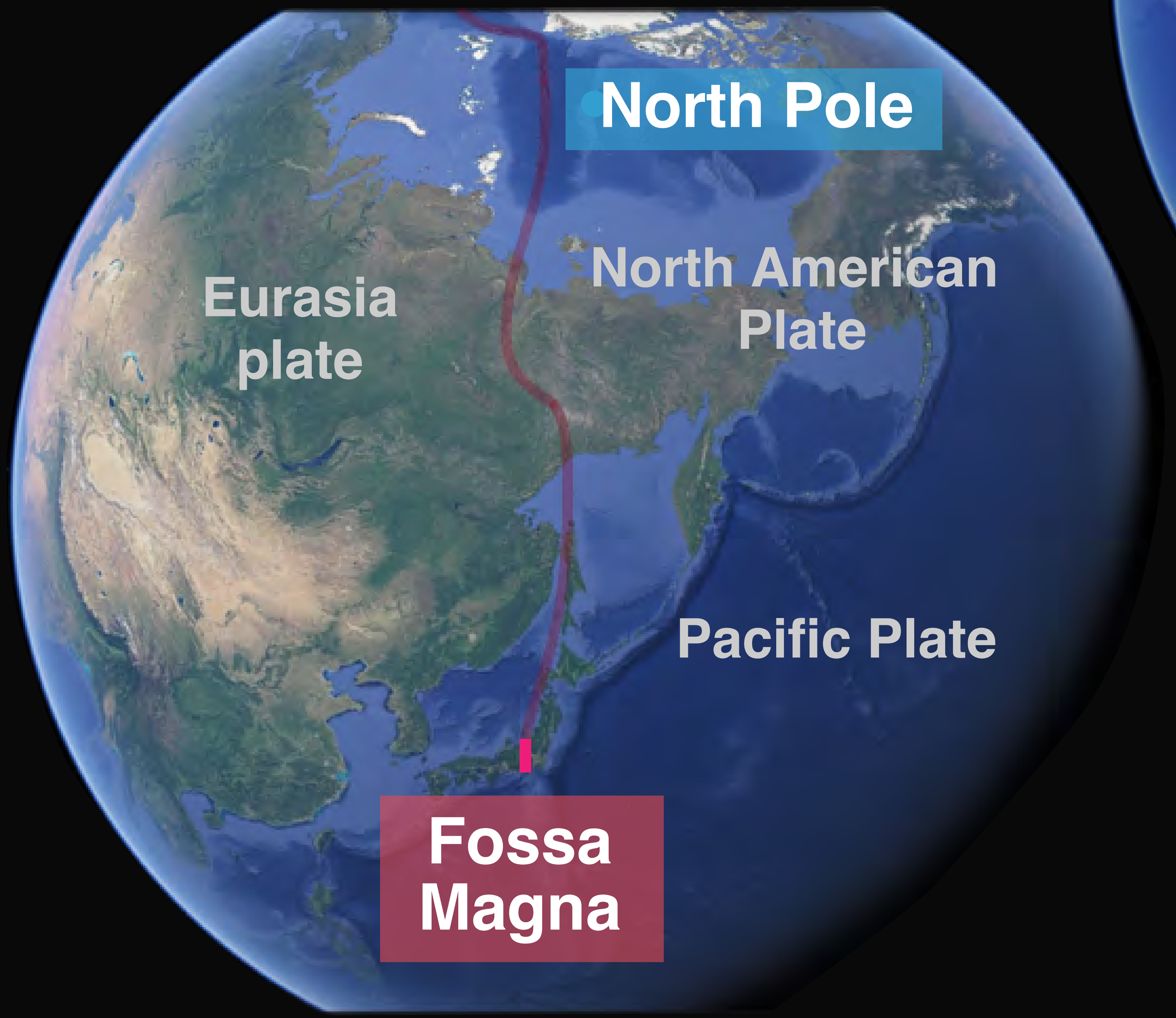
Headwaters of Japan's Sake Culture

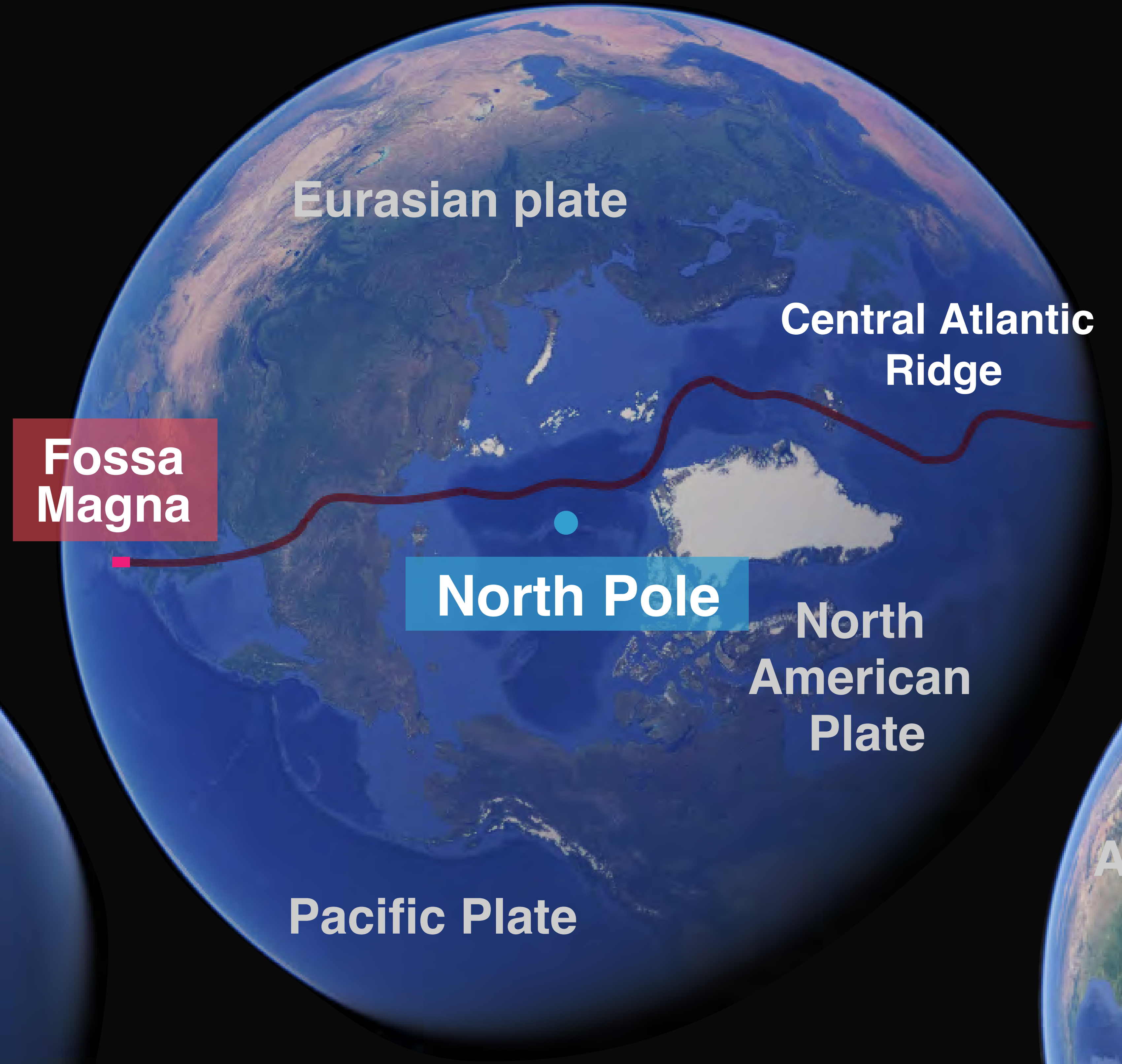
Yamanashi Through a Geoscience Lens

- Japan's Archipelago consists of a complex geology of rocks and layers.
- Distribution of strata and rocks is divided into either Northeast Japan or Southwest Japan; the latter can be further subdivided into the Japan Sea and Pacific Ocean sides.

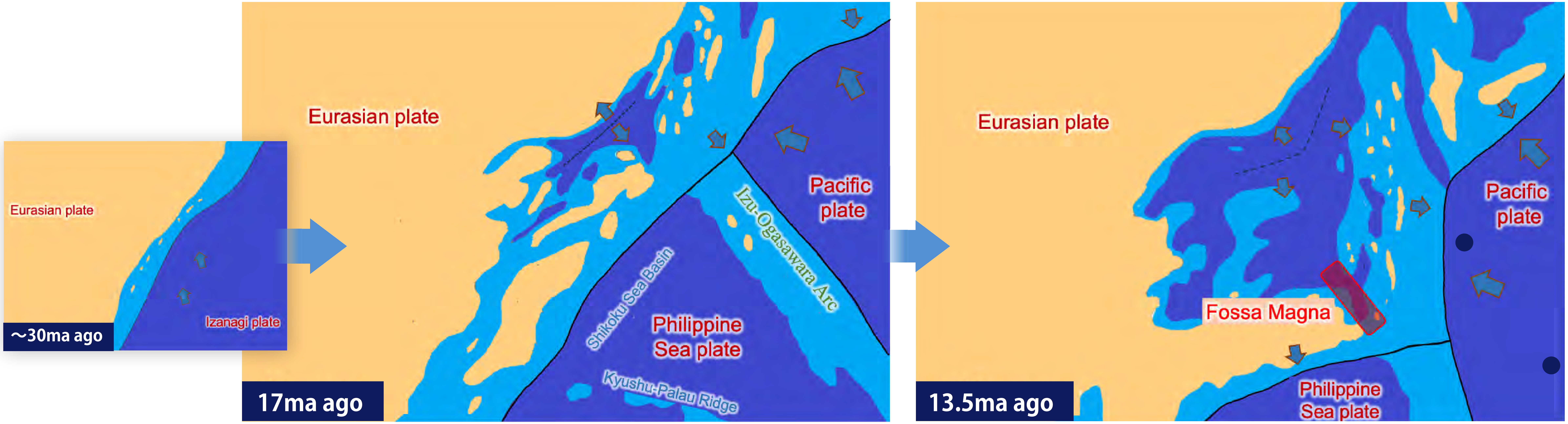


Fossa Magna is a plate boundary extending from the Atlantic Ocean.





Formation of the Fossa Magna



1 The Japanese archipelago separates from the continent to form Sea of Japan.

Originally part of the Eurasian continent, the Japanese archipelago broke off with the expansion of the Sea of Japan, which began around 22 million years ago.

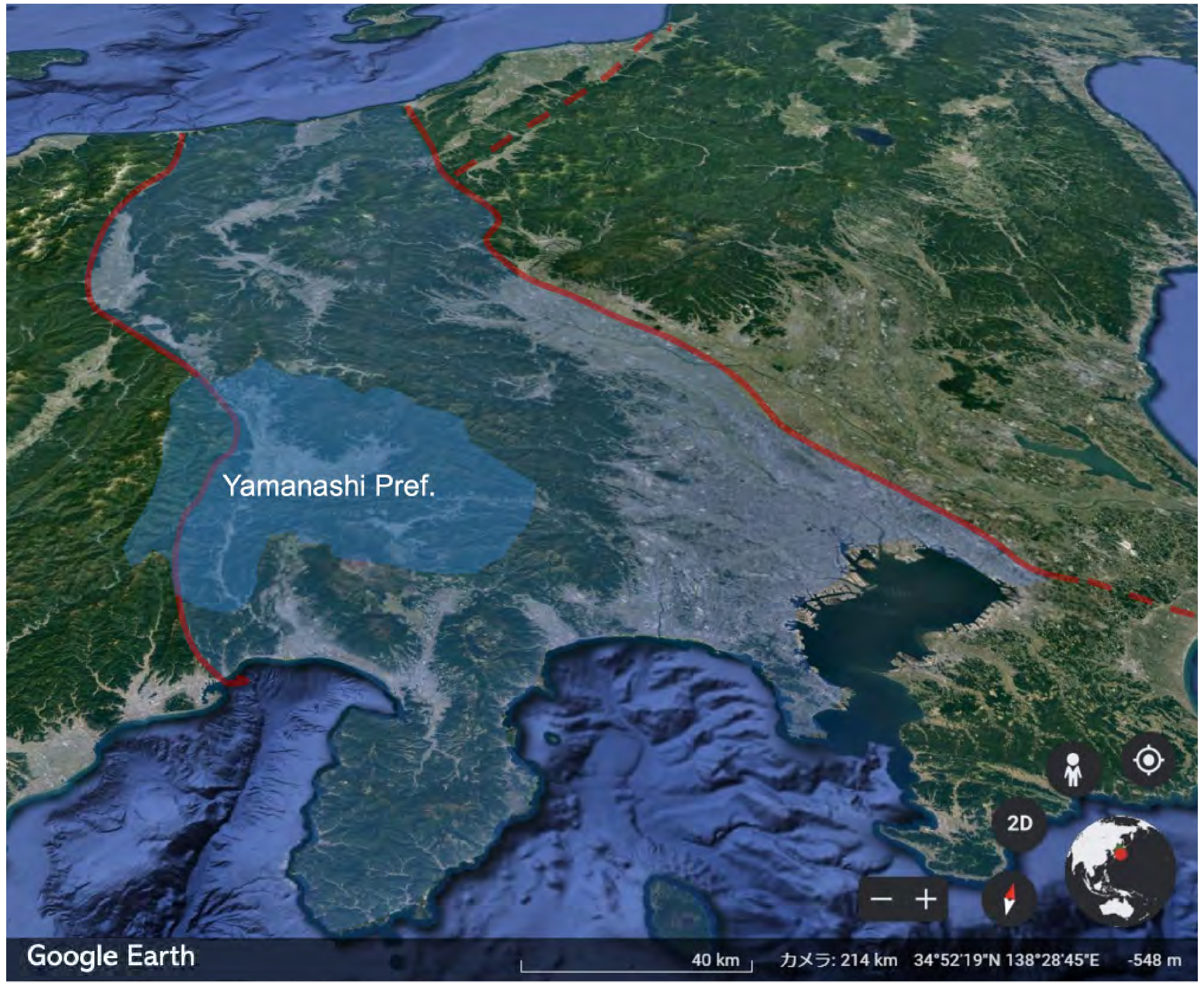
2 With the expansion of the Sea of Japan, the Fossa Magna was formed.

Over a period of about 15 million years, north east Japan rotated clockwise, while south west Japan moved parallel to the south east.

The Fossa Magna as a Giant Corridor during Jomon Era (14,000 - 300BC)

- A large landform marking the boundary between northeastern and southeastern Japan.
- **“Unparalleled global landform”,** Kantaro Fujioka

Northern Fossa Magna	Crustal deformation that accompanied the formation of the Sea of Japan
Southern Fossa Magna	Two or more volcanic island collisions



Yamanashi Prefecture Kofu Basin is a part of the Southern Fossa Magna.

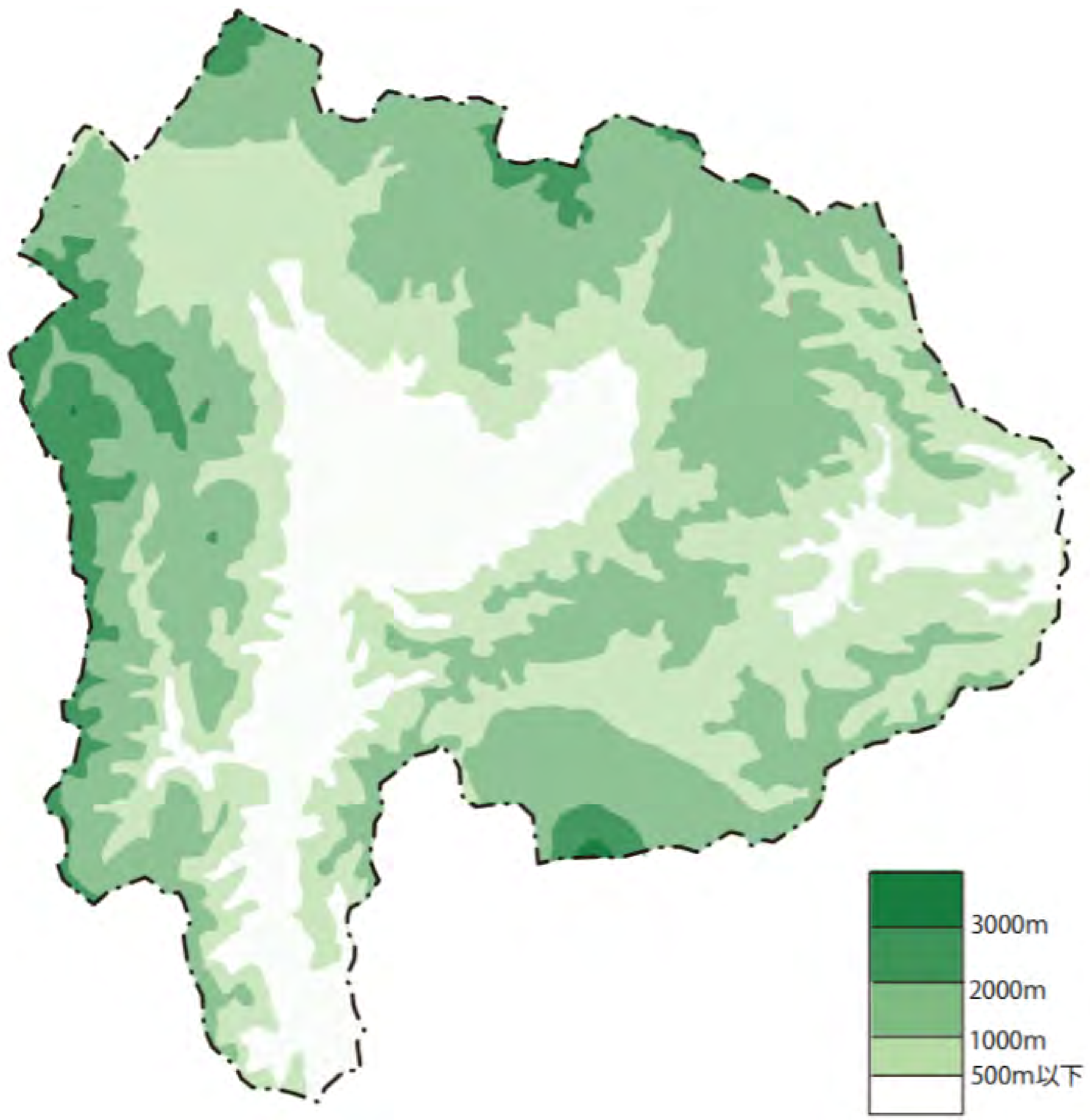
Prosperity of Yamanashi During the Jomon Era

- **In 2018, a website titled: "Jomon World at the Starry Central Highlands of Japan" (abbreviated) was registered as Japan Heritage.**
- **There are many archaeological sites and earthenware and clay figurines have been excavated.**
  - ➜ 5,000 years ago, the region was home to a quarter of the population of the Japanese archipelago.

▼

- **The Geology was the Reason**
  - ➜ The Kofu Basin and surrounding highlands.
  - ➜ 2,000-meter or more elevation difference between mountains and basin.
  - ➜ With easy access from all four sides, it prospered as a trading hub for people visiting Nagano to collect Obsidian.

Elevation distribution of Yamanashi



- **Old name for Yamanashi, Kai, comes from the Japanese word for trade, Kai or Majiwaru.**

Potential as Japan’s First Sake Brewing Region

Yuukou tsuba-tsuki doki

- Potential as brewing tool (to make fruit wine)
- The possibility that, sensing the presence of deities through the mystique of Yamanashi’s mountains, people began to make sake for rituals.

How did rice-based sake brewing develop?

Photograph taken at Yamanashi Prefecture Archeological Museum.

2

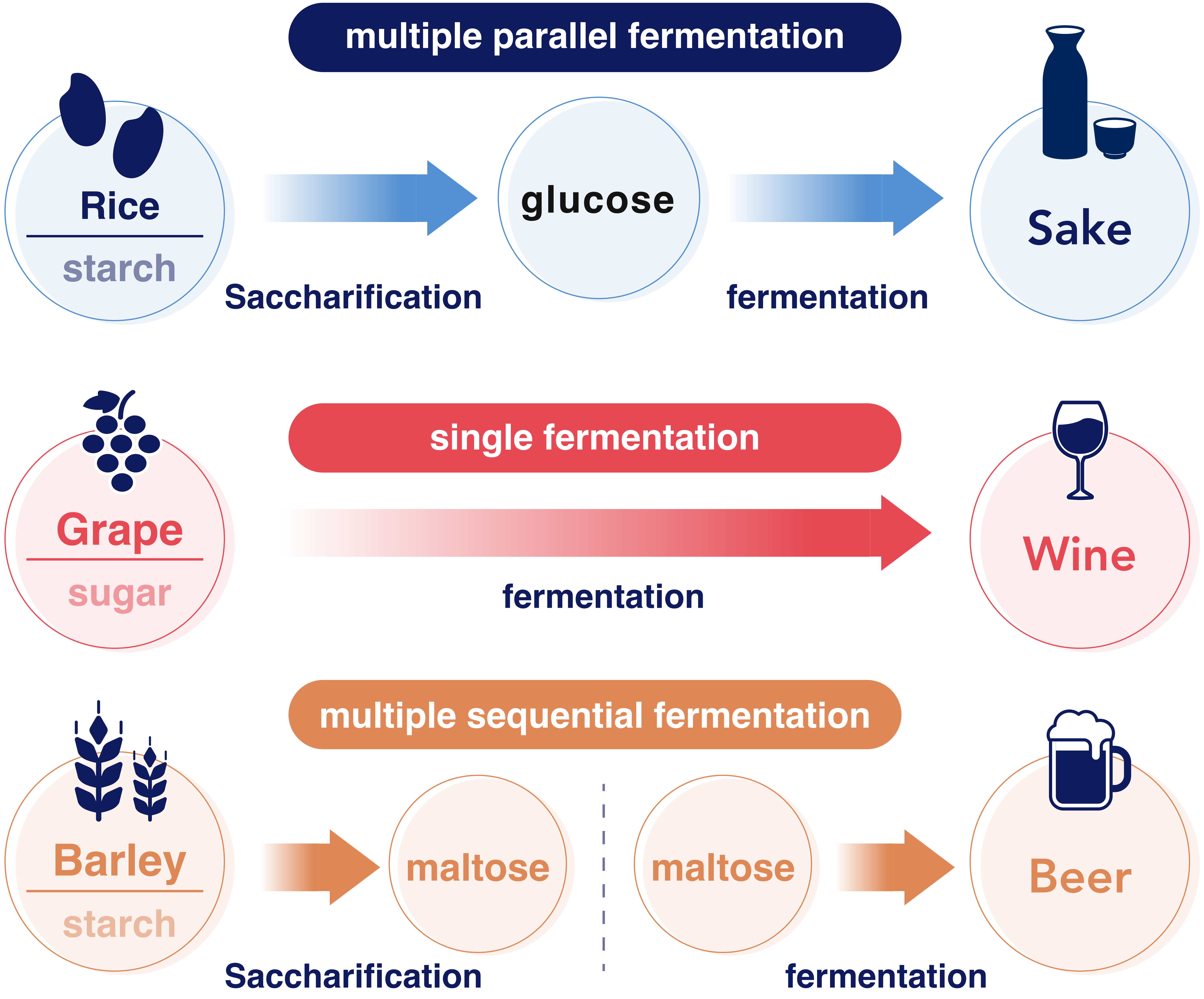
Sake Crafted by Japan’s Topography

Ingredients, Method and History of Sake

Ingredients and Method

- Ingredients: rice, rice koji and yeast
- Fermented beverage
  (like wine and beer)
- Multiple parallel fermentation
  → **high ABV**

Wine :	**single fermentation**
Beer :	**multiple sequential fermentation**



Ingredients, Method and History of Sake

History

Introduced in the Yayoi Period (300BC - 250AD) along with rice cultivation in the form of homebrew sake called doburoku

Sake becomes an integral part of national spiritual rituals

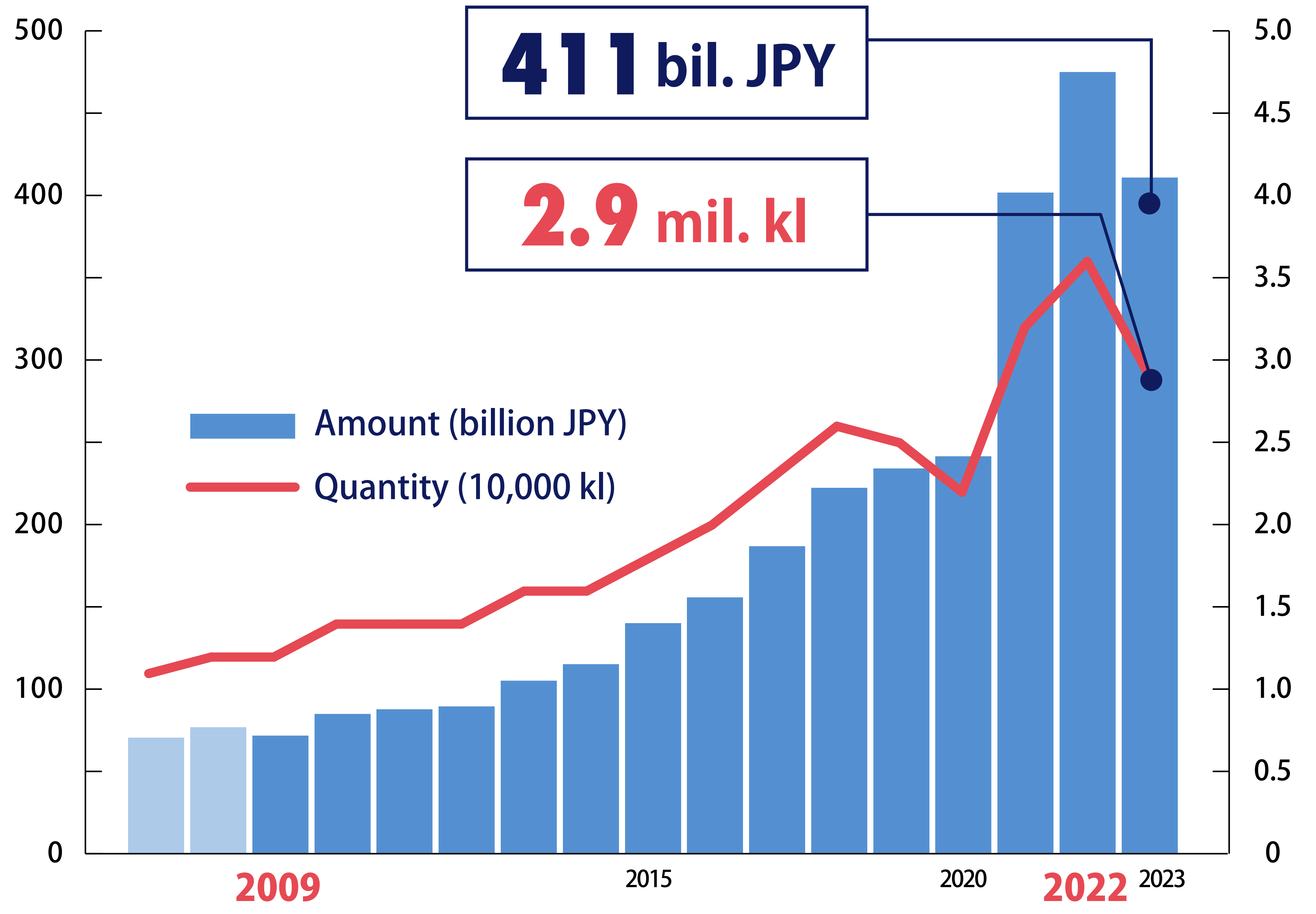
The present-day culture of brewing in breweries does not come about until the Edo Period (1603-1868)

In 1899, homebrewing is banned and a license is required to make sake

The Sake Crafting Brewery and Terroir

- **1,500 breweries in Japan (as of March 2024)**
  - → 1,200 active
- **Domestic demand for sake peaked in 1973, then went into decline for more than 50 years.**
  - → population decline, ageing population, diversification of alcohol beverage selection
- **Increased demand from overseas markets**
  - → In the period 2009-2022, the export value increased consecutively from 7.18 billion to 47.49 billion yen.
- **Breweries began adopting the terroir of concept as a way of carving out a niche.**
  - → Rice, water and yeast

Changes in Export Results



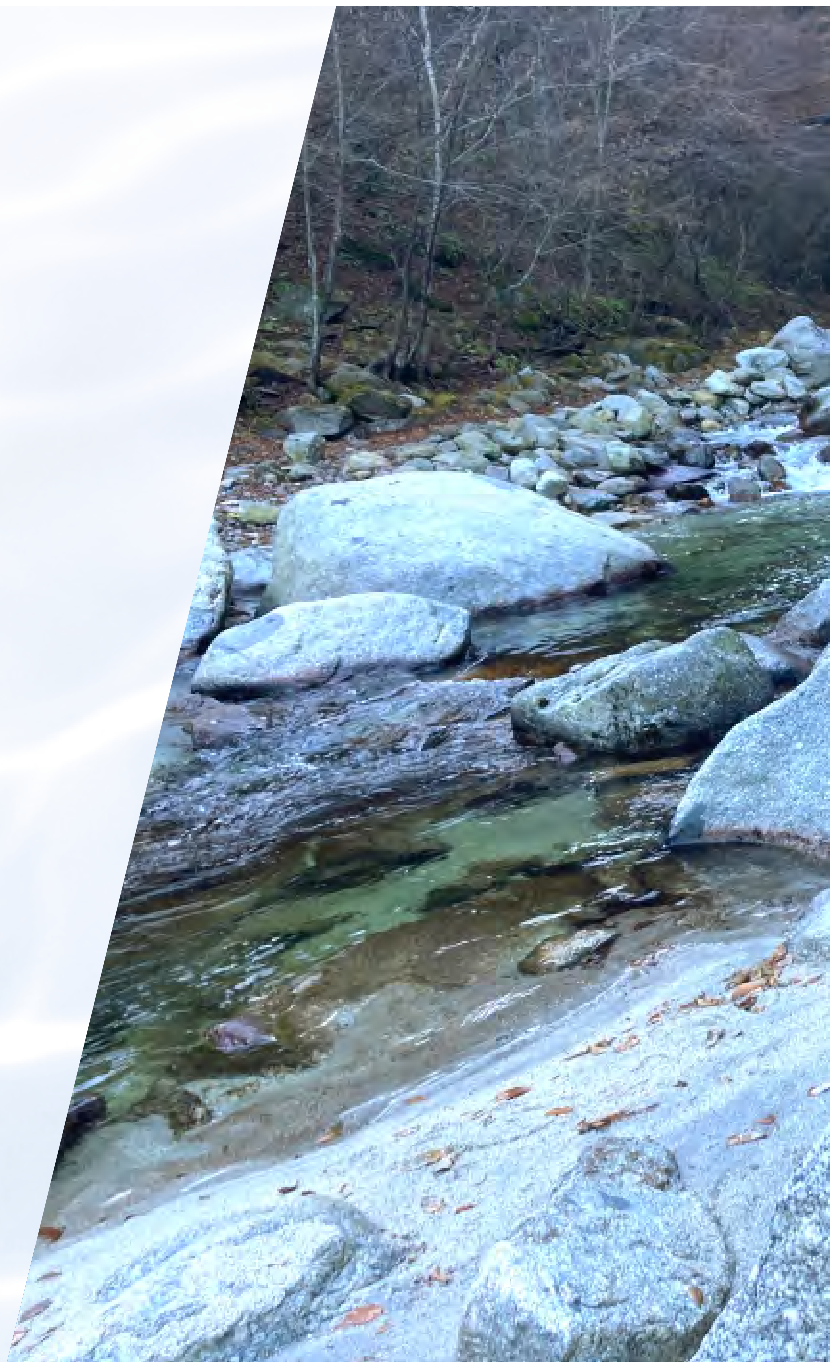
Source: 2023 Customs Clearance Statistics, Japan Ministry of Finance

GI - As an Extension of Terroir

Yamanashi is the first prefecture to acquire a GI for both sake and wine

GI Yamanashi (certified in 2021) Conditions

- ☑ A clean taste with softness and clarity
- ☑ It results from natural factors, such as gentle fermentation, and human factors,such as developing a sake brewing process to craft sake that pairs well with salty foods.
- ☑ **Brewing water is limited to six water systems in the prefecture, with strict collection conditions.**
- ☑ The sake must be made with domestic rice of grade 3 of higher under the Agricultural Produce Inspection Law, and alcohol addition is limited to 10% of the weight of the mass of the polished rice.



3
What Makes Yamanashi Sake Unique

Basic Data About Yamanashi Sake

Number of Breweries : 12

Oldest remaining brewery :

Sasaichi Shuzo (Est.1661)

Production Yield : 7,547kL

Premium Sake: 38%

- **Junmaishu: 24%**
- **Junmaiginjyoshu: 12%**

Mt.Fuji Worship and Sake Brewing

Mt.Fuji has been a symbol of worship in Yamanashi and people would carry out rituals to prevent eruptions.

In Shinto rituals, sake played an essential role as an offering called omiki.

Local breweries still serve sake for Kitaguchi Hongu Fuji Sengen Shrine began as a miniature Shinto shrine

Sake Industry Development as a Castle and Inn Town

Highway : **Koushu Kaidou**

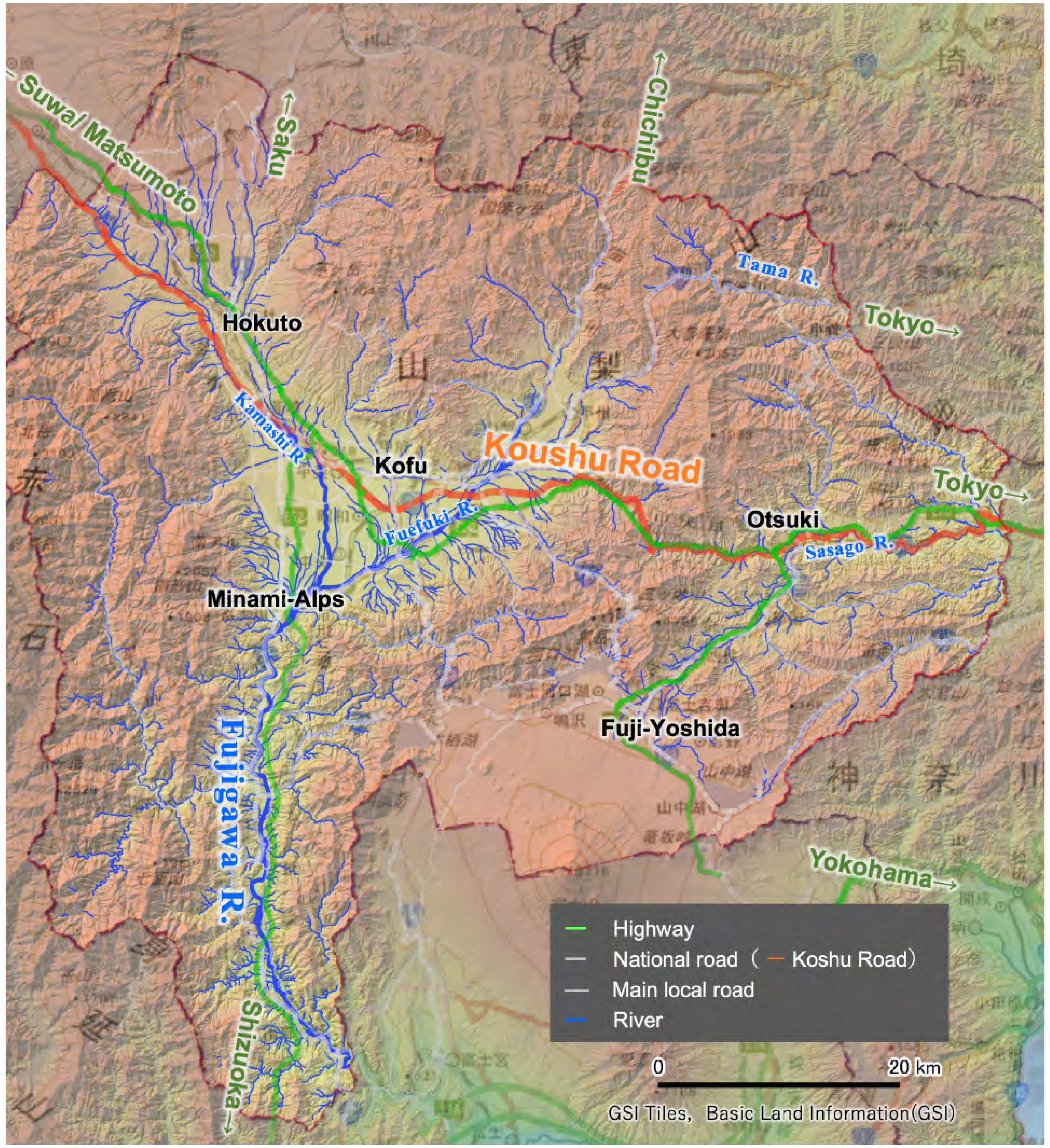
➔ Constructed from 1603 by the shogun Ieyasu Tokugawa

Waterway : **Fujikawa Canal**

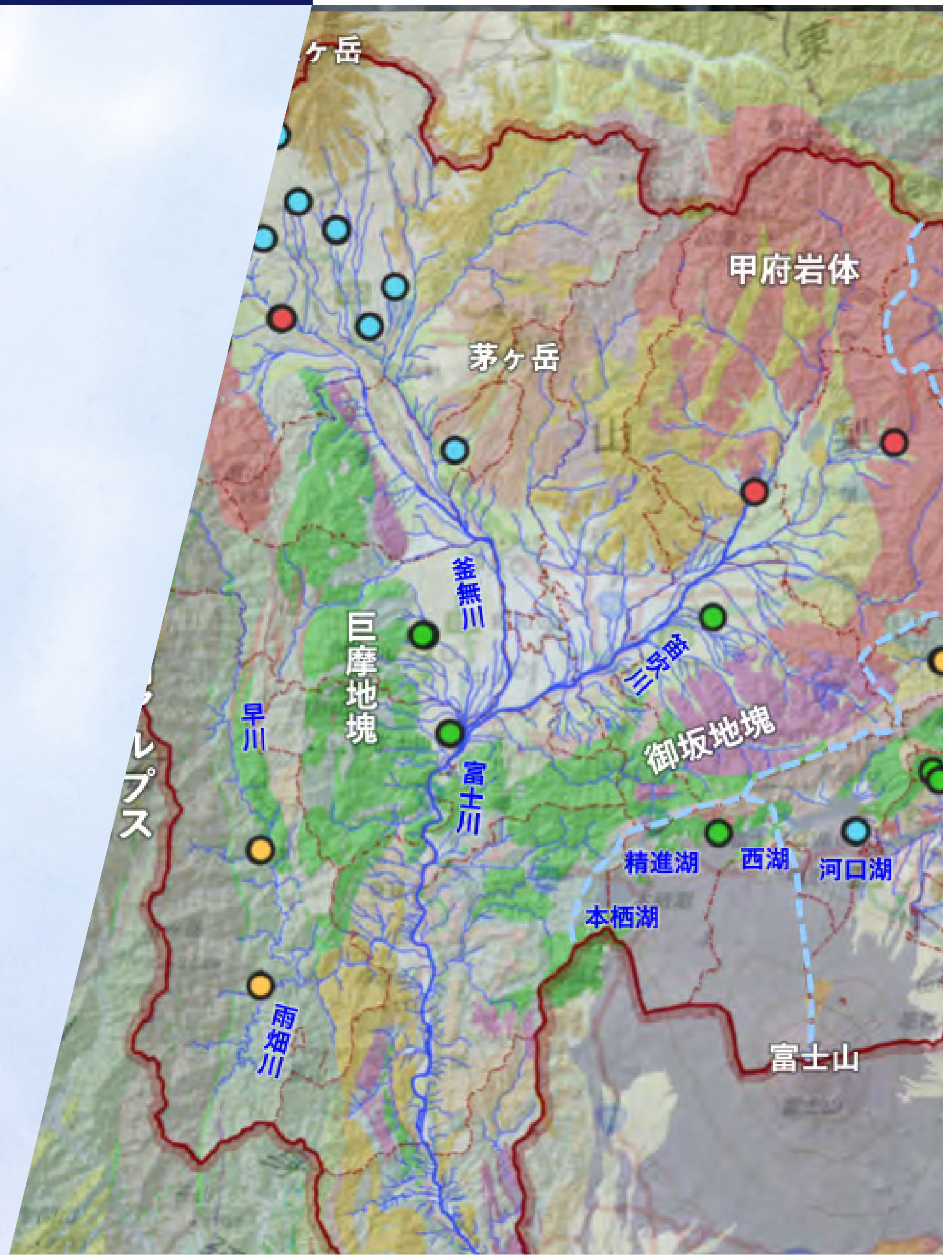
➔ River construction work by Ryoui Suminokura in 1607

Yamanashi was transformed into a major city with a population of 180,000.

As an Inn Town, Yamanashi begins sake sales aimed towards travellers to Edo and Mt.Fuji.



4 Yamanashi's Sake Terroir as Reflected in the Water



Water as a Differentiating Factor Between Sake & Wine

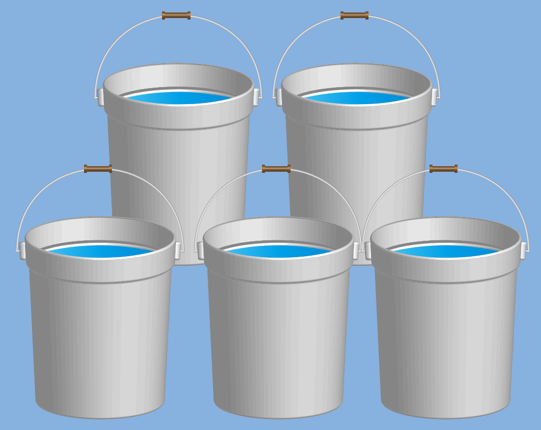
Wine

- fermenting grapes

Sake

- made from rice
- water makes up 80% of raw ingredients

~~Grape~~ not transportable



~~Mass of water~~ not transportable

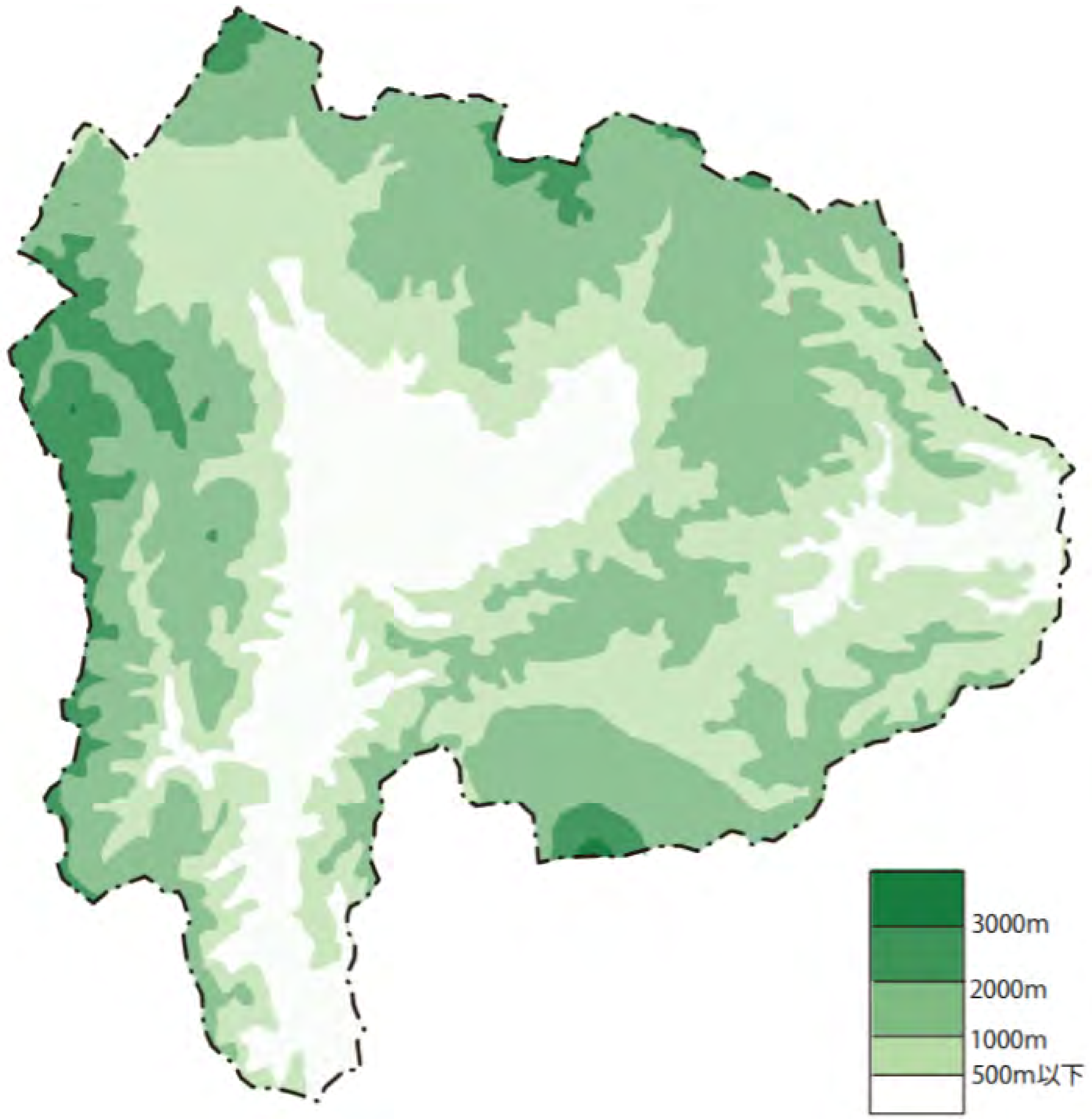
Mass of rice transportable

Bound to soil = regional character emerges

Water Born from Yamanashi's Unique Topography

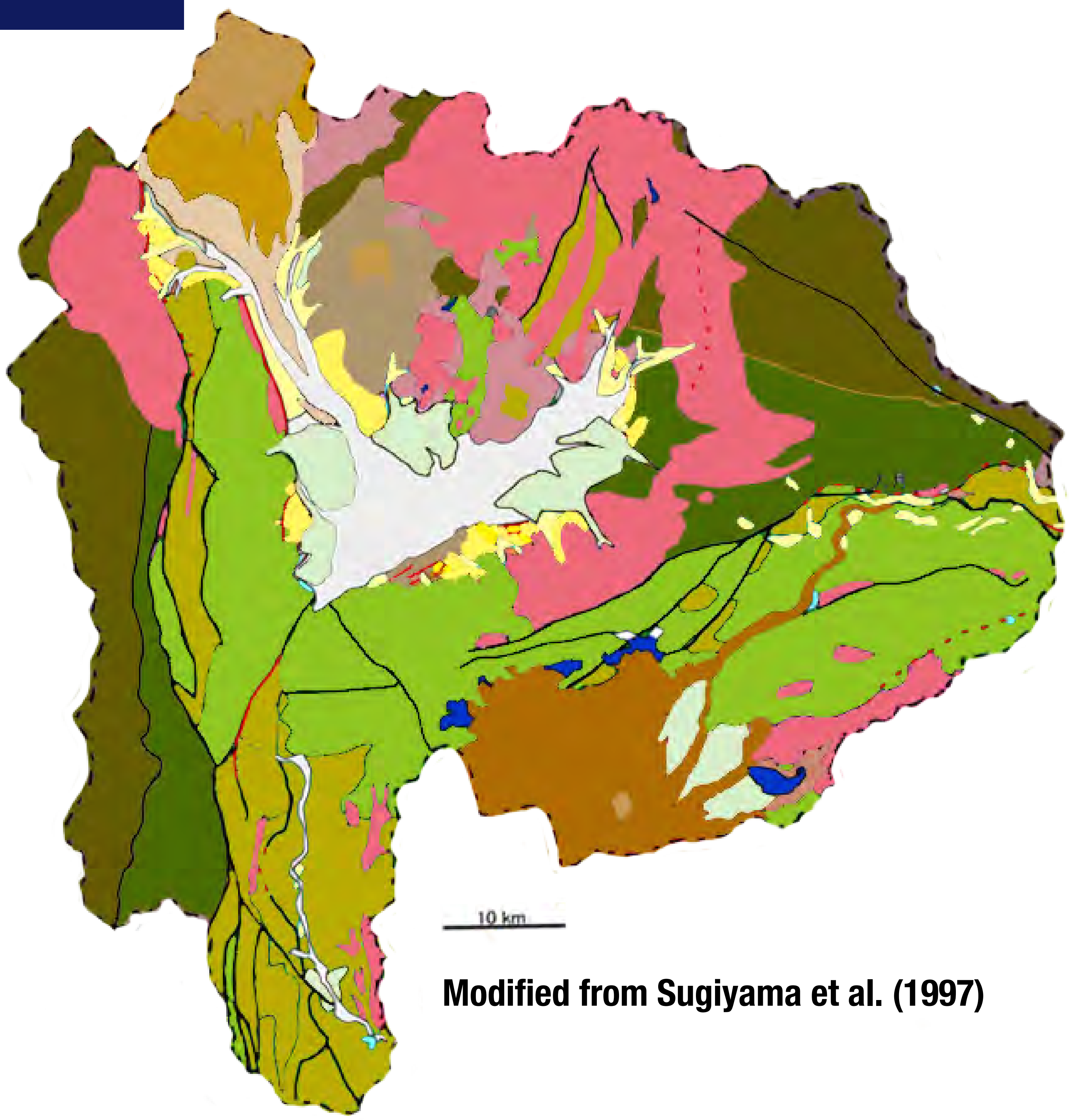
- The Kofu Basin and surrounding highlands
  - **Abundant groundwater in comparison with low precipitation.**
- A variety of geological features woven together by two plates.
  - **Groundwater quality varies from catchment to catchment.**

Elevation distribution of Yamanashi



Characteristics of Each Brewery’s Brewing Water

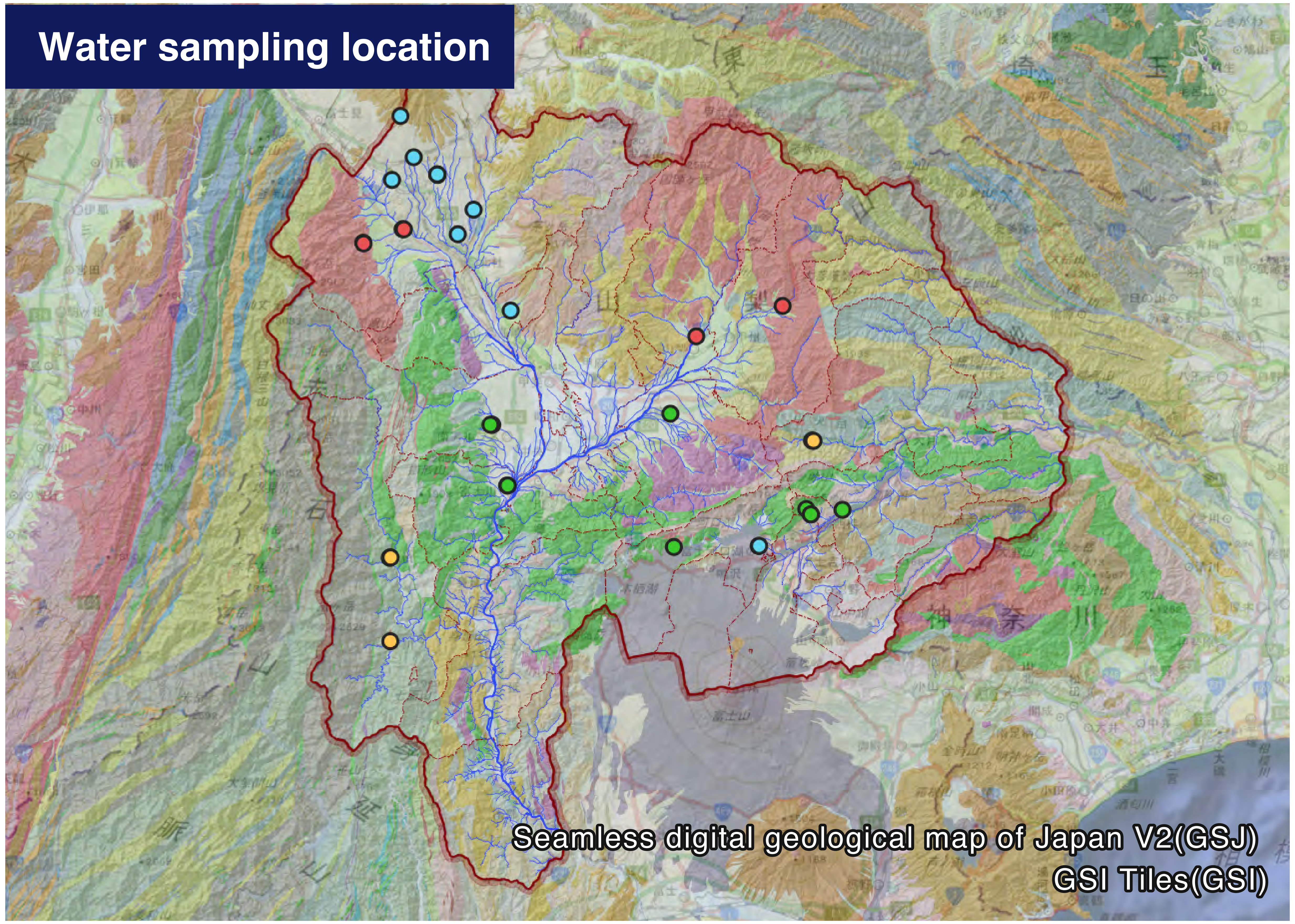
Geology of Yamanashi



Modified from Sugiyama et al. (1997)

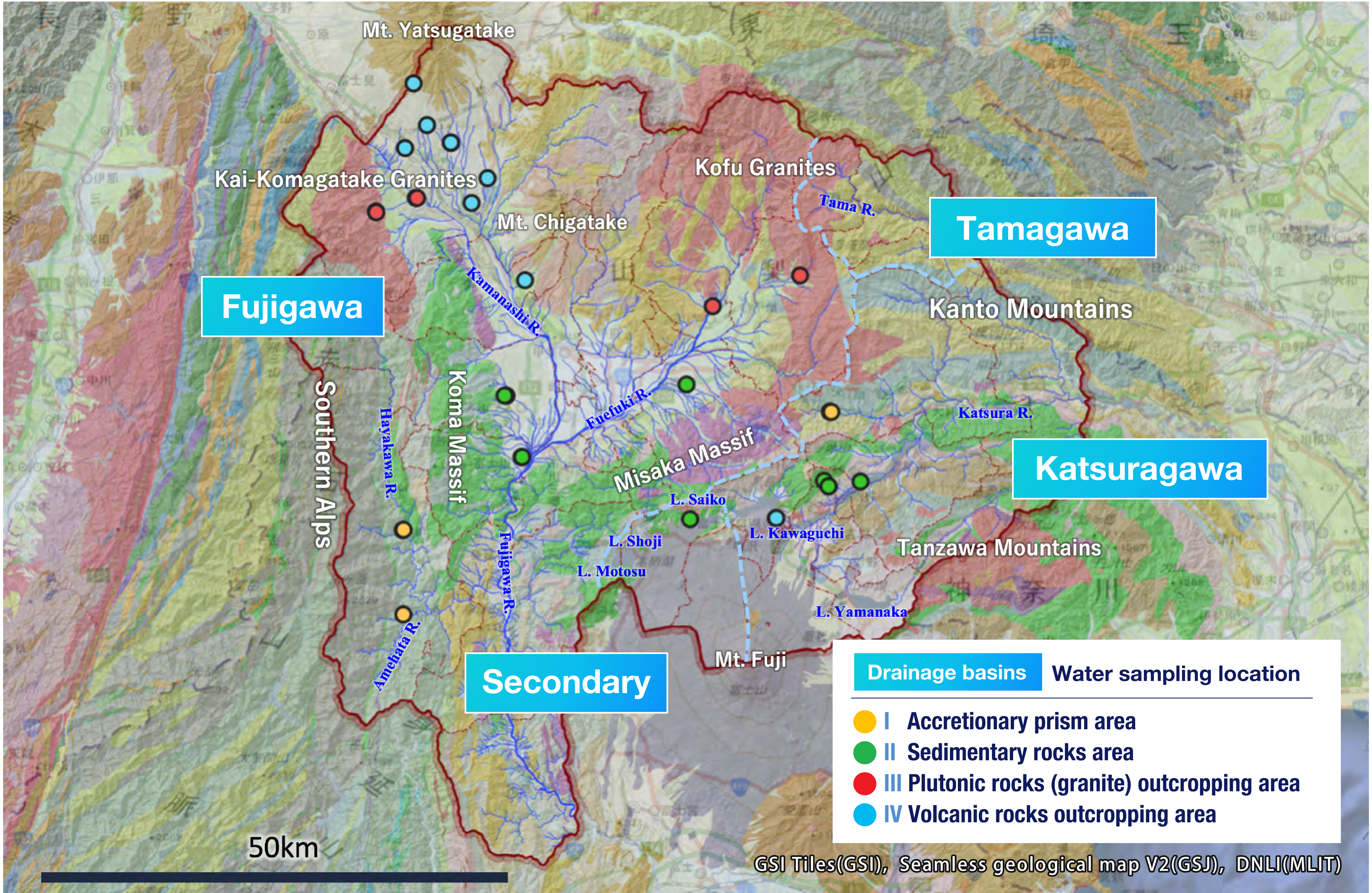
- ～Paleogene Accretion sedimentary rocks
- Neogene volcanic rocks, sedimentary rocks
- Neogene Granites, intrusive rocks
- Quaternary volcanic rocks, ejecta

Water sampling location



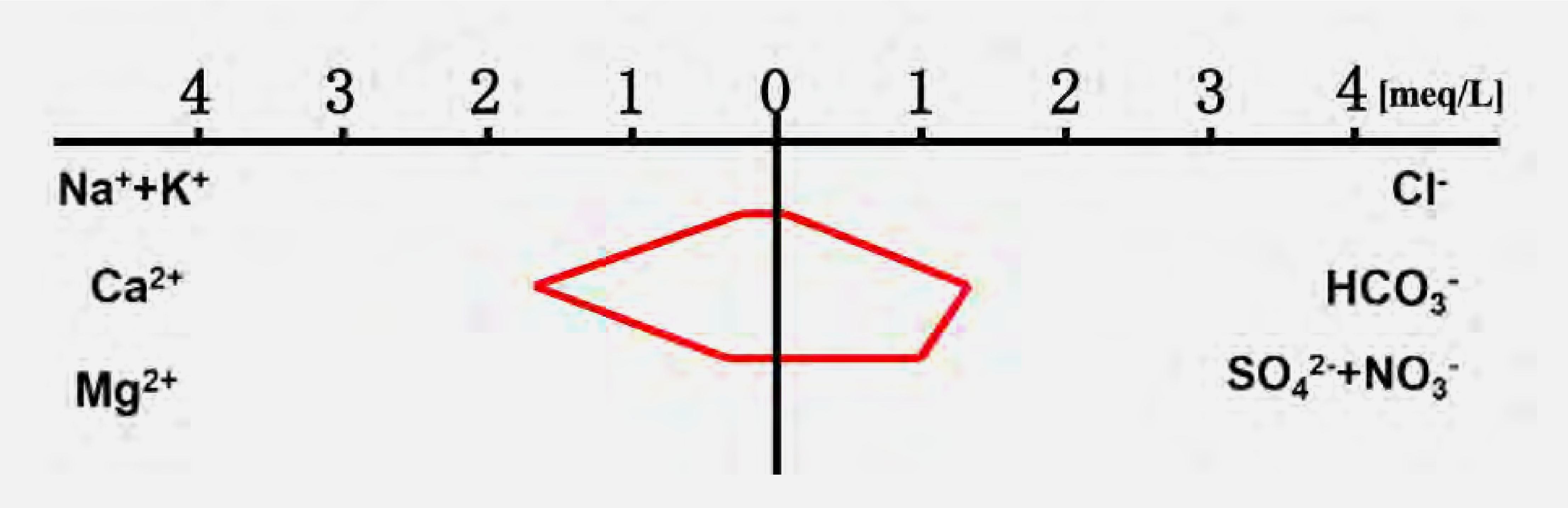
Seamless digital geological map of Japan V2(GSJ)
GSI Tiles(GSI)

- I Accretionary prism area of the outer belt of southwest Japan
- II Sedimentary rocks area due to the impact of the Izu Peninsula
- III Plutonic rocks (granite) outcropping area in the southern Fossa Magna
- IV Volcanic rocks outcropping area in the southern Fossa Magna

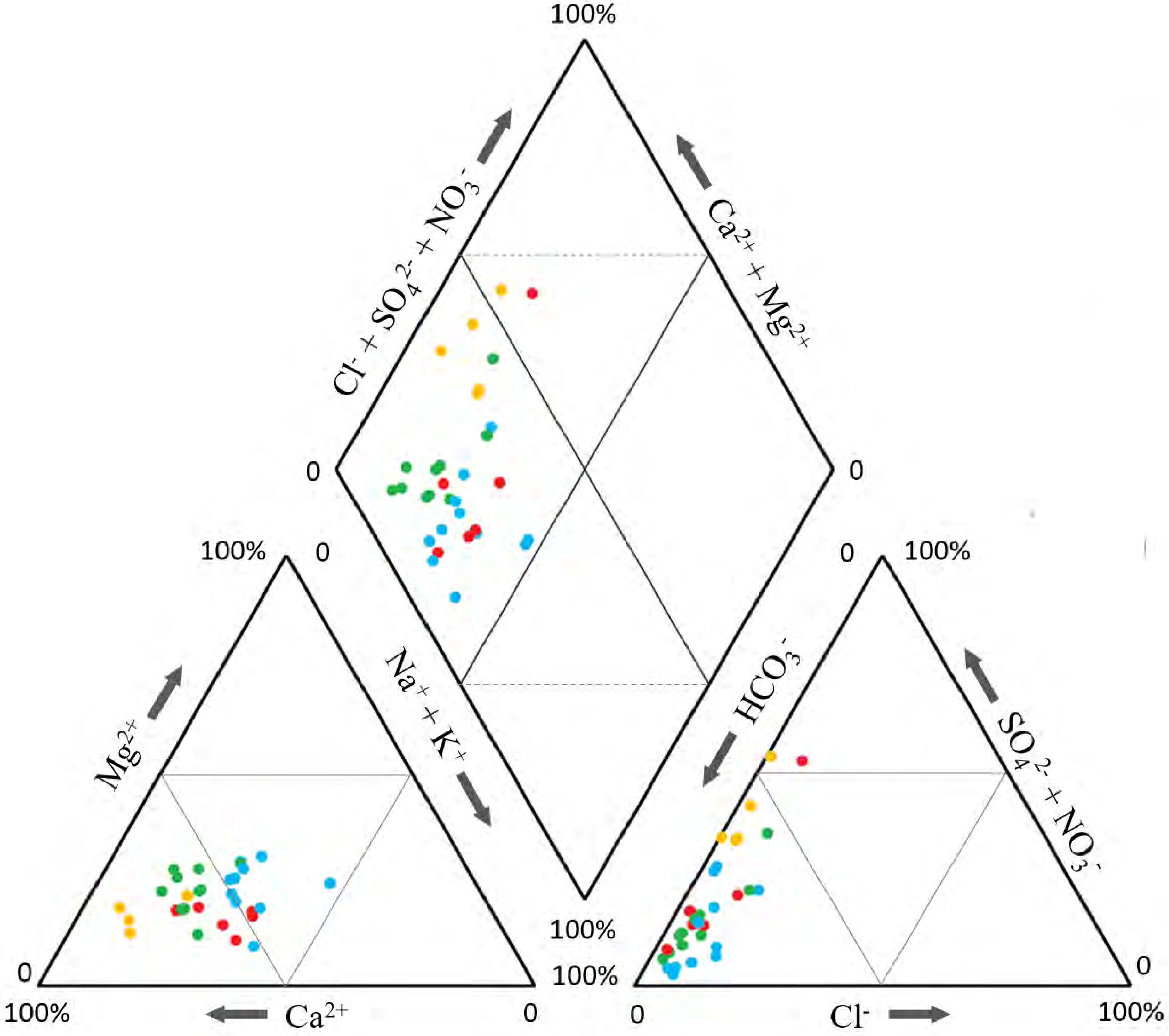

Mt. Yatsugatake
Kai-Komagatake Granites
Mt. Chigatake
Kofu Granites
Tama R.
Tamagawa
Fujigawa
Kamanashi R.
Kanto Mountains
Southern Alps
Hayakawa R.
Koma Massif
Fuefuki R.
Katsura R.
Misaka Massif
Katsuragawa
L. Saiko
L. Shoji
L. Kawaguchi
Tanzawa Mountains
L. Motosu
Fujigawa R.
L. Yamanaka
Amehata R.
Mt. Fuji
Secondary
Drainage basins
Water sampling location
I Accretionary prism area
II Sedimentary rocks area
III Plutonic rocks (granite) outcropping area
IV Volcanic rocks outcropping area
50km
GSI Tiles(GSI), Seamless geological map V2(GSJ), DNLI(MLIT)

Stiff Diagram

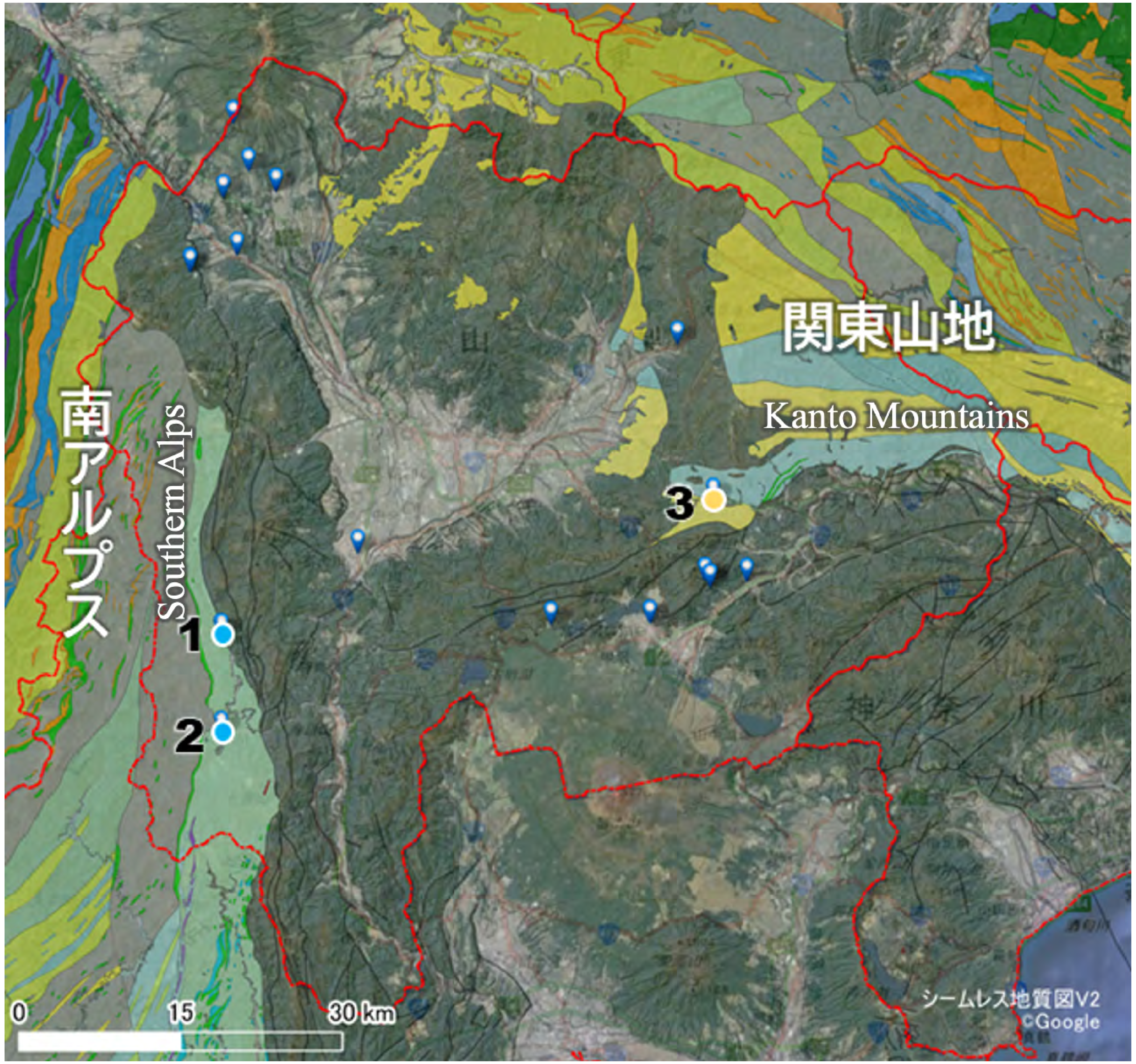
1.Hayakawa (river)

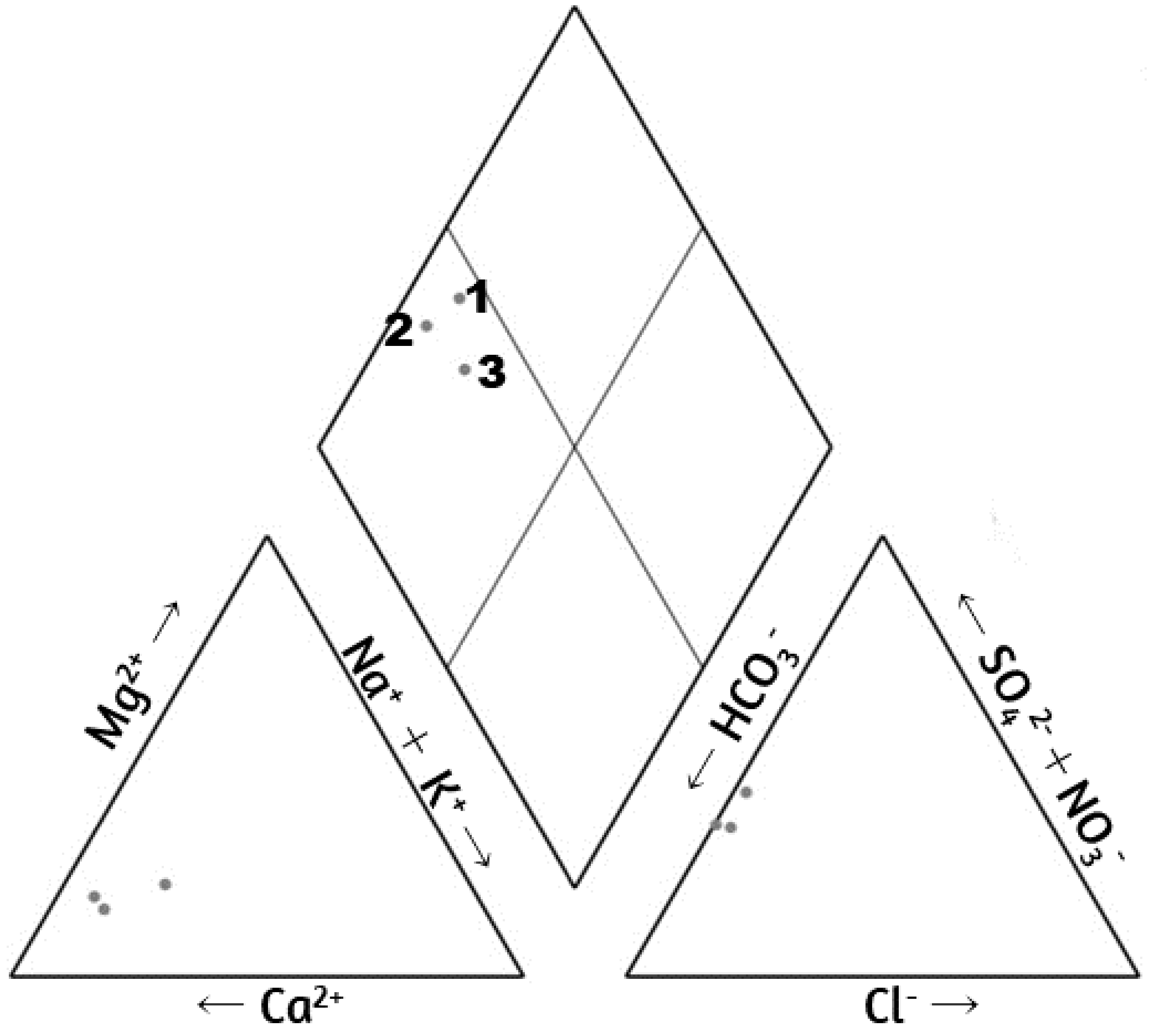


Trilinear Diagram



I. Accretionary prism area of the outer belt of southwest Japan





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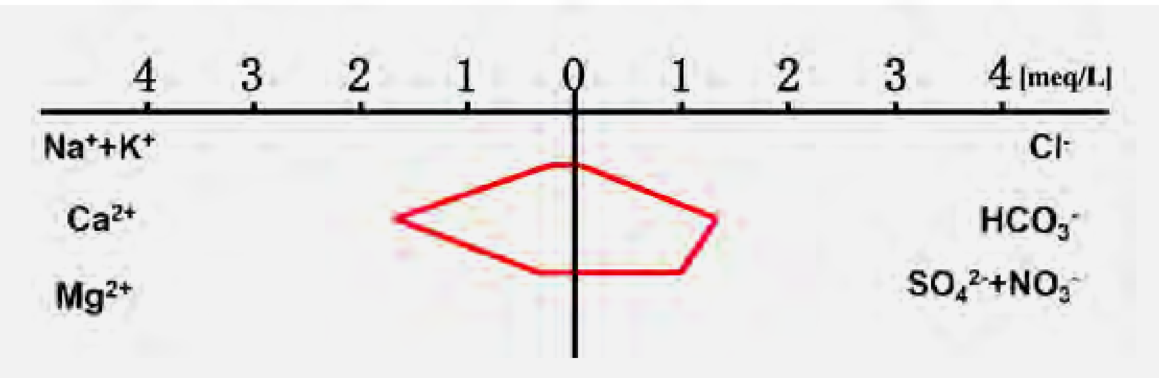
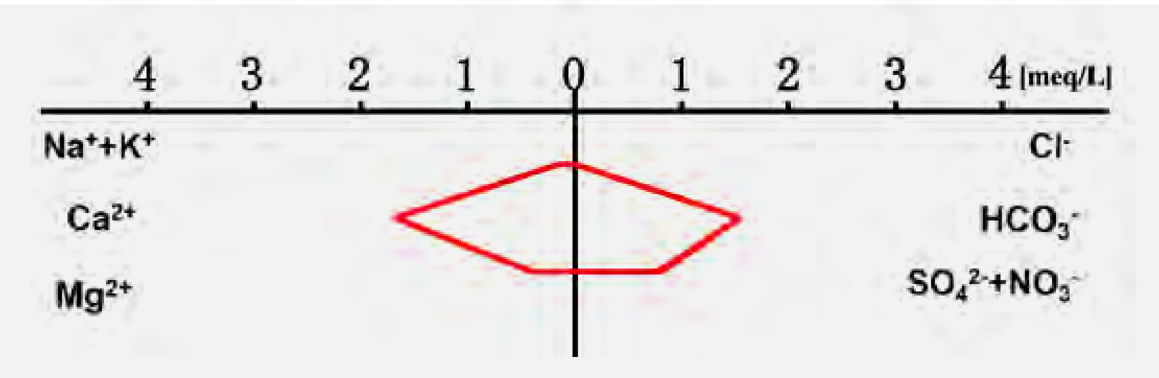
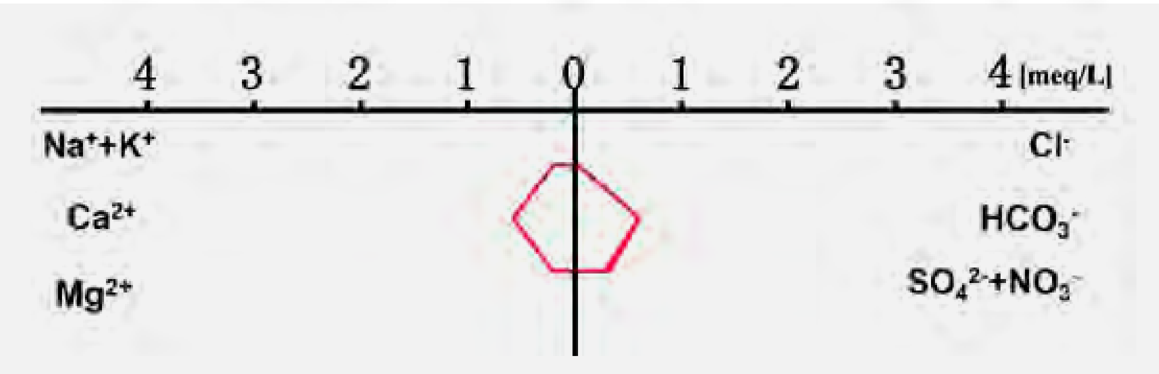


2.Amehata (river)

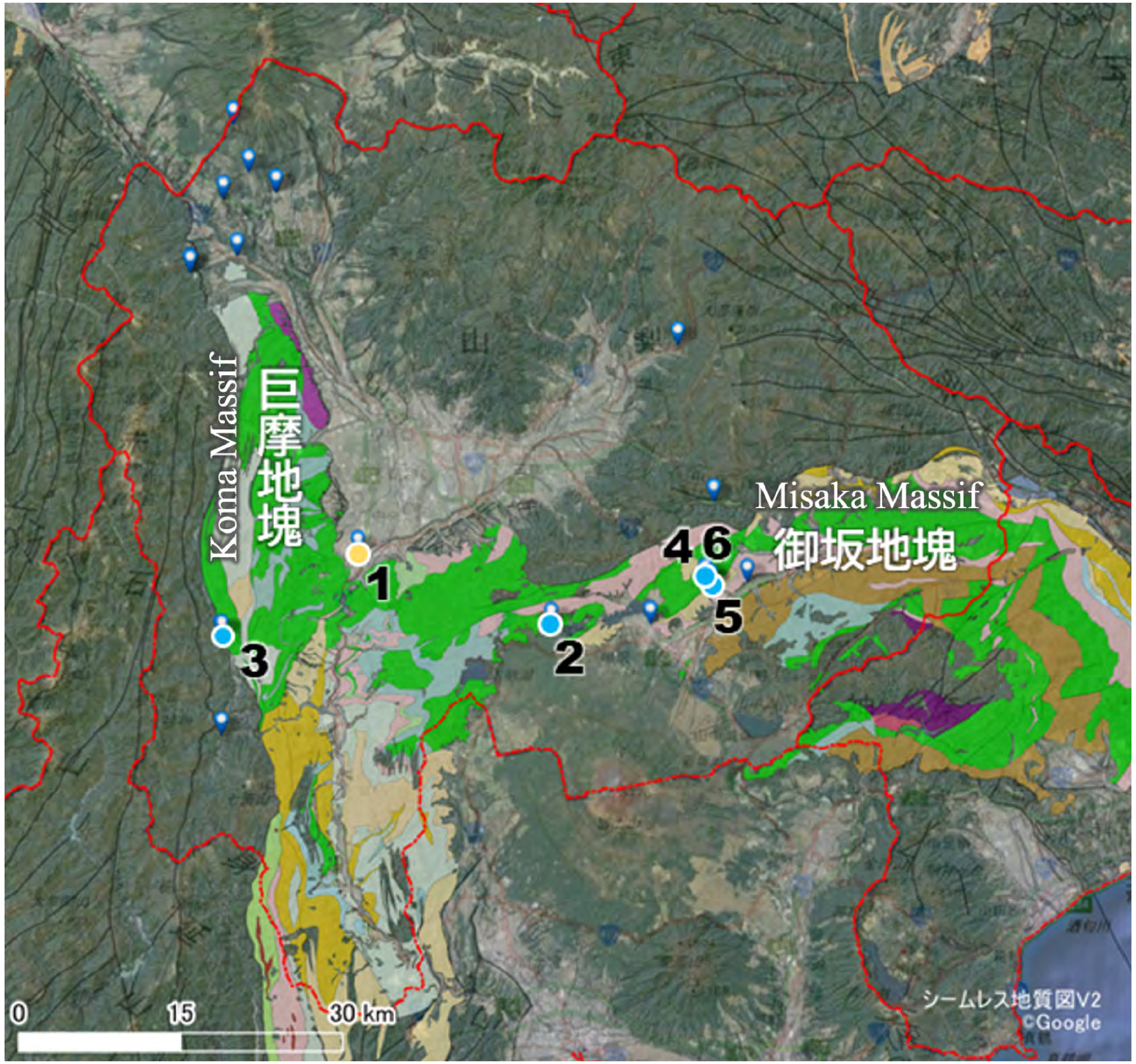


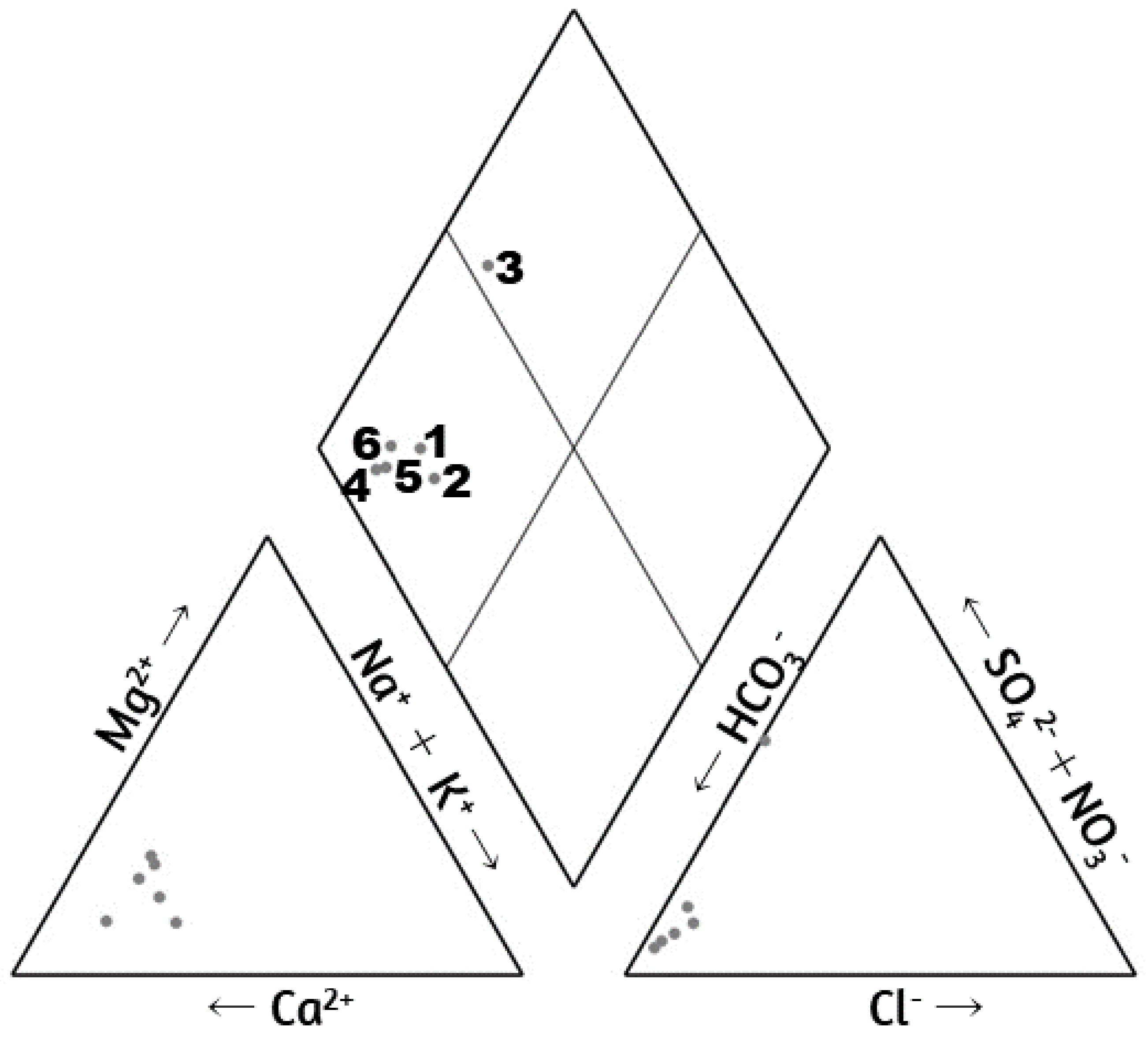
3.Sasaichi brewing water (springs)

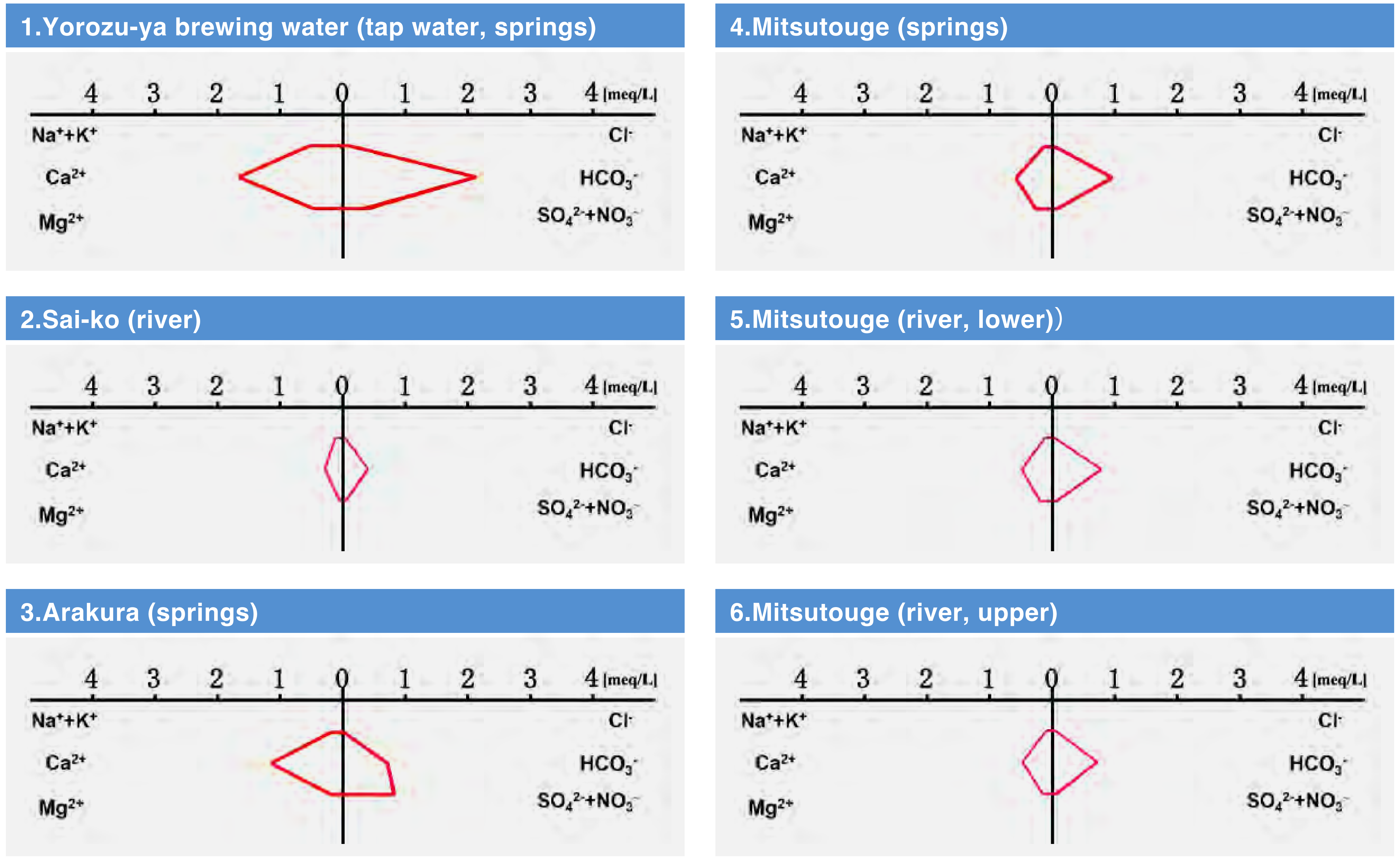


Hayakawa River flowing along the Ito-Shizu Techtonic Line

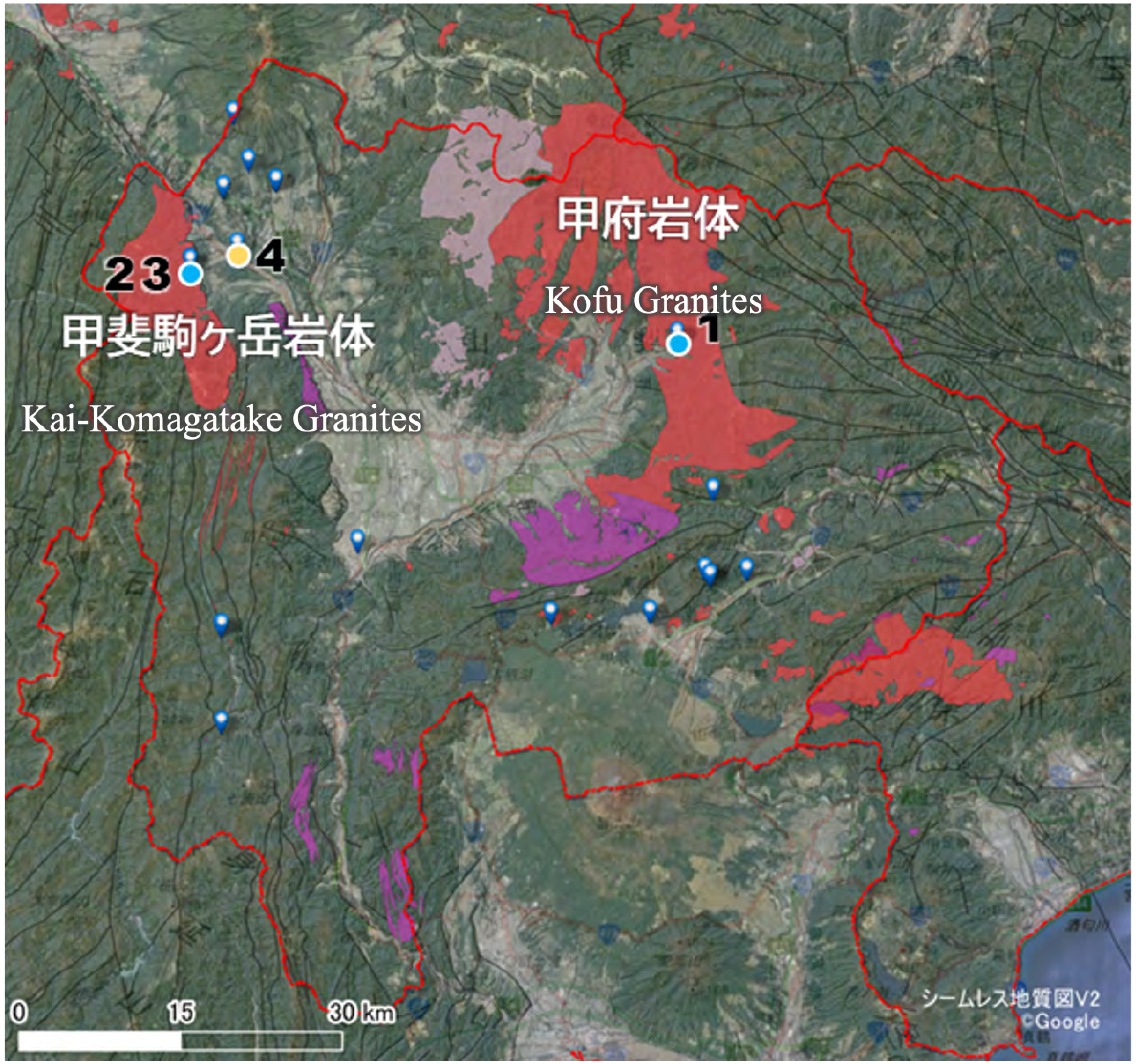
II. Sedimentary rocks area due to the impact of the Izu Peninsula

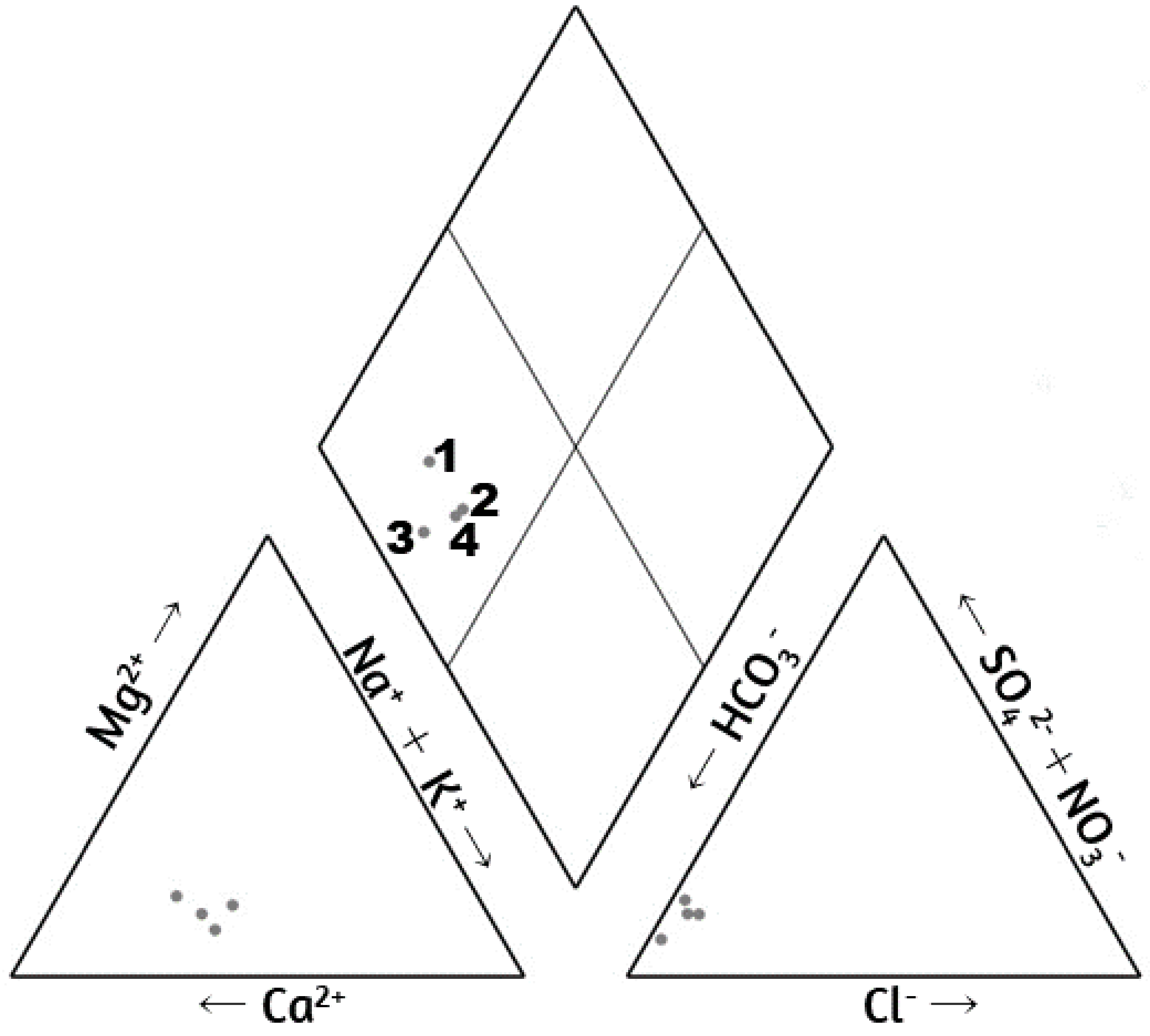




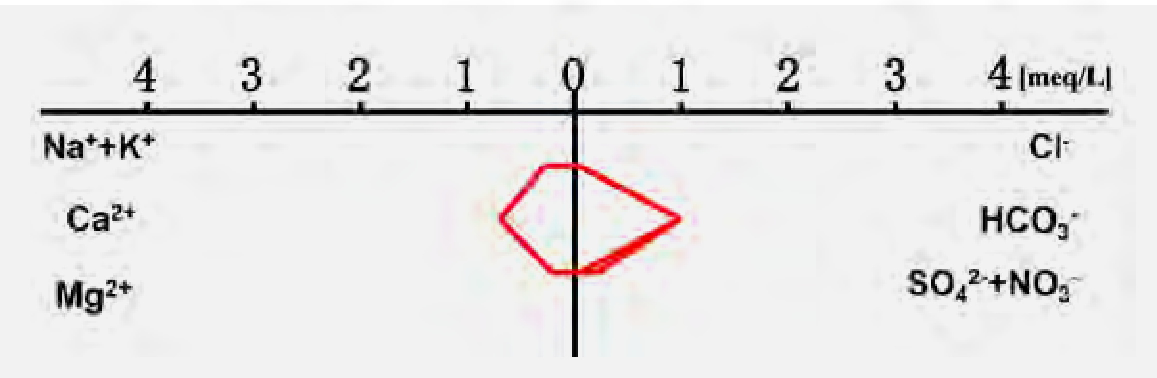


III. Plutonic rocks (granite) outcropping area in the southern Fossa Magna

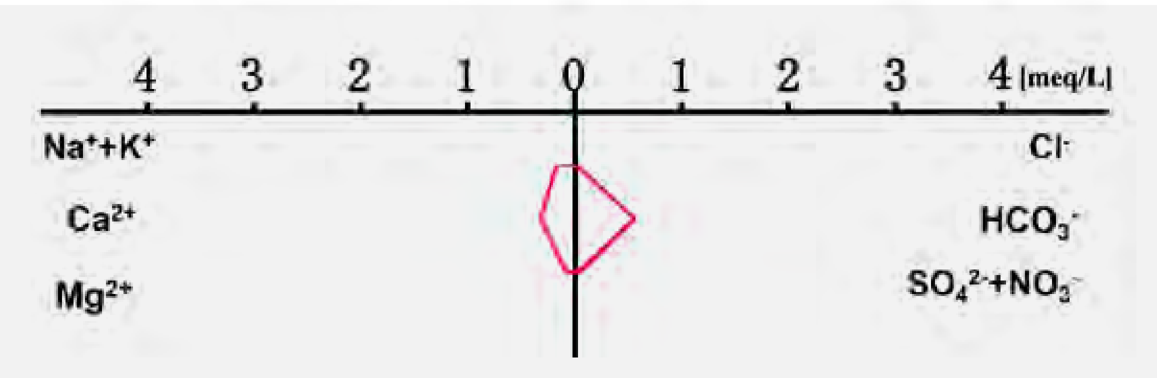




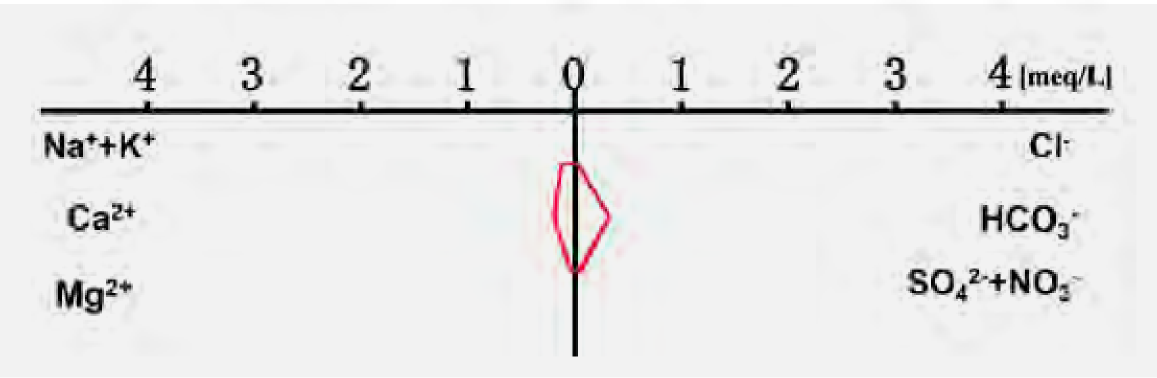
1.Touge no Yusui (springs)



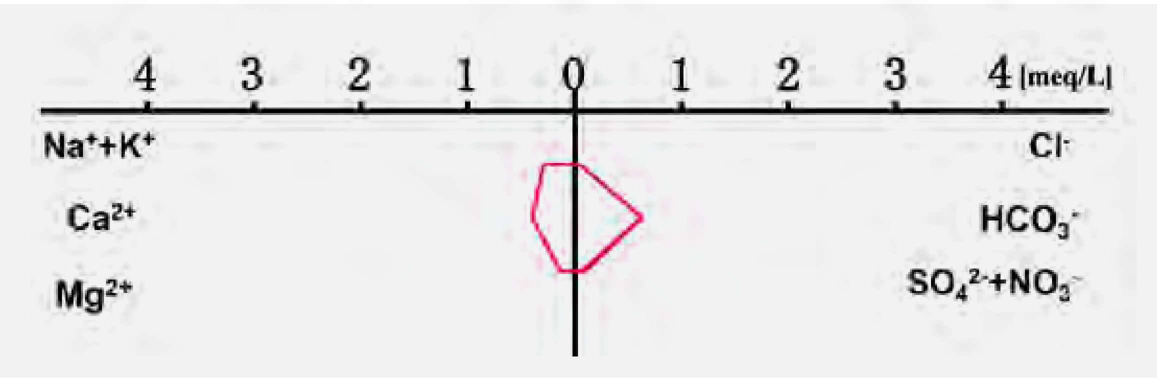
3.Komagatake Shrine (springs)



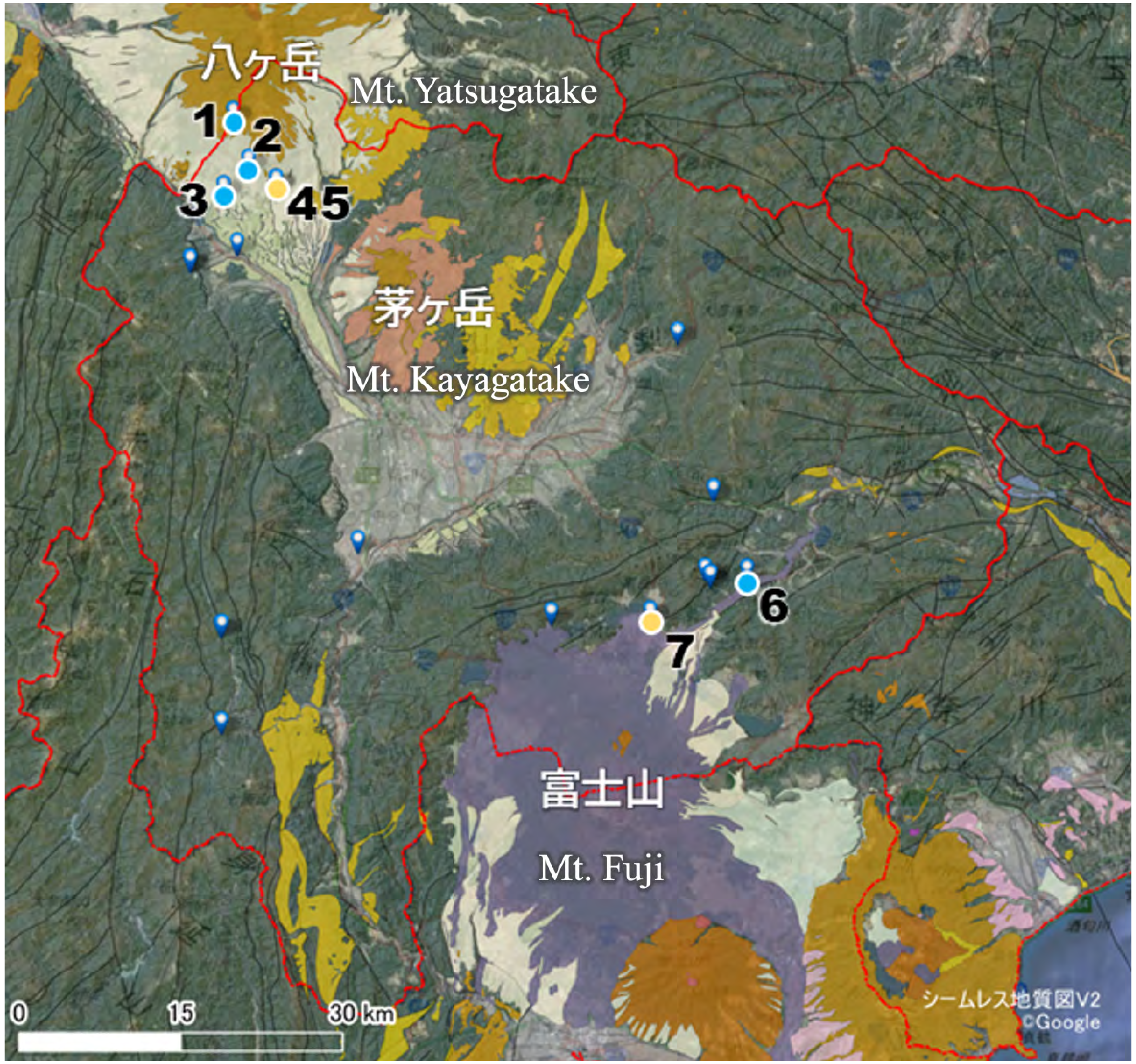
2.Ojira River

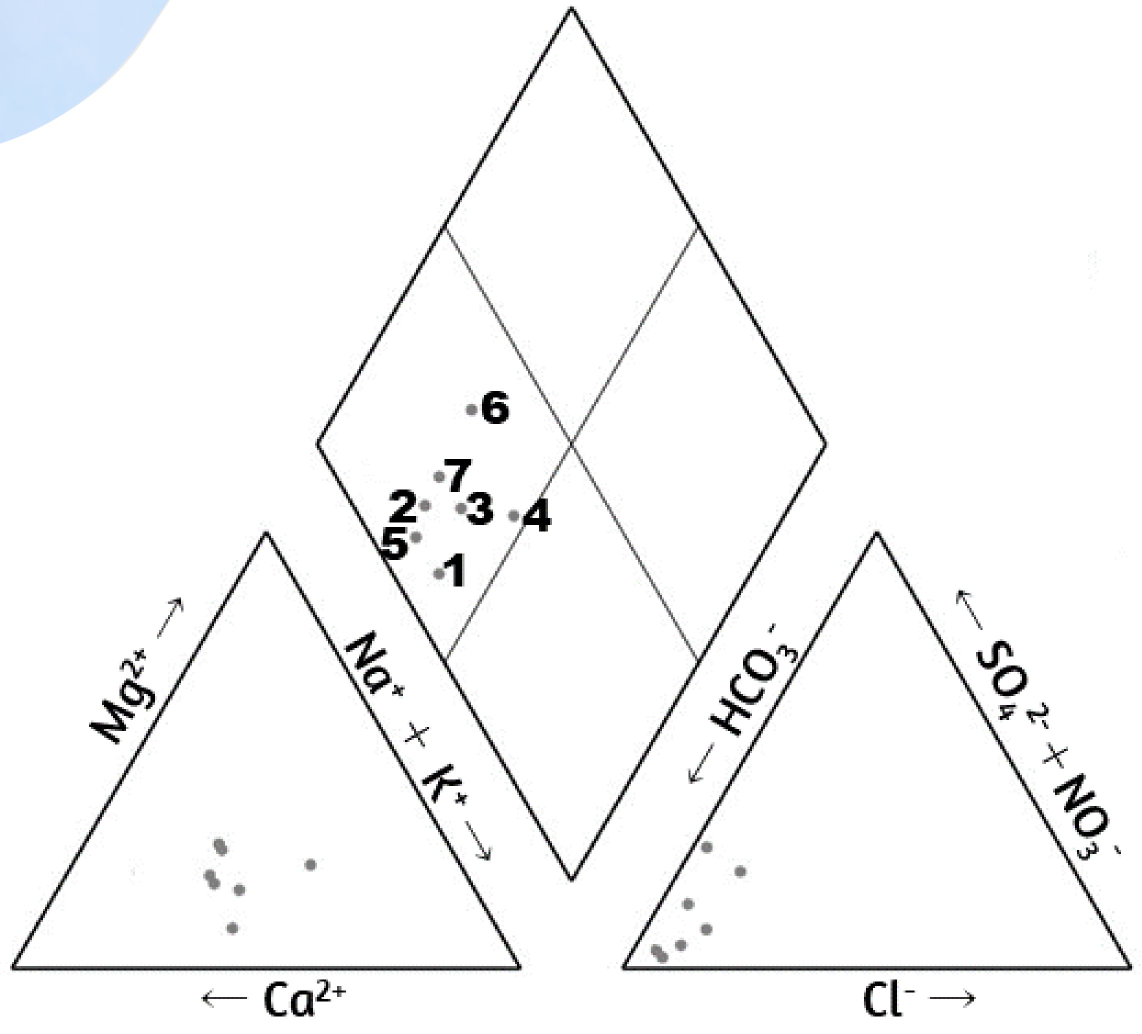


4.Yamanashi-Meijo brewing water (springs)

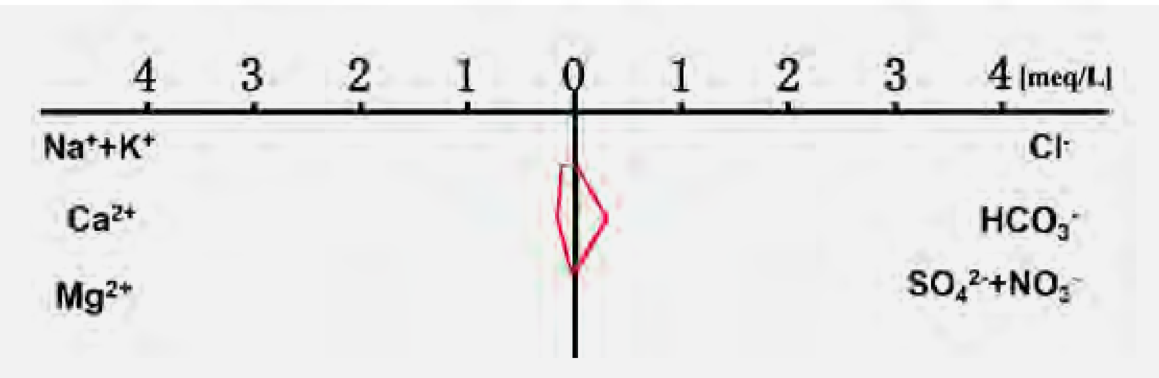


IV. Volcanic rocks outcropping area in the southern Fossa Magna

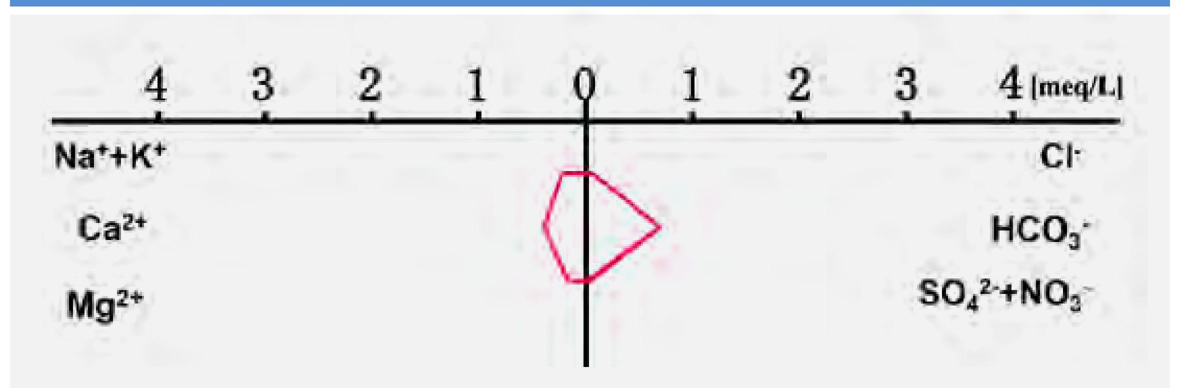




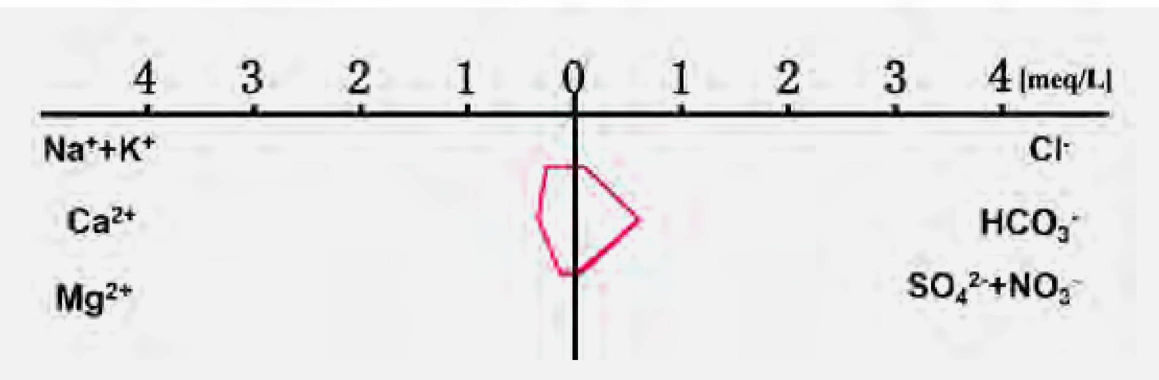
1.Enmei-sui (springs)



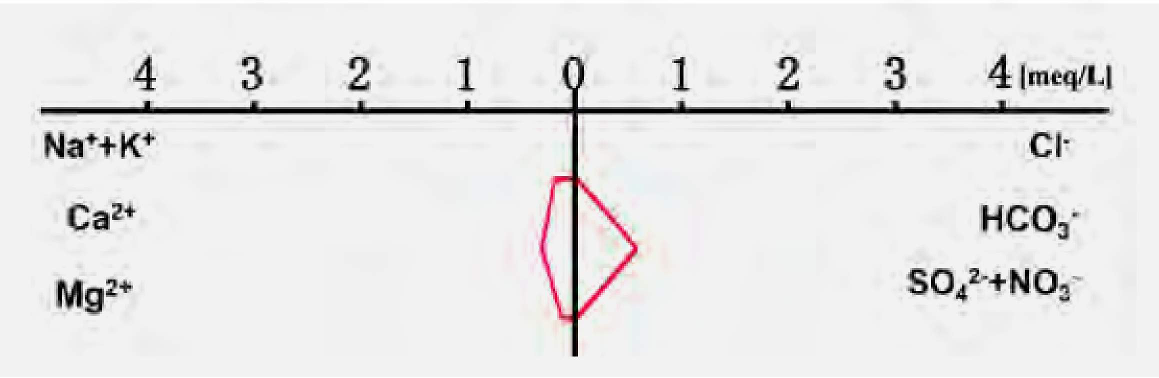
2.Sanbuichi Yusui (springs)



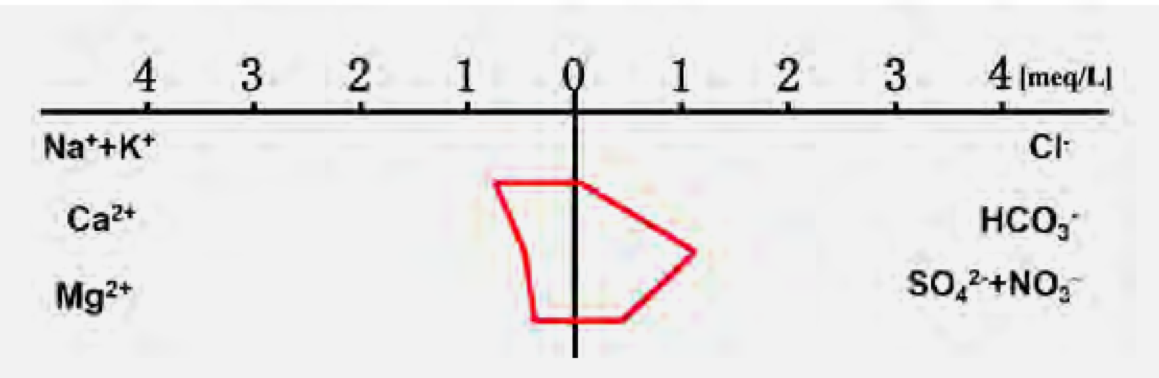
3.Otaki Shrine (springs)



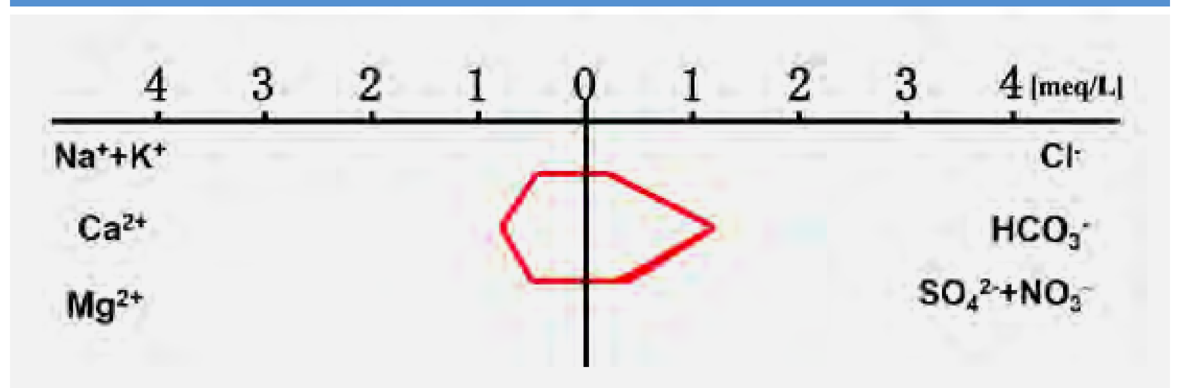
4.Tani-akura brewing water (tap water, springs)



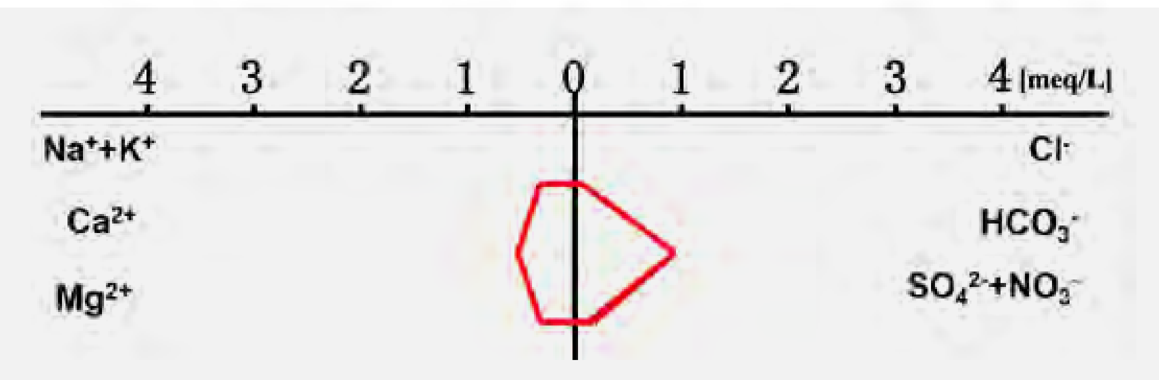
5.Tani-zakura brewing water (springs)



6.Wasabi-en (springs)



7.Ide brewing water (tap water, springs)



Conclusion

- Yamanashi may be home to only 12 breweries, but it boasts a diverse range of different brewing waters.

- Yamanashi's unique topography and geology, crisscrossed by the Fossa Magna, imparts diversity into the water.

- Each of the 12 breweries was attracted to their current location by the water and has made the quality of the water the cornerstone of their brewing.