Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

G04-01 Room:423 Time:April 29 09:30-09:45

Learning Tsunami Physics by Numerical Simulation: A Curriculum of Physical Oceanography Education in High School

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In this study, we have developed the curriculum for high school students to learn the physics of tsunami waves. A special feature of this curriculum is that students try to perform numerical simulations to understand the basic behavior and dynamics of tsunami waves. This curriculum is composed of two successive classes of physics for second grade high school students (each class is 45 minutes in length). In the first class, we explain the physical characteristics of tsunami waves, the physical laws governing tsunami waves, and the basics of numerical simulation approach. In the second class, every student plays the numerical simulations of tsunami waves by using PC.

Keywords: Tsunami Wave, Numerical Simulation, Physical Oceanography Education, Marine Education

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G04-02 Room:423 Time:April 29 09:45-10:00

Geoscience curricurum on High School research program

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Background: A new system for researchprogram on high school had started at 2013. And some school has started the research program as SSH, SPP and so on. Many universities and research instituts suports research by high school students. In many case scientist suport sturents on specific skill not basic skill. As increeasing the number of SSH, theme for research had diversed lile as the interraction of science and society.

Basic skill Lesson: Authors had suported for the resson of basic skill to cross the filds, referenc skill, cretical thinking and so on.

Activities: Lessons from the Great East Japan Earthquake are summarized in White Paper on Science and Technology 2012. The public trust in scientist declined from the gap between expectation and real. Promotion of integrated research of different fields such as seismology, geology, archaeology and history to enough understand earthquake and tsunami is a pressing need. Risks and uncertainty involved in science and technology have not been seriously considered with regard to the provision of information by the government and experts for the public. Therefore most of the people did not have an adequate understanding of the situation. Social Engineering, Social Sciences, and Humanities have to be considered in implementing countermeasures.Anticipating massive earthquakes and tsunamis by taking every possibility into account.

Propose: The uncertainty of geocience has been the reason to avoid geosience in school curricurum.

Keywords: geoscience, statistics, refference

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G04-03 Room:423 Time:April 29 10:00-10:15

Multi-site observation program of sprites in collaboration with high schools and universities: from 10-year activities

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As one of the educational projects in geoscience, TLE (Transient Luminous Events: sprites, elves, etc.) triangulation has been carried out since 2004 with collaborating many high schools in Japan and Kochi University of Technology (KUT). Since 2006, some high schools has been funded by Japan Science and Technology Agency (JST). In this decade, collaboration has been improved educationally and scientifically, resulting almost full-coverage of Northern sky over Japan by high-sensitivity CCD video cameras (Wat-100N) and motion-detective software (UFOCapture V2) operated by high school students. The activity generated the largest TLE observation network in the world by participating 30 or more high schools. After ended the funding from the JST as the SSH consortium or Core SSH, high school teachers and students continued their relationship to study the science of TLEs with having internal meetings twice per year until now.

The first sprite detection was made in Dec. 2004. More than 3000 TLE events were detected by high school students, creating many scientifically interesting results, i.e., the world first triangulation of elves in 2008, a few examples of gigantic jets with VLF signals. Existence of an elf with apparent stripe wave pattern was clearly confirmed by simultaneous observation of the elf, suggesting modulation by gravity waves. Such results were and will be presented by high school students with their impression at the domestic scientific meetings like JpGU high school student session as well as some international conferences (see Shirahata et al., 2014; a scientific paper submitted by Iwata Minami high school team).

Thus, the campaign was very successful to obtain new results of TLE as well as the special educational project for high school students. Their research activities were widely introduced to people in Japan by NHK special TV program ”The cosmic shore” in 2012. In this talk, 10 years collaboration between high schools and universitiy activities will be presented.

Reference: Shirahata et al., Striped structure observed in the elves: Relation to turbulences in the upper atmosphere, AS28 session, AOGS 2014, Sapporo, 2014.

Keywords: high school student, collaboration with high school and university, Astro-HS, Super Science High school (SSH), multi-site observation, sprite

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Deployment of a teaching material for observing electric field by sprite parent storm at high school

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Sprites are observed by many high school students by means of high sensitivity CCD cameras. They have revealed the optical characteristics of sprites (e.g. morphology and 3-dimintional location). However, they do not have materials to observe electrical phenomena originating from sprites. So, we developed a low cost field mill data acquisition system observing surface electric field change produced by sprite parent storms. Then, we deployed some field mills at high school in Tokyo. We will present some sample of the data observed and problems on the observations revealed.

Keywords: sprite, electric field observation, teaching material

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Let's Observe the Sun with Hinode! - Coordinated Observation Campaign with High School Students -

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Hinode is the solar observation satellite that launched in 2006. Since its launch, Hinode has given us great new observation results. In addition, it is encouraged to use of the observation data for education. So, as one of education and public outreach(EPO) activities of Hinode, we have proposed to perform coordinated observations with high school students, public observatories and science museums, every year since 2010. The proposal is adopted as "EPO campaign observation mainly for high school students(HOP173)". The goals are that they have interests in Hinode data and compare their own data with Hinode data. They compare Hinode data with their data and obtain new solar knowledge, which make their motivation higher on their activities. The students have a presentation on the observation results at a science contests. Foreign researchers have high interests in the coordinated observations, which contribute to extension of Hinode mission.

In this presentation, we repot the results of the coordinated observations, and the effects.

Keywords: Hinode, sun, astronomical education, outreach, coordinated obsevation, high school

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G04-06 Room:423 Time:April 29 11:00-11:15

Making ”high schools list of the whole country which can study Earth Science”

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In Japan Society of Earth Science Education, it is tackling making ”high schools of the whole country which can study Earth Science” list beginning in the 2013 fiscal year, and has posted on the society homepage.

From the result of this list, the present condition of today’s high school earth science education is considered.

Keywords: high schools, Earth Science

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G04-07 Room:423 Time:April 29 11:15-11:30

Finding Instructional Difficulties on Basic Earth Science for High School Students

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In February 2011, the author carried out a questionnaire research to science teachers about the awareness of any difficulties on new subject Basic Earth Science lesson for senior high school students under the new Course of Study in Japan. One of aim of the research was to get some responses from science teachers in Akita and Kagawa prefectures. In this year, the author conducts the second research to teachers so that to discuss any perception gap of difficulties between the 2011 and 2014 researches.

Keywords: science teacher, senior high school, Basic Earth Science, questionnaire research

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G04-08 Room:423 Time:April 29 11:30-11:51

Is the Earth Science Education of High School at the Stable Standing ?

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As a result of the revision of the government guidelines for teaching, the number of students who learn the *Basic Earth Science* increased sharply from *Earth Science I* of the previous guidelines. However, it cannot necessarily mean that the educational world had a new appreciation of the importance of earth science education in high school. This problem is considered from a viewpoint of the number of textbooks demand and the number of teachers' adoption. Also, it to be discussed how the contents of this subject have changed in comparison to the previous ones.

Keywords: high school earth science education, textbook demand, teacher adoption, Basic Earth Science

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Development of laboratory seismic exploration experiment for education and demonstration

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[1]IFREE, JAMSTEC

We developed laboratory seismic exploration experiment apparatus for education and demonstration. As an elastic medium, we use agarose-gel. Because agarose-gel is transparent and its s-wave velocity is 3 orders of magnitude smaller than the seismic waves that propagate earth's crust, we can easily observe wave-propagation by the photo-elastic technique. We report the detail of the experimental apparatus and practice of seismic exploration using the apparatus for high school students.

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A simplified focal model constructed with prastic spheres and slinky springs

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In the high-school earth-science text books, it is written that the P-wave first motions of an earthquake show a four quadrant distribution, which is related to the focal mechanism. However the detail of mechanism about this phenomenon is never shown. Among the seismology text book, although there are many introduction about this quadrant polarity using mathematical formula, which is too difficult to understand for non-professionals. Therefor, we developed a simplified focal model with cheap cost and easy construction.

By this model we can demonstrate the relation between the focal mechanism and the P-wave first arrivals for educational and outreach purposes. The model consists of 1) Two transparent plastic half spheres purchased at home centers eg. Tokyu Hands. 2) Two acrylic plates 3) Four Slinky Springs(plastic springs can be used as alternatives) attached to spheres with tapes. Two alternate plates mimic a buried fault and a sudden dislocation of this fault causes an earthquake. If the fault moves, the four slinky springs attached to two plastic spheres might show compressional or dilatational first P-wave motions consistent with the fault geometry. We can observe the detail of this phenomenon with high speed video movies. In our tests of this model, we can barely recognize the polarity of the first motions. We also try to improve our model to carry out more comprehensive demonstration.

Keywords: focal sphere, P-wave first motion, earthquake mechanism, fault, slinky spring