

# Geology around Sanko

## -Looking at the past-

Miyagi Sendai Daisan Senior school

Tsurugaya, where Sendai Daisan Senior High School is located, is said to be an area with many height differences. Usually, several swamps are formed along the height differences of the topography, but some of them are formed along the opposite direction. In this research, we conducted three things about geology to clarify the causes of the formation of topography. At the result, We found that there is a gently geologic fold around our school. Also, the Rifu Nagamachi fault runs near us, and its strike and the axis of the fold are parallel. This is evidence that the geologic fold was formed due to the influence of fault activity. We hope that our research will be useful for estimating the scale of damage about future natural disasters.

### 1 Background

There are many kinds of geologic features around Tsurugaya. For example, geologic folding, swamps and valleys.

Every place where we live has some features of geography. Many of them are caused by natural activities of the Earth (volcanic activity, land subsidence, crustal earthquake) and places with slopes, valleys, and swamps with large differences in elevation are considered to be affected by these activities.

Around Tsurugaya, Miyagino ward, Sendai City, Miyagi Prefecture has the swamp called Ozutsumi swamp or Yohee swamp. It has a special shape that is formed along the direction against the flow. Such a shape is rare even in Japan. In addition, outcrops where the ground is exposed are usually buried in the topsoil or hidden by man-made structures, but there are many of these outcrops, compared to other areas in Miyagi Prefecture, the topography is known for its drastic difference in elevation, with the Rifu Nagamachi Fault running through it. A fault is a place where the strength of the ground or geology is lower than that of other places in the land plate that carries Japanese islands. It is the active faults that break and cause earthquakes. The Rifu-Nagamachi Fault is one of the active faults.

The Rifu-Nagamachi Fault is located on the west side in the Sendai plain and runs from Rifu town to Murata town in Miyagi prefecture. It is about 21 up to 40 kilometers long. (fig.1) It is also known that this active fault is a reverse fault with the west side rising. A reverse fault is a fault that moves in a direction opposite to the direction in which it moves. We thought that the unusual topography around Tsurugaya was formed by the influence of this fault because it is located near the Rifu Nagamachi Fault.

In general, the evidence for the presence of active faults and faulting includes the presence

There are some folds and the existence of many fractures in the ground and bedrock.

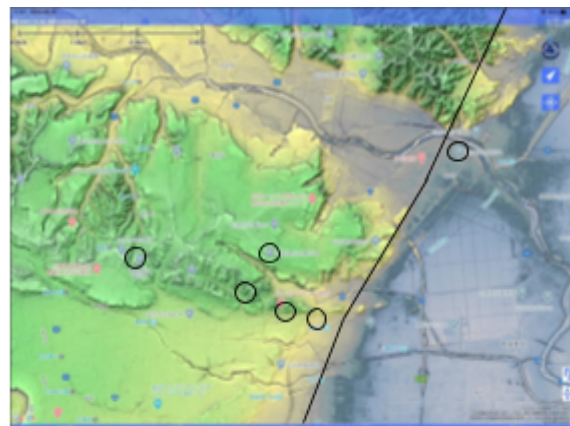


fig1 Topographic map around Tsurugaya

Black line : Rifu Nagamachi fault

Black circle : Public school which are investigated

In this study, we will focus on confirming the existence of folds in the Tsurugaya area, because it is difficult to find cracks in the subsurface ground.

Since the Rifu-Nagamachi Fault is a reverse fault, it is closely related to folds, and therefore, we will focus on confirming the existence of folds in the Tsurugaya area. Folding refers to a phenomenon in which strata are deformed in such a way that they bend and twist when a large force is applied to them from both directions.

Folds and reverse faults are closely related because they are both structures formed by compression.

The relationship between folds and faults is well known. By showing the relationship between folds and faults, we can understand the areas affected by faults and use this information to create hazard maps.

In this study, we did the following three methods to clarify the existence of folds.

- comparing ground layer log
- fieldwork and topob
- Stereonet

## 2 Method

### (1)Collect theData of Drilling Survey.

We received the data of drilling survey from public schools near our school.

For example,Masue elementary school,Dainohara elementary school and Iwakiri junior high school(fig1).

After that, we started analyzing how ground layers overlapped and make the log which symbolize transition of ground layers

### (2 Fieldwork

We looked the area around Tsurugaya.

Moreover,we recorded the data of strikes, dips and kinds of stones.Strikes and dips means that it symbolizes the shape of faults.

### (3) Make Stereo Net

This is stereo net.We analyzed the data of strikes and dips from results of fieldwork.

Stereo net is one of the best ways to change the type of space.

In this research,we used the way that makes the shadow about line and surface on half of the circle

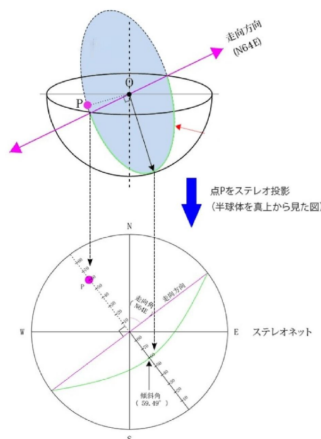


fig2 Explanation about stereo nets

## 3 Result

(1)We compared the log about the data from the dolling survey.(fig3)We corrected the rule.In detail,the vertical line stands for the altitude and the cross shaft provides from west to east.Moreover, we choose most west and east in per public schools.

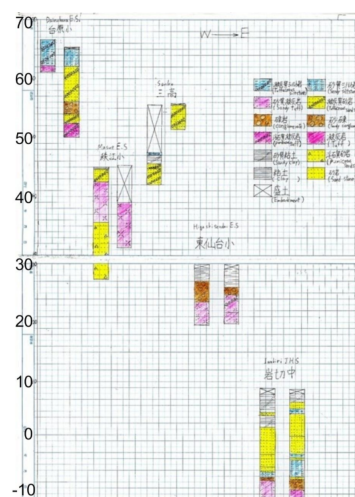


fig3 Ground Layer Log

From data of drilling surveys,Higashi Sendai Elementary School has the layer of Kameoka and Sanko has a layer of Nanakita. Moreover, Dainohara Elementary school has the layer of Tatsunokchii and Mukaiyama.

These layers are known as what are piled up in the first half of the New Tertiary period.It set up the age which is oldest to newest order, Nanakita-Kameoka-Tatsunokchii-Mukaiyama. Iwakiri Junior Highschool is located on the east side of the Rifu Nagamachi Fault,which is a very new layer.Therefore,our research excluded from the research.The older layer,the layer of nanakita and Kameoka,are discovered tuffaceous stone from volcanic activity. In contrast,layers of Tatsunokuchi and the Mukaiyama, which are the newest layers around Tsurugaya, are dominated by marine deposits. This suggests that volcanic activity occurred in Tsurugaya between 2.03 million and 2.58 million years ago, during the first half of the New Tertiary period, causing seaward movement and retreat, and that the Tsurugaya area was formed.

### (2) Fieldwork

As a result of fieldwork, there are sandstone,tuff and mudstone.Moreover,we discovered outcrops at 3 points.We recorded strikes and dips using a clinometer.Clinometer is the tool which can measure strikes and dips.We mention these results in a map.

Besides the result,we use the record which is the science museum in Sendai City.

The clinometer is used to measure the strike and dip of the layer. The clinometer is used to measure the strike and dip of the strata, and the binder is placed at the point where the binder is in contact with the strata parallel to the horizontal plane. In the map, green is tuff, pink is

mudstone, and yellow is sandstone. The arrows in the map indicate the strike of the stratum and the angle indicates the dip. Clinometer is used to measure strike and dip. In addition, The binder is placed at a point parallel to the horizontal plane and in contact with the geological formation, and creates a horizontal state and is measured with a clinometer. In this map, pink color shows mudstone, yellow one shows sandstone.



fig4 Results about field work

From fig. 5, it can be confirmed that the area surrounded by the mark ( symbolizing the direction and slope) is a hilly area. The outcrops at Zennoji temple, Tsurugaya, Miyagi Prefecture (fig. 6) and at second ground in Sanko, Miyagino-ku, Miyagi prefecture (fig. 7) are made of sandstone and tuffaceous sandstone, which are contained a lot in the layer around Tsurugaya.



fig5 Zennouzi Sandstone



fig6 Sanko 2nd ground  
Tuffaceous sandstone

### (3) Stereo Net

A stereonet of the Tsurugaya area was created by stereo projection. The data created the stereonet which was taken from two sites collected by the fieldwork and 15 spots from the geological map published by the Sendai Science Museum, because the number of outcrops was not as many as we had expected. We decided to use a stereonet to capture the collected two-dimensional data in three-dimensional form.

The black line in the middle of fig. 5 symbolizes the direction of the Rifu Nagamachi fault, and the black point stands for a total of 17 strike and dips data.

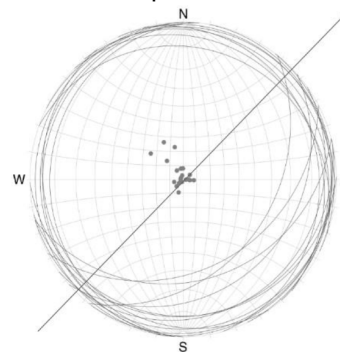


fig7 Stereo Nets around Tsurugaya

This result shows that most of the data are concentrated on the middle. This means that there is almost no slope, but there are four points that are far from the center on the left diagonal. This shows that the area around Tsurugaya is shaped like a belt from northwest to southwest, what is parallel to the axis of the fault, and a gentle fold structure exists in this area. In addition, the Rifu-Nagamachi Fault is a reverse fault that uplifts the western side of the area, and the strike and axis of this fold consist with each other.

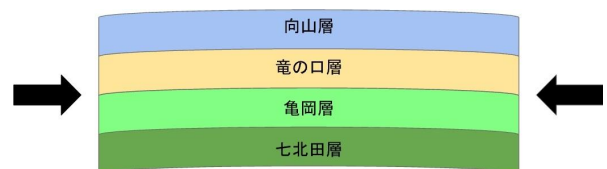


fig8 Geologic foldings about "Tsurugaya"

The results which we explored were obtained the data from public institutions, and the results were consistent with established facts. Therefore, it was found that the fold exists around Tsurugaya due to the influence of Rifu-Nagamachi fault. In addition, this study is the first time to have been obtained these results. In other words, If Rifu-Nagamachi

fault starts some activity, Tsurugaya might gotten much damage. We think this can be used when disasters happen.

### 【Literature cited】

#### ○Book

・National Federation of Geological Survey Associations of Japan「地質調査入門」  
第3版 経済調査会 2015年9月発行

geological map which is made by the science museum in the city of sendai.

#### ○Essay

・University of Kagoshima Iwamatsu  
ステレオグラフ

#### ・AIST

「活断層の追加・補完調査」report of result  
No.H21-3

#### ○Web page

・ボアホールカメラ検層 Ltd, ASIAGEO

<http://www.asiageo.co.jp/service/borehole.html>

[https://docs.google.com/document/d/1C2zfRZx6s9sL01Nn\\_EG6WpSL5aNkB9HM\\_z6SCCsWAyc/edit](https://docs.google.com/document/d/1C2zfRZx6s9sL01Nn_EG6WpSL5aNkB9HM_z6SCCsWAyc/edit)