Analyzing the Nijo family diary to Understand the Weather in the Latter Stage of the Edo Period -The comparison with the Sekiguchi diary

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1. Ikeda Junior-Senior High School

1 The motive of the study
We learned about the novelist, Kafu Nagai, who lived from 1879 to 1959, in our Japanese Literature class. We knew that he had kept a record of the weather in his diary. But we wanted to know about older Japanese weather charts; namely those that recorded the weather before 1883. Sekiguchi family lived in Namamugi of the current Kanagawa Prefecture.And we found older documents, called the Sekiguchi diary, in which the weather of the Edo period was recorded.
This year, we converted the Nijo Famliy diary into data. The Nijo family diary is an old collection of documents written by the Nijo family from 1635 to 1912. Although there are some gaps in the records, the documents record what happened in Kyoto and the weather.
2rd The purpose of the research
The weather record written by the Nijo family was analyzed in composition with the recent weather data. We also compared this record with what we found in the Sekiguchi diary of the Edo era.
3rd Experimental medhods #1
(1)To turn the information about the weather in the Nijo family Diary into data, we wrote both the Christian and the Japanese calendar, but in the comparisons of weather we used the Christian era. We deleted years when information for more than one-third of the year was omitted and data for February 29.We analyzed 202 years from 1676 through 1867.
(2)The weather recorded in the Nijo family Diary was classified to make it closer to the definitions of the modern meteorological agency.
(3)The descriptions such as “Today is cloudy, and become fine weather from 3 a.m.” were defined as follow:
・cloudy for more than 80% of the day, more than 19 hours as cloudy,
・ cloudy less than 80% of the day, as sunny.
4th Data#1
While comparing the annual appearance of different weather with the present, we found that in the Edo era, the days with fine weather in all periods was around 70% in all seasons.
In the Temmei famine from 1782 to 1787, the fine weather percentage (including that in famine) was 66.9% and it was the lowest of the study period.
In the Tenpo famine from 1835 to 1837,the percentages of both rain and snow were the lowest of the study period.
Data#2
We made a graph of the appearance-ratio of the fine weather and the rain recorded in Nijo family diary from 1677 to 1867.
The red bars show fine weather and the short dark blue bars show rain.
In the period of any famine, the appearance-ratio of sunshine falls.
Data#3
February was most common for the last snow, and was earlier later than in the present, and the period between the first snow of the year of Kyoto of the Edo and the last snow of the season was found to be shorter.
5th Results

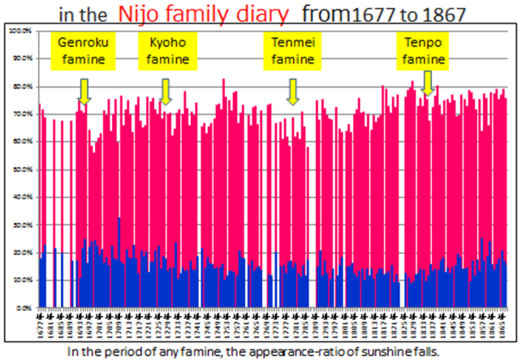
As for the weather in the Edo era which was taken from Nijo family diary, like data, the appearance-ratio of the sunshine is equal to or more than 15 % higher than today, and the appearance-ratio of rain and snow is low.
Also, as for snow, the appearance-ratio is higher in winter than in spring.
6th Discussion
When looking at the Edo era, like in the table of data#1, the appearance-ratio of rain and snow recorded in the Nijo family diary is low and was influenced by the little-ice-age.
Because the cold air was strong in the Edo era, it is thought that the number of days with snow in March to May decreased because the southern coast low atmosphere pressure which brings about snow in the spring didn't develop too much.
Also, it is thought that the appearance-ratio of the sunshine is high like data is caused by the decline of temperature, making the Siberian anticyclone in the winter stronger, causing a wintry pressure pattern to strengthen in Japan.
7th Challenges for the future
To make use of other documented data and restore the weather information and analyze it in the wider period.

Data#1 The annual appearance of weather

period／place	incidence of the weather(%) sunny	cloudy	rain	snow
1981to2010・Kyoto	51.0	15.6	27.1	8.1
1676to1696・Kyoto	72.1	7.1	18.9	1.9
1697to1726・Kyoto	70.3	8.9	18.7	2.1
1727to1756・Kyoto	70.0	11.6	16.6	1.8
1757to1786・Kyoto	66.9	14.9	16.5	1.7
1787to1816・Kyoto	68.7	16.2	13.8	1.3
1817to1846・Kyoto	75.7	10.8	12.6	0.8
1847to1867・Kyoto	76.7	7.5	15.1	1.1

In the Temmei famine from 1782 to 1787, the fine weather percentage was 66.9% and it was the lowest of the study period. In the Tenpo famine from 1835 to 1837, the percentages of both rain and snow were the lowest of the study period.

Data#3 Fine weather and rainy incidence in the Nijo family diary from1677 to 1867

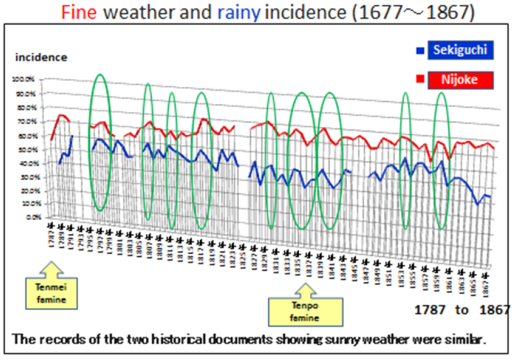


In the period of any famine, the appearance-ratio of sunshine falls.

Data#2-1 The appearance of weather in different seasons

period／place	season	incidence of the weather(%) sunny	cloudy	rain	snow
1981to2010・Kyoto	spring	45.9	11.6	25.9	16.6
	summer	44.0	22.8	33.2	0.0
	autumn	59.2	14.6	26.1	0.1
	winter	57.2	9.7	17.3	15.8
1676to1696・Kyoto	spring	69.4	8.1	21.4	1.2
	summer	69.8	6.4	23.8	0.0
	autumn	75.6	6.8	17.4	0.1
	winter	73.4	7.4	11.7	7.5
1697to1726・Kyoto	spring	69.4	8.7	20.6	1.2
	summer	69.3	7.2	23.5	0.0
	autumn	70.2	10.2	19.5	0.0
	winter	72.5	9.2	11.1	7.3
1727to1756・Kyoto	spring	65.5	17.2	16.7	0.6
	summer	69.6	11.2	19.2	0.0
	autumn	70.3	11.6	18.1	0.0
	winter	74.5	11.5	7.9	6.1

Data#4 Nijo family diary and Sekiguchi diary Fine weather and rainy incidence (1677～1867)



The records of the two historical documents showing sunny weather were similar.

Data#2-2 The appearance of weather in different seasons

period／place	season	incidence of the weather(%) sunny	cloudy	rain	snow
1757to1786・Kyoto	spring	66.0	12.0	21.1	1.0
	summer	67.5	13.6	18.8	0.0
	autumn	66.8	16.4	16.6	0.2
	winter	69.1	14.8	10.3	5.8
1787to1816・kyoto	spring	64.2	14.7	20.0	1.1
	summer	76.9	9.6	13.5	0.0
	autumn	70.1	14.9	15.0	0.0
	winter	70.7	16.5	8.0	4.9
1817to1846・Kyoto	spring	72.5	11.5	15.4	0.5
	summer	76.9	9.6	13.5	0.0
	autumn	76.4	11.2	12.4	0.0
	winter	77.0	11.0	9.1	2.7
1847to1867・Kyoto	spring	74.0	8.9	16.8	0.4
	summer	75.4	7.1	17.4	0.0
	autumn	78.2	7.3	14.4	0.1
	winter	79.5	6.7	11.5	4.2

Data#6 Comparison between first snow of the year and the last snow of the season of Kyoto

The first snow of the year and last snow of the season of Kyoto		
period	first snow	last snow
1981～2010・present	December 15	March 20
1676～1696・Edo era	December 27	February 14
1697～1726・Edo era	December 21	March 9
1727～1756・Edo era	January 5	February 25
1757～1786・Edo era	December 23	February 23
1787～1816・Edo era	December 28	February 23
1817～1846・Edo era	January 2	February 27
1847～1867・Edo era	January 3	February 25

February was most common for the last snow, and was earlier later than in the present, and the period between the first snow of the year of Kyoto of the Edo and the last snow of the season was found to be shorter.

Investigation of tectonic geomorphology by statistics and computer applications

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In order to prevent disasters caused by the earthquake, it is necessary to know the position of the active faults and their activity cycle. The high resolution DEM with 10 m interval or 5 m interval can be used for detection of tectonic geomorphology due to past earthquakes. In this research, we aimed to assess the tectonic geomorphology from the high resolution DEM with the geographical slope gradient analysis function of GIS and the autocorrelation analysis of the statistics.
The tectonic geomorphology due to the active faults are considered that they construct the repetition of gentle slopes and steep ones. Therefore, the slope gradient of the topography is calculated from the DEM with the GIS applications. The target areas are set in the southern part of Okayama Prefecture, where the active faults are considered to be few, and the southern part of Hyogo Prefecture, where the active faults distribution are studied in depth.
In the south part of the Okayama prefecture, it was found that there were few tectonic landscape caused by the active faults. A distribution of the slope gradients greater than 10 degrees was analyzed using the 5 m DEM data around the southern part of Hyogo prefecture. A weak periodicity with about 125 m intervals in the correlation was observed in the North - South direction. A clear periodicity with about 100 m intervals in the correlation was observed in the East - West direction. In addition, as a result of two-dimensional autocorrelation analysis, a periodicity of the correlation was observed with about 80 m intervals. The periodicities of the intervals in the autocorrelation analysis of the distribution of the slope gradient in this area were suggested that there is a sudden topographic change every approximately 80 m in this area. If this topographical variation can be combined with the change due to the earthquake, the interval can be treated as the interval of the occurrence cycle of the earthquake in this area. This is a subject to be studied in the future.

Keywords: Tectonic geomorphology, DEM, GIS, Autocorrelation analysis, Active faults, Slope gradient

Predict earthquake using tablet terminal

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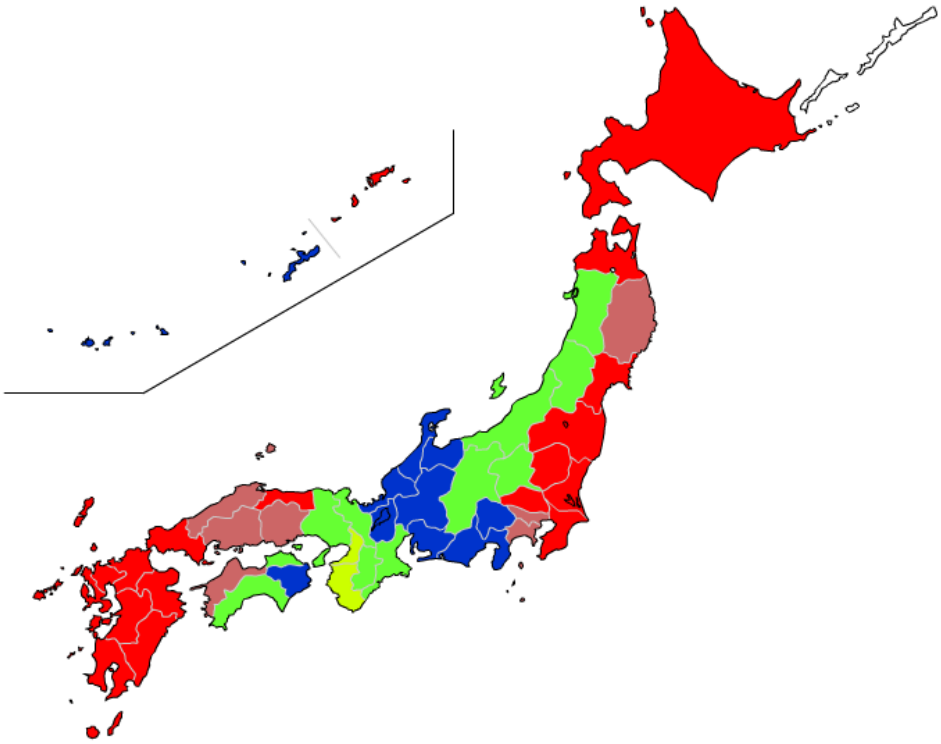
1. sanonihondaigakuhighscool

We have experienced many earthquakes as strong as the Great East Japan Earthquake.We accessed the database of seismic intensity of the Meteorological Agency on the tablet terminal and showed it on the map.I will report whether earthquakes can be predicted by this method and it becomes easy to understand by visualization.

Keywords: Earthquake prediction, Tablet terminal, Seismic Intensity Database



The Geological Structure of Nonoshima Island in Shiogama City.

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1. Miyagi Prefectural Tagajo High School

There are many islands dotted in Matsushima Bay near Tagajo High School. One of them is Nonoshima Island, the stratum can be clearly observed. We tried estimating the geological structure based on the information obtained from the stratum of Nonoshima Island.
On the eastern side of the Nonoshima Island, interbedded sandstone and mudstone are distributed. In contrast, tuff layers are distributed on the west side of the Nonoshima Island. We focused on the two boundaries, measured the strike and tilt, then compared and examined the results. In this study, we estimated the geological structure of the Nonoshima Island using a stereonet lower hemispherical projection. As a result of estimating by using the measurement result of Katsurashima Island located on the west side of Nonoshima Island and the measurement result of Nonoshima Island, we conclude that an anticlinal structure exists in the western part of Nonoshima Island. Furthermore, we conclude that this plunging anticline is inclined on the southeast side.

Keywords: Geological, High School, Issue Research, Disaster Science

Microfossils from the Nihon University Mutsuai Campus core, Fujisawa City, Kanagawa Prefecture

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Four sediment samples were collected from the Fujisawa Mudstone in the Nihon University Mutsuai Campus core, Fujisawa city, Kanagawa Prefecture, central Japan. This core was situated the middle part of Paleo-Sagami Bay developed during the interglacial period (MIS 5). In total, 26 ostracode species and 47 foraminiferal species are identified in four samples. The dominant ostracode species are *Bicornucythere bisanensis*, *Neomonoceratina delicata* and *Trachyleberis ishizakii*. The dominant foraminiferal species are *Elphidium subgranulosum*, *Pseudorotalia gaimardii*, *Buccella frigida*, *Elphidium advenum* and *Murrayinella minuta*. These species are living in middle to outer bays. These data indicate that the depositional environment of the Fujisawa Mudstone at the study site was middle to outer bay area. In addition, the dominant four foraminiferal species were examined the ratio of dextral individuals and sinistral individuals.Furthermore,the ichinospecies of *Oichnus simplex* were comfirmed on the test of *Buccella frigida*.

Keywords: ostracode, foraminifera, Fujisawa Mudstone, Paleo-Sagami Bay

Microfossils from the Kushiro Marsh Core,Hokkaido

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The sediment samples collected from boring core drilled at the center of the Kushiro Marsh in eastern Hokkaido were studied using foraminiferas, ostracodes, radiorarians and mite fossils. In total, 10 genera and 12 species of foraminiferas and 3 genera and 3 species of ostracodes were identified. The dominant species of foraminiferas were *Trochammina hadai*, *Ammonia beccarii* forma 1, *Buccella frigida*,*Elphidium clavatum* and *Elphidium subarcticum.* The dominant species of ostracodes was *Howeina camptocytheroidea* . Most dominant specie of mite fossils was *Oppiella nova* .The poorly preserved radiorarian fossils were interpreted as reworked materials. The palaeoenvironment of the Kushiro Marsh was inferred from these fossils. Consequently, these data indicate that there was middle bay in depth 9.30m and inner bay in depth 5.20m. Therefore, the reduction of the area of Paleo-Kushiro Bay was inferred.

Keywords: ostracode, foraminifera, microfossils, Kushiro Marsh

Earthquake prediction by radio wave noise

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This research focuses on earthquake prediction technology.
This technology is needed to decrease the victims of big earthquakes by warning them ahead of time.
VHF band are used to gather electromagnetic noise which can be used to tell if electrical discharges and pressure builds up in the earths crust.
The noise is thought to be of corona discharges.
Because corona discharge is the beginning of the discharge,the electromagnetic noise is a sign of earthquakes.

Keywords: Earthquake, Corona Discharge, Induced Electromotive Force

Removing heavy metal ions from waste water using peat repeatedly.

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1. Tokyo Metropolitan Tama High School of Science and Technology

Peat is widely distributed over the world.
However, peat tends to contain a lot of heavy metals, and its treatment has a problem.
In the previous research, it was found that humic acid contained in peat adsorbed heavy metal ions.
Therefore, we succeeded in treating humic acid after adsorption with acid and separating lead.
When the lead solution was passed through the treated humic acid, the lead ion concentration in the solution decreased.
From this, it is considered that peat can be recycled by extracting lead ions, and the residue can function as a lead removal filter.

Keywords: peat, heavy metal, adsorption, lead, Reuse method, water pollution

Analysis of the flow of water in the surface of Mars using a gravity variable apparatus

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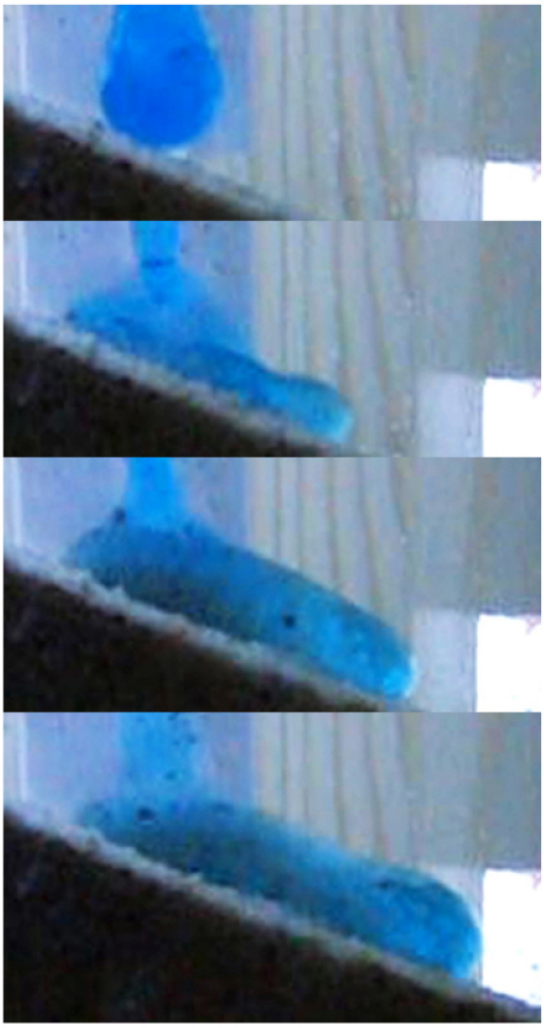
1. Kasugaoka High-school of Osaka prefecture, The evening course, 2. Otemae High-school of Osaka prefecture, The evening course

The Atwood pulley can control the acceleration of the weight by adjusting the weight of the two weights. Using this weight as an experimental capsule, we created a "gravity variable apparatus" that realizes the gravity of the moon and Mars on the ground. Within the descending capsule, we could create gravity of 1 G or less. We succeeded in making Martian gravity and moon gravity for 0.5 seconds. We also believe that we can create gravity of 1 G or more within capsules that will climb. Using the gravity of Mars, we observed how water flowed on the surface of Mars. On Mars the viscosity of water was increased 2.4 times compared to the Earth. In the past of Mars, it may have influenced water erosion and weathering. In the future, we plan to adjust the pressure and temperature inside the experiment capsule.

Keywords: Gravity variable apparatus, Microgravity generator, Gravity of Mars, Mars water, viscosity

地球の斜面を流れる水

火星の斜面を流れる水



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Urban Heat Island phenomenon in the central of Tsukuba city

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1. Ibaraki Prefectural Namiki Secondary School

Background and purpose of the study

Focuses on Tsukuba city, I investigated the relationship between land use and air temperature distribution in stationary observation. We found that the heat island phenomenon is occurring in Tsukuba city. However, the characteristics analysed. From previous my research, stationary and mobile measurement know it is good to see the relationship between land use and air temperature. Also, according to previous studies, mobile measurement using a "Field-portable Forced Ventilation Tube", make accurate observations.

Therefore, I aimed at investigating how land use affects temperature by doing stationary measurement and mobile measurement using a "Field-portable Forced Ventilation Tube".

Definition of the urban heat island

It is the phenomenon that the temperature of the urban area becomes higher than that of the suburb area. when we drew a distribution map of the temperature, a high temperature level was distributed over the shape such as the island around a city.

Method of the study

・Stationary measurement

I established data logger for measuring air temperature and collect the data of temperature at stevenson screen in 9 elementary schools of Tsukuba city. Then, I investigated the relationship between temperature and proportion of land use within radius of 200, 500, 1000 and 2000 m.

・Mobile measurement

I installed the thrmometer with "Field-portable Forced Ventilation Tube" on the bicycle. Then, I measured the temperature and location at 10-second intervals. Lastly, put the data on the map and shows the temperature distribution.

Result and Consideration of the study

・Stationary measurement

Forest, especially 500m buffer, found that strong negative correlation. It is perceived impact on lowering the temperature.

Building site, particularly a 500m buffer, found that strong positive correlation. It is perceived impact on highering the temperature.

・Mobile measurement

Able to do high-precision observation by using "Field-portable Forced Ventilation Tube". Also, we could see forests and agricultural land in the low temperature area. Forests are considered effective in lowering the temperature.

On the other hand, we could see building site in the high temperature area. Building site is considered the effect of rasing temperature.

Conclusion

In considering the effect of buffer from a stationary measurement, that, especially 500m buffer forests and building sites for temperature effect tends to be found.

From the result of mobile measurement, able to do high-precision observation by using "Field-portable Forced Ventilation Tube", so it is good to use for mobile measurement.

Also, considered at the city scale, 500m buffer of building sites and forests for tempereature sensitive affecting cause, changes in temperature. At the block scale, there is no big difference of temperature.

However, it is thought to have contributed to lowering the temperature can have a street trees , just that.

Ackowledgments

This study was adopted to University of Tsukuba GFEST program. Associate Prof. Wakazuki and graduate student Kosuke Igari advised me a lot of information.

Keywords: Urban Heat Island phenomenon, Field-portable Forced Ventilation Tube, Mobile measurement, Land use, Stationary measurement

A Classification Model of Exoplanets using Microsoft Excel

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1. Seishin-Gakuen High School

Characteristics of exoplanets were studied to comprehend what kind of planetary system in the universe our solar system is.
1. Study method
339 exoplanets were selected whose radius, mass, and semi-major axis of the orbital ellipse were calculated, and also whose central star’ s spectral type, temperature, apparent magnitude, and distance from the Earth were known. They were compared separately on the spectral type of central stars, and their features were shown graphically using Microsoft Excel.
In order to determine a type of planet (terrestrial planet, ice planet, or gas giant), we used a theoretical curve of Radius–Mass graph proposed by Seager *et al.* (2007). The semi-major axis was compared with the inner limit of the Habitable Zone and with the so-called Snow Line.
2. Result and Discussion
Except in the case of M-type stars, there are a lot of low-density planets close to their central stars. They are assumed to be as gas giants. On the other hand, the relatively high-density planets determined to be terrestrial planets are not few in the case of M-type stars. No evident ice planet may be included in samples of this study.
Such result may suggest that large planets near the central star are detected more easily with any observation method. However, the low-density planets close to the central stars are also numerous in the G-type star systems, so it is thought that our solar system was formed maintaining equilibrium among the same spectral type.

Keywords: Exoplanets

Investigate underground structure above Rifu fault -faults and volcanoes-

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1. Miyagi Rifu senior high school, 2. Miyagi Rifu senior high school Department of Geoscience

We constructed geological histogram which was making from boling core samples in/under our school where located on Nagamachi-Rifu fault. We discuss about the ground strengthes and old-Adachi volcano sedimants.

Keywords: Boling core analisys, Nagamachi-Rifu Fault, Adachi volcano

Differences between arc basalt and MORB

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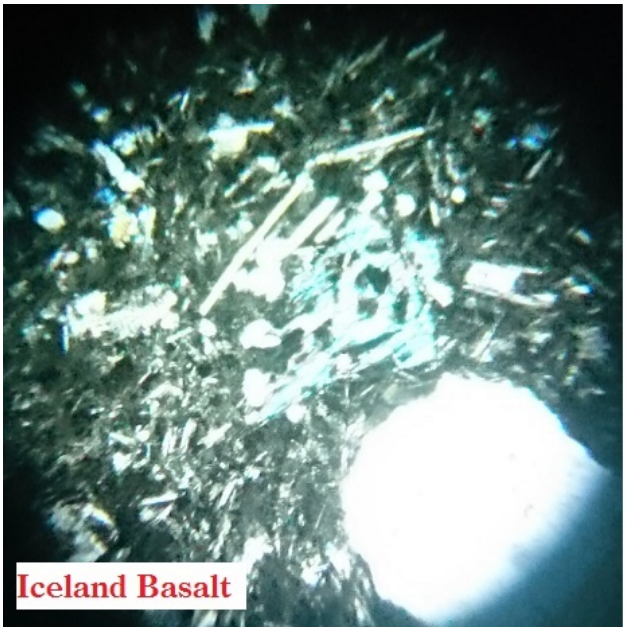
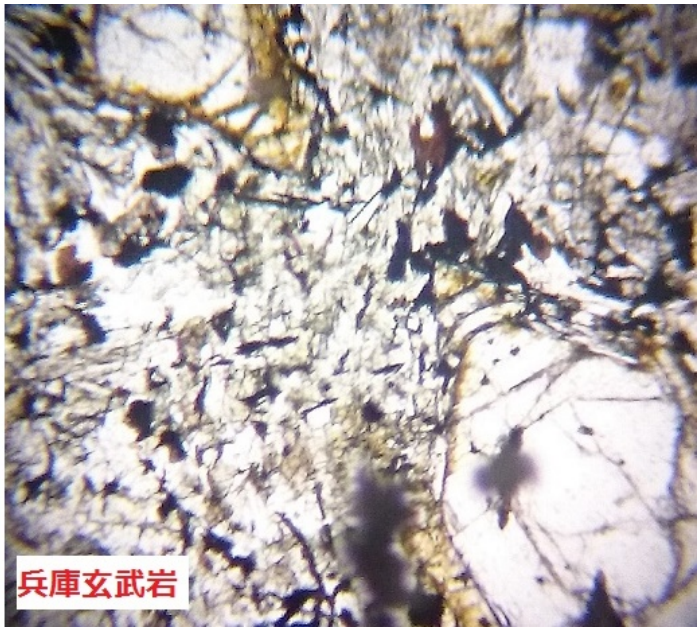
Making thin sections from Island arc basalt from Hyogo prefecture and mid-ocean ridge basalt sample from Iceland, mentioned to compare rock organization and considered the cooling history difference.

Keywords: Basaltic Rock, Mid ocean ridge, Islands arc





Measuring the risk of landslides in areas dominated by granite using relative abundance of minerals and permeability coefficients

*Syo Tamura[1], *Minami Iwamoto[1], *Aoi Higashimori[1], *Haruka Tajima[1], Syota Nakano[1], Miku Nakano[1], Miki Bitho[1]

1. Hyogo Prefectural Kakogawa Higashi High School

During the 2015-16 academic year, we studied the relationship between the presence of granite and the occurrence of landslide disasters and concluded the weathering of granite increased the risk of disasters. However, geology is not currently taken into consideration by the Hyogo prefectural government when making landslide hazard map. We think that measuring risk by considering the degree of weathering in granites should be used when drawing new hazard maps. We evaluate the risk of landslides by measuring permeability coefficients and relative abundance of minerals in soil samples from Mt.Ofuji, Hyogo.

Keywords: granite, landslide disasters, permeability coefficients

図1 全国の土砂災害発生場所の地質別割合[98件]

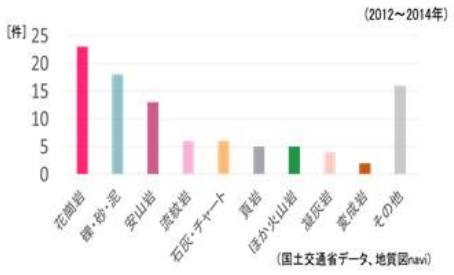


図2 土砂災害発生危険度の分布表

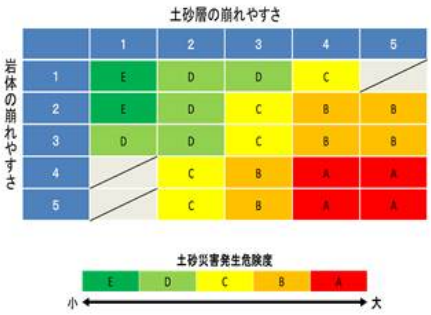


図3 ユールストローム図

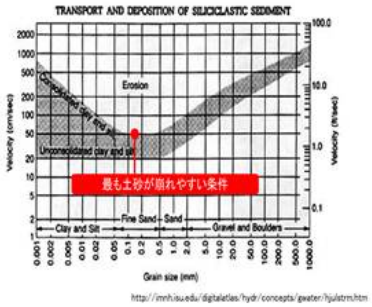


図4 クレーガー表

図5 透水係数装置

The Investigation to Figure Out How Tsuyama Sea Disappeared

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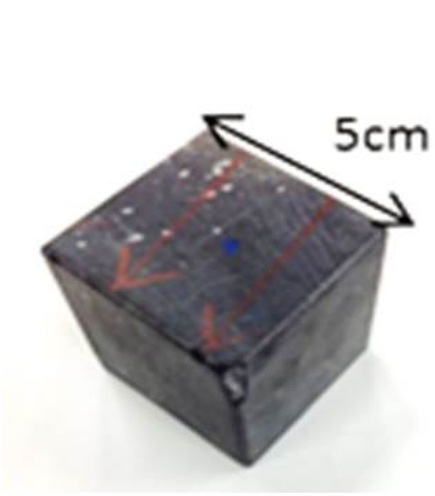
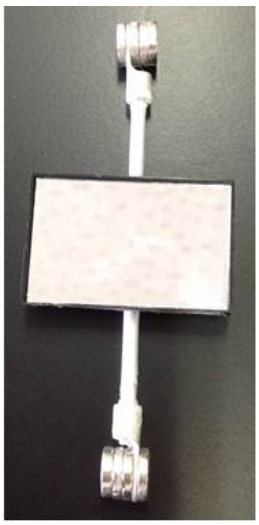
The area of Tsuyama was under the sea about 16 million years ago. We investigated this area to figure out the process in which the sea (we named it “Tsuyama Sea”) had disappeared. There are basalt dikes running from north to south (N2°E) around Sara River in Tsuyama. There are mountains running east to west in the north of Tsuyama. We built up a hypothesis that the dikes and the mountains were the results of the movements of the plate in the north being pressed by the plate in the south (Philippine Sea Plate). So we constructed an astatic magnetometer to measure the rocks’ residential magnetization. The results of this measurement show that the magnetic north at the time the dikes were made was similar to the current magnetic north, which means that the dikes were made by the north-south pressure after the Japanese Islands finished moving 15 million years ago. This pressure may also be the factor which the mountains in the north of Tsuyama were raised. Therefore, we thought that the north-south pressure formed basalt dikes and raised mountains in the north of Tsuyama around 15 million years ago. This uplift made Tsuyama Sea separated from Sea of Japan, causing it to disappear.

Keywords: Paleomagnetism, Astatic magnetometer, Basalt dike, Neogene





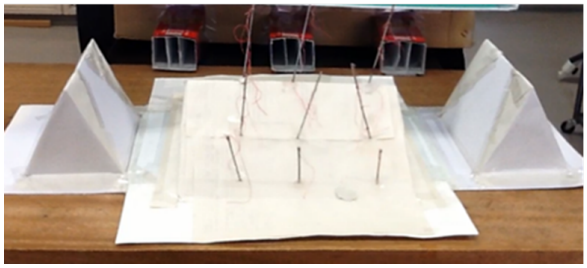
Research On The Relation Between Hirodo Wind And Geographical Features

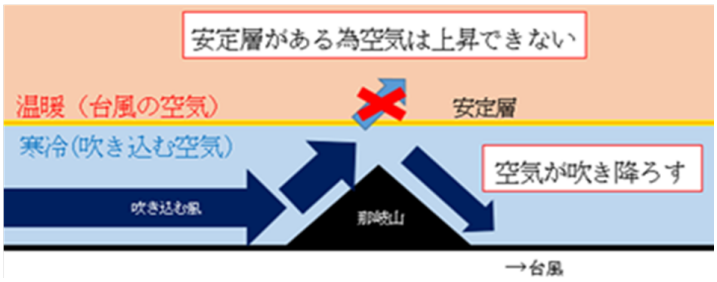
*Keisuke Hinoda[1], *Daiki Hayase[1], *Takuto Hanafusa[1], Yusuke Fukuda[1], Akihito Takahasi[1], Aoi Kondo[1]

1. Okayama prefectural Tsuyama High School

What Is Hirodo Wind?
Hirodo Wind blows through the wide area in Nagi and Syouboku districts.
The atmosphere above Tottori Plains gets together and comes up and down Mt.Nagi and other neighboring mountains. This is called Hirodo Wind. Because there is no clear definition of Hirodo Wind, we decided to call a wind Hirodo Wind when it is blowing from north to south of Mt.Nagi at the speed of over 10m/s and when the speed is twice or more faster than that of the winds blowing in Tsuyma City.
Purpose
To solve the mystery of Hirodo Wind and find some clues to forecast it.
Method
We collected the data released from the Meteorological Agency (MA) about what we would call Hirodo Wind.
We made some three-dimensional geographic maps, one of which was the same as the actual features of the area (original topography) and the rest of which were slightly different from each other.
We generated artificial winds and observed the movement of the air.
We used evaporated alcohol instead of natural air so that the movement of air would be visible.
We used acrylic plates in order to produce the similar condition to the actual atmospheric layers.
We compared the air current we observed in our experiments with the data released by MA.
Result
・The current of the wind was affected by the height of air layers(acrylic plates).
・In the first experiments, Hirodo Wind was not observed in any of the geographic maps.
・When we added the condition of valleys to the original topography, the speed of the wind increased and it seemed like Hirodo Wind.
・In each experiment, an unusual air current was seen at the south foot of Mt.Nagi.
Consideration, Conclusion
The valleys located in both sides of Mt.Nagi seem to be the prime factor for the rising wind.
According to the data from MA, Hirodo Wind is generated while a typhoon is going through the Kii Peninsula.
When we consider our experiment results, Hirodo Wind seems to be part of a greater swirl than people have thought.

Keywords: HirodoWind, Meteorology, Typhoon, Airlayer, Vally





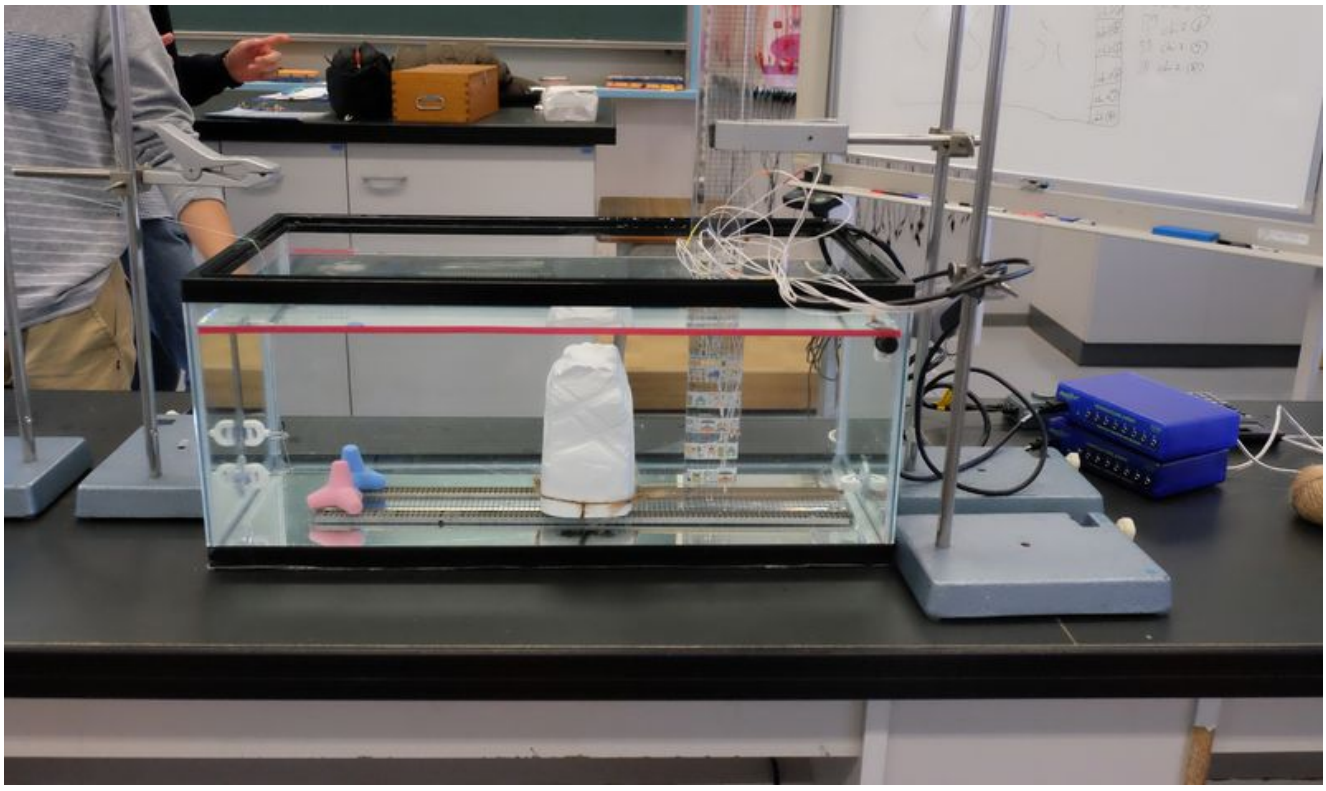
Change in water temperature distribution by turbulent mixing with a seamount model

*Aoi Shinkai[1], *Ryuuichirou Isshiki[1], *Yuuki Ishibashi[1], *Tatsuya Hirabayashi[1], *Yuuki Momose[1], *Shuugo Matsuno[1], *Tomohito Miyazawa[1]

1. Zushi-Kaisei Senior High School

According to the report of Noriyuki Hibiya, a professor of the University of Tokyo Graduate School of Science Department of Earth and Planetary Science, tidal current produced by moon affects heat transportation caused by ocean deep current of the earth. This is the structure that turbulence produced by tidal current conducts heat of surface layer to deep layer and water of deep layer performs upwelling with buoyancy. At this researching, we reproduced tidal current by moving a original sea mount model in the water tank and observed change of temperature About evaluation that reproduced the ocean deep current in the water tank modeling real sea, we judged from changing in water temperature distribution. This is based on thermal measurements using a high-speed response temperature probe which is established each points.

Keywords: sea



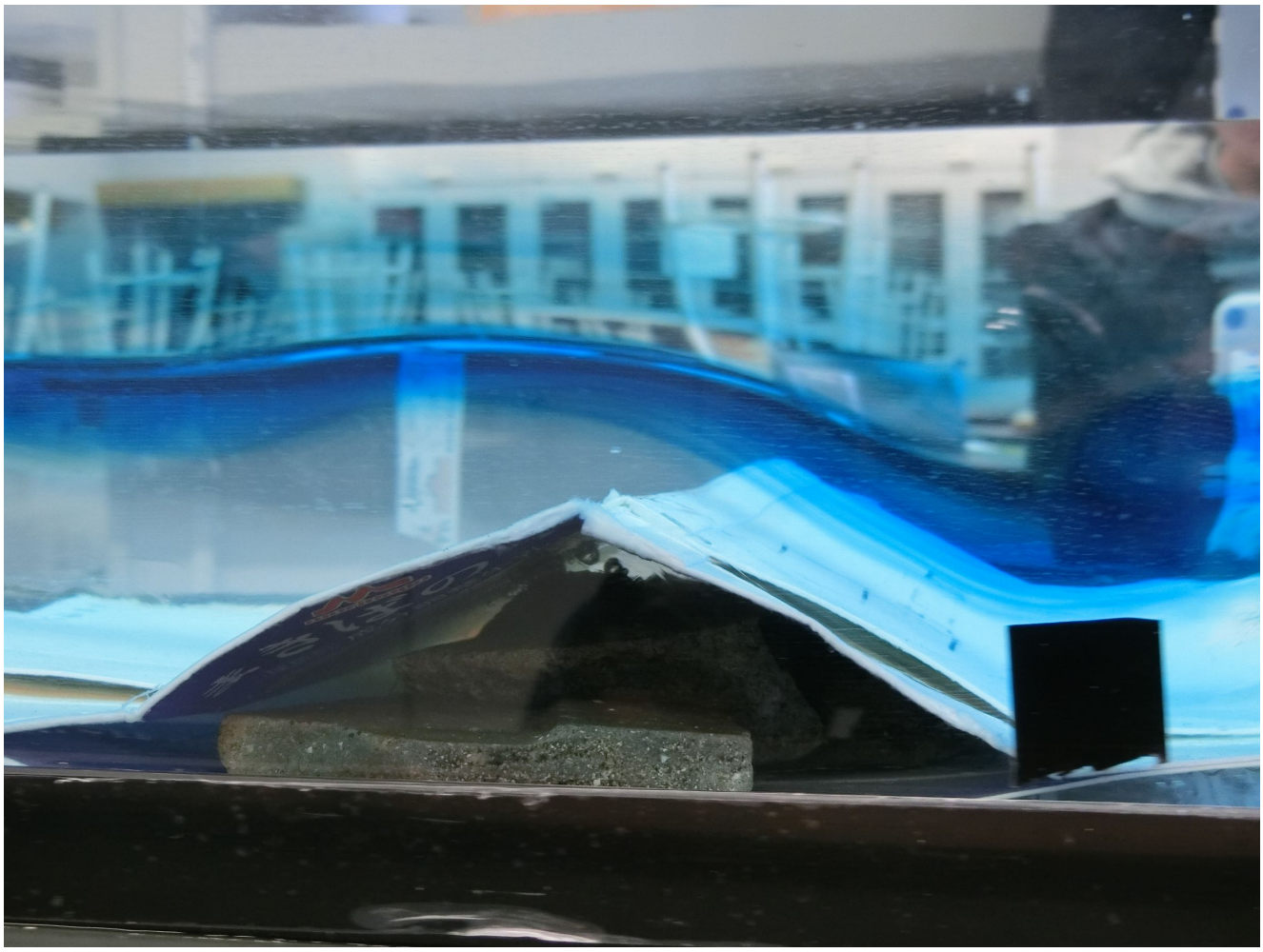
Search for the method of turbulent observation using an aquarium

*Takeru Satou[1], *Rei Akiyama[1], *Ukon Koda[1], *Eishi Ninomiya[1], *Yuuya Hayashi[1], *Takayuki Maeda[1]

1. Zushi-Kaisei Senior High School

Deep circulation plays an important role in the global environment. Through our research, we contribute to clarify structure of the heat-transportation, which the huge circulation has something to do with reconstructing actual environment of the sea in aquarium.
We experimented the vertical directional turbulent observation by the method of new visualization. Specifically, we made different temperature colored layers in water, and then flowing the colored-water to crash model of seamount. We aim to observe the vertical directional turbulence which was created by disturbed colored-water. We recorded these experiments using a high-speed camera. We are going to report in detail.

Keywords: sea



Is it possible to predict with a usual telescope how sun- spots will change in form?

*Kiko Katayama[1], *Rio Shimizu[1], Meku Takeda[1], Ayane Takebe[1], *Rina Moteki[1]

1. Gunma Prefectural TAKASAKI Girls High School

The activity of the sunspot is closely related to the solar wind that affects the environment around the Earth. We examined whether the day change of the sunspots can be predicted in advance from the observation using a commercially available amateur observation device (if possible, as in the current weather forecast).

We compared the observation results obtained by imaging observation between visible light and Hα light in chronological order to investigate characteristic phenomena associated with the change. Based on them, we would like to try to predict the appearance of sunspots and subsequent development and shrinkage, and compare them with the actual change.

The observation seems to show that there is a correlation between the appearance of an active region preceding the appearance of sunspots with Hα light and the development of sunspots seen with visible light and the change in the active region seen by Hα light.

Based on these results, We would like to try to predict the subsequent development and shrinkage of the sunspots and we want to consider how much prediction is possible.

Keywords: astronomy, sunspot, developmental contraction

Growth of frost pillars

*Sho Shimada[1], *Miku Suzuki[1]

1. Tokorozawa High School

The Tokorozawa High School Faculty of Earth Science has been conducting experimental research on the growth of frost pillars over the past few years. Generally, frost pillars are frozen by water which is sucked up from underground due to capillary phenomenon and grows as crystal of ice. We conducted reproduction experiments and observations with the aim of learning more about the mechanism of its occurrence.
Research in the last few years found the following. 1, frost pillars occur on the surface of wet porous soil. (There are moist soil on the underside of the of the frost pillars both in the field and in the laboratory equipment) 2, geothermal works for the growth of the frost pillars. 3, due to radiative cooling, solid particles on the ground surface become nuclei, moisture adheres thereto, and solid frost pillars grow.
The experimental method is as follows. Place a transparent partition around the center of a plastic box, set up soil on one side on one side and a camera on the other side. We add water to the soil side. And lay heating wires. Measure the temperature of the bottom of the unit, 3 cm deep in the ground, the surface and in the air with a data recorder. Shoot with the camera every minute. We made a moving image by continuously reproducing the images. An experiment using water mixed with a blue coloring agent was also conducted.
Firstly, an experiment was conducted using a blue coloring agent. Blue colored frost pillars occurred. Therefore frost pillars grow by the solidification of water. Next, we observed the cross section. We saw the white streaks representing the underwater surface. Streaks climb, big growing when it come to the surface. The growth of frost pillars formation is intense when the temperature in the freezer is low. And it is gentle when temperature is high. At that time, increase and decrease of condensations (water droplets) were confirmed on the cross section plate. Also, a fringe pattern entered the frost pillar bodies. These were frost pillars made by experiment. Even natural occurring frost pillars were the same. These were because the part involving mud separates up from the part with no mud. The frost pillars made by the experiment had narrow striped patterns. And the frost pillars contained rich muds were made when the temperature inside the freezer was high.
Throughout this experiment, frost pillars grow by solidification of water. They grow remarkably when the temperature is low. It turned out that it gentle when it is high. Also, the portion of the frost pillars where mud particles are involved enters when the temperature is high. Therefore, in natural frost pillars, the change in temperature is moderate, so the distance between stripes and next stripes is considered to be long.

Keywords: frost pillars growth

霜柱の成長について(2017)

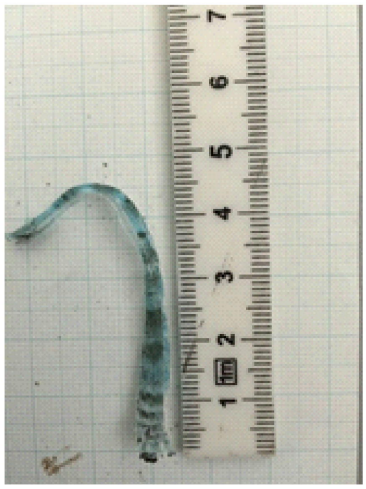
埼玉県立所沢高等学校 地学部　島田 匠　鈴木美紅

畑の霜柱

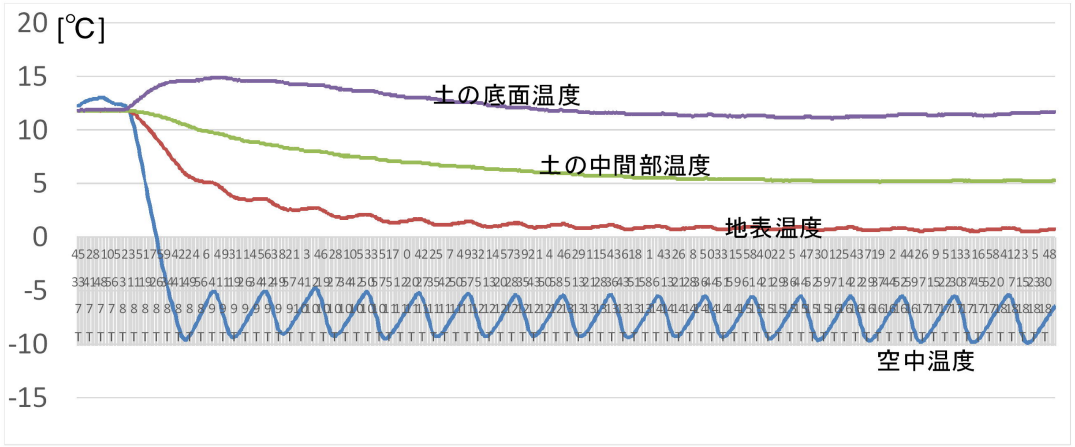
霜柱の針状結晶

2段重ねの霜柱（畑）

霜柱の発生実験・観察装置



実験で得られた青い霜柱



冷凍庫内の温度分布（青：空中、赤：地表、緑：土の中間部、青：土の底面）

（フリーザーのサーモスタットにより ON・OFF が自動的に切り替わるため空中温度は周期的に変化している）

The visibility of ISS

*Momone Horiuchi[1], *Reika Maruyama[1], Masako Ozai[1], Asuka Saito[1], Mai Sekiguchi[1]

1. Maebashi Girls' High School

We examined how the visibility of the ISS changed under various conditions. As a pilot study we took a series of photographs of the ISS. We defined the visibility index of the ISS as the visibility of the ISS is equal to the brightness of the ISS divided by the brightness of the sky. We showed our visibility index of the ISS in graphs, the results matched with our records of visual observation.
As for the brightness of the ISS, we set up a hypothesis that it is related to the position of the sun, the ISS and the observation points. We did an experiment with a model of the ISS and a light source to represent the sun. As a result, we found that the difference of the brightness of the ISS depends on the position of the sun, the ISS and the observation points.
As for the brightness of the sky, we took pictures of the whole sky every minute from sunset for 150 minutes with a fish-eye lens.
We have been comparing the predicted visibility index of the ISS with the actually measured value of the visibility of the ISS.

Keywords: ISS

Traditional Tanabata Festival ; Measuring the success of the “lightdown” II

*Yuka Hoshino[1], *Moe Ueno[1], Akari Ubukata[1], Rikako Suzuki[1]

1. Maebashi Girls' High School

We, the Earth science club have agreed with “Traditional Tanabata Festival Lightdown campaign” and have continued to promote it within Gunma prefecture since 2014.Traditional Tanabata Lightdown is an event in which we recommend you to look up at the starry night and turn off lights of houses, buildings and so on. And it is on July 7th by the lunar calendar from 20:00 to 22:00.We have groped for how we can assess the effects of Lightdown from a viewpoint of science and tried to experience it in various ways over the last two years. For example, we have tried to measure and extract only artificial light sources. We have divided the brightness of pixel into two parts. Using our methods had good results. Though the result of our experiments about Lightdown seemed bad, we observed the effect of “Mountain day”, a new national holiday in Japan from last year.

Keywords: Lightdown, Traditional Tanabata Festival

Look for a reliable Weather Forecast !

*Chinatsu Kobayashi[1], *Ako Miura[1], Momoka Yoshida[1], Misato Roppongi[1], Marin Sawada[1]

1. Maebashi Girls' High School

When we made plans such as the astronomical observation event and the camp to practice earth science in our club, we thought that we wanted to more accurately practice the weather forecast of high starlit sky, because good weather conditions are important to practice astronomy. At first, we thought about analyzing weather satellite images, but we doubted how predictable they are. Instead, we thought that by using existing weather forecasts and comparing their predictions with the actual weather conditions in real time, we could find the most accurate conditions to determine the best time to view the starlit sky. To test, we recorded the weather forecast of several companies online and checked the state of the weather of the night sky in person and investigated by comparing those data. In addition, we organized the data which we collected, applied it to a formula, and compared the value. As a result, we found that the amount of days which are good for viewing the starlit sky increased in winter in comparison with summer and we found that the starlit sky index and accuracy ratio of Grid Point Value were higher for ‘Weather .jp' and ‘Excite weather' than other weather forecasts.

Keywords: Weather Forecasts

Spring and Autumn Equinox : Why is the daytime longer than the nighttime ? II

*Kanami Okaniwa[1], Chisa Hasegawa[1]

1. Maebashi Girls' High School

It is said that the length of the daytime and nighttime is equal on the vernal and autumnal equinox but the daytime is actually longer than the nighttime in that case.
There are two hypotheses.
First, there is the difinition of sunrise. We define sunrise as the moment when the bottom of the sun touches the horizon and sunset as the moment when the top of the sun touches the horizon.
Second, light is refracted when it goes through the atmosphere so we see light before the sun rises above the horizon. So there is the time lag between the difinition and the phenomenon.
We observed the sun so that we would verify whether these two reasons are true or not.
We also analyzed the data but the result was different from the hypothesis.
When we made revisions in the data so that we could check the difference again, we could observe that the sun seems to move slowly near sunrise and sunset.

Keywords: Sun, Vernal Equinox, Autumnal Equinox

Dark side of the moon:Is the Earthshine really blue? II

*Shito Fukuda[1], *Honomi Sano[1], Satomi Nakano[1], Neo Takakusagi[1], Shiho Nakajima[1], Misato Roppongi[1]

1. Maebashi Girls' High School

Yuri Gagarin, who is a Russian astronaut and the first human in space, said
“The Earth is blue” when he looked at the earth from space.
We would also like to say,“The Earth is blue”as he did, but it is not easy for us to travel into space to see the Earth as he did. Then, how about saying “The Earth SHINE is blue”, instead?
The earthshine is a natural phenomenon, where the light which is reflected from the earth shines on dark side of the moon dimly.
Last year, we proved the Earthshine is blue. This time, we looked the process by which we could prove that the Earthshine is blue over again, and we hypothesized that the earth is blue.
To test this hypothesis, we took pictures of the Earthshine, the sun and the full moon whose altitude is equal. Besides, we took a picture of the sun whose altitude is not equal.
After that, we analyzed the color of the Earth based on its reflection in those pictures and recreated the earth’s own color.
At last, we came to conclusion that “The earth is blue”.

Keywords: Earthshine, moon, blue, Yuri Gagarin

Analysis and Meeting of Broken specter

*Momoka Yoshida[1], *Akari Ubukata[1], Chinatsu Kobayashi[1]

1. Maebashi Girls' High School

A Broken specter is magnified shadow of an observer that happens when there is mist that is lit by sunlight. A ring of rainbow colors can been seen around the shadow. It is so difficult to find this specter in everyday life. Therefore, we are trying to find a constant and predictable condition for when and how this specter will happen by recreating this specter in a controlled situation. Also, we are studying this theory and trying to determine whether this condition is based on theory or not. We also observed another atmospheric optical phenomenon such as Choi and Circumzenithal Arc to compare the necessary conditions to see the Brocken specter. In the end, we want to find this specter in nature and estimate what kind of specter will happen.

Keywords: Broken specter, atmospheric optical phenomenon

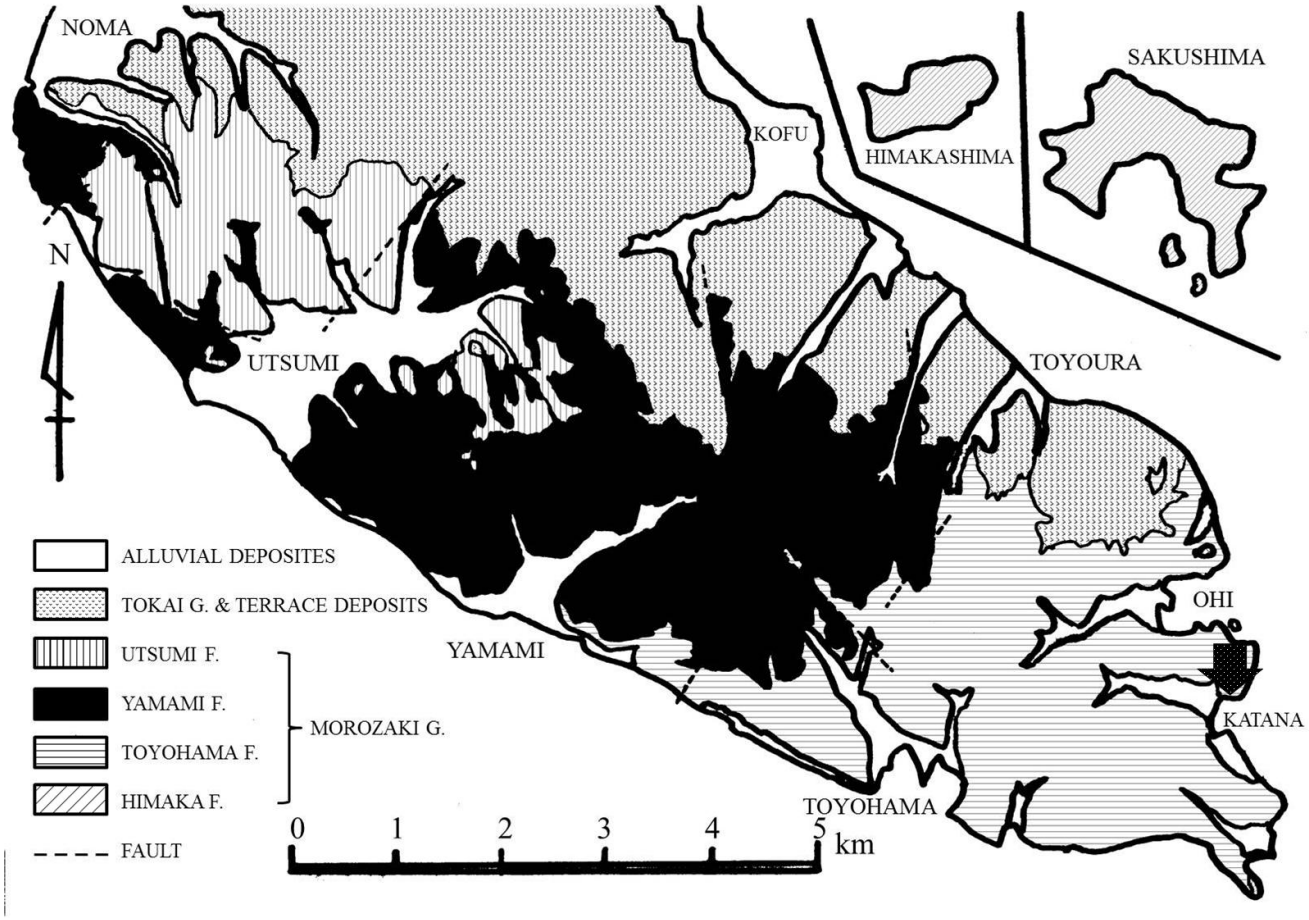
Estimating the paleoenvironment utilizing Foraminiferal Fossils

*Ryusuke Kimitsuki[1]

1. Ritsumeikan Moriyama High School

Microfossil assemblages in marine archives represent a powerful tool to estimate prehistoric marine environments (Suto, 2011). Therefore, in this experiment, the author utilized foraminiferal fossils to estimate the environment when the Morozaki Group formed. Microfossils, including foraminiferal fossils, are more likely to dissolve chemically, but are physically stronger than other macrofossils. Therefore, a large numbers of microfossils are contained in sediments, making them a very significant tool for various paleoceanographic reconstructions (Suto, 2011).
The stratum observed in the Katana outcrop is included in Toyohama formation, Morozaki Group. According to Yamaoka (1993), the Morozaki Group formed from the Early to Middle Miocene in the Neogene. This group belongs to the Setouchi Miocene Series which was formed in deeper parts of the ocean compared with other strata such as Ichishi, Fujiwara and Mizunami Group which formed at the same time (Yoshida, 1991). The group is composed of Himaka, Toyohama, Yamami and Utumi formations in ascending order.
The Morozaki Group is mainly composed of sandstone, mudstone and tuff. Many fossils of fish and mollusks are found. However, Planktonic foraminifers were scarcely because of its siliceous lithofacies (Ibaraki et al., 1984).
In addition, this group is mainly made by turbidites. Turbidites only form when a large amount of sediments originated from a landslide transport to deeper than 200 m under water. This fact has led to the hypothesis that the Morozaki Group formed in the deep ocean (Yamaoka, 1993). Since the deep ocean has only little impact of currents and waves, muddy sediments would slowly form compared to sandy sediment. This is visible in the outcrop which had a clear difference between each layers.
Previous reports suggest the depth of the Chita Peninsula was between 200 m - 600 m (Shikama and Kase, 1976) or deeper than 500 m (Hachiya *et al.*, 1988), based on macrofossil assemblages such as mollusks. Furthermore, whilst research has been undertaken on the foraminiferal fossils from the Morozaki Group, none of them have tried to estimate the paleodepth of the Chita Peninsula utilizing this technique. Therefore, the aim of this study was to estimate the paleoenvironment, especially the depth, of the Chita Peninsula utilizing foraminiferal assemblage. Faunal analysis was used in this experiment.Faunal analysis is a method to estimate the paleoenvironment from the habitat of the detected fossil species.
As a result of this research, the paleodepth was estimated as 100 - 2000 m. The research also showed that the strata formed 17.54 Ma where there were two kinds of ocean currents and indicated a possible sub-oxic environment.

Keywords: Foraminifera, Chita peninsula, Morozaki Group, Toyohama Formation, Turbidite, Faunal analysis



Restoration of Salt-Affected Soils Utilizing Halophiles Retained in Rice Bran

*Shigetatsu Nishigai[1]

1. Sendai Nika Senior High School, Miyagi Prefecture

Salt damage has been a serious problem on a global scale due to drought and inappropriate use of irrigation water, and salt-induced land degradation is leading the world to a potential food shortage crisis. To cope with this problem and restore the productivity of farmlands, an innovative method must meet the following criterion; inexpensive, rapid, simple and non-invasive to plants.
In this research, we aimed to restore the salt-affected land to the level in which plants that are naturally cultivable in the region can be grown.
Fundamentally, salt concentrated environments need to be diluted to the level that Sodium Ion and NaCl concentration is low enough for plants to grow. Since it is impossible to degrade NaCl further into any elements, and our aim is to make it feasible for farmers to grow crops before rains push salt out of farmlands, we need to consider ways to prevent NaCl from dissolving in water absorbed by plant vessels.
I positively utilize the characteristic of halophiles such as yeast that generates organic acids by eating rice bran as bait. Here is our hypothesis, when we mingle salt-affected soils with halophiles retained in rice bran, organic acid effectively works, and reach out the salt adhering to soils. Next, when halophiles multiply in salt concentrated environment, it is considered that a certain amount of Sodium Ionare incorporated into the cell membrane, especially that of alkali/acidic halophile utilizing Sodium Ion instead of or in addition to proton to take in nutrition. Then, the Sodium Ion and NaCl concentration are expected to decrease.
To give scientific evidence to the hypothesis, I organized two sorts of experiments.
As the first step, we tried to observe if it is true that halophiles incorporated Sodium Ion ions to inside the membrane.
We centrifuged the sake lees and water mixed solution, blended the supernatant fluid with 4.4% salinity, pH5,6,8,9 adjusted LB liquid media, and incubated at 35℃. The salinity continuously got lower, especially in pH6 media it went down to 3.7% after five days of incubation. To prove that the changes are caused by halophiles, later we left the LB media at 10℃ environments for two days and determined that the salinity remained the same or got back higher. However it was still possible that the nutrient was insufficient, so I incubated them at 35℃ again for four days, and got the result that the pH6 media reached 3.2%, meaning the halophile incorporated Sodium Ion.
As the second step, we implemented our method to a practical stage; observed the germination rate of radish sprouts and the salinity decrease in salt-affected soils mixed with the halophiles retained in rice bran.
As for the experiment to observe the germination rate, we centrifuged the sake lees and water mixed solution, blended the supernatant fluid with 1.4% salinity, which is slightly beyond the range of radish sprouts optimum salinity. Then we grew 20 grains of radish sprouts in 20℃ on the three kinds of paper towel, the first one absorbed the distilled water, the second one, the 1.4% salinity water without halophiles, and the third one, the 1.4% salinity water with halophiles. After leaving them for a week, we observed the germination rate, how many grains have germinated out of 20. Judging from the data, it turned out that whether halophiles were added to the solutions or not resulted in three times of difference in germination rate.
As for the experiment to observe the salinity decrease in artificial salt-affected soils, we simply mixed soil with the halophiles retained in rice bran and measured the change in salinity and ppm. We prepared the

suspension of yeast and poured it to rice bran. Then I incubated them at 20 ℃ and got a result that the ppm of the salinity went down for 15% on average in the third day from the day started incubation.
From these experiment, it turned out that this method is effective in restoring the salt-affected lands to some degree, but there is strong need to improve the effectiveness and efficiency.
The deeper acknowledgment regarding the more specific mechanism of how the salinity decrease occurs and the prevention of recurrence of salt damage would provide further insight into the more efficient procedure of recovering salt-affected lands.

Keywords: Salt-Affected Soil, Food Production, Microbiology

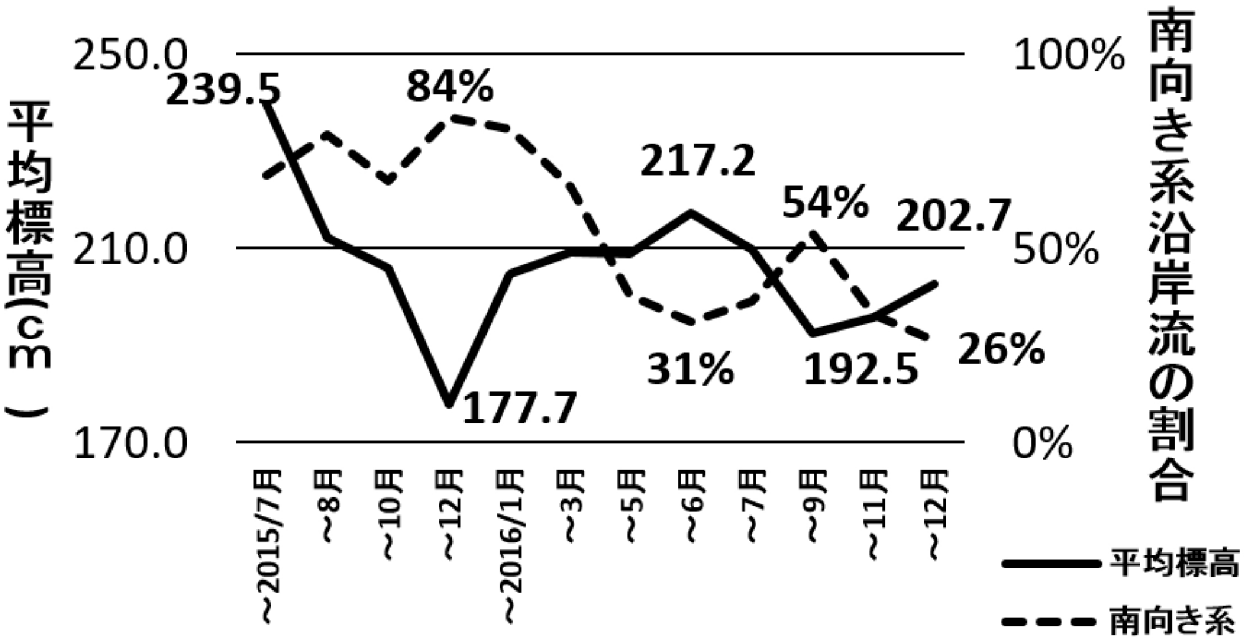
Factors of beach change on the Ose coast in Ibaraki prefecture

*Ren Moriizumi[1], Kohei Shiseki[1], Syoma Chiba[1], Tomoya Niwa[1], Masayoshi Isobe[1], Tsuyoshi Kawasaki[1], Syunsei Hosoya[1]

1. Ibaraki Prefectural Hitachi First Senior High School

[Introduction]
In recent years, the impact of coastal erosion has been reported in the north of the coast of Ibaraki Prefecture (Uda etl,2008). We examined by using aerial photograghs the situation of shoreline of Ose coast in Hitachi City. As a result, we investigated the coast as beach erosion seemed to be happening.
[Purpose]
The purpose of this study is to examine the situation of the beach change on the Ose Coast and to examine the beach change factor.
[Overview of the Ose coast]
Ose coast is located about 1km away south from Hitachi Station. Ose coast lies between Ose fishing port and marine bench. Sea cliffs are located behind the coast. The length of the coast is about 100m ofsandy beach. The sediments on the Ose coast were mainly medium sand and coarse sand,and developed sedimentary structure. Incidentally, in December 2015 , the embankments-protection works of the Ose fishing port was held.
[Experiments and results]
In an region of 50m ×30m in the coast, we measured to 5m intervals. We studied from July 2015 to December 2016. As a result, the average altitude of the Ose coast was fluctuating.It was confirmed that a beach change occurred. Furthermore, it turned out that beach change repeatedly occurred.
[Consideration]
In order to clarify the factors of this beach change, we made the following consideration.
As a result of analyzing the beach topography section, it turned out that the only foreshore was fluctuating. So,we considered the coastal current and the significant wave height.
In case of coastal current,we used the data of marine research buoy,at 5 km off the coast(Tohoku National Fisheries Research Institute,Japan Fisheries Research and Education Agency). We analyzed the data for the past two years. The dominant trends were southeast, south, southwest. We grouped these three flows together as "southward current". The proportion of this "southward current" was fluctuating. And it was inversely proportional to the variation of the average altitude. The correlation coefficient (R) was -0.78.(This result does not include data for the embankments-protection works period.)In case of significant wave height,we used the significant wave height data of Hitachi Naka Port that 20 km south from the Ose coast (Nationwide Ocean Wave Information Network for ports and harbours) . The fluctuation of the significant wave height was also similar to coastal current.The correlation coefficient (R) was -0.46.
[References]
Takaaki UDA, Toshiro SAN-NAMI, Hideki NAGAYAMA, Michio SUMIYA and Takayuki KUMADA,(2008) : BEACH EROSION ON NARUSAWA, TAGA AND KAWARAGO COASTS IN IBARAKI PREFECTURE, Annual journal of civil engineering in the ocean, 24,pp1327-1332

Keywords: Beach change, Coastal currents, Significant wave height



The Conditions of Occurring a Tornado

*Kanna Tsukagoshi[1]

1. Yokohama Science Frontier High School

Introduction
Tornadoes are natural phenomena that occur in particular areas. To discover the conditions leading to the occurrence of tornadoes, an experiment of the collision of warm air and cold air was carried out to make a horizontal vortex, which was the cause of a tornado. Then, making a tornado with a horizontal vortex and ascending air was attempted. Furthermore, natural tornadoes in Japan were researched.

Method 1
Experiment 1 Making a Horizontal vortex
1. Make two holes on both sides of a Styrofoam box.
2. Add wind: from right-fog machine’ s smoke
from left-hair dryer wind passed over ice cubes
3. Observe the movements of the winds.
4. Change the difference of temperature, walls, and cylinder to control the quantity of smoke(Fig. 1).

Experiment 2 Making a Tornado
1. Make two holes on both sides of a cardboard box and another hole on the top.
2. Add the winds: from right - cold wind
from left - warm wind
3. Pull in the wind using a vacuum.
4. Observe the movements of the winds(Fig.2).
5. Change the temperature of wind using something.

Result 1
Experiment 1
-Please find the attached document.
Experiment 2
Tornado did not occur.
-The reasons
-The power of vacuum cleaner was too weak.
-Two types of winds repelled each other.
-The difference of temperature of two types of winds was not enough.

Method 2
1. Accessed web page named “The database of Gusts” of the Japan Meteorological Agency.
2. Downloaded “the reports of the research of tornadoes” from 1st April in 2016.
3. From the reports, collected the data
-The speed of tornadoes
-The of damaged area
-The atmosphere in synoptic scale.
4. Downloaded the aerial photograph of the area where tornadoes occurred from web page of Geospatial

Information Authority of Japan.

Result 2
-The speed of a tornado is proportional to the length of damaged area(Fig.3).
-Where tornadoes occurred were like a farm from the aerial photograph.
-There are three places where tornadoes occurred twice in other day and the weather charts of these time were likely.

Discussion
The conditions of occurrence of tornadoes
-Collision of warm air and cold air whose temperature is much different from each other in a ground level makes a horizontal vortex occurs.
-To pass over the ascending current to the top of the horizontal vortex, a tornado occurs.
-The area where the tornadoes occur more frequently is changed by atmosphere in synoptic scale.

Future View
-Repeat experiment 2 to make a tornado by measuring the temperatures of two types of air with a thermocouple.
-Use upper-level weather charts and AMeDAS data, continue researching the data of tornadoes

Keywords: Tornado

Table 1 The result of experiment 1

	Ice cube (piece)	Wall	Result
1	10		×
2	10	①	×
3	20	①	△
4	20	①+②	○

①: A wall ②: A box
×: Not observed
△: Start to occur
○: Observed

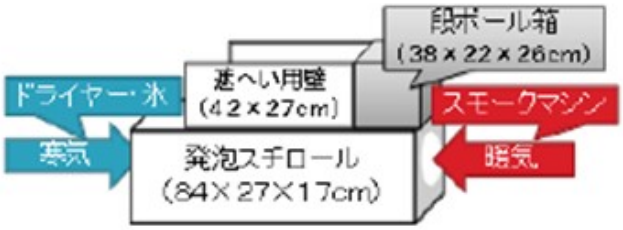


図1 実験1の装置概観

図2 実験1の様子

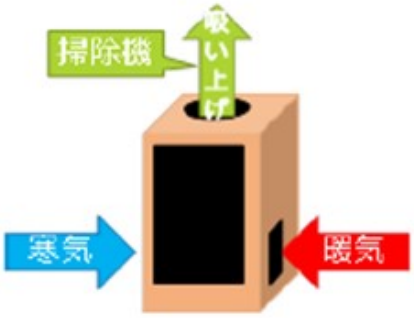


図3 実験2の装置概観

図4 実験2の様子

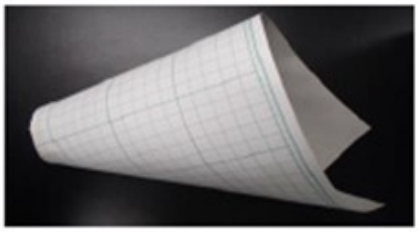


図5 実験で利用した煙調節筒

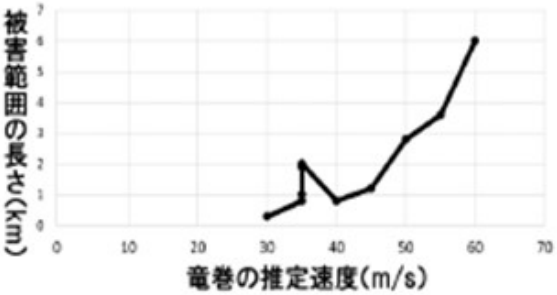


図6 竜巻の推定速度と被害範囲の長さ

O05-P31

*Minori Shinozaki[1]

1. Japan Geoscience Union

Poster

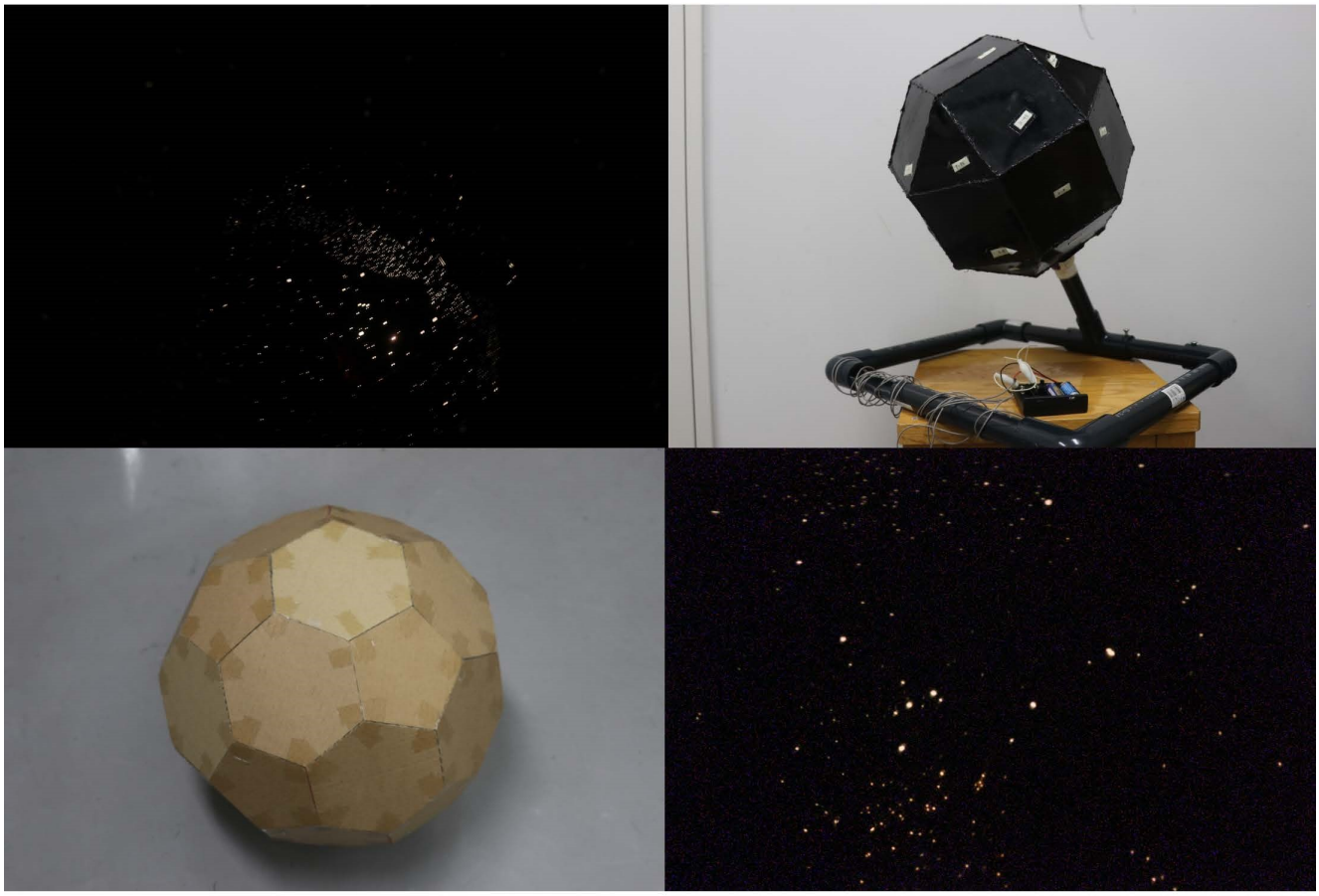
Four Improvements of the Pinhole Planetarium

*Nodoka Shimomura[1], *Himeka Kamioka[1], *Torataro Kurumida[1], *Ryoga Matsumoto[1], *Kaname Yamamoto[1]

1. Yokohama Science Frontier High School

The purpose of this study is to make the pinhole planetarium, which replicates the real starry sky. There were four problems in our planetarium.
The first problem was about the brightness of the stars. We expressed the brightness with the size of hole, but the size of bright stars was too big.The second one was that all the stars were the same color.The third one was that the range of stellar magnitude would become wider than before. So we have to use various radius holes.The fourth one was that the projector of the pinhole planetarium would be bigger than before. So, we have to make a stronger base.
This study showed the improvement on these problems.

Keywords: self-build planetarium



Radio observation of Perseid Meteor Shower

*Rio Sato[1], *Yoshiki Mori[1], Ryunosuke Saito[1]

1. Yokohama Science Frontier High School

Perseid meteor shower was observed with radio wave in Myoko City from Aug 10 to 13.
Then, by comparing our data with Sugimoto's data acquired in Hachioji City and the data collected by YSFH students with visual observation, the credibility of our data turned out to be bad.
A receiver (HRO-RX1a) and an antenna toward to Sabae City were connected each other. They were connected to the laptop. At the same time, meteor shower was observed with visual observation in Myoko city. The amount of meteors in 10 minutes and 60 minutes were tallied up. Each data was compared in correlation coefficient, scatter plot and graph. Observing time was from every 22:00 - 3:00 (next day), on Aug 10th - 12th.
Relations between data acquired in Myoko City with radio observation, one taken with visual observation and Sugimoto's one couldn't be found. Correlation coefficient between radio and visual was 0.27. And one between radio meteor observation in Myoko City and one in Hachioji City was 0.38. It was unable to observe meteor because radio wave was stopped on August 11th and 12th. The amount of meteors between 2:00 and 3:00, Aug 11th was larger than any other period. In that time, there was much background noise. This means sensitivity of the receiver was too high. Sensitivity was changed according to background noise. The timing of changing sensitivity turned out to be incorrect afterward.

Keywords: Radio observation of meteor

Shape and Genesis of Plate-like Beach Sand Concretion on the Samejima Coast of the Enshu Sea

*Shunta Miyahira[1], Keiichi Hashimoto[1], Tatsuya Niijima[1], Rikako Tanaka[1], Akane Tasaka[1], Kengo Ohishi[1], Shogo Yamada[1], Takehiro Suzuki[1], Riko Senoo[1], Minori Koike[1]

1. Shizuoka Prefectural Iwata Minami High School

1. Introduction

During our survey on the Samejima coast of the Enshu Sea, we found sand lumps. As there was no previous research about it, we named it “Beach Sand Concretion” and started to research its forms and how they were created.

2. Method

By doing field survey, we divided Beach Sand Concretions into some types. Next, we decided the foreshore into a concretion area and a non-concretion area and took some samples. And we did leveling, particle size composition analysis, mineral composition analysis and titration of chloride ion using the mall method. To investigate the further fine structure, we observed them using electron microscope.

3. Results

From this survey it is believed that Beach Sand Concretion are divided into Cliff type and Flat-Surface type, and the latter can be further classified into Plate-like shape and Lump shape. Focussing on Plate-like Beach Sand Concretion, no significant difference was found in its particle size composition and mineral composition in conparison to normal sand on Samejima Coast. Snad from the concretion area included a lot of chloride ion, but non-concretion area side from the concretion area almost did not include it. Using binocular stereomicroscopes, we observed Scaly or granular white or transparent crystals between sand particles. So we carried out Element mapping with an electron microscope and found that they were crystals consisted of salts like sodium chloride and calcium sulfate.

4. Conclusion

From the statement above, we found that precipitated salts made by the evaporation of sea water on the sand at high tide connected sand particles each other and as the result Beach Sand Concretions were formed.

Keywords: Beach Sand Concretion, Beach, Saits

Occurrence Mechanism of the Sprites due to the 2015 Kanto-Tohoku Heavy Rainfall

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1. Shizuoka Prefectural Iwata Minami High School

Our club has been observing TLEs (Transient Luminous Events) over the Sea of Japan from our school building (Iwata City, Shizuoka) since 2007. And in August 2015, we installed a camera aimed at the Kanto region. On September 9, 2015, 10:16 PM, an event of five sprites (a type of TLEs) was simultaneously observed by our club and Mr. Shimoda in Asahi Village, Nagano (Image : The sprites observed by our camera). Analyzing the data from the two observation points, it we determined that the sprites occurred over Utsunomiya City, Tochigi at an altitude of 75km. This occurred during the 2015 Kanto-Tohoku Heavy Rainfall.

Because there were masses of precipitation, we hypothesied that Mr. Masashi Kamogawa of Tokyo Gakugei University’ s occurrence mechanism (private note) of sprites during summer would apply. The purpose of this research is to verify this claim.

The hypothesis is as follows:
1. Heavy rainfall and -CG (thunderbolt having negative polarity) cause negative charge to leak from the bottom part of the cumulonimbus, leaving positive charge in the upper part of the cumulonimbus.
2. A +CG (thunderbolt having positive polarity) will occur between the positive charge of the cloud and the negative charge of the ground generating sprites.

The data acquired for this research is as follows:
a) Altitude around Utsunomiya City (Released from the Geographical Information Authority of Japan)
b) Wind direction and speed from September 8 to 10 at each Local Weather Observation Points of the Meteorological Agency in Tochigi
c) Precipitation from September 8 to 10 at each Local Weather Observation Points of the Meteorological Agency in Tochigi
d) Thermal satellite images around the Kanto region from September 8 to 10
e) Radar images around the Kanto region from September 8 to 10 (b)-e) acquired from the Japan Weather Association)
f) Thunderbolt observation data in the 200km square area around the occurrence point from an hour before to an hour after (Observed by FRANKLIN JAPAN Inc.)
We superimposed the data on a Google Earth map to make comparisons.

The results are as follows.
1. There was wind from the East near the ground in Tochigi.
2. An arm-shaped cluster of spikes stretched along the plateau that runs from Takanezawa Town, Shioya Country, Tochigi to Kameyama, Mooka City, Tochigi from the thundercloud covered the south half of Tochigi and only one +CG arose there at the same time the sprites took place. The sprites occurred in a pentagon-shape which extended a little east and west of the +CG center.
3. On the squall line, the cloud from which the sprites arose generated both +CG and -CG heavily. However, no thunderbolts were observed from the cloud north of it.

Considering the above, the formation process of the sprites can be estimated as follows:
1. Interaction between the extratropical cyclone over the Sea of Japan (Changed from the Typhoon No.18) and Typhoon No.17 provided the Kanto district with humid air from the Pacific Ocean. The squall line was formed on the afternoon of September 8, 2015 and rain clouds passed from south to north one after the other.
2. Around September 9, 06:00 PM, a cumulonimbus appeared over Tokyo Bay and moved northward growing and polarizing, then moved north. The northernmost point of it reached Chikusei City, Ibaraki at 09:00 PM and Utsunomiya City, Tochigi at 10:00 PM. Incidentally, the cloud which went ahead of it did not become a thundercloud.
3. Easterly wind which ran up the plateau that runs from Takanezawa Town, Shioya Country, Tochigi to Kameyama, Mooka City, Tochigi made a partial ascending air current along the plateau. Effected by this, an arm-shaped cluster of spikes stretched from the northernmost point (over Utsunomiya City) of the cumulonimbus to the north-west.
4. The upper part of the cumulonimbus which had positive charge got over the plateau and induced negative charge to the ground underneath. The space above was negatively charged as well.
5. At 10:16:20 PM, over Higashi-machi, Utsunomiya City, a 28kA +CG occurred between the positive charge of the upper part of the cumulonimbus and the negative charge of the ground.
6. The negative charge of the upper part of the cumulonimbus that was left induced positive charge further above. Dielectric breaks down between the two charges and five routes of electric current surrounding the +CG run as sprites from the altitude of 70km to 80km.

The assignments for the future include:
1. To clarify the reason why there are both thunderclouds and normal rain clouds on the squall line.
2. To clarify the reason why the distribution of five sprites was a pentagon which extended east and west surrounding the +CG.

Keywords: Ionosphere, Transient Luminous Events, Sprites, 2015 Kanto-Tohoku Heavy Rainfall

Age estimation of Tsunami Deposits before Hakuhou Earthquake near the mouth of Ota River, Shizuoka prefecture

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1. Shizuoka Prefectural Iwata Minami High School

We discovered that the four deposits found near the mouth of the Ota River in Shizuoka prefecture were not flood deposits from Old Ota River, but there are Tsunami deposits from the Hakuho earthquake (684), the Ninna earthquake (887), the Eithou earthquake (1096), and the Meiou earthquake (1498). Similar Tsunami deposits have been found at 100~150years intervals in the lowland of Ota River.
So, we took core samples to find older Tsunami deposits. As a result, we found an event deposit beneath the Hakuhou earthquake deposit. We compared the facies of this event deposits with that of the Tsunami deposits on the Ota River lowlands based on the post study (by Nakamura etal., 2014) by examining the compositional make up such as average size and mineral content of the two deposits. The composition of the event deposit corresponded with the results of the Tsunami deposit. From this result, we found this event deposits is Tsunami deposit.
Next, we estimated the age of this Tsunami deposit based on its sedimentation rate. It is believed to have accumulated around 340 B.C. Therefore, it is estimated that in the Yayoi era, there was a huge tsunami off the coast of the sea of the Enshu. So we named it ” Ota River-Yayoi era Tsunami” .

Keywords: Tsunami deposits, lowland of Ota River, Hakuho earthquake, Boring survey

Restoration of the late "Kano Bay"

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1. Shizuoka Prefectural Nirayama Senior High School

Restoration of the ancient‘Kano Bay’ by researching
the geological survey date and distribution of *Quercus phillyraeoides*

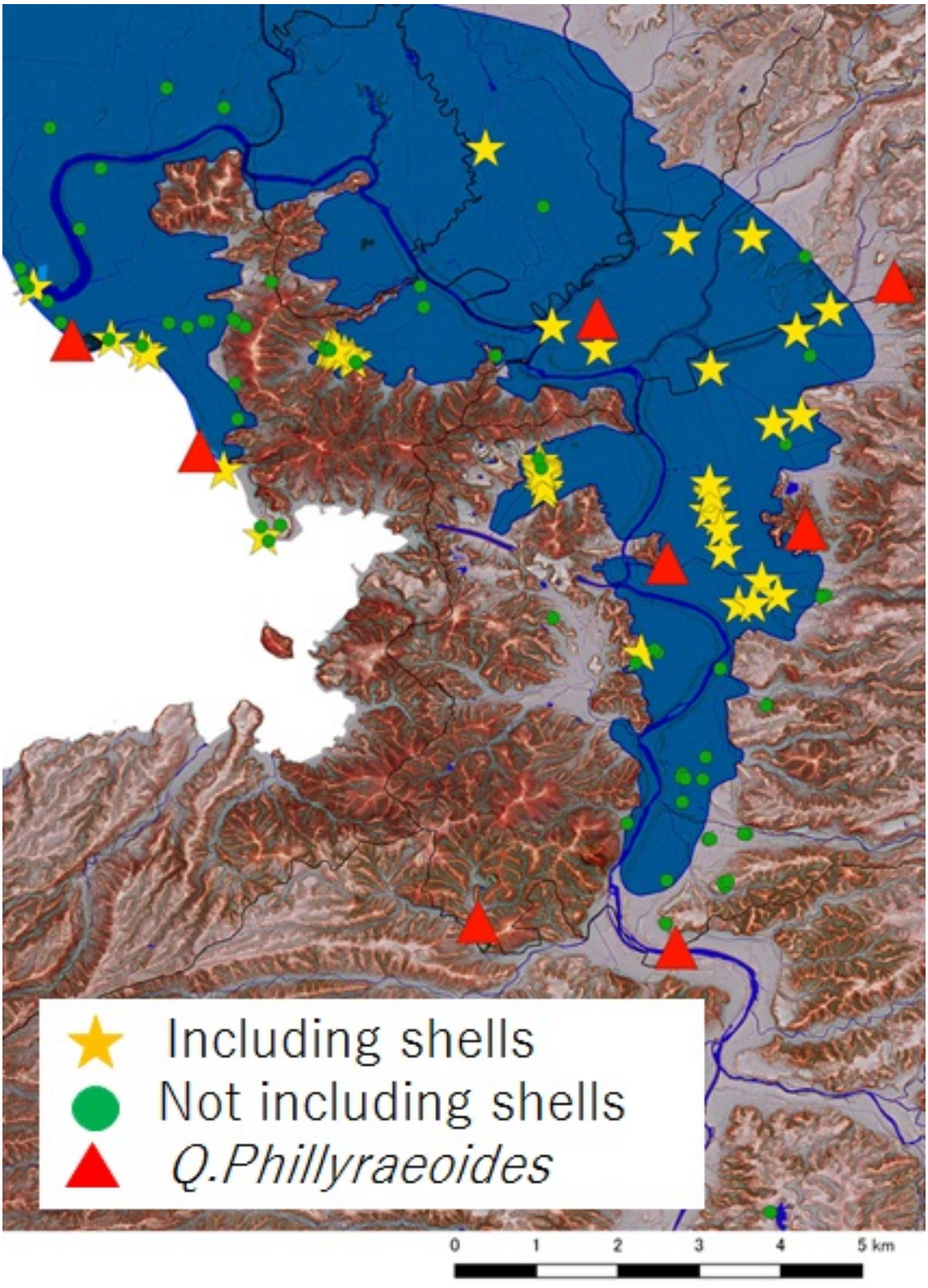
I.Introduction
About 6000 years ago, after the last glacial period, the Holocene glacial retreat(Jomon-kaisin)caused the sea level to rise 2 - 3 m due to the increase in the average temperature of the Earth. At that time, the ocean also progressed to the Tagata Plain of the Izu Peninsula, where ‘Kokano Bay‘ is said to have formed. However, the coastline has not been found. Therefore, we conducted this research to try to prove the existence of this coastline.

II. Method
1. Geological survey data analysis
Extract data(including shells) from bowling data and make a distribution map.
Based on this distribution map, connect the columnar diagram of the silt layer and show it in section.
Radiocarbon dating of shells and confirmation of age.

2.Distribution Analysis of *Quercus Phillyraeoides*
Field study: Choose 15 locations on the Tagata Plain and investigate the distribution of *Quercus Phillyraeoides*
Collect the leaves of *Quercus Phillyraeoides* from coastal and inland areas, extract the DNA, and examine the genetic differences.

III.Results and Discussion
We analyzed the geological survey data and the distribution of *Quercus Phillyraeoides* . As a result, it was found that the silt layer (including shells) caused by the Holocene glacial retreat agree with the distribution of *Quercus Phillyraeoides* . Therefore, we could estimate predict the innermost part and the coastline of ‘Kokano Bay’.
We hope that this research will be useful for the disaster prevention of the area, assumed to be soft ground.

Keywords: the Holocene glacial retreat, Quercus phillyraeoides, Izu Peninsula



Multifaceted function in the Woods for Field Practice - Decline of shrub-layer and soil erosion by feeding pressure of Sika deer -

Natsuho Kyogaku[1], *Wataru Konishi[1], Takuto Sumi[1], Sato Yamada[1], Yosuke Okamoto[1], *Ami Taniguchi[1], *Nanako Inoue[1], Genki Iwashita[1], *Kohtaro Ono[1]

1. Kyoto Prefectural Sagano High School

Recently it has been reported that wildlife causes various damage to the environment including feeding damage. The purpose of this research is to clarify the damage to ecosystems by mammals. In the Woods for Field Practice owned by our school especially, the possibility of soil erosion with the decline of understory vegetation can occur.
Through our research, we found out, most of the lower vegetation consisted *D. Linearisa* and *G. japonica.* Moreover, *Sasa* were not confirmed. We also confirmed minor soil erosion on the steep slope.
We set experiment areas for soil erosion on the steep slope, where no flow of soil particles had been confirmed. The organic matter layer and A layer are comparatively developed, and the soil permeability is excellent in the school forest. From the above results, we found that little water flowed on the surface of the soil because of rain. Thus we can conclude there is little possibility of soil erosion.

Keywords: Soil respiration, Soil organic matter, Soil permeability

The investigation of soil organisms in the forest owned by Sagano High School

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1. Kyoto Prefectural Sagano High School

The Woods for Field Practice Owned by Sagano H.S. (WFS) is located between the urban area and the mountains. We have researched the WFS from various viewpoints to evaluate the multifaceted functions of the school forest. We can confirm ecological succession to mixed broad –leaved forest. We have conducted studies on soil, birds, and vegetation to investigate the ecosystem in the WFS.

In this research, we investigated soil color, moisture, and so on. We also collected and classified soil animals, using the method of Tullgren.

We found more soil organisms in investigation areas where there was a large amount of organic matter than in other areas where there was a smaller amount of organic matter. Through these results, we found out a clear correlation between the amount of organic matter and the population of soil organisms.

Keywords: Method of Tullgren, Soil respiration, Soil organic matter

The brightness of the Milky Way in the night sky

*Kentaro Takagi[1], *Masaya Iwasaki[1], *Rentaro Masuda[1], Ayumu Shiraki[1], Yuito Ishida[1], Shota Enya[1], Yu Katayama[1], Ko Ichihara[1]

1. GIZAN SENIOR HIGH SCHOOL

Since 2014, we were conducting comparative studies on the brightness of Milky Way in all skies using digital cameras equipped with diagonal fisheye lenses. In the last year, considering the influence of atmospheric light reduction near the surface of the earth, although incorporating a correction formula, the Milky Way’ s magnitude does not have the same value every second number, etc. still have problems. To solve them, we made the hypothesis that the reference star for grading conversion was incorrect to examine the reference star and the photometry method.

Keywords: Milky Way, Photometry, Makali'i

Measurement of the Distance between the Earth and the Sun using Radio Telescope

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1. Kindai University Wakayama Senior High School

1. Motivation

We became able to calculate the relative velocity of the earth and interstellar material by observing the frequency of the hydrogen line, 21-centimeter line or H1 line refers to the electromagnetic radiation spectral line that is created by a change in the energy state of neutral hydrogen atoms in interstellar material (hereinafter referred to as H1 line) in the previous research. Therefore, we started this research because we thought that we may calculate the distance between the earth and the sun (so called one astronomical unit) by observing the frequency of H1 line twice in different season.

2. Previous research

We observed the frequency of H1 line. Its original frequency is 1420.40575MHz (wavelength 21.106114 cm) but the frequency we observe on the earth is slight different from it due to Doppler Effect. By observing this difference, we can calculate the relative velocity between the earth and interstellar material (hereinafter referred to as relative velocity).

2-1. Reason for focusing on H1 line

Various types of electromagnetic waves fall on the earth, but many of which are bounced off the atmosphere or absorbed by the atmosphere (figure 1). Therefore, the observable frequency of outer space origin electromagnetic waves is limited. Frequency of H1 line is fortunately in this suitable area.

2-2. Area of observation

Area where we can observe H1 line is limited to galactic plane area which galactic latitude is 0 degree.

2-3. Influence of the rotation and the revolution of the earth to the relative velocity

Relative velocity we observed is approximately between 50km/s and -100km/s. The rotation speed of the earth at the observation site (Misato Astronomical Observatory, Kimino cho, Wakayama Prefecture, Latitude 34 degrees 14 minutes north) is 0.384 km/s, which is sufficiently smaller than the relative velocity. Therefore, we do not need to think about the influence of the earth’ s rotation rate. The revolution speed of the earth is 29.9 km/s, which is nearly equal to the relative velocity. Therefore, we have to take care of the revolution speed of the earth.

3. This research

3-1. Principle

Observe the relative velocity twice, first in May and second in August. Determine the revolution speed of the earth using those datas. When we considered that the earth’ s orbit is an exact circle, we can calculate the distance between the earth and the sun.

3-2. Angle of observation

Areas to be observed must be the intersection point of galactic plane (latitude 0 degree) and ecliptic plane (latitude 0 degree). Galactic plane is the only angle where we can observe H1 line from interstellar

material (figure 2) and ecliptic plane is the only angle where the calculation method is not so complicated. Two points will satisfy this requirement, and we chose one of them which can be observed at the time of observation (figure 3).

Coordinate of observation point
Ecliptic longitude 90 degrees, Ecliptic latitude 0 degree
Galactic longitude 186 degrees, Galactic latitude 0 degree
Equatorial longitude 90 degrees, Equatorial latitude 23.14 degrees

3-3. Observation schedule, place and instrument
Observation 1: May 9, 2015. 15:00 - 19:00 rainy then sunny
Observation 2: August 2, 2015. 08:00 - 12:00 sunny
Place: Misato Astronomical Observatory in Kimino cho, Wakayama Prefecture
Instrument: radio telescope (8 meters in diameter) (Wakayama University / Misato Astronomical Observatory)

3-4. Result (figure 4) (When the interstellar material is moving away from the earth, we defined it as a positive value.)
May 9, 2015: Relative velocity -4.06 km/s
August 2, 2015: Relative velocity 39.2 km/s

3-5. Calculation results, conclusion and consideration
We used equation 1 and equation 2 to calculate the revolution speed of the earth.
Relative velocity (May) = V (interstellar material) - V (earth) x cos48.23---equation 1
Relative velocity (August) = V (interstellar material) - V (earth) x cos129.30--equation 2

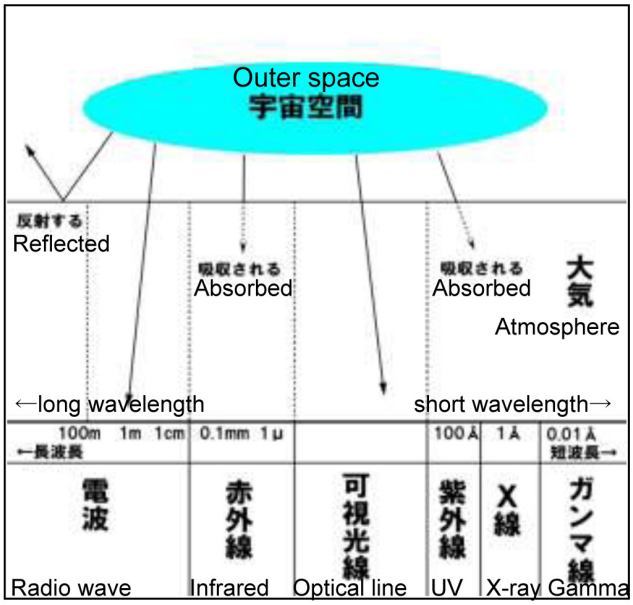
Calculation result;
Revolution speed of the earth: 33.3 km/s
Distance between the earth and the sun (one astronomical unit): 167,000,000 km
Error compared to the true value of one astronomical unit (150,000,000 km) 1): 11 %

The following can be considered as factors of the error.
The revolution orbit of earth is not a true circle.
The revolution speed of the earth is not constant.
The interstellar material’ s movement is not linear at a constant speed.
Influence of rotation of the earth.

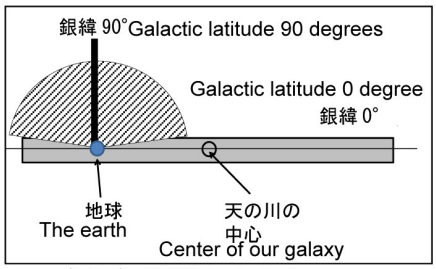
3-6. What to do next
We review the observation and consider how to explain the error. Then try to remove the cause of error, and try to get the distance closer to true value.

1) Chronological Scientific Tables 2011, page 77, National Institutes of Natural Sciences, National Astronomical Observatory of Japan.

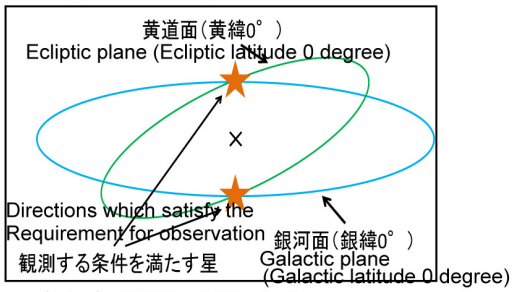
Keywords: Astronomical Unit, 21 cm hydrogen line, Earth, Sun



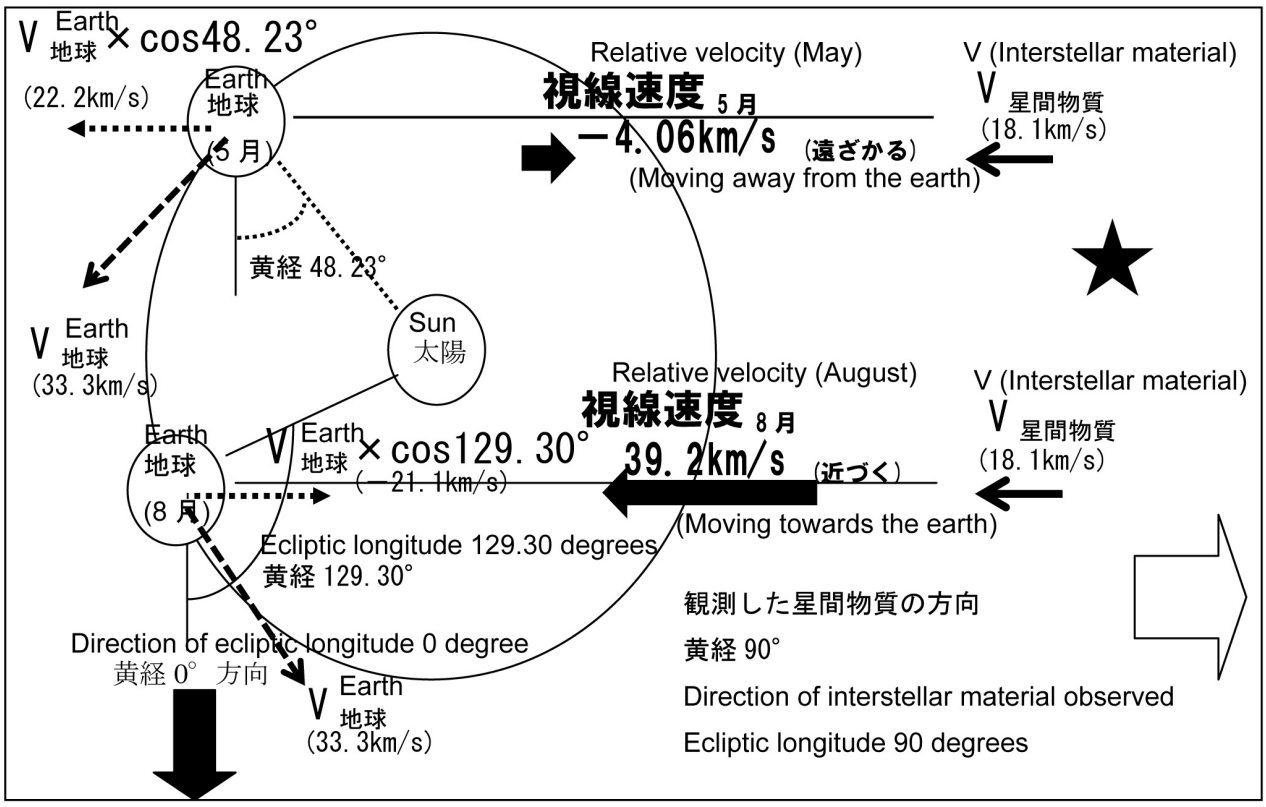
(図 1) 電磁波の種類
(Figure 1) Types of electromagnetic waves



(図 2) 観測する方向
(Figure 2) Angle of observation



(図 3) 観測に適した方向
(Figure 3) Directions which satisfy the requirement for observation



(図 4) 観測図
(Figure 4) Results

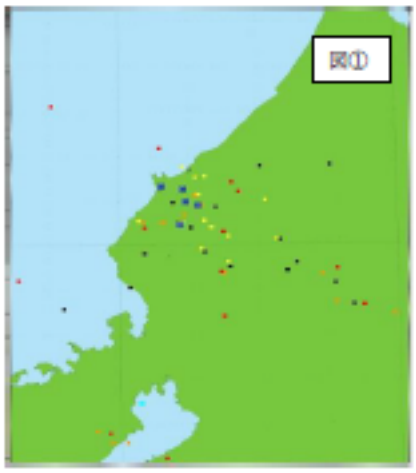
The research of Fukui earthquake fault (Ⅴ) ~How about the shake of Fukui plainwhen earthquakes occur?~

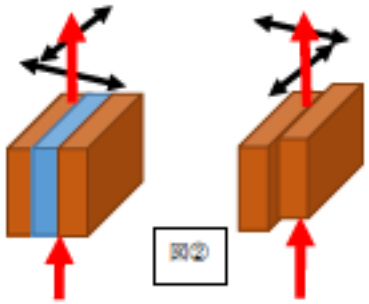
*Rena Nakayama[1], *Mizuki Ueda[1], *Nao Uzui[1], Koki Minamitani[1]

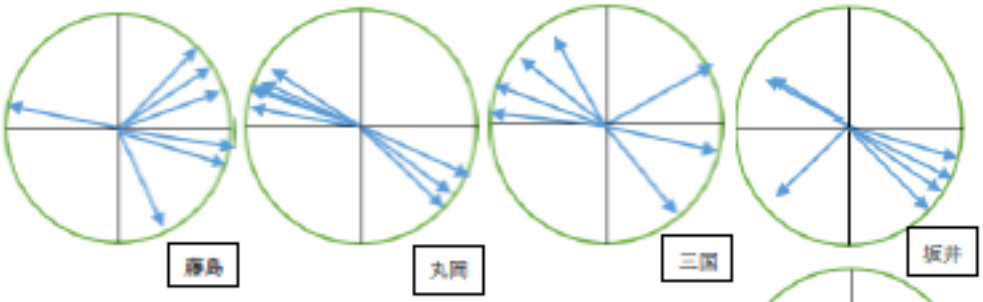
1. Fujishima High School

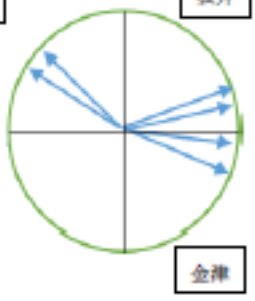
We are studying about fault zone at the eastern margin of the Fukui plain, where Fukui Earthquake occurred. There are many earthquakes in Fukui prefecture because of the existence of many active faults. So we want to clarify underground structure of Fukui plain and mechanism of earthquakes' shake.
It is known that when S wave arrives, the velocity vector of ground surface shows a certain direction remarkably. This direction is so called the fast-shake-direction of S wave. We can get this element from hodograph which makes velocity vector into graph. By accumulating information about the first shake direction at high school in Fujishima, Kanazu, Maruoka, Sakai and Mikuni, we can know their tendency and guess their characteristics.
From the figures, we analized first shake direction of S wave at each high school.
We learned that Fujisjima has some special underground structure from former study. In this year, we found the cases which shaking direction is irregular and we made two hypothesis. Firstly, the underground of Fujishima is stable. Secondary, closed crack NS direction exists under the school. Generally, the destruction incline to WNW-ESE.
According to the former study, there are cracks just under the surface of Kanazu. Also, We can't see any irregular direction, so we can judge that crack was always closed when earthquakes occurred.
The result in Maruoka coincided with the direction of stress field and no phenomena shows crack's existance. The result is as same as former study.
Waves in Sakai tend to incline to NW-SE. This result is different from former study, but there is irregular direction, so we judged that the crack hasn't formed enough yet.
There is no tendency in Mikuni. Maybe, stress field around Mikuni is unstable land view of the Tozinbo.
Many cracks formed by fault movements. There are closed and opening cracks. If crack opens, then liquid like water is accumulated. We'll explain the change of both cracks. We define that a premise crack is NS direction. Closed crack gives no influence on S waves with WE vibration direction, but waves with NS vibration direction are influenced by the friction of crack. On the other hand, When wave go through liquid parts of open crack, liquid can't convey transversal waves, so their passage gets slower, while SN direction waves won't change, so SN wave is recorded earlier we think.
Next, we explain about trapped wave. In fault zone, refractive index is larger than normal zone. For S wave to go through fault zone, an incident angle should be as small as possible, but the incident angle of waves which is parallel to the zone can't be as small as critical angle. So waves reflect again and again like light in fiber and can't go out from the zone. In S-coda, the wave whose size is as same as former one is recorded.
An earthquake case, we call them Trapped Waves.
We found the wave in two earthquakes. First case occurred near Neo village 2014.9.20. There was trapped wave in Sakai and Kanazu. We can see subtle succeeding wave in Fujishima, but it is maybe because the feature of the ground. The other case occurred around Ikeda town 2016.1.13. We can see trapped wave in Kanazu. Crack hasn't formed enough in Sakai and velocity didn't become slow enough, so we can't see trapped wave. There is a kind of following wave in Maruoka, but it would be because Maruoka is nearest place to epicenter. Trapped wave didn't occur in Fujisjima because Fujishima exists west side of fault zone.

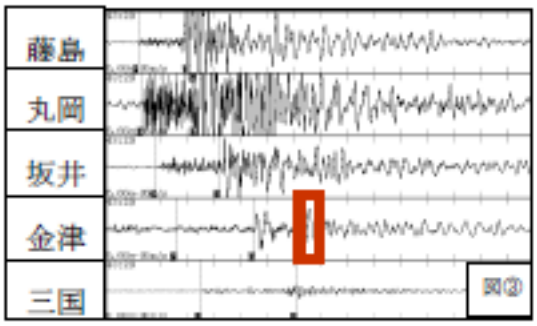
Keywords: Earthquake, Crack, Trapped Wave

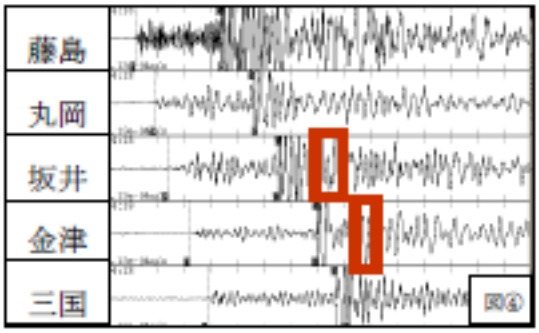


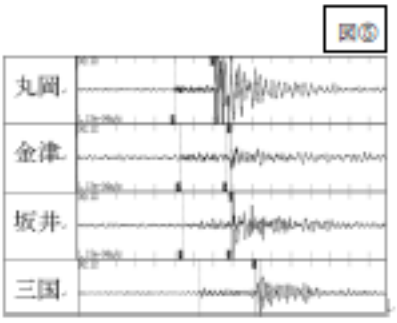












What is required for liquefaction to occur?

*Moe Sakano[1], *Tsubura Miyasaka[1], *Misaki Masuzawa[1], *Nene Naito[1]

1. Nagano Prefectural Yashiro High School

The factors, which are closely related to cause liquefaction, can be listed as "the environment of sedimentation"," the sizes of the clastics and combination of different sizes", "water level", and "the amount of water pressure". In this study, we performed the following experiments and discuss about the mechanism of liquefaction occurring after earthquakes.
1 We used 6 different sized sands and combinations of them. In the combination study, we also tested about the mass ratio in the mixture of fine sands and coarse sands.
2 In the situation we found in which jetted sand happens the most easily, we tested the effect of water pressure above the sand layers.
3 We also tested the effects of ground water levels.

Analysis and consideration of metal ion concentration of water taken from a stream in Yosemite Valley using ICP-AES Ver6

*Shu Yanagisawa[1], *Hikaru Tajima[1], *Nitika Tokiwa[1]

1. Nagano Prefectural Yashiro High School

We've collected fresh water samples from 6 spots in the Merced River in the Yosemite National Park USA. We asked Shinshu University the Faculty of Engineering to analyse the samples. They analysed concentrations of 28 kinds of metal ions using ICP-AER Ver6. Among them, 7 kinds of ions, Ba, Ca, Fe, K, Mg, Na, Sr, showed relatively high readings. In this study, we discuss about the possible correlation between the river length and the ion concentration using the dataset we've made in the last 5 years.

The study of Old Tottori sand dunes.why the sand become hard ?

*Juri Kitagawa[1], *Sakura Ikeuchi[1], *Natsuki Nisihigaki[1], *Chika Fujiwara[1]

1. Tottori Prefectural Tottorihigashi High School

Tottori is famous for Tottori sand dunes. There is a Museum of Sand sculpture that is exhibited many sand sculptures. In addition, we found that they become hard only water and sands without others. Also, we learned that the sand we can see don’ t become hard and the sand used them is called “Old sand dune”; thus we considered “Why the sand become hard?”

Keywords: geology, petrology

Sedimentary environment of reef limestones in Kuzu area, Sano city, Tochigi Pref.

*Hidetoshi Masuda[1]

1. Kaijo Senior High School

The Nabeyama Formation, which consists of Middle Permian carbonate rocks were deposited upon a seamount, is distributed in Kuzu area, Sano City, Tochigi Prefecture. The Nabeyama Formation is divisible into three Members: The Lower Limestone Member, the Middle Dolostone Member and the Upper Limestone Member which are established by Yanagimoto (1973). We surveyed three routes in Kuzu area and collected 47 samples. The study of sedimentary environment is based on observation on thin sections.
The Lower Limestone Member mainly consists of bedded dark gray limestone. These limestones are abundant in lime-mud and partly contain peloids. These can be classified as lime-mudstone, wackestone or packstone. According to these features, it could be presumed that sedimentation of the Lower Limestone Member probably occurred in the bottom of lagoon. In addition, grainstone occurs a little, which indicates influence of storm. The lowest part of the Nabeyama Formation includes volcaniclastic grains. This is the evidence that volcanic island existed above sea-level surrounded by reef.
The Middle Dolostone Member is mostly crystalline. It has been regarded as result of dolomitization. There is no evidence which indicates primitive sedimentary environment of the Middle Dolostone Member.
Almost all parts of the Upper Limestone Member are massive light gray limestone. Most of them contain lime-mud and classified as lime-mudstone, wackestone or packstone. There is abundant in lime-mudstone and grainstone is not found in scope of our survey. The Upper Limestone Member could be presumed that deposited in calm environment like bottom of lagoon, the Lower Limestone Member likewise.
The Nabeyama Formation is covered by Triassic conglomeratic limestone and Jurassic siliceous shale. The conglomeratic limestone contains gravels of Permian limestone which derived from the Nabeyama Formation. It indicates fall of sea-level in Upper Permian or Lower Triassic. In addition, Jurassic siliceous shale is presumed to be deposited in the deep sea. It shows that top of the seamount moved to deep sea by Jurassic.
The research was supported by Science Mentor, which the Japan Science Society projects.

Keywords: Limestone, Sedimentary environment, Kuzu

The spring in the Otomeyama Park, Shinjuku ward and the recharging area of the ground water around there

*Taiga Suzuki[1]

1. Kaijo Senior High School

There is a spring in Otomeyama Park Shimo-ochiai area in Shinjuku Ward, Tokyo, which is precious place in city environment. We have observed discharge from the spring and water level at the well nearby, and studied the data for 7 years.

We have developed a model that represents variations in ground water level, based on the precipitation and groundwater level data, and estimated the area which has precipitation data that we could calculate groundwater level the most accurately by using it, considered as recharging area. However, the area was not inspected enough, so we tried to estimate the recharging area more accurately taking landform and geology into consideration.

The estimated area lies on the northern area from the spring: about 10km². There is a former river channel in the area north of the spring from west to east with an altitude of 20m T.P. and on the north-eastern part of the area 26m T.P. and a ground in south-eastern part of the area 35m T.P. that it ridges extend north-east and east: 4km². The stratigraphy of this area is the permeable Musashino Loam, the hardly permeable Shimo-suekichi Loam, the permeable Musashino gravel Bed, the Tokyo Formation impermeable and the permeable Tokyo gravel Bed, from the top. The Musashino gravel Bed is the aquifer of the spring, considering the altitude of the spring. And groundwater is under pressure: the groundwater level of the well is higher than Musashino gravel Bed. We draw a geological section based on the drilling data which Tokyo Metropolitan Government Bureau of Construction releases. Then we found that the aquifer, Musashino Gravel Bed, is inclined to north-east, following the topography of the surface. It is consistent in the preceding study saying that the groundwater surface of Musashino plateau is similar to the shape of the surface. Therefore, there is little supply of water from north-eastern part of the area, and south-western-part of the area supplies water to large area including the spring. The slope of the plateau is very gentle, so clear watershed do not exists probably.

How the way ten cloud types form can change with the seasons

*Aoto Okuzumi[1]

1. Kaijo Senior High School

We usually understand that each type of clouds has seasonal differences of its frequency and amount. In this research, I collected the data about the ten cloud types for three years and found out the differences in a numerical way. Furthermore, I compared the collected data with the Meteorological Agency’ s data of atmospheric pressure, temperature and humidity.
The way of the observation was to analyze the cloud cover in the photos of the northern, southern, eastern and western sky at Saitama City in the morning. The Meteorological Agency’ s data, which I used, was obtained from the Tokyo District Meteorological Observatory which is the closest to the observation point at Saitama City.
As a result of the analysis, I did not observe major differences of the frequency and amount in each cloud type in spring and summer, on the other hand, observed some differences in autumn and winter. The monthly average cloud cover was larger from June to September, and from the comparison of the data of the Meteorological Agency, the monthly average value of humidity and cloud cover showed a similar tendency of changes. So, there seems to be a relationship between them. However, based on the analysis of daily data, no relationship was observed between the humidity and cloud cover. I have not found the reason of the different tendency of monthly and daily data yet, and it needs more analysis and consideration.
In addition, the average value of cloud cover at an occurrence was bigger in layered clouds than in bulky clouds . This result accorded with the feature that layered clouds tend to take a larger area of sky than bulky clouds. Therefore, I could admit that the way of the observation was adequate and accurate to a certain extent.

Keywords: Ten cloud types

The Component Change of Three Comets by Spectroscopic Observation

*Takuto Nishikawa[1], *Shunya Okumoto[1], *Mako Sugimoto[1], *Remi Yamamoto[1]

1. Nara Prefectural Seisho High School

1. Introduction

Two years ago, the students of Seisho High School launched a research group to study comets. The group conducted spectroscopic observations on a number of comets including Comet PanSTARRS. Unfortunately, due to limited observational data and other experimental issues, the original research group could not make ample progress on the study. That is why our team took over their research project. Here, we focused on observing only one comet by tracing its spectrum change. The number of appearances of comets suitable for our research this year was very limited. Therefore, we made use of data from spectroscopic observations of three comets in the past, C/2012K1, Comet Lovejoy(C/2014Q2) and Comet Catalina(C/2013US10). The data for those three comets was collected by researchers working at the Bisei Astronomical Observatory in Okayama prefecture and volunteers who participated in the public offering observation program.

2. Purpose

The purpose of our research is to study two changes. The first is the change of the emission line in the comet spectrum during or before and after the comet passes through perihelion. The second change is the change of gas releasing velocity.

3. Method

We conducted the data analysis with the following steps.
(1) We performed a primary treatment on the picture of the comets' spectrum using "Makali'i" (National Astronomical Observatory of Japan and Astro Arts Company). The picture was obtained by a telescope at the Bisei Astronomical Observatory in Okayama. The mirror was 101 cm in diameter.
(2) We made a spectrum diagram using "Be Spec" (Tetsuya Kawabata).
(3) We specified the chemical composition for the main emission line in the spectrum diagram. Furthermore, after reading the whole width of the CN emission line, the maximum value of the releasing velocity of the gas in coma was calculated using a function of the Doppler Effect.

4. Result

The strength of each emission line (CN, C_2, C_3 and NH_2) and the releasing velocity of the gas from coma, as read from the spectrum diagram is shown in the chart below.

5. Discussion

(1) According to our results, CN emission line appears for quite a long period of time. On the other hand, CN emission line was found to become clear just before it passed through the perihelion. The emission line gets the clearest soon after it passes the perihelion.
(2) It was also found that the releasing velocity of the gas from coma becomes the greatest at the point of perihelion.

6. Conclusion

One of the remaining problems could be solved by analyzing more spectroscopic data of the comets.

However, we think it is necessary for us to continue researching the principle that dictates the order of appearance of emission lines.

Acknowledgement
We would like to express our deepest appreciations to Professor Fukue and Associate Professor Matsumoto at Osaka University of Education for advising us. Furthermore, we thank Principal Ayani and Mr. Maeno of the Bisei Astronomical Observatory, and Mr. Uno and Mr. Matsushita for giving us permission to use their observational data.

Keywords: Comet, Coma, Spectroscopic observation, Emission line

ラブジョイ彗星（C/2014 Q2） 近日点通過日[a)]2015. 1.30

観測日[b)]	CN	C_2	C_3	NH_2	ガス放出速度[c)]
2015. 1.10	?	○	○	△	−
2015. 1.20	?	◎	○	○	−
2015. 2.18	?	◎	◎	◎	−
2015. 3.24	◎	◎	◎	○	$(1.5\pm0.2)\times10^3$km/s
2015. 4.22	◎	○	◎	○	$(9.7\pm2.7)\times10^2$km/s
2015. 6. 6	◎	△	○	△	$(7.8\pm0.8)\times10^2$km/s
2015. 6.28	○	△	○	×	$(5.0\pm3.5)\times10^2$km/s
2015. 8. 5	?	×	?	×	−

パンスターズ彗星（C/2012 K1） 近日点通過日[a)]2014. 8.27

観測日[b)]	CN	C_2	C_3	NH_2	ガス放出速度[c)]
2014. 5. 9	○	△	△	×	$(4.7\pm0.8)\times10^2$km/s
2014.10. 3	◎	○	○	△	$(1.0\pm0.2)\times10^3$km/s

カタリナ彗星（C/2013 US10） 近日点通過日[a)]2015.11.15

観測日[b)]	CN	C_2	C_3	NH_2	ガス放出速度[c)]
2015.12.19	◎	◎	◎	○	$(2.4\pm0.5)\times10^3$km/s
2016. 1. 2	◎	○	◎	○	$(1.7\pm0.1)\times10^3$km/s

◎ 非常に強い(Very strong) ○ 強い(Strong) △ 弱い(Weak) × 見えず(Invisible) ? CCDカメラの故障(CCD camera failure)
a) Date of perihelion passage b) Date of observation c) Gas releasing velocity

Making a Seismograph with Daily Materials

Karen Mukai[1], *Ryota Tanaka[1], Ryusei Takino[1]

1. Tennoji High School attached to Osaka Kyoiku University

We made a seismograph by using familiar materials. The seismograph observed some earthquakes. We used materials which we can buy at DIY shops. The seismograph is composed of a pendulm, a brake, an electromagnetic sensor, an amplifier, and a computer. It is recording earthquakes all day. It recorded some earthquakes which ocurred at various places. We changed digital data recorded in the computer into waveforms of some earthquakes with Excel. The assignment is to examine how far from here the earthquakes recorded by the seismograph ocurred and how big they were.

Keywords: earthquake, seismograph, DIY

What do the “waves” reveal on earthquake?

Takuto Fukunishi[1], *Kana Ogawa[1], *Hareruya Shimonaka[1]

1. Tennouji high school attached to Osaka Kyouiku University

We announced to pay attention to fixed number k used for "the distance formula of Omori"-The formula which expressed proportional connection of which I consist during an observed preliminary tremor time in the haypocentral distance until an earthquake and an observation point-"in last year's SSH study.This study tried calculation of the correct value of the k by Hi-Net from National Research Institute for Earth Science and Disaster Prevention and waveform analysis software called Win system. As a result, we got the score over than 8.

Keywords: earthquake, the distance formula of Omori

Water flows.-About the relation between a water current and winds-

*Rion Hamada[1], *Yoshiki Masuda[1], Yuri Inui[1]

1. Tennoji High School attached to Osaka Kyoiku University

We thought that there will be a relationship between an ocean current and a sea breeze.
As the basic research,we develop a water tank(*1)
which is able to visualize the water flows. After that, we have studied a wind effect using a PC wind fan,
*1) To hoist flags in 15 places into the tank, We measured the water flow directions.)
Things to prepare:
Ⅰ.Preparation
water tank(glass, W588×D287×H233mm),vinyls, plastic bottles, expanded polystyrenes, toothpickes, bonds, air ponps,and glass beads.
Ⅱ.Main research
with PC's external fan(W143.5×D143.5×H48mm)

Keywords: Ocean current, Visualize, Wind

Origin of Nakisuna coast

*Misaki Hishinuma[1], *Yuuka Dairaku[1]

1. Iwaki High School

Toyoma coast, in Iwaki city, Fukushima prefecture, is Nakisuna coast, but others around it are not Nakisuna coast. Nakisuna is a kind of sand that gives off characteristic sound because of rubbing of quartz in sand. It is inclined to change its sound by environmental factors, so it is called “barometer of environment”.
However, as a result of prior research, we knew roundness of sand and mixture have more influence on Nakisuna than environment. And we determined whether it makes sound or not depending on difference of frequency of Nakisuna by doing physical research about it.
On the other hand, we do not find out how Toyoma coast became Nakisuna coast. To clear its process, we examined the percentage of containing quartz in sand of Toyoma coast and that of Natsui river, which is big and near Toyoma coast. After that, we compared with each other. Also, to find where the sand of Toyoma coast is supplied from, we examined difference of the percentage of containing quartz in sand of Toyoma coast, which was separated at low tide and at high tide.
As a result, it is cleared that the percentage of containing quartz in sand of Natsui river was 71.4%,and that of Toyoma coast had a few differences at low tide and at high tide.
Because the percentage of containing quartz in sand of Natsui river is close to Toyoma coast’s one, we can say the sand of Toyoma coast has its origin in Natsui river. In addition, from the percentage of containing quartz in sand of Toyoma coast at high tide was higher than that at low tide, so there is a high possibility that quartz contained in sand of Toyoma coast is supplied from sea.
After this, to find out the origin of Nakisuna in detail, we are going to examine a mechanism of sea current. Natsui river has many sediments, so we are also going to examine how they arrive in sea shore.

Keywords: Singing sand

Wind and Bonze come at ten o’ clock

*Haruka Saito[1], *Yosuke Suzuki[1], *Yui Ichikawa[1], * Emiri Miyashita[1]

1. Iwaki High School

In Iwaki city, Fukushima prefecture, there is a saying that “Wind and Bonze come at ten o’ clock”. To make sure that the saying is true, we processed weather data of twenty years from the Meteorological Agency and managed data of weather and data of season separately. We set four observation points, two coast areas (containing Iwaki city), an inland area and a mountainous region and then we investigate the time of starting to blow and the amount of changing of the wind velocity. As a result, we found that the wind tend to start blowing in coast area of Fukushima prefecture, at 10 o’ clock, and in spring and summer the wind started to blow earlier than autumn and winter, Influenced by the sea breeze. On the other hand the wind tend to start blowing after 10 o’ clock in inland area and mountainous region. In order to conclude this result is influenced by the sea breeze, we did an experiment about making a sea breeze. In the end we found the sea breeze blows before 10 o’ clock.
In conclusion, this saying is applicable generally in coast area of Fukushima prefecture.

Keywords: Meteorology, Wind

A study about the eruptions of Kilauea

First Family[1], *Joe Griffiths[1], *Nayuta Izumi[1], *Tamami Suzuki[1], *Haruka Yanagawa[1]

1. hokkaido muroransakae highschool

We went on a volcano field trip this March.We went to areas around Kilauea and saw craters,lava fiows,and places which had disaster.In our presentation,we're going to talk about the eruption aroud Kilauea,while comporting it to Mt.Usu.
In this field trip,we were glad that we could see the liquid surface of the lava lake in the Halemoumou crater.We were very lucky to see the surface,and it was a very experience.
We walked around various places and observed and measured various things.In The Kilauea Iki crater,we measured the lengths of cracks,and tried to find the relation between the length of crack and the time it took cooling down.Also,we measured the direction of the lava flows from the lava tree molds.
Through this field trip,we learned the importance of looking at the "real"thing.Especially,the size of Mauna Loa is something that can't be experienced from a photo,and we are glad we could see the real thing.

Keywords: Kilauea, lava, eruption

Spectroscopic observation of a meteor using a diffraction grating

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1. Miyagi Prefecture Furukawa Reimei Sinior High School, 2. Miyagi Prefecture Furukawa Reimei Junior High School

Since we were interested in the emission of meteors by looking at the image where the color of the meteor changed at the light emission starting point and the light emission end point, we studied what kind of element the meteor is emitting from the spectroscopic observation . For the research, we used a blazed diffraction grating with 300 lines / mm and a transmission type diffraction grating film with 1000 lines / mm on a digital single lens reflex camera. In the research method, firstly, the spectral photograph of the meteor is photographed using the above apparatus. Next, a spectral tube is brought close to the situation of taking meteor images, and spectroscopic photography is performed for calibration to check the scale of the diffraction grating. Then use the image analysis software and measure the distance (number of pixels) from the meteoroid main body to the bright line spectrum representing the element from which the meteoroid's light originates on the picture. Then, in this observation that estimates the element from which the meteoroid luminescence is derived by comparing this spectral photograph with the image of the calibration work, the Perseidian meteor shower is observed by using six cameras from four places in Miyagi prefecture with a personal computer and a remote shutter connected and taking shots continuously with exposure of 5 seconds and 10 seconds. And we were able to take a spectrogram of one that seems to be one of Perseid meteor shower groups. For the calibration work, it was performed assuming that the bright line spectrum (wavelength 589 nm) of the image was sodium, and the spectrum was further estimated. As a result of analyzing by the above method, wavelengths which are seen at 521 nm and 630 nm were specified.This suggests that meteors may emit light with elements such as Magnesium (518 nm) and Silicon (634 nm). Lastly, we would like to express our sincere gratitude to Dr. Mr. Masayuki Yamamoto, Kochi University of Technology for cooperating with doing this research, Thank you very much for Mr. Yuhei Suzuki of Faculty of Science, Ibaraki University.

Keywords: Meteor, Brightline spectrum, Diffraction grating

Where is the northern limit of the caldera, and what type of magma activity has occurred in the southern Hyogo Prefecture

*Sachi Ishii[1], *Akane Tanaka[1], Ryoga Toda[1], Tomo Murakami[1], Naoya Kanzaki[1], Daiki Kishimoto[1], Akitoshi Tsuda[1], Syunsuke Fukuda[1], Kouma Fujiwara[1], Kaisei Murakami[1], Runa Sasakura[1]

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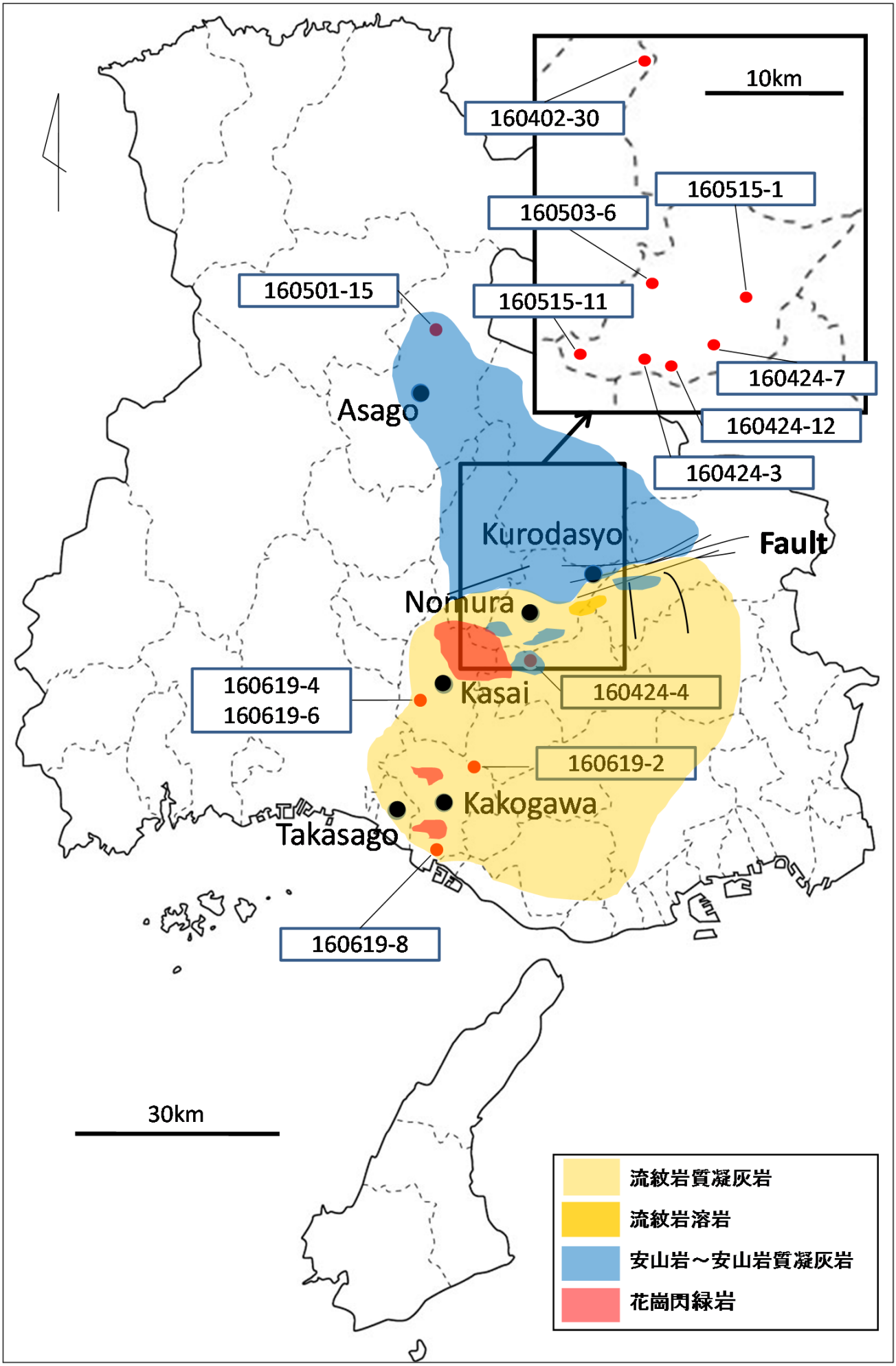
The authors suffered flood by the flood of the first grade river Kakogawa flowing in the southern Hyogo Prefecture. We have continued research to elucidate the cause from 2014. We conducted an outcrop survey along the Kakogawa - Maruyama River, 30 km east - west x 90 kilometers north - south. In Nishiwaki city, the east - west direction and several fault groups orthogonal to it, are developing. Rhyolite tuff is southern in the fault group, and the north is andesitic tuff, and the strike also differs by nearly 90 °. The rhyolitic tuff spreading in the Kakogawa watershed accompanies multiple intrusive rocks of andesite. These results indicate that the northern limit of the caldera is in Nishiwaki city. A natural embankment formed by the penetration of rigid andesite into the soft tuff which is widely distributed in the Kakogawa basin is the cause of the flood.

Keywords: caldera, rhyolitic tuff, intrusion of andesite, fault group



Proposal of road conditions to make left turn of intersection smooth

*Kota Kotera[1], Hiroto Kubo[1], Ryuusei Saitou[1], Akihiro Sakamoto[1], Mina Fujiwara[1], Naoki Tokuoka[1], Taichi Nishiyama[1]

1. Hyogo Prefectural Nishiwaki Senior High School

When we go to school in the morning, traffic jams are occurring while the car is trying to turn left at the intersection. Care must be taken so that the driver does not protrude into the oncoming lane and that the rear wheels do not protrude from the roadside belt. If there is a fan-shaped area (called "hakama" in this paper) at the corner of the intersection, we can safely turn left. However, there are many intersections where the gob is not maintained and many intersections where the area is insufficient.
The radius of the hakama necessary for safe left turn is 2.55 m. Regulations on the maintenance standards of intersections, etc. are not stipulated about hakama. The authors have suggested to the administration that it should be clearly stated in laws and regulations to set up a hazard with a radius of 2.55 m at intersections for roads to be developed in the future.

Keywords: fan-shaped area (called "hakama") , Road structure ordinance

The energy relationship between close binary star system Cygnus X-1 and its companion star.

*Manami Kanemura[1]

1. Fuji Sacred Heart School High School

Cygnus X-1 is a close binary star system, one is a black hole and the other is a companion star. Minoru Oda explained that Cygnus X-1 is sure to a black hole when black hole had been a theoretical result. That is to say, black hole astrophysics was a mysterious box opened by Cygnus X-1.
By the way, what is a close binary star system? It is a binary star system which interacts with each other. The reason why he found Cygnus X-1 is a black hole was that Cygnus X-1 is a close binary star system.Usually, we cannot observe black hole by visible light, but in this case, thanks to a massive giant companion star, we are able to observe light released from the black hole by gas friction.
I show that the energy relationship between Cygnus X-1 and its companion star.
In order to calculate all energy per unit mass, I use specific data taken from literature.
Then, I utilize routine kinetic energy, gravitational potential energy, and condition for the equilibrium of two forces: centrifugal force and gravity are equal.

Keywords: black hole, close binary star system , Cygnus X-1

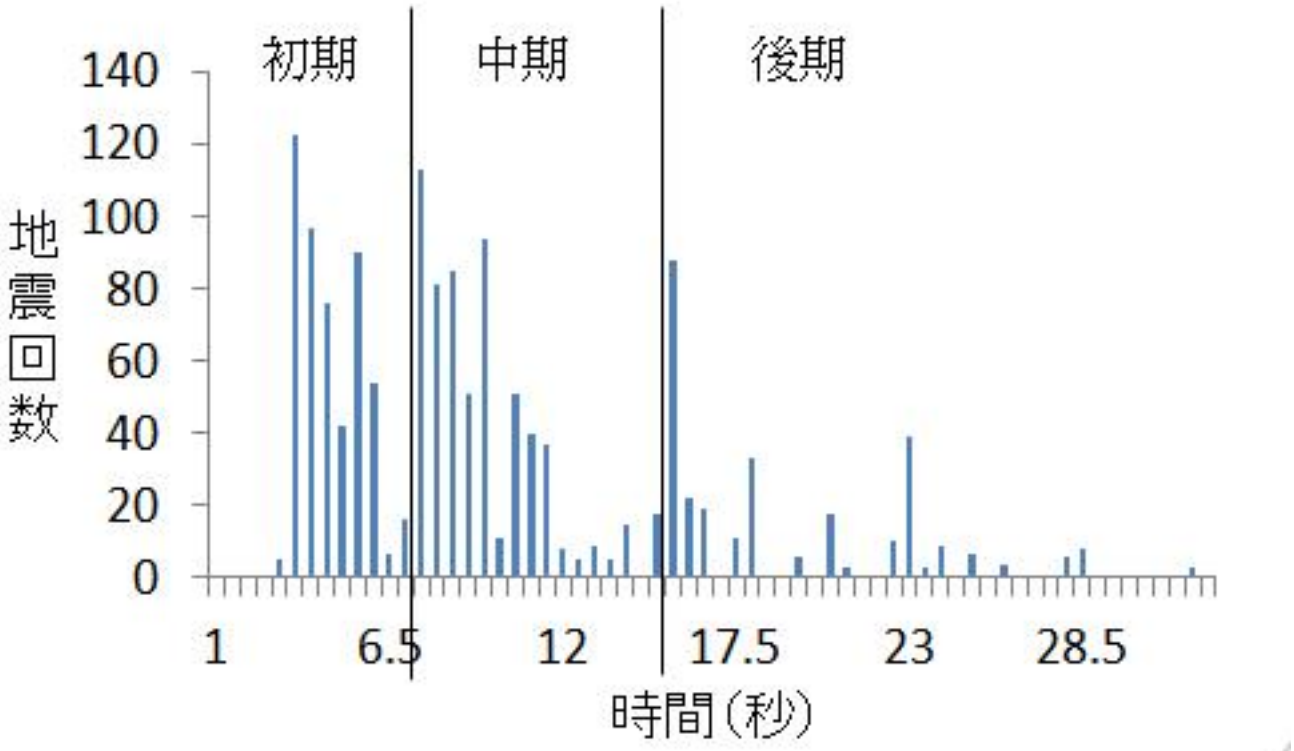
Seismicity of the soft rice cracker,'Happy Turn'

*Rio Makino[1]

1. Tokyo Metropolitan Ryogoku High School

On April 14,2016,an earthquake occurred on Kumamoto prefecture . This earthquake registered a magnitude of 6.5. I heard the news,and I took a interest in seismic activity. Therefore I tried to reproduce the seismic activity by cracking soft rice cracker, 'Happy Turn'. I report the experimental result.

Keywords: Earthquake , Snacks



Reproduction experiment of the relations of the eruption scale with magma temperature

*Kaito Ogura[1]

1. Ryogoku high school

The eruption is the phenomenon that magma spouts out.There are many factors of the eruption. However, when I simplify the factor,it is thought that it is the foaming of the fluid.Therefore I try reproduction experiment.I report problems and a solution and laboratory finding of the experiment.

Observations of sprites by the grating and identification of bright lines

*Risa Higuchi[1], Asaka Hattori[1]

1. Ichinomiya High School

We installed a diffraction grating in Watec100N,which in a sensitive monochrome video camera,and we observed spectra of sprites with it.
And we tried to identify bright lines by following the steps described below.
1. To subtract about ten average images which have been photographed before and after the emission of sprites' light.
2. To make brightness of the images uniform.
3. To calculate the wavelength of sprites' spectra of a mercury lamp and a neon lamp.
4. To consult literature for the wavelength of spectra of oxygen and nitrogen.
5. To try to identify bright lines comparing the results of the above-mentioned facts of No.3 and No.4.

Keywords: sprite, spectra

Why is volcanic ash different at Mt.Usu

*Eri Tanaka[1]

1. Sapporo Kaisei Secondary School

Mt.Usu is a 737m tall volcano in Hokkaido. Many people know Mt.Usu is a volcano, because Mt. Usu erupted in 2000. Researchers know the ash is different every eruption. Mt. Mitaka ash is red too. It was found that only the black ash contained iron. But I could not found iron oxide in the red ash.

Keywords: Mt.Usu, volcanic ash

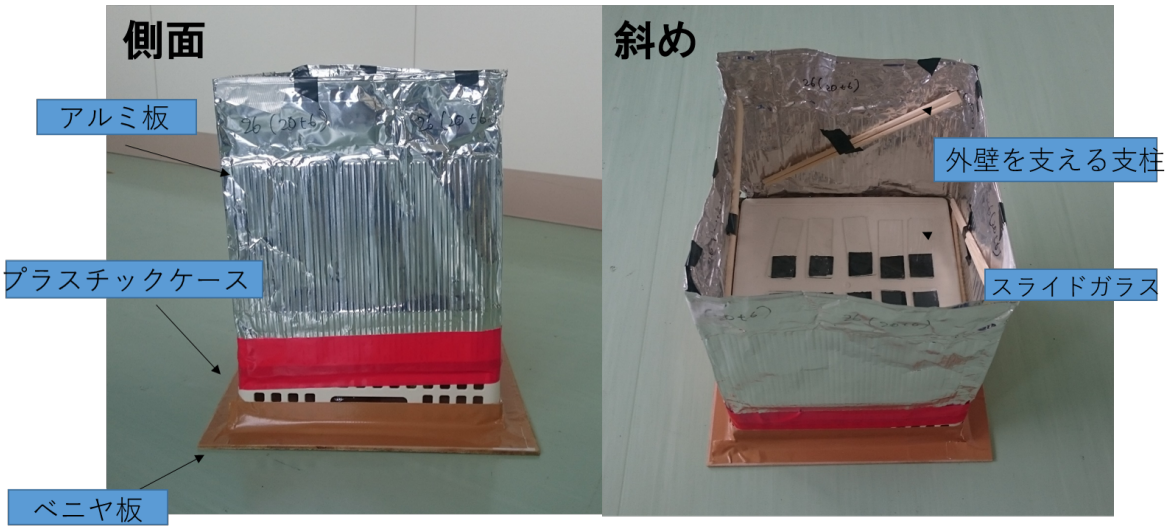
Development of Sampling Method of Cosmic Dust

*Kaho Tanabe[1], *Kinuka Matsuzaki[1]

1. Sapporo Kaisei Secondary School

It is important to figure out the how planets were formed in the early solar system. Meteorites is serve as clues, but there are few meteorites that fall to the earth. In contrast, there is a greater amount of cosmic dust that fall to the earth than meteorites. Therefore, it is high probable the formation of the planets can be figured when researching cosmic dust.
A common way of sampling cosmic dust it is coating on a slide glass with adhesive (like Vaseline) and letting it stand overnight outside. By doing so, on each slide glass the matter from the Earth’s surface is mingled. In addition, the amount of cosmic dust can be as little as 1 piece per 1 slide glass, so it takes time to observe cosmic dust when viewing the sample with a microscope because most of matter in fact not cosmic dust and is just matter from the Earth’s surface. Thus, a sampling method of cosmic dust that reduces mixing matter from Earth’s surface was developed.
Firstly, this equipment (fg.1) was manufactured to prevent blending cosmic dust and matter from Earth’s surface. A plastic container was turn over and attached to plywood with tape, and an aluminum board was pasted on the side of the plastic container. The aluminum board prevented other matter from adhering to the slide glass. In the experiment, the height of the aluminum board was raised progressively to verify whether it can be used to prevent matter from Earth’s surface from adhering to the slide glass. The first measurement was taken without aluminum boards (i.e. This the baseline control for the 0 cm aluminum boards) remaining measurements are expressed as percentages. It was found that there was a 74% reduction in the amount of matter from the Earth’s surface when 30 aluminum boards were used. Thus, it became easy to collect cosmic dust.

Keywords: cosmic dust, sampling method



Air Observation in Konan and Analysis of the Data

*Shunsuke Yamada[1], *Rikuto Suzuki[1], *Shunsuke Niwa[1]

1. Taki High School

In recent years, air pollution and deterioration of visibility due to PM 2.5 have become a serious issue. In cooperation with Dr. Kazuo Osada (Nagoya University), we have been conducting research on relation between air pollution and visibility since April 2014. As a part of it, in August in 2016, we set up equipment in our school and have continuously collected data of atmospheric pollutants, for instance PM 2.5, PM 10, and weather data since then.

With this data, we analyzed whether or not atmospheric pollutants are affected by the surrounding weather elements. Fourier analysis and multiple regression analysis were used for the analysis. As a result, we found that the influence of PM 2.5 decreases when the wind is strong.

Keywords: Weather, Environment, Air pollution

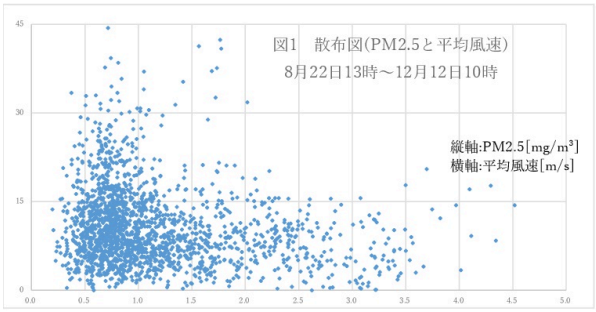
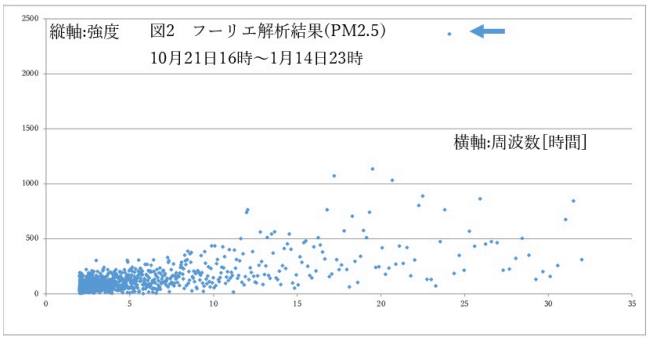
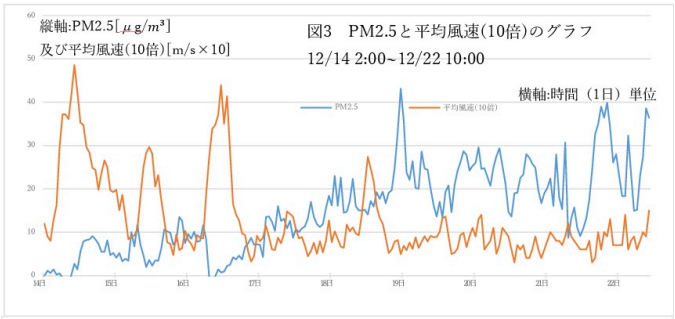


表 1　相関係数

	平均風速	最大風速	積算降雨量	気温	湿度
PM2.5	-0.204	-0.206	0.0943	-0.135	0.113





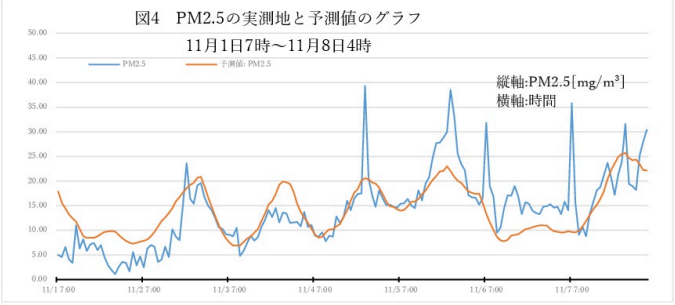


表 2　重要度

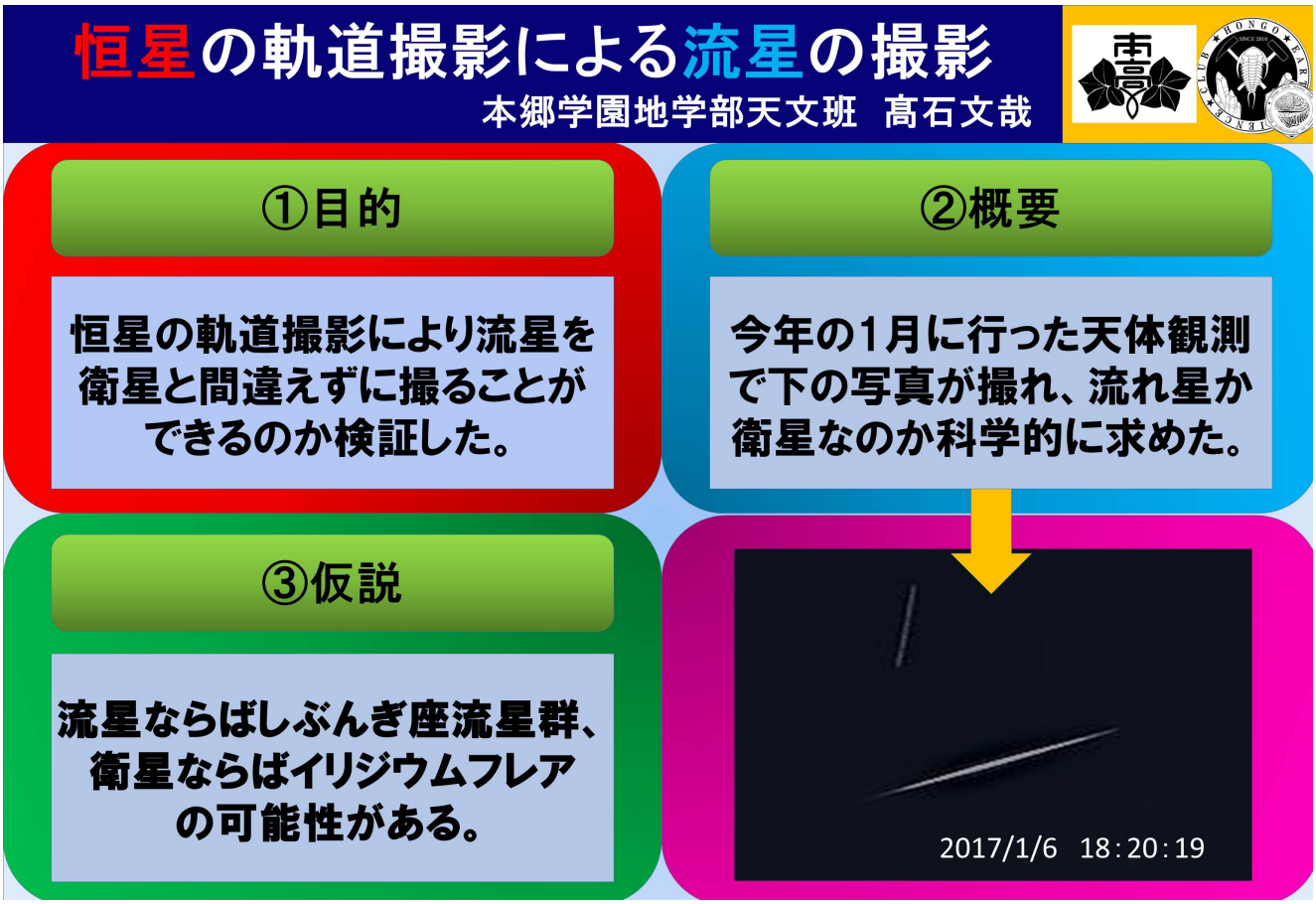
	11/1 7 時～11/8 4 時	12/14 2 時～12/22 12 時	12/27 10 時～1/8 11 時
平均風速	-0.234	-0.00779	-0.383
気圧	-0.0519	0.397	0.0101
気温	0.728	0.337	0.471
湿度	0.795	0.416	0.211
南北	0.158	0.00789	0.0997
東西	0.282	0.206	0.366

About photography in a meteor by orbit photography in a fixed star

*Fumiya Takaishi[1]

1. hongo high school

Hongo junior and senior high school earth science club made observations of the stars on January 6, 2017. Hongo junior and senior high school earth science club made observations of the stars on January 6, 2017. Because there was extreme large of the SHIBUNGI seat meteoric swarm on the 3rd of the same month, a possibility which is a meteor is high, an orbit of a problem was also similar to an orbit by emission of light in an iridic satellite (iridic flare). It'll be proved scientifically whether it depends on one chosen as a meteor or satellite. I'm thinking this proof is something to get in touch with a possibility of the photography in a meteor by orbit photography in a fixed star.

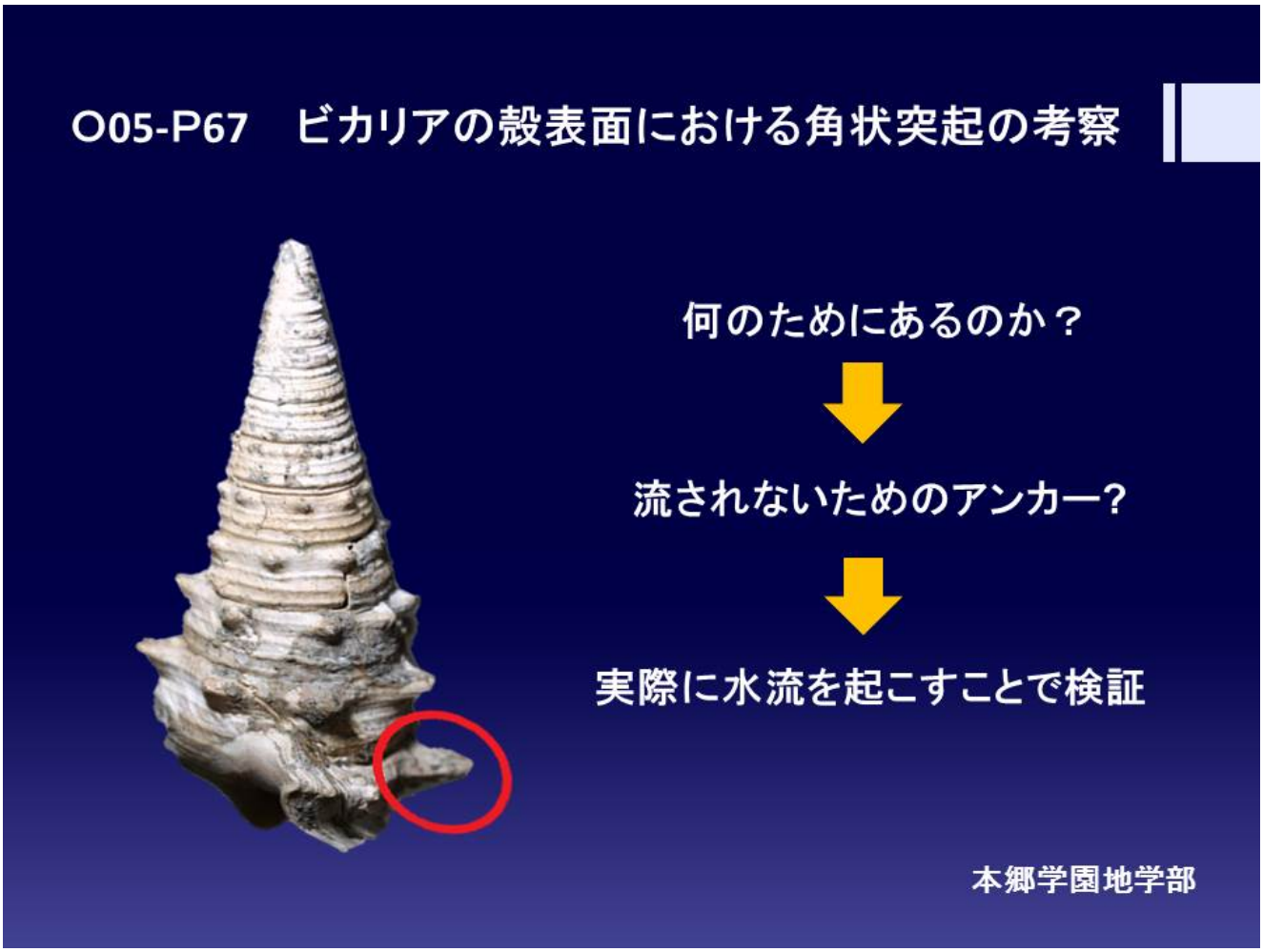


Experiments and considerations on protrusions on the surface of Vicarya shell

*Kazuma Ito[1]

1. Hongo high school

This time we observe experiments and considerations on prismatic protrusions seen on the surface of Vicarya shell. Vicarya is a type of conch that lived from the 3rd Century New World to the Miocene, and Man It is thought that it lived in brackish water area such as globe forest. Horny projections on the surface of the shell there are also types that can be seen, but details on their work has not been elucidated yet. Therefore, we placed replicas taken from Vicarya fossils in a water flow experimental apparatus and observe the flow of color water and the resistance of replica by flowing water flow with color water, based on the obtained results I examined and verified what the function of the prismatic protrusion is.



About earthquake resistant building

*Takuma Ue[1]

1. Hongo high school

"Buildings resistant to earthquakes" are the subjects of Japan, which is an earthquake great country. Therefore, we have considered the difference in construction method such as "earthquake resistance", "vibration control" and "base isolation". Both of these methods are excellent construction methods in terms of preventing the building itself from being damaged, but in the case of "base isolation", there is another advantage of "reducing the shaking in the building”. The seismic isolation device embedded in the foundation is "absorbing severe earthquake energy" and "to turn it into a gentle rolling and stop the damage such as falling of furniture to the minimum", shake the earthquake compared to earthquake resistance It seems to be suppressed to about one third. Therefore, by experiments, we reproduced models of "earthquake resistance", "vibration control" and "base isolation" and considered "reduction of shake due to base isolation".

City of Kitakyushu Hiraodai Karst Hirotani moor revival "Planimetry and Groundwater"

*Yoshiaki Matsushita[1], *Nao Komori[1], *Kevin Chen Williamson[1], Hiroe Hirota[1]

1. Higashitikushigakuen high school The Science Group

Hiraodai karst located in Kitakyushu City, Fukuoka Prefecture, has Hirotani moor.
Originally there is no water on the surface of the karst. However, the Hirotani moor is maintained by a special cause involving karst and granite zone, and registered to important wetland of Japan 2016. The Science Group has been planimetry form 1994.
Then we noticed the Hirotani moor’ s area has decreased 60% through 1994-2010. So we are doing regeneration activity using groundwater. As a result, Hirotani moor’ s area has increased 22% through 2010-2016. Now We are doing Conservation activities around groundwater. This spring, we have done planimetry of Hirotani moor Fifth time to quantification.

Keywords: karst, water quality survey, groundwater recharge, moor, planimetry, Hiraodai

北九州平尾台カルスト

広谷湿原の復活(面積測量と地下水)

付属図、写真

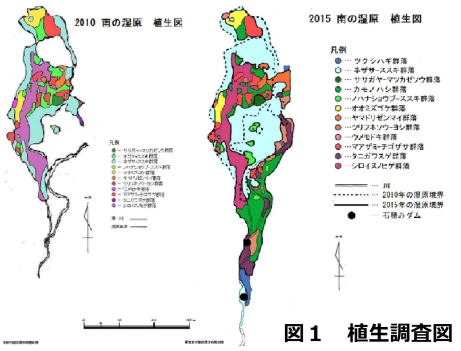
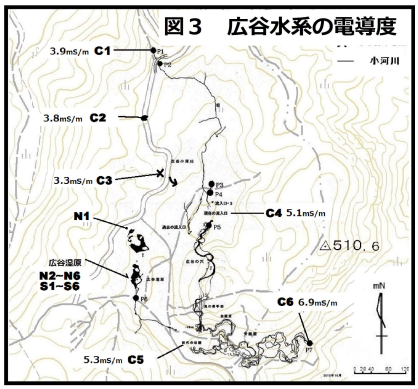
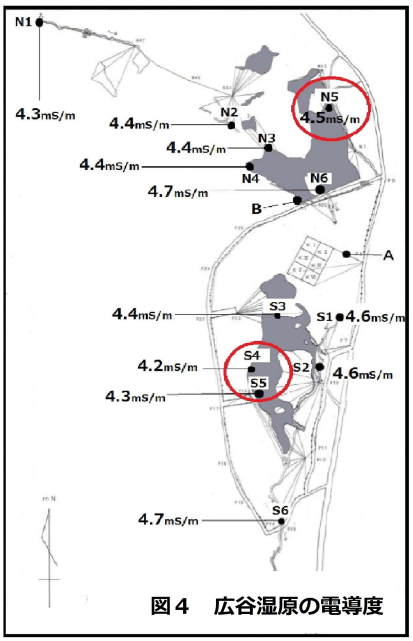
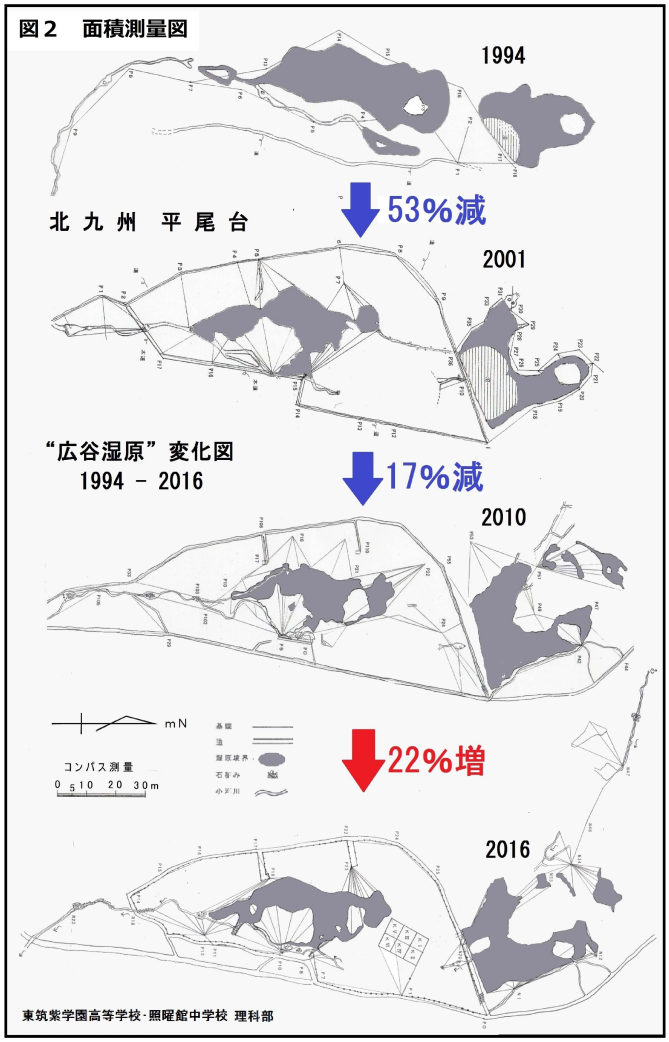


図１　植生調査図







Method for measuring of gravitational acceleration using electromagnetic induction in space

*Fuya Makino[1]

1. Sapporo Nihon University Senior High School

When a magnet drops through a metal pipe, eddy currents are induced in the pipe. The magnet receives a vertical upward-force from the magnetic field that eddy currents produce and the magnet falls at a slow and constant speed. The falling velocity can be determined from a theoretical formula including the mass of the magnet, the magnetic dipole moment of the magnet, gravitational acceleration on the earth, the metal resistivity, the pipe’s internal radius, and the pipe’s thickness. We built a theoretical formula representing the velocity, considering pipe’s thickness. The magnetic dipole moment of the magnet can be determined from the magnetic force-distance relationship between the two magnets. From measurements conducted by varying the mass, the metal resistivity, and the pipe’s thickness, we confirmed the validity of our formula. When we measure the falling velocity at a specific location, we will know the magnitude of gravitational acceleration at the location from our formula. In this way, we can determine the gravitational acceleration in space or on other planets if we have a magnet and a metal pipe.

Keywords: Gravitational acceleration, Electromagnetic induction, Neodymium magnet

Under what conditions are landslides likely to occur

*Tamana Yamauchi[1], *Sera Nakagawa[1], *Ayumu Taguchi[1], Joji Furuya[1], Takuto Matsuda[1], Kota Yamashita[1]

1. Yamanashi Prefectural Hikawa High School

Last year when we did a field work for another study in the Sagashio Area of Enzan,Koshu City,landslides occurred there.There were also big landslide disasters in Hiroshima and Kumamoto,and we got interested in landslides. Futhermore,Yamanashi Prefecture is surrounded by mountains,so landslide-related disasters may occur. For these reason,we studied the occurrence of landslides caused by different conditions. According to our research,landslides are likely to occur regardless of the angle of the slope is under the following conditions.

・When water easily penetrates into the sand
・When the angle of the slope is sharp
・When there is much precipitation throughout the year

Futher, when the angle of the slope is 35˚ 40˚,the niguer the ground density is, the more likely laudslide will occur. When the angle of the slope 30˚,the lower the grounde density is, the more likeliy laudslide will occur.

The examination about effect of global warming on sea-ice volume diminition

Moe Nakahara[1], *Shihoko Hurusako[1], *Rinako Furukawa[1], Daigo Kumagaya[1]

1. Yokosuka High school

We researched “Is the volume of sea ice made to decrease by global warming?” This is because we want to know how to save the ecology of the sea. For that reason, we collected information from books, websites, and magazines. Through our research, we think ice-albedo feedback is one of the most important things so we experimented about that.

From the above information, our conclusion is that the volume of sea ice is decreased from global warming.

Keywords: sea-ice volume diminition, Global warming

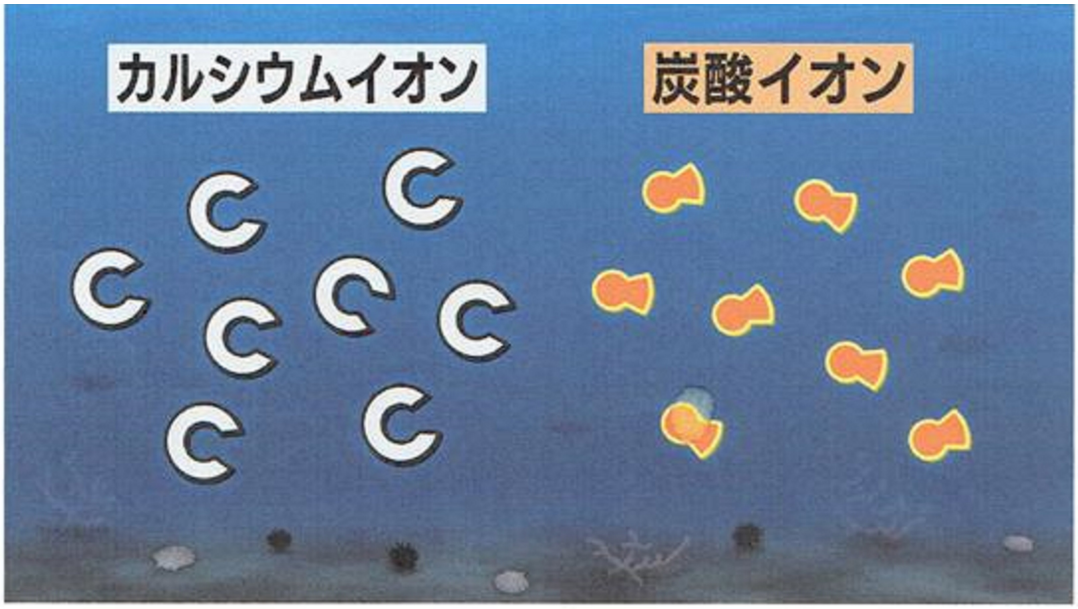
The possibility of whether "ocean aciditification" can be stopped until 22nd century

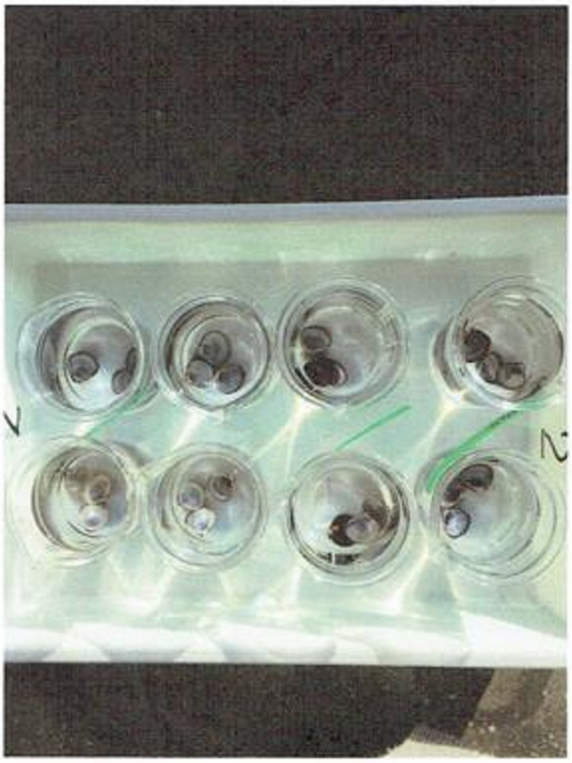
Moemi Suzuki[1], *Sosuke Sasayama[1], *Yuka Satou[1], *Ken Sakurai[1]

1. Yokosuka High school

Ocean acidification is a serious promlem; It may relate to our lives. We researched about the effect of ocean acidification by focusing on what that is difined and what is happened by that.
Carbon dioxide causes ocean acidification. We did two experimentations. Although we couldn’ t find enough results, we understood how to stop ocean acidification.
Above all, we concluded that ocean acidification can be stopped by some actions. To stop ocean acidification, we must take two actions. First, it is necessary to reduce the amount of carbon dioxide which is the cause of ocean acidification. Second, we have to find other ways of producing energy; fossil fuel can’ t be used anymore.

Keywords: Ocean acidification, pH of sea water, Amount of carbon dioxide emission





Light emitting of deep sea creature

*Sana Hashimoto[1], Yuta Makino[1], Jutaro Miura[1], Yuka Ishikawa[1], Ryuya Tanoue[1], Yumi Mineshima[1]

1. Yokosuka High school

A deep sea generally indicates area of sea of more than 200 meters of water depth. And there is a world of darkness which doesn’t receive sunlight. Deep sea creature made mechanism as emission of light in the sun. in this presentation luminous role of sea creatures and its mechanism are explained.

First one is called “counter illumination”. This is used to hide themselves from their enemies. It is taken by the creatures living in the deep sea called “twilight zone”, which is not too deep.

Second one is for communication. The creatures don’t reflect light like a creature in a shallow sea, produces and communicates. It’s also used for mutual recognition and courtship.

Thirdly, the emission is used for predation. It can be the lure which attracts other species to be eaten by them. When the emission is used for propagation, the males seek the female’s emission.

To occur the bioluminescence, a luminescence phenomenon caused by a chemical reaction between a luminescent substrate (luciferin) and a luminescent enzyme (luciferase) are necessary. And many deep-sea creatures have those.

To see the emission really happen we gathered Cypridina hilgendorfies. There are two in the center of the “cold sake sea water falling drop method” and the “weak electric current way shocking way” as a way to make a cormorant Miho barrel luminous intentionally.

First, let me explain about the “cold sake sea water falling drop method”. They put ice in a laboratory dish including a cormorant Miho barrel. The cormorant Miho barrel suddenly changes in temperature, which was astonishing. It is done by hanging sea water by a syringe, emitting light. It’s possible to repeat the experiment many times this way.

Next, I’d like to explain the “weak electric current way shocking way”. This method makes the core of the two pencils a pole, putting it in a container, and allows 20 volts of electricity run momentarily and makes them shocked, including the cormorant Miho barrel in the container. Then in a moment, movement stopped and it emitted light. But a cormorant Miho barrel is failed by the electric current amount and the number of times, so this way the experiment may be made moderate. I knew that emission of light was the existence you should have for the creatures who live in the ocean. These are the results of the these experiments and investigations at the end. Light in the sun was different from the ground, which is reaches down the shallow sea. I thought many devices by the environment were clogged. A deep sea occupied approximately 80 percent of the marine area and it’s often misunderstood. So I thought I’d like to also investigate other points of view.

By these experiments above, it is noticed that the emitting is necessary for the deep sea creatures. On the other hand, there are still many aspects which we haven’t research; we need to check the deep sea creatures with our own eyes.

Keywords: deep sea creatures, bioluminescence, luminescent substrate, luminescent enzyme

Usability of the enzyme found in deep sea

*Ryuhei Asanuma[1], *Tomohiro Seki[1], *Kousei Nakamura[1], Sayaka Ishii[1], *Rana Kamota[1], *Rina Satomi[1]

1. Yokosuka High school

The sea is deeper than 200m, where the light does not shine. The deep sea creature living there uses various methods to survive. Our subject is “How functional is the sea creature useful for our daily lives?”

In our research, we pay attention to an enzyme called *agarase*, which is a microbe. This breaks down a sugar called agarose, which is the main ingredient for the agar and has two kinds. When the agarose breaks down, it becomes *agarooligo saccharides*.

Each of the agarooligo saccharides have different effects. It can be applied to medical care as well as health foods. It even uses the enzyme to break down agarose, which we can do. But I think that you should use the enzyme while you push the study forward.

Keywords: An enzyme, Disassembly, Agarouse, Medical, Healthy food

Fine Laminetede Structure of Stromatolite Suggests Seasonal Climate Change in Cretaceous Period

*Mineto Ogawa[1]

1. Saitama Prefectural Kasukabe Senior High School

I sutdied the causes of the fine laminated structure of the Cretaceous Stromatolite which was collected in the Andes in Bolivia. The structure consists of alternately laminated light colored laminae and dark colored laminae. The light colored laminae are mede up of crystallized,grown CaCO3 grains. The dark colored laminae are composed of rounded fine grained Carbonate clastics. In short,crystallization and deposition of CaCO3 form the two different laminae.
I predict that the photosynthesis of Cyanobacteria can be related to the deifferent forming of the laminae. In winter,when the photosynthesis becomes anactive, the concentration of CO2 in seawater becomes high. During this period, fine grained Carbonate clastics deposit on the surface of the Stromatolite. In contrast, the concentration of CO2 in seawater becomes low because the photosynthesis becomes active in summer. During this period, CaCO3 crystalize on the surface of the Stromatolite. In conclision, the light colored laminae are formed in summer, and the dark laminae are formed in wonter.
I suggest the fine laminated structure of Stromatoite is caused by the seasonal climate change in the Cretaceous period.

Keywords: Stromatolite, laminae, photosynthesis

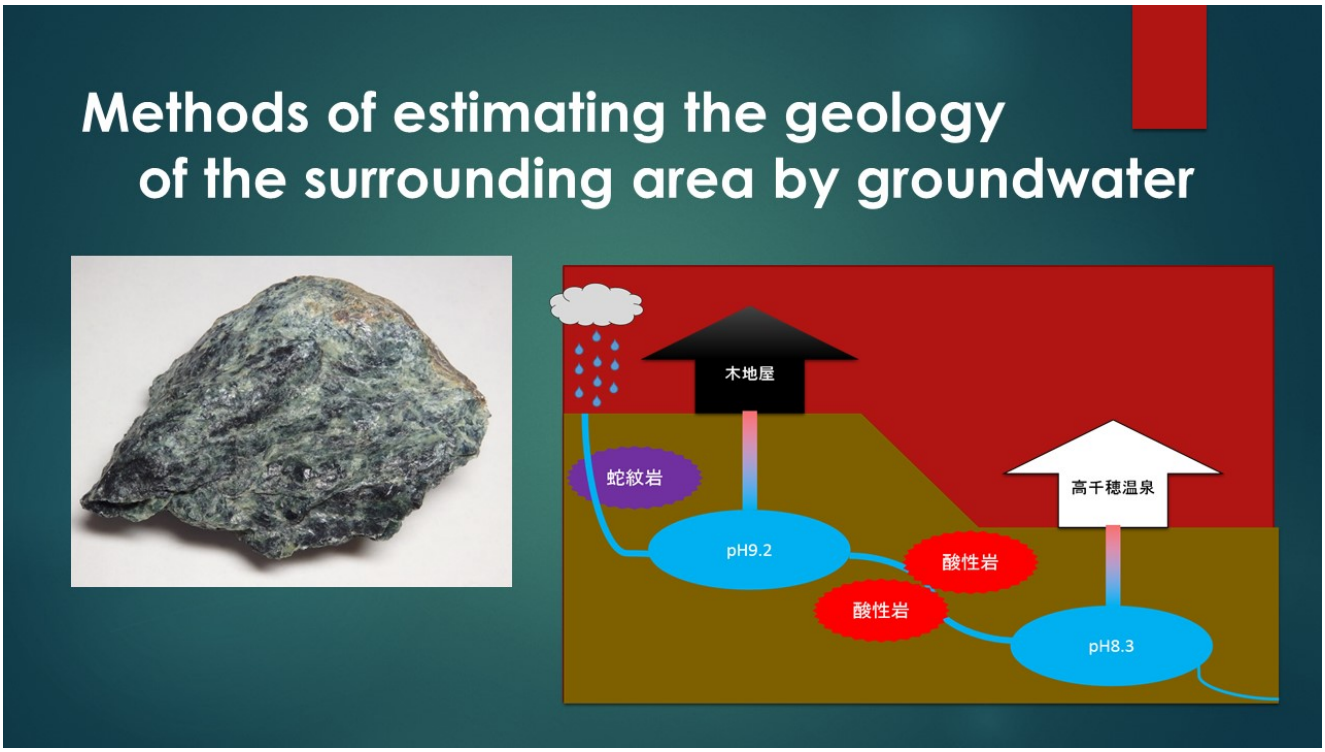
Methods of estimating the geology of the surrounding area by groundwater

Kotaro Kubo[1], *Takumi Yada[1], *Riki Nishiyama[1]

1. Miyazaki Prefectural Gokase Secondary School

There is an alkaline hot spring in Gokase town, Miyazaki prefecture, where we live. The reason why the water is alkaline is presumed to be the effect of the igneous rock called serpentinite. Furthermore, when we measured the ph of the hot spring, it was 9.2. Also, we measured the ph of the hot springs in Takachiho Town, a next town with a low altitude, and the value was 8.3. From these facts, when groundwater in Gokase Town and Takachiho Town were connected, the value of ph dropped because the alkaline groundwater passed through the stratum of acidic rock on the way to Takachiho town. In addition, we research the hot spring in Beppu whether it has the same trend. By doing this, we made a hypothesis. We presume that the mineral affects the surrounding area by investigating the liquidity of groundwater.

Keywords: Serpentinite, Hot spring, Groundwater



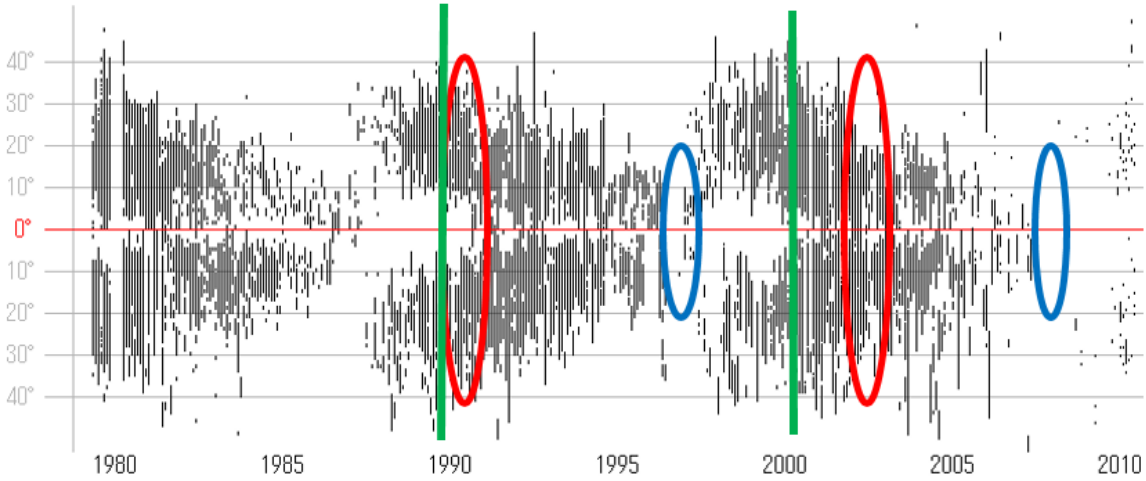
Relationship between Aurora and sunspot

*Takuto Hirabayashi[1], *Mayu Yamashita[1], *Haruka Iuchi[1], *Sunao Ito[1], *Minoru Kimura[1]

1. Naganoken Suwa Seiryo Senior High School

We went to Alaska last March in order to observe Aurora. We have been observing the sunspot in Japan since 1950. We have an interest in the relationship between Aurora and sunspot, so we started studying it. We research it by observing the sunspot and *Data Analysis Center for Geomagnetism and Space Magnetism*' s data.

Keywords: sunspot, Aurora



Capturing the turquoise fringe reflected on the ISS

Hiroaki Kuroiwa[1], *Daichi Takada[1], *Naruhisa Yamazaki[1], *Maena Urano[1], *Madoka Nozaki[1], *Chika Iiduka[1]

1. Iiyama Senior High School

In this research, we try to capture turquoise fringe reflected on the ISS. Propounded by NASA in 2008, Turquoise fringe is a blue belt seen between the shaded and the sun-lit part on the surface of the moon at lunar eclipse when the image is intensified with blue color. It is thought that when sunlight passes through the ozone layer, red light is absorbed and this causes turquoise fringe. We assume that turquoise fringe should be reflected on artificial satellites if it should be on the moon.
We took pictures of ISS passing by the boundary between the shaded and the sun-lit part, and analyzed the RGB value of the satellite orbit. We detected high B value near the boundary. We reached the conclusion that this part is comparable to turquoise fringe.

Keywords: the turquoise fringe, ISS, lunar eclipse

Verification of *Screen Effect by the Earth* by Counting Craters of the Moon

*Shota Suzuki[1], *Emi Komori[1], *Keito Wakamatsu[1], *Takuto Yoshii[1], Kohei Nagata, Kiyoshi Yamamoto, Sakura Kiyama

1. Kansai SOKA Senior High School

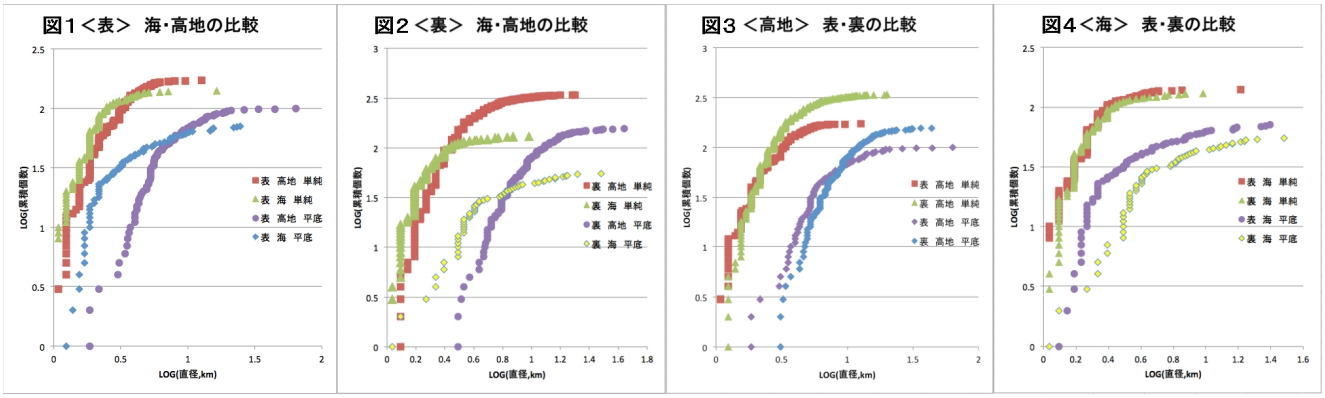
Abstract

The Moon is constantly facing the same side towards Earth. The closest surface towards Earth has more craters than the far side. Based on these facts, we created the hypothesis that “the closest surface towards Earth has fewer craters because the Earth interrupts meteorites to collide with the side”. We called this hypothesis *Screen Effect by the Earth*.

When meteorites collide with the Moon and craters are formed, crashed stones and rocks are piled as regolith layers. Based on data from Lunar Reconnaissance Orbiter (LRO), we compared the diameter between simple craters and flat-bottomed craters within highlands, oceans, near, and far sides from the Moon. As a result, we found that (1) areas covered with thin regolith layer have fewer large simple craters and more narrow flat-bottomed craters, whereas (2) areas covered with thick regolith layer have more large simple craters and fewer narrow flat-bottomed craters.

These findings not only prove the initial *Screen Effect by the Earth* hypothesis but further suggest a new hypothesis that in Lunar crater chronology, there is a need to use different crater production functions to calculate the near and far sides from the Moon, and comparison of craters’ shapes and diameter can help indicate underground structure of area.

Keywords: Moon, Crater, Chronology



Is the Entrance to the Mythical Ryugu-jo Castle Really in Itoigawa!? Benten-iwa, the Geosite in the Sea, is Full of Sights!

*Sota Tsuchiya[1], *Ibuki Sasaki[1], Yoshitaka Kaneko[1], Takahiko Ogawara[2], Ko Takenouchi[2], Toshihiro Uchiyama[3]

1. Niigata Kaiyo High School, 2. Fossa Magna Museum, 3. Itoigawa Geopark Promotion Office

In the Marine Development Marine Innovation Course, we are planning a snorkeling event at the Benten-iwa Geosite in accordance with the Ministry of Education's program of "strategic promotion of core specialist human resource development in the growing fields."
Benten-iwa Rock, a large rock reef, is one of the Geosites of the Itoigawa UNESCO Global Geopark. The rock is geologically volcanic, having formed one million years ago in an underwater volcanic eruption in the Fossa Magna's sandstone-mudstone strata which forms Itoigawa's Nou Region where the rock is found today. It is an important habitat for marine life and helped foster the local fishing community and historical shipping industry. Its name, Benten, refers to the Goddess of the Sea who is enshrined at Itsukushima Shrine on the rock along with a dragon-god of shipping. A local legend also suggests that the rock is the entrance to the mythical underwater "Ryugu-jo Castle." In these ways, Benten-iwa Rock proves to be not only geologically interesting, but also a valuable contributor to the marine life necessary for supporting a fishing industry and has even shaped the culture of the local people.
As a Geosite, Benten-iwa Rock contains many points of interest for both tourism and education, useful for regional promotion. Some of these are underwater, so they can only be seen by diving. Snorkeling is an excellent way to allow both researchers and tourists to enjoy these sites using simple equipment. Therefore, we think it is important to consider a course for guiding a snorkeling event.
In this research, we surveyed the underwater sights of the Benten-iwa Rock area through scuba diving with the goal of selecting the best underwater sights and planning a course for use in a snorkeling event. Through the diving survey, we could see the so-called "Entrance to Ryugu-jo Castle," as well as fish, seaweed, and other sights.
Appreciating this underwater Geosite through snorkeling is limited to the summer when the water is warm. However, seaweed changes along with the seasons, so year round inspection is valuable for deeper study. For that reason, we considered an underwater walkway as a means of seeing these sights year round without having to enter the water.

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