Science Lecture at PCSHS NST
What is science?
And some model experiments

Lecture by Yoshio Okamoto

PCSHS Nakhon Si Thammarat on 19th Dec. 2022

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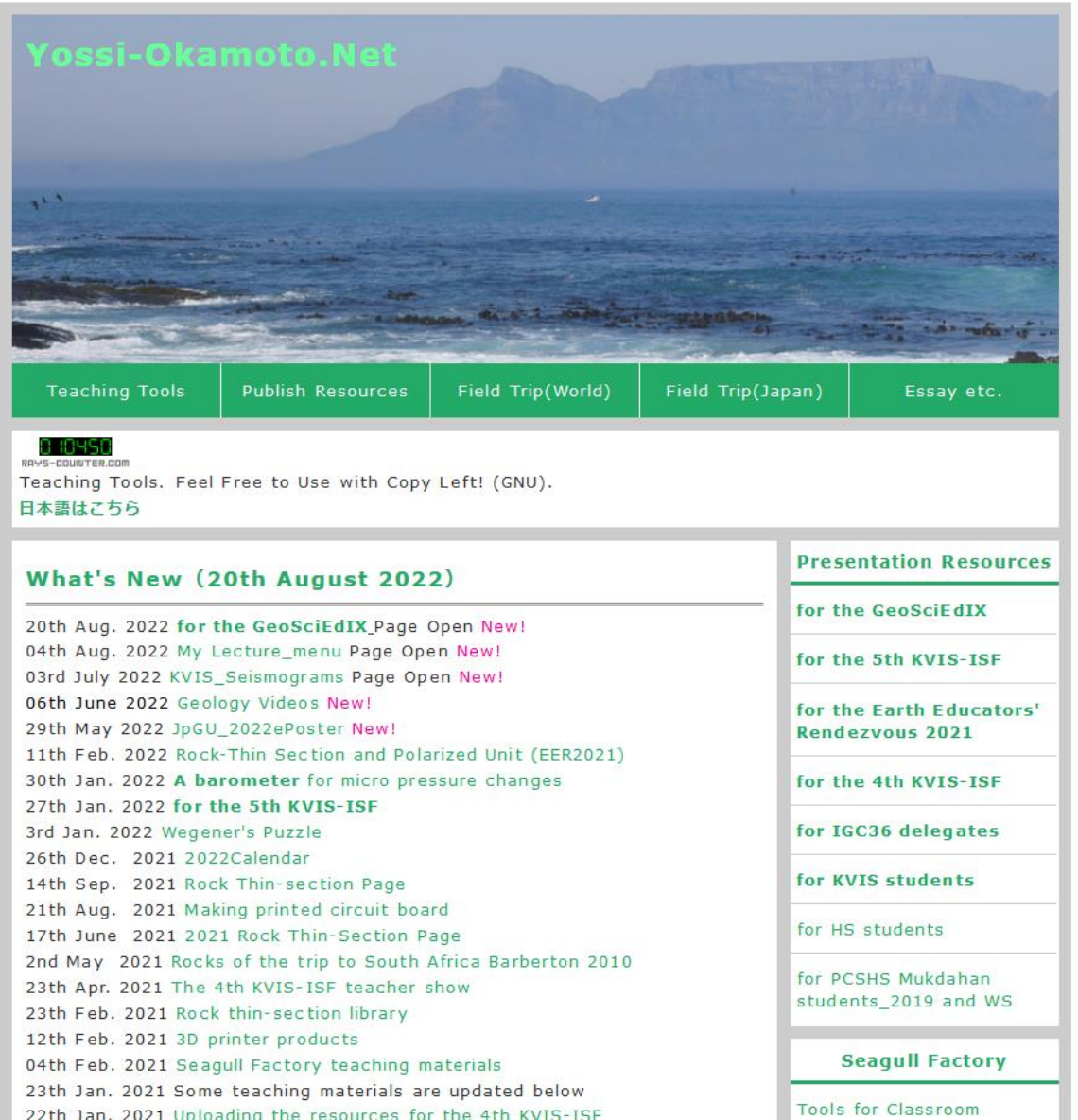
Who a

- Earth science high school tea
- Study at a teacher training c
- Associate professor and part
  Osaka-Kyoiku University 2
- Earth Science visiting teache
  at PCSHS Mukdahan in 20
- School seismograph system (
  this year: PCSHS Loei)
- **3D seismicity map**, tsunami
- Polarized microscope unit &
- Linux Programing (awk, C, Pr
- 3D printing (2019-)



Tennoji High school attached to Osaka-Kyoiku University

A novel prize winner of our graduate

- Shinya Yamanaka **山中伸弥**
- The 2012 Nobel Prize for Physiology or Medicine
- for the discovery of iPS cells.

A week plan (a tentative plan)

- Seismograph and seismogram
- How to identify rocks (Some school rocks)
- What is a polarized microscope?
- How to observe thin-sections
- Volcanic ash observation and FOB pumices
- What does volcanic ash reveal?
- Questions and discussions

Overview of today's class (13h - 15h)

- Self-Introduction
- What is science?
- My iPhone XV?
- Some model experiments by our HS students
- Questions and Answers

My policy! for science education

- I will show you **two videos** of the volcanic eruptions.

- What is the **fundamental difference** between the two videos?


1991 Unzen Pyroclastic Flow

A Day in Pompei AD79

Comparison of two videos

- Real (Fact) VS. CG (Artificial)
- Low-resolution High-resolution

- Fact

Science is based on!!

- Artificial (Fake)

What I most emphasize in science education

- The original data

  -> How to get them
- The mechanism of sensors or recording systems that you use.
- Because, in science festival, the students treat a lot of data in their presentation, however, **only a few students comprehend how their data are collected and where come from.**
- This is because the most of **ICT devices are “Black-Box”,** so students can not understand the mechanism inside.

Caution!

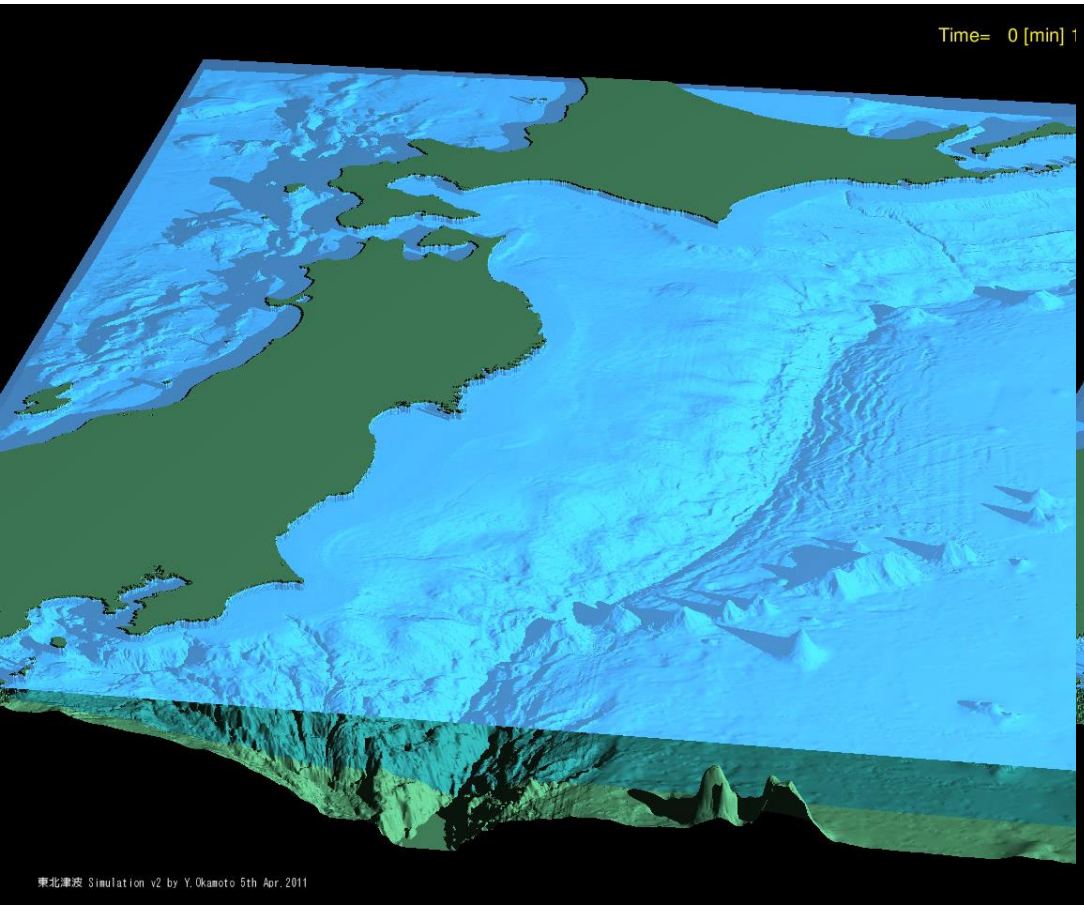
- I do not talk “ICT” devices are not suitable for education.
- Because I already use a lot of ICT devices in my teaching tools;

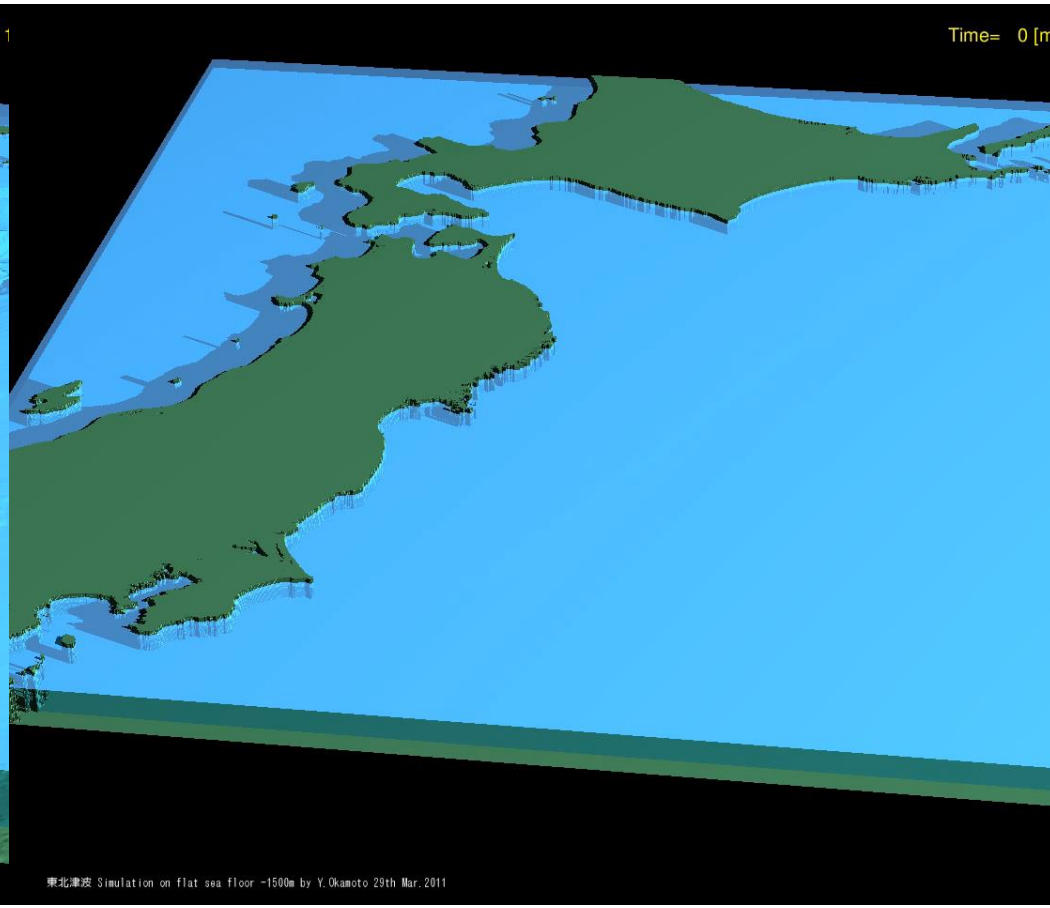
Arduino, Raspberry Pi, M5Stack, or ICT sensors.

- Also I made a lot of simulations about nature;

I will show you some;

Tsunami simulations by me





What I recommend to my students

- Make your tool to measure something in nature.
- **Simple and primitive** device is better.
- From this experience, the students know how the data are contaminated with “noises” or distorted.
- **Making measuring devices by hand gives the students important skills and wide viewpoints for science.**
- High-tec tools and super-low-tech tools are both important!
- So, I always said to my students; make a simple device and get data, after that, you can use PC or high-tech tools.

I recommend “model experiments”

From http://seagull.stars.ne.jp/2006_Germany/model-based777.pdf

- **Nature: Complicated**
- **Some fundamental features to extract from natural phenomenon**
- **Simplified the fundamental features -> “Model”**
- **Build your own model using daily materials**
- **Measure two parameters using high-tech tools**
- **Make a graph of two parameters**

Examples_1 *Using sugar sweets!*

Fig1. Sugar calmera as a mimic of basalt lava

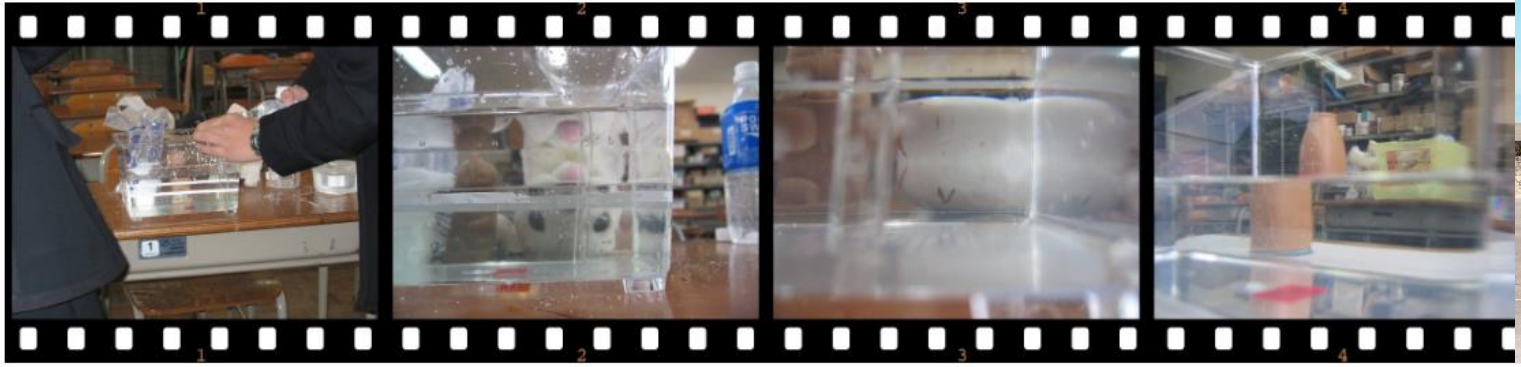
Fig2. Sugar candy models cool joints of lava flow

Examples_2 *Karst related*

Fig3. Stalactite using Sodium thio-sulphate($Na_2S_2O_3$) aqua.

Fig4. Doline like surface using powder and spray.

Examples_3 *Mirage in water and geyser*



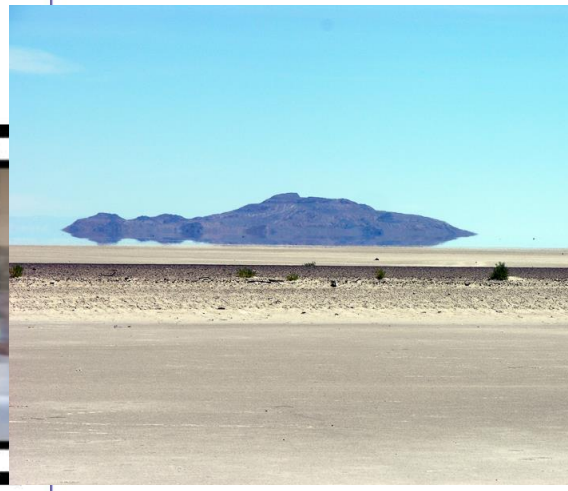


Fig5. Mirage in a fish tank using sugared water.

https://educalingo.com/ja/dic-fr/mirage

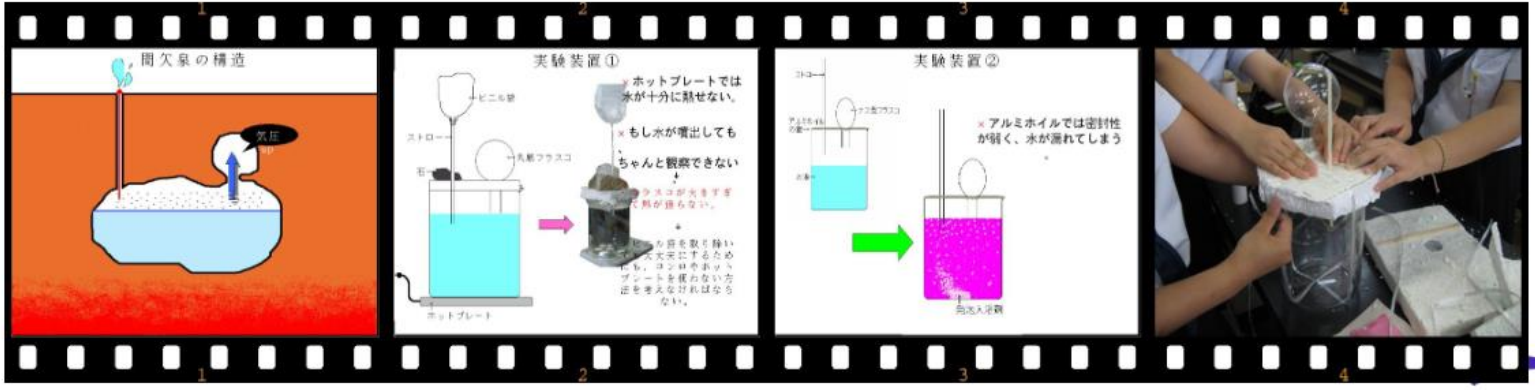


Fig6. A geyser model using a beaker and a flask.

https://yellowstone.net/geysers/

Example_4 *Plate tectonics*

Fig7. Plates collision (Himalayan orogen model with flour).

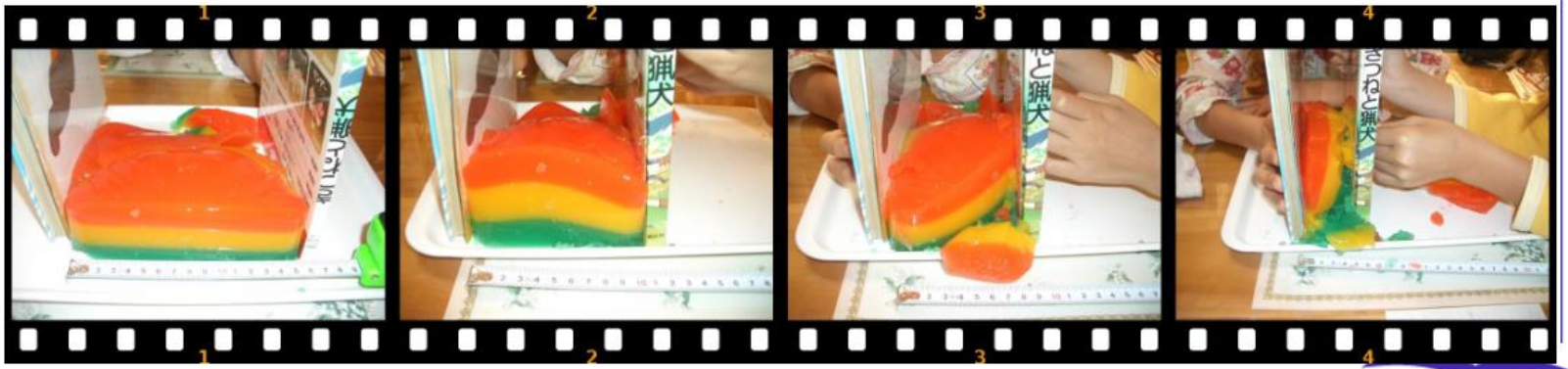


Fig8. A gelatin reverse fault failed.

Example_5 *Volcanic eruption*

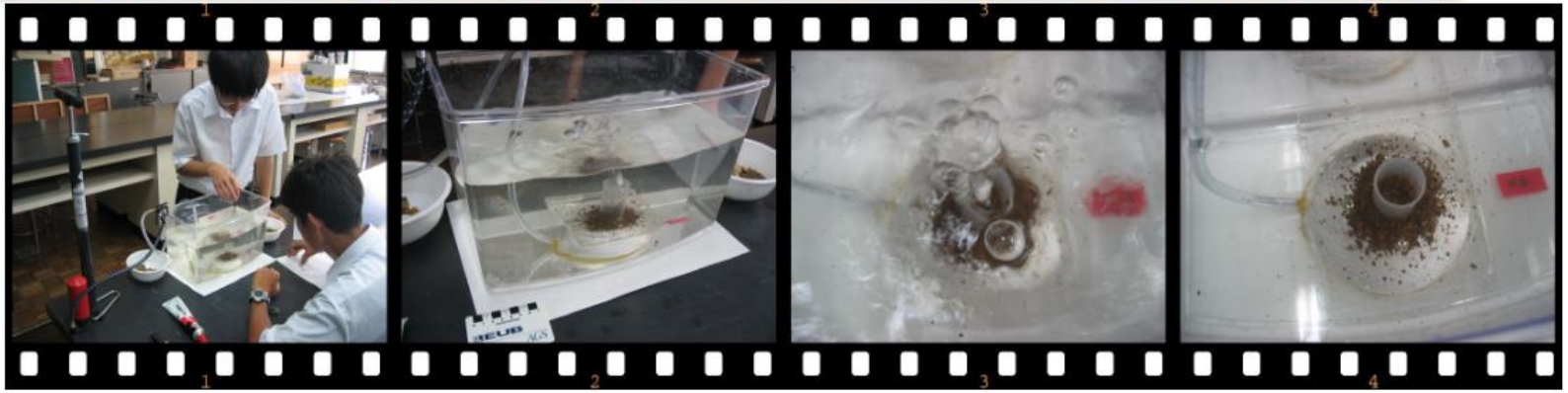


Fig9. Water bottom volcano showing inverse distribution of pumice.

Fig10. A Video capture of a bath sparkler and hot water volcano.

Model experiment and data analysis

例その5：火山噴火関連

Ocean floor volcano

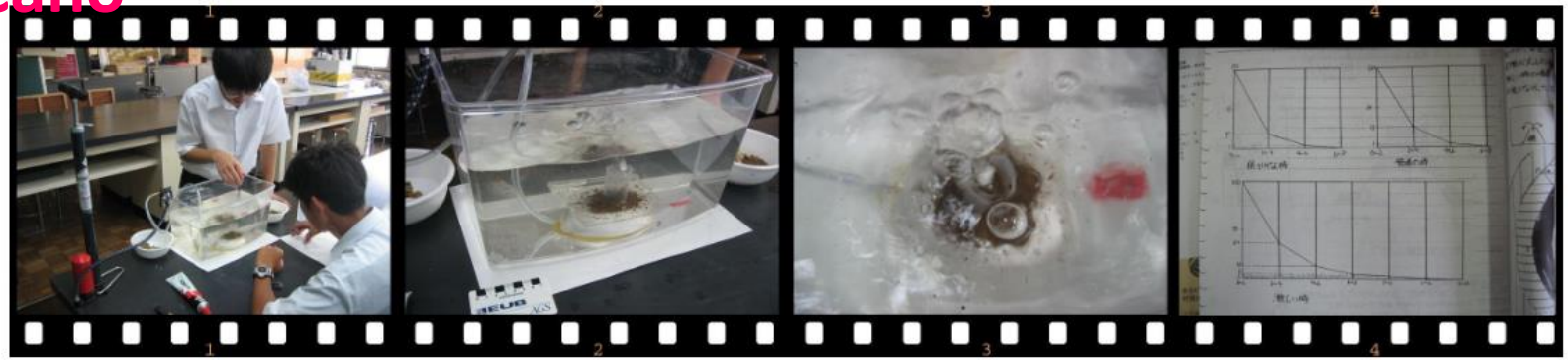


図9. 水槽の底の火山噴火. 噴出物の密集度を距離の関数で表現.

Bath bomb and eruption heights

図10. バブとお湯による噴火実験. 噴水の高さが温度に比例.

Example_6 *Pyroclastic flow in a water tan*

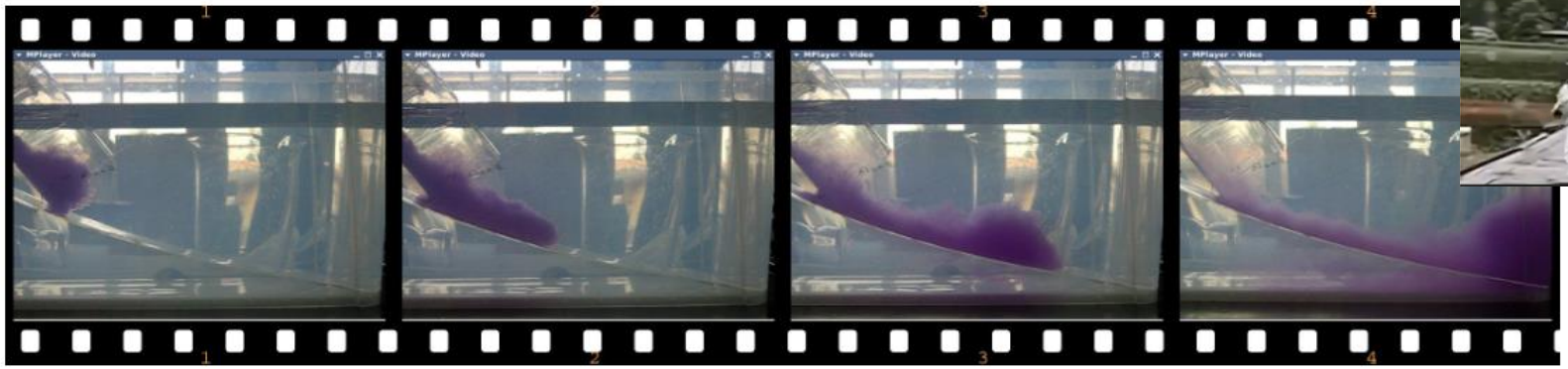


Fig11. A coloured sugar water flow mimics a Pyroclastic flow.

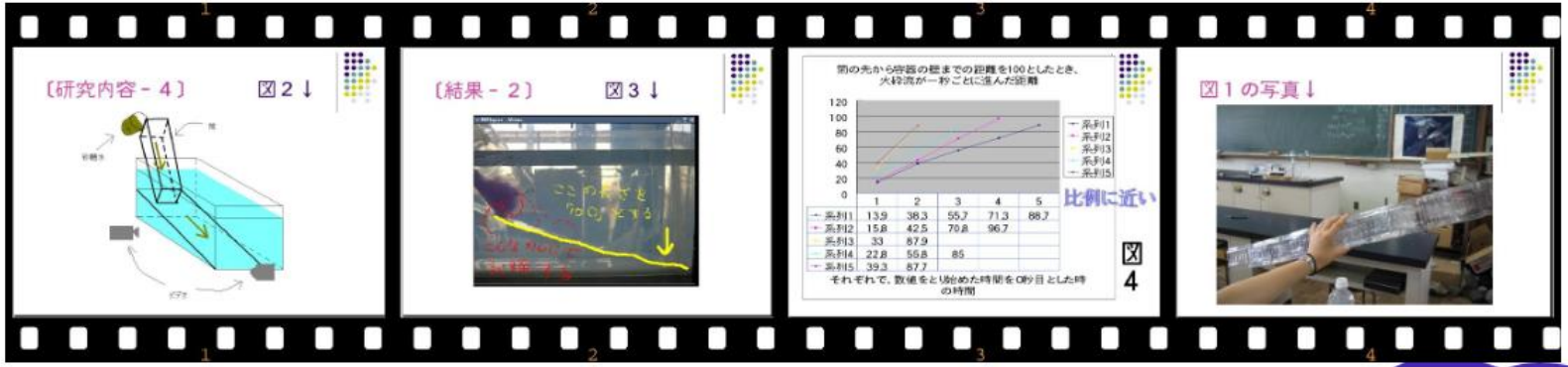


Fig12. An analysis about "Sugar water pyroclastic flow".

Example_7 *Liquidization and sand_dune*

Fig13. Mixture of plastic balls with vibrate-motor mimic ground liquidizing.

Fig14. A sand dune model using polyethylenes balls.

detail/pickup012.html

Example_9 *'Air mirage' is examined---*

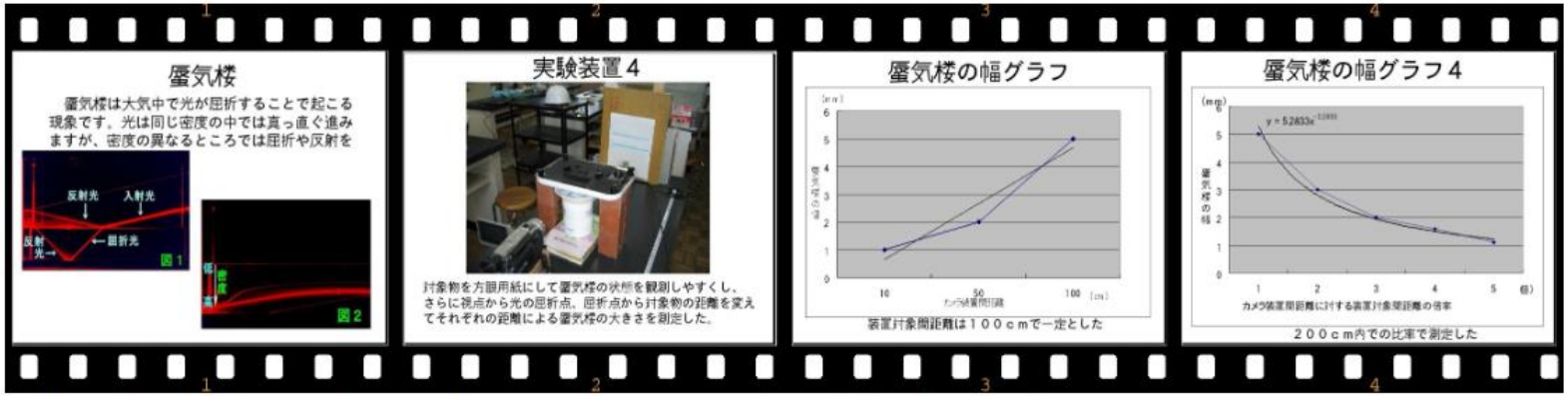


Fig17. 'Air mirage' in a hot and cold chamber .

Fig18. An example showing inverse layer and failed examples.

n/ja/dic-fr/mirage

Example_10 *K/T asteroid impact!!!*

Fig19. Baby powder in a 'Fish tank' and a Japanese food 'Fu' .

Fig20. Volt-meter shows a depletion of sun ray with an impact.

David A. Hardy
www.astroart.org

Example_8 *The 'Japan Island' is sinking---*

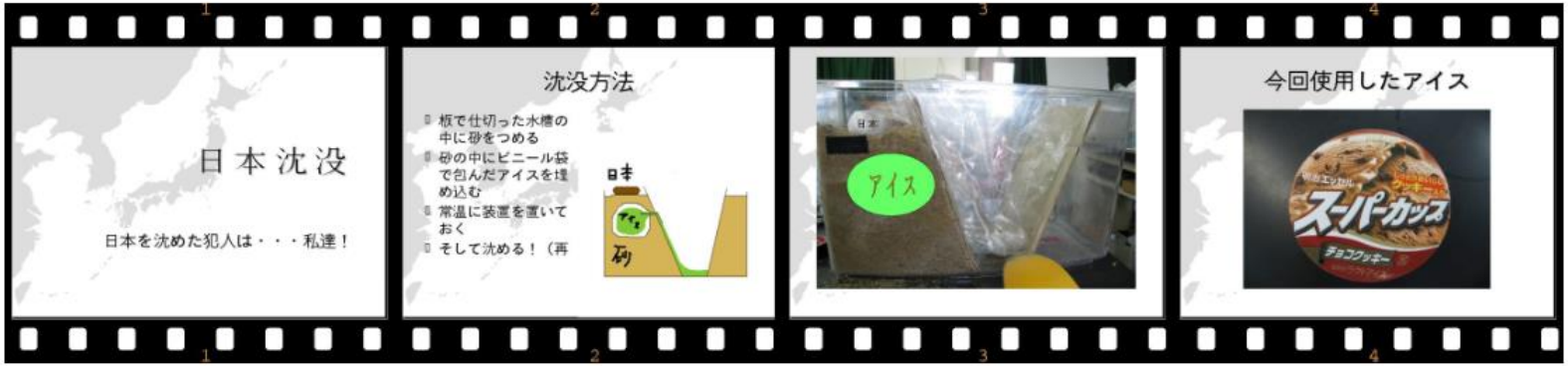


Fig15. 'Japan island' sinks into the pacific plate! After ice cream melting.

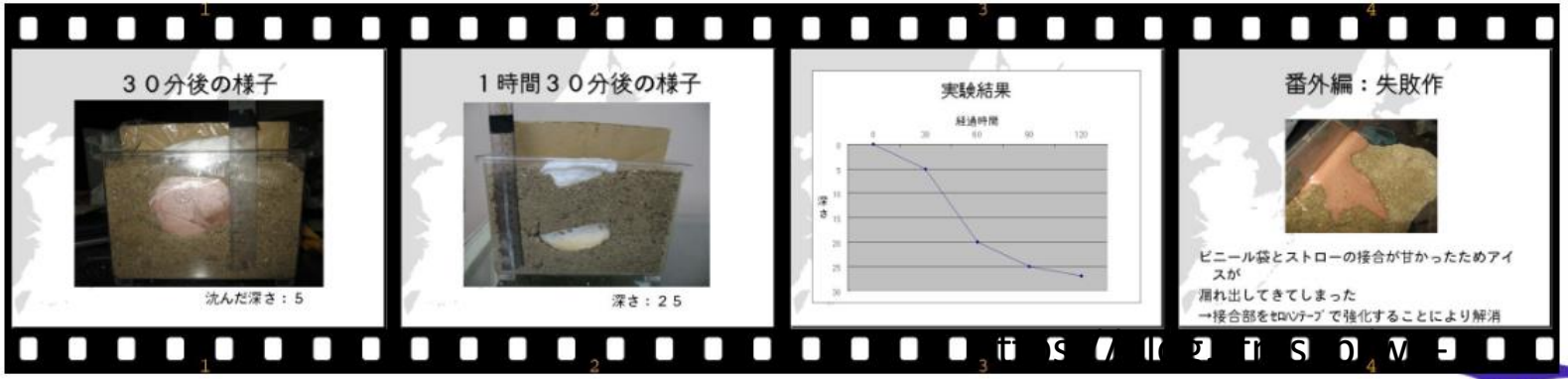


Fig16. Clips, an analysis and a failed example!

content/uploads/2010/07/2012_wp2_1024.jpg

Some clips of experiments:

Fig21. Shake the bottle but not stand. And shake---, succeed!

Fig22. Making chocolate fan??? Too sweet!!!!!

Let's cook!

Fig23. This is not a kitchen but a earth science laboratory.

We call them Kitchen Earth-science!

Fig24. Various food materials and items for experiments.

I recommend “model experiments” or “Kitchen Earth-science!”

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