



# Nagatoro & Nikko Field Excursion

## 23 - 25 August 2023

The 2nd International Association of Geochemistry (IAGC) Conference  
Water-Rock Interaction WRI-17  
Applied Isotope Geochemistry AIG-14  
in SENDAI 2023

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### Overview

The Sanbagawa belt which is a typical subduction-related metamorphic belt extends from the Kanto Mountains to the Kyushu island for ~800 km east-west throughout Japan. The Nagatoro-Chichibu area located in the Kanto mountains which is the eastern part of the Sanbagawa belt is the area where the Sanbagawa river flows, which is the origin of the name of the Sanbagawa belt.

The Nagatoro-Chichibu area has been known as one of the areas where the paleo-subduction boundary zone is well preserved. We will be able to observe the mesoscopic textures of the subducting materials metamorphosed at low-T and high-P conditions and the hydrated overlying mantle materials.

This area has been visited by many researchers and students since Prof. Naumann introduced his geological surveys of 1878, and now is also famous as the place where piemontite schist was first reported. In the Nagatoro-Chichibu area, many types of schists including metabasaltic, metasedimentary and serpentinite schists with various mineral assemblages are widely exposed along the Arakawa river. This area that included the riverside exposures of the Sanbagawa belt is also known as "the Birthplace of geological studies in Japan", and qualified as one of the Japanese Geoparks, which is named "Chichibu Geopark".

Small serpentinite blocks and relatively large-scale serpentinite bodies are also distributed in this area. These serpentinite blocks and reaction zones at the boundaries with the metamorphic rocks derived from the subducting slab have been studied as a key to understanding the subduction boundary between the subducting slab and the overlying mantle wedge.

In the Nikko area, volcanic landforms and the beautiful scenery created by the volcanoes, and the cultural structures that were influenced by them can be seen. In addition to the outcrops and landscapes associated with metamorphic, volcanic and faulting activities in the Nikko and Nagatoro-Chichibu areas, we would be very happy if you would also enjoy the cultural activities of people formed through their geological backgrounds.



### Schedule

#### 23 August

|  |       |  |
|--|-------|--|
| Utsunomiya JR Station                            | 10:00 |  |
| STOP 2<br>Kegon waterfall (Mt. Nantai)           | 11:00 | STOP 1<br>Nikko Toshogu shrine (Lunch) |
| STOP 4<br>Chuzenji and Chuzenji Lake Observatory | 14:00 | STOP 3<br>Akechidaira Ropeway          |
|  | 15:00 |  |
|  | 16:00 |  |
|  | 18:00 | Check in at the hotel *                |

#### 24 August

|   |       |  |
|---|-------|--|
|   | 8:30  | Check Out from the Hotel                           |
| STOP 5<br>Nagatoro (Tora-Iwa) (Saitama Museum of Natural History) (Lunch & Photo) | 11:30 | STOP 6<br>Bukou sake brewery                       |
| STOP 7<br>Hijiri shrine   | 14:30 |  |
|   | 16:00 |  |
|   | 17:00 | STOP 8<br>Check In at Wado (Chichibu Onsen Ryokan) |

#### 25 August

|  |       |                            |
|--|-------|----------------------------|
| Check Out from Wado  | 8:30  |                            |
| STOP 9<br>Iwa-Tatami (Rafting or boat tours down the Nagatoro River) | 9:00  | Lunch                      |
|  | 12:00 |                            |
|  | 13:30 | STOP 10<br>Takasago bridge |
| Kumagatya JR Station   | 15:30 |                            |

\* Asaya Hotel, Kinugaya Onsen Ryokan or somewhere around the Chuzenji lake

Volcanoes younger than 25 ka

- Vd4 Dacite lava
- Vb4 Basalt to andesite lava and pyroclastic rocks

Volcanoes in 200-25ka

- Vd3 Dacite lava and pyroclastic rocks (partly andesite)

Volcanoes in 780-200 ka

- Vf2 Volcaniclastic materials
- Va2 Basalt to dacite lava and pyroclastic rocks

Late Cretaceous

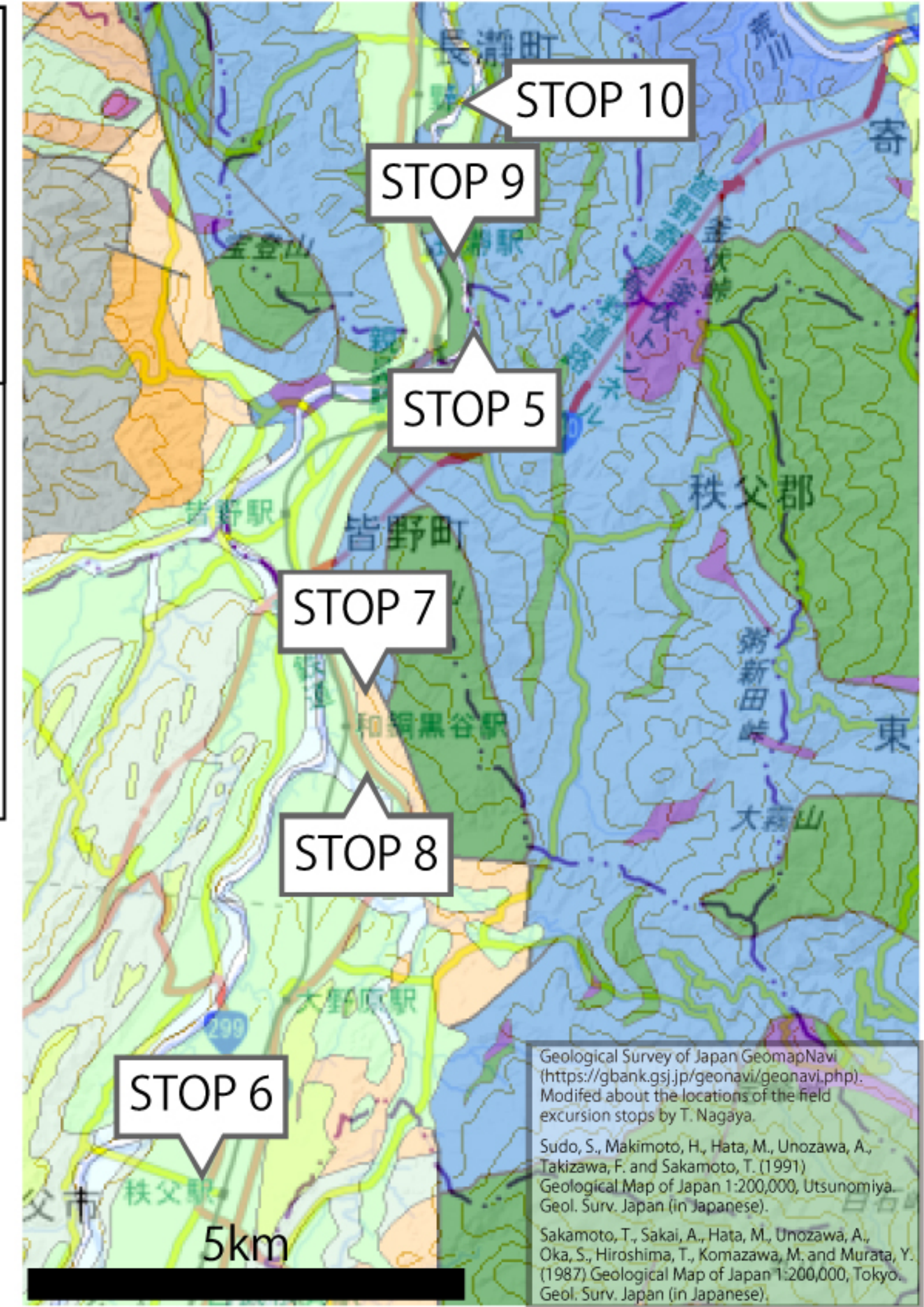
- G2 Biotite granite, hornblende-biotite granite, and hornblende-biotite granodiorite
- Kr Rhyolite to dacite tuff breccia and lapilli tuff (welded partly intercalating rhyolite lava, conglomerate, and sandstone)

Late Pleistocene - Holocene

- s Gravel and sand
- tl Gravel and sand

Jurassic

- J1 Shale and sandstone, including exotic blocks of Triassic chert, and minor mafic volcanic rocks, and limestone



Pleistocene (Late)

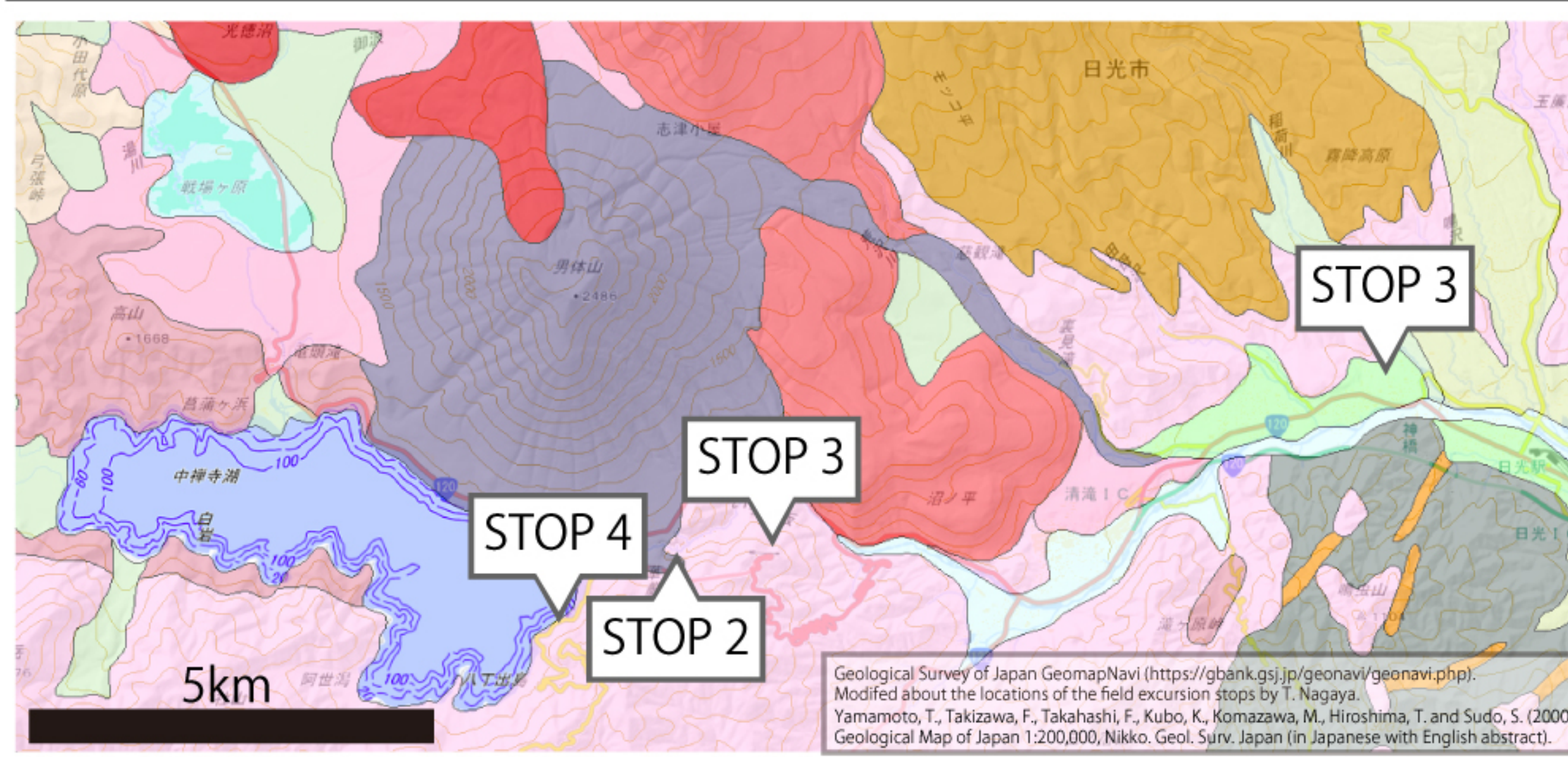
- T Gravel, sand, mud and clay

Miocene (Early to middle)

- Cu Conglomerate, sandstone and mudstone

Jurassic

- C Chaotically mixed rocks containing blocks of basalt, limestone, chert and sandstone in muddy matrix
- ch Chert
- Mk Basalt, dolerite, hyaloclastite and tuff, with mudstone, chert and limestone
- Sm Pelitic schist, with quartz schist and psammitic schist
- U Ultramafic rocks (mostly serpentinized)

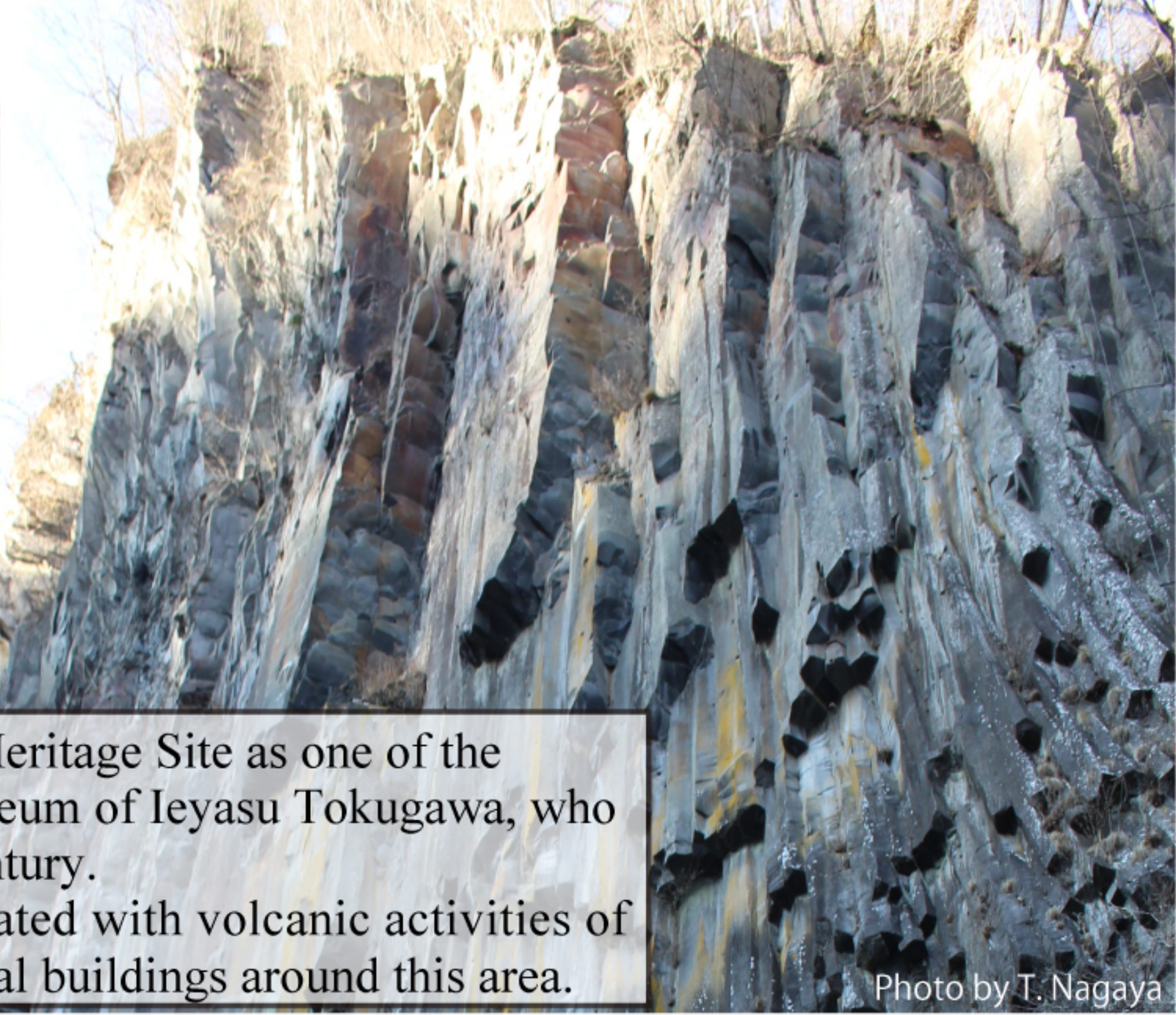


STOP 1 Niiko Toshogu Shrine  
 STOP 2 Kegon waterfall  
 STOP 3 Akechidaira Ropeway  
 STOP 4 Chuzenji and Chuzenji Lake Observatory

STOP 5 Nagatoro (Tora-Iwa)  
 STOP 6 Bukou Sake Brewery  
 STOP 7 Hijiri Shrine  
 STOP 8 Wado (Chichibu Onsen Ryokan)  
 STOP 9 Iwa-tatami  
 STOP 10 Takasago bridge

STOP 1 Niiko Toshogu Shrine

STOP 2 Kegon waterfall



Stop 1: Nikko Toshogu Shrine is registered as a World Heritage Site as one of the "Shrines and Temples of Nikko". It is the mausoleum of Ieyasu Tokugawa, who founded the Tokugawa Shogunate in the 17th century.  
 Stops 2-4: We can see the topographic changes associated with volcanic activities of Mt. Nantaisan and the development of cultural buildings around this area.

STOP 3 Akechidaira Ropeway & STOP 4 Chuzenji and Chuzenji Lake Observatory



STOP 5 Nagatoro (Tora-Iwa)



STOP5: Stilpnomelane schist with alternation of quartz, feldspar and calcite rich layers and strong micro-folding, resulting in the rock face looks a pattern of tiger skin.

STOP 7 Hijiri Shrine & STOP 8 Wado (Onsen Ryokan)



STOP 7: Natural copper was collected and produced from fault zones between Sanbagawa metamorphic rocks and Neogene sedimentary rocks. Copper coins manufactured using natural copper of this area have been proposed as the first circulating coins in Japan from 708 A.D., called "Wadokaichin".

STOP 8: Onsen in this area has been famous for hot spring cures since the 17th century. The oldest spring was discovered over 1,200 years ago when mining a trail for the coins Wadokaichin. That original spring is called the "Waters of the Medicine Buddha"

STOP 9 Iwa-tatami & STOP 10 Takasago bridge



STOP 9: We can see a natural monument "Nagatoro s Iwa-datami (rock pavement)" that is a river terrace of fractured schists developed joint structures. We can also go down the river with a boat while watching the characteristic quay formed as results of uplift and erosion by the river flowing through schists.

STOP 10: There are en echelon veins filled with white quartz and calcite in this stop and serpentinite and thier metasomatic reaction zones with metamorphic rocks derived from the subducting slab in this area.