2012 Annual Meeting of the Next-Supported Program of the Strategic Research Foundation at Private Universities: Natural Resource Environment and Human.

Date: Saturday, March 16th 2013
Venue: Meiji University "Academy Common" Building 8, Floor, A7/A8 room.

1) General reports

1-1) Kazutaka Shimada: Summary Report Of The Humans And Resource Environment Group :Archaeological and palaeoenvironmental research at the Hiroppara site group in 2012, Nagano Prefecture, Japan

The team excavating the region around the Hiroppara wetland has named the sites of the area collectively as the "Hiroppara site group". At present at least seven sites have been found, named respectively Hiroppara I to VII. In 2012, the "Humans and Resource Environmental Group" conducted the second excavation season around the Hiroppara wetland together with three other teams from April 28th to May 13th. The excavations by the Center for Obsidian and Lithic Studies (COLS) indicate that the Hiroppara site group was formed by recurrent human land-use in prehistory spanning the Early Upper Palaeolithic to the Earliest Jomon.

The site location and the prehistoric land-use at the Hiroppara site group show different features than those of other site groups in the central highlands. Firstly, obsidian sources directly accessible from the Hiroppara are absent. Obsidian procurement at the Hiroppara was probably dependent on multiple sources. Secondly, prehistoric people benefited from diverse geographical features and resources for their subsistence within a relatively small area around the wetland.

Three Upper Palaeolithic industries and the Earliest Jomon potteries have been unearthed from the excavation area 1 (EA-1) at the site I and excavation area 2 (EA-2) at the site II. Soil samples were also collected from both EA-1 and EA-2 for palaeoenvironmental analyses.

On-going research at the Hiroppara site group will provide significant information to help us understand complex human behavior with regard to prehistoric obsidian exploitation at the central highlands.

1-2) Shigeo Sugihara: Summary Report of the Foundations of Resource Environment Group Environmental Survey Around The Obsidian Source

The survey work carried out by our project in the 2012 field season can be summarized as follows:

1) We generated the landscape classification map, and also carried out a geological investigation with the aim to understand the topographic environment of the archaeological sites around the Hiroppara wetland as well as their formation history. The sites are located in the upstream watershed of the Wada River in Nagawa town, Nagano Prefecture.
2) A field survey was conducted in order to clarify the emission source and radiometric age of pyroclastic flow deposits, which were widely distributed both in the Horokayubetsu caldera, where the Shirataki obsidian source is located, and its surrounding area.

Obsidian sourcing studies were carried out in various prehistoric sites of Japan. Especially obsidian found at the Sannai-maruyama site in Aomori Prefecture and other Jomon sites both in Fukushima and Iwate Prefectures were identified as obsidian from Kirigamine, which leads us to believe that in the future obsidian from Kirigamine could also be found in more sites from these regions. Moreover, our research suggests that there are many more undiscovered obsidian sources in the Tohoku region.

1-3) Fujio Kumon : Summary Report Of The Palaeoenvironment Group : Scientific Drilling Of The Boggy Sediment In 2012 At The Hiroppara Lowland, Nagawa, Nagano Prefecture, Japan

Scientific drilling was performed at the center of the Hiroppara lowland to clarify the palaeoenvironmental history around the Palaeolithic archaeological sites of Hiroppara in November 2012. The sediment core is 3.77m in length, and its upper half is composed of peat associated with a thin layer of volcanic ash (Fig.1). The lower half of the core consists of sand, clayey sand and clayey gravel. The gravels are mostly angular to subangular in shape. ^{14}C date at 1.55m depth is about 14 cal ka and that at 2.80m depth is 28 cal ka. Therefore, the lower part of the drilled core can be correlated to the horizon below the TR-02 trench sample taken in 2011. The analyses of pollen, diatom and phytolith are ongoing for both the TR-2 and Site 1 core sediments, and their integrated information will result in the palaeoenvironmental reconstruction around the Hiroppara lowland.

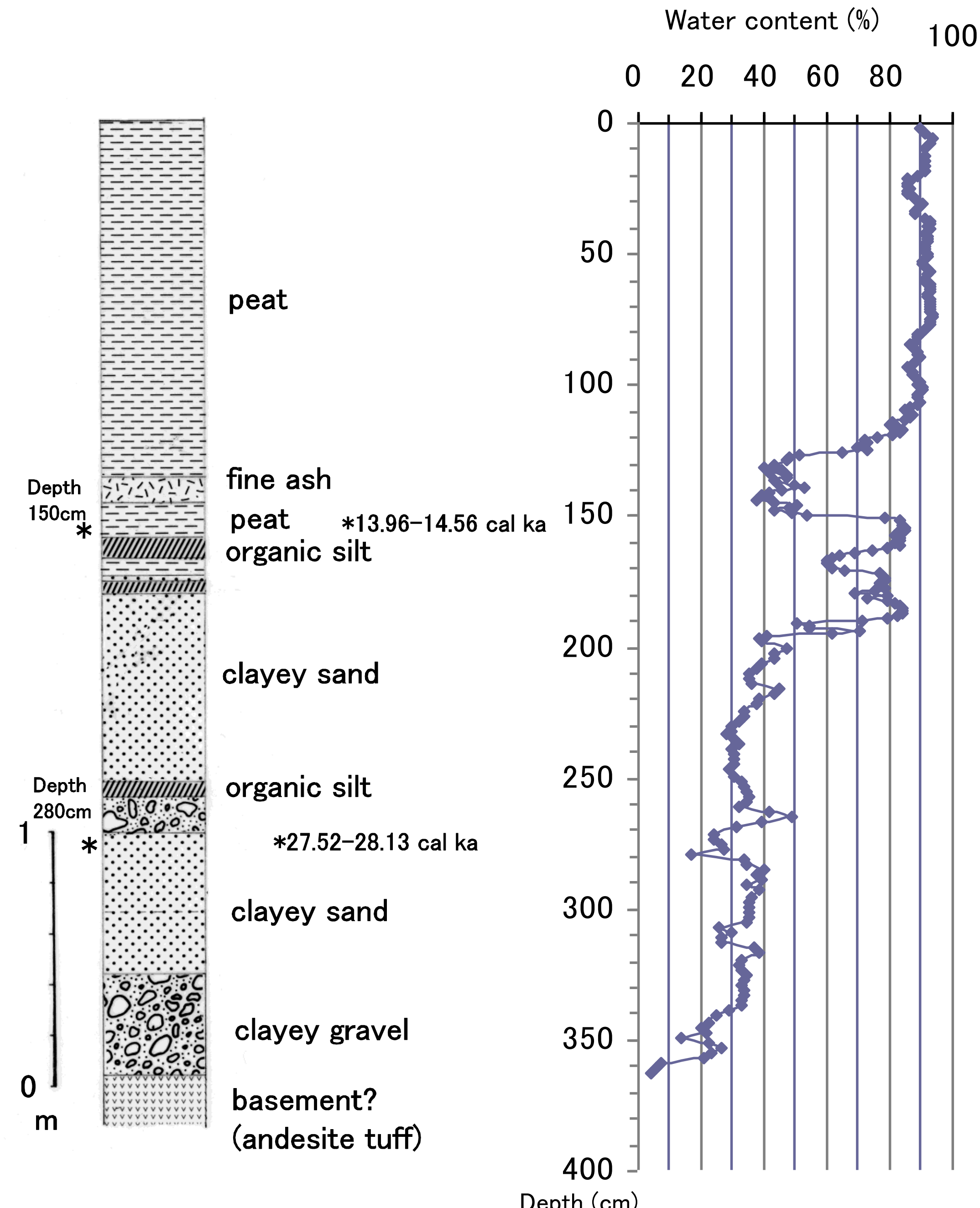

Fig.1 Composite columnar section and stratigraphic change of water contents of the drilled core sediments from Hiroppara lowland, Nagano, Japan

* ^{14}C dates and their horizon

1-4) Yuichiro Kudo: Summary Report Of The Dating Group Radiocarbon Dating Of Core Samples From The Hiroppara

Sample from the lower part of T2 trench excavated at Hiroppara marsh at 2011 was dated 8815±30 ^{14}C BP (T2 ^{14}C-2). It shows that peaty sediments of the lower part of T2 trench accumulated during the early Holocene. The upper part of peat layer (49-50cm depth) was dated to 590±15 ^{14}C BP, which corresponds to the late Kamakura and Muromachi Periods.

In 2012 sediment cores that reached the lowest layer (496cm depth) were drilled at the Hiroppara marsh. Samples for radiocarbon dating were collected from three levels:

155cm depth: wood

391cm depth: wood

461cm depth: herbaceous root

The dating results will be reported at the end of March 2013.

2) Individual reports

2-1) Susumu Aida : An Analysis Of Potteries Excavated From Archaeological Sites Around The Hiroppara Wetland

This report discusses briefly the Jomon pottery excavated from trenches EA-1, TP-2, EA-2, and TP3 at Hiroppara I and II of the Hiroppara site group. The pottery sherds found are 76 in total, with 25 found in EA-1 and and 40 in EA-2. The remaining 11 sherds were recovered from other excavation areas. The excavated potsherds are dated mainly to the middle to latest phases of the Earliest Jomon and specifically belong to the *Oshigatamon* ware (roller pattern using a carved stick), the *Chinsenmon* ware (impressed pattern), and the fiber tempered type. Potsherds of the early phase of middle Jomon have also been excavated. The assemblage indicates that the pottery wares of the central highlands are dominant, in addition to some typological elements from the Kanto region. This trend provides important insight in reconstructing the behavioral patterns of the Jomon people with regard to their land use strategy.

2-2) Jun Hashizume, Yuuki Nakamura: Preliminary Report Of The Lithics From The Hiroppara I And II Sites, Central Highlands In Japan

The Hiroppara wetland is located about 1.5 km to the north of Wada-toge (Wada Pass), which is a well-known obsidian source area, at an altitude of 1,400 masl. The extensive survey program conducted by the former Wada Village Board of Education in 1989, 1990, and 1991, documented several Upper Palaeolithic (ca. 38–16 ka cal BP) to Jomon period (ca. 16–2.8 ka cal BP) sites around the wetland. In 2011, the COLS began new research on this wetland and the prehistoric sites around it.

This presentation is a preliminary report of the lithics excavated from the sites around the Hiroppara wetland during the field seasons 2011 and 2012.

The excavation area 1 (EA-1) at the Hiroppara I site has revealed the following:

1) An Early Upper Palaeolithic lithic industry found in layer 6 (under the Aira-Tn tephra);

2) A bifacial point industry with a blade core from layers 2b and 3;

3) Late Earliest and Early Jomon period assemblages from layers 2a and 2b.

The excavation area 2 (EA-2) at the Hiroppara II Site in turn revealed:

1) An early Late Upper Palaeolithic lithic concentration composed mainly of large blade-like flakes, cores and some finished tools;

2) A concentration of Jomon lithic industry associated with the late Earliest Jomon pottery from the layers 2a and 2b.

These new studies expand the scope of information yielded from multi-layered prehistoric occupations at the Hiroppara I and II sites. Not only that, but they have also allowed us to extract a significant amount of information on prehistoric human behavior with specific regard to the exploitation, transportation and consumption of obsidian. These issues require further study.

2-3) Shigeo Sugihara: Topographical Environment Of The Archaeological Sites Found Around The Hiroppara Wetland (2)

We generated the landform classification map and also carried out the investigation of surface geology with the aim of understanding the topographical environment of the archaeological sites found around the Hiroppara wetland.
Topographical overview: We classified the topographical features around the Hiroppara wetland (microtopography) into mountain collapse (clear), mountain collapse (unclear), volcanic mud flow terrace (I and II), mountainous region, moor, etc.
Survey points: Among the excavation and drilling points surveyed in 2011 and 2012, the EA-1 (P-2) is located in the saddle formed by the watershed of the streams flowing through the Hiroppara wetland; the TR-2 is in a bog, and the EA-2 (P-3) is situated on a moderate slope at the foot of the "Mokkoriyama" mountain (correlated to the volcanic mud flow terrace I).
Formation of the Hiroppara wetland: Both many collapses found in the upstream of Wada River and abundant rhyolitic sand gravel deposited in the lowland suggest that the Hiroppara wetland was formed by the influx of a huge amount of debris flow deposits delivered from the surrounding rhyolitic area (Sannomata pyroclastic rocks and lava [Nagai *et al.* 2010]) which buried the old river channel of Wada River and its tributaries to make the bog. It is considered that the channel of Wada River was fixed down on the current flow path before the AT ash fall.

2-4) Masashi Nagai: Volcanic Formation History Of The Kirigamine-Wada And The Shirataki Areas: An Overview

We examined formation histories and magma processes for the Kirigamine-Wadatoge and Shirataki areas. The petrogenesis of Kirigamine-Wadatoge high-silica rhyolite magmas can be probably explained by the crystallization differentiation of the rhyodacite magma. However, there is significant difference in the chemical composition and phenocryst contents among the high-silica rhyolite bodies. Magma plumbing system may be configured with small felsic magma batches repeatedly generated and destroyed. On the other hand, there is a possibility that can explain the chemical variation trend in the high-silica rhyolite magmas in Shirataki area by crystallization differentiation from rhyolitic magma of large-scale pyroclastic flows in Taisetsu-Tokachi volcanic chain; that is, the magma was probably ejected sequentially from the top of a zoned magma chamber. Such difference in the magma plumbing system is due to differences in tectonic setting. The magma chambers in the Kirigamine-Wadatoge area close to the ISTL active fault system are considered more unstable due to the crustal strain rate being higher.

2-5) Yoshimitsu Suda: Standardization Of Obsidian Compositional Data For Provenance Studies: Petrology And Data Compilation Of Intra-Laboratory Results For Obsidian From The Shirataki Source, Northern Japan

The Center for Obsidian and Lithic Studies (COLS), Meiji University, held an international symposium on "Methodological issues of obsidian provenance studies and the standardization of geologic obsidian" on November 5-6, 2011 in Nagano, Japan. The symposium was organized by Professor Akira Ono, director of COLS. The participants and presenters at the symposium included geologists, archaeologists and analytical chemists interested in provenance studies of lithic raw materials. A pre-symposium excursion at the Shirataki source in northern Japan (Hokkaido island) was included in this symposium. Most of the participants joined us for this excursion to visit several key geologic obsidian outcrops. Afterward, the obsidian collected from four different outcrops was shared among the participants and laboratories at the closing ceremony and we began a research project for compiling and standardizing data.

As far as archaeological studies are concerned, works by Izuho and Hirose (2010: BAR International Series 2122, pp.9-25) and Kuzmin (2010: BAR International Series 2152, pp.137-153) indicate that many archaeological artifacts found on the Sakhalin Island were made of Shirataki obsidian. On the other hand, proper source characterization requires multiple reference samples of obsidian to accurately determine the element concentrations in the artifacts. In the context of the provenance studies, a geochemical database of major geological obsidian sources is deemed necessary. This means that the standardization of obsidian source samples and sharing of samples are fundamental to successful provenance studies and are necessary in order to verify the existence of long distance exchange networks across mountain ranges, downstream of rivers and seas.

The aims of this project are: 1) to compare the results of quantitative analysis among independent laboratories, 2) to establish obsidian geochemical reference standards, and 3) to compile the quantitative values for the Shirataki obsidian source. Four types of obsidian from different geologic sites were selected for this study. These were named JOSH-1, JOSA-1, JOO-1 and JOR-1 after the locations of the obsidian outcrops (Hachigosawa, Ajisai-notaki, Oketo and Rubeshibe, respectively). A variety of analytical techniques were used, including: EPMA at the National Institute of Polar Research; WDXRF at the COLS, the Palynosurvey Co., Ltd., the Paleo Lab Co., Ltd. and the Hokkaido University; ICP-MS at the Korea Basic Science Institute and the Institute of the Earth's Crust, Siberian Branch of Russian Academy of Sciences; and EDXRF and NAA at the University of Missouri Research Reactor Center. EPMA analysis stands to examine the chemical homogeneity and the petrology of the samples. Other methods serve to determine the whole-rock element concentration in the samples.

In this presentation, we first detail the occurrence and petrology of the obsidian. Next, the results of data compilation and their geochemical characteristics are presented. Finally, the utilization of common standards is proposed.

2-6) Atsuko Kanauchi and Chiho Kamiya: Pollen Analysis Of The Hiroppara Wetland Deposits

Pollen samples were taken from the TR-2 section of the east wall of the trench in Hiroppara wetland. Hiroppara wetland deposits are mainly composed of black-brown peat and tow usually with three sand layers in between peat layers. Pollen samples are taken every 10cm, from the surface to 230cm in depth. The KOH-ZnCl2-acetorisis methods are used for preparation on the pollen and spore fossils. Preparation slides bind with glycerine jelly. Pollen and spores had been counted to over 400 types of arboreal pollen grains. Then calculated percentages for each taxon based on the arboreal pollen numbers.

The lower part of the Hiroppara wetland deposits were dominated with coniferous pollen such as *Pinus*, *Tsuga*, *Picea*, *Abies.* The middle to upper parts were dominated by deciduous broadleaves trees: *Quercus* subgenus *Lepidobalanus*, and *Carpinus*. The Hiroppara wetland was formed in the coniferous forest. At ca. 8800 BP, however, it changed into a cool-temperate deciduous broadleaved forest. Spores of *Selaginella selaginoides* markedly appeared in the deposits from the beginning of the Hiroppara wetland to ca. 8600 BP.
Sakai & Kuninobu (1993) described the Hiroppara wetland pollen data.
Coniferous pollen, mainly *Picea*, continuously dominated the assemblage until the postglacial age. Our newly obtained pollen data show that coniferous pollen decreased to a very low percentage by the end of the late glacial period and in turn cool-temperate deciduous broadleaved pollen dominated from the beginning of the postglacial period. This difference supposedly occurred in the spreading and deposition of pollen grains.
Hiroppara pollen data can be correlated to the Yashimagahara pollen data (Kanauchi & Sugihara 2007). In the Hiroppara wetland and surrounding area, subarctic coniferous forests mainly composed of *Picea* were dominant in the late glacial period. Later, during the in the postglacial period, the forests changed to cool-temperate broad-leaved forests dominated by *Lepidobalanus*.

2-7) Yoshiaki Matsushima: Preliminary Report On The Alluvial Deposits From The Oppama Lowland, Yokosuka City, Kanagawa Prefecture

The Natsushima shell mounds date back to the beginning of the earliest stage of the Jomon Era. However, little is known about the natural environment, and especially the shoreline, before and after 10,000 years ago when the shell mounds were formed. A drilling project was conducted in the Oppama lowlands close to the Natsushima shell mounds, which yielded valuable data. At present, we have been researching the palaeoenvironment at the time the Natsushima shell mounds were formed, by using multidisciplinary analyses, that involve radiometric dating, mollusks, ostracods, foraminifers and diatoms. Until now, we have done work on the stratigraphy of the alluvial deposits and some of the sedimentation dates became clear. Here, we present the preliminary report on the stratigraphy and the palaeoenvironment revealed by the borehole core materials. The alluvial deposit reached the depth of 33.15m from the land surface, and recovered a total of 30.75m length of marine sediments. Although the lithofacies are varied, the alluvial deposit is divided into as follows in ascending order: lower sand member (33.15 m ～ 21.55 m), middle mud member (21.55 m ～ 12.55 m), upper sand member (12.55 m ～ 2.40 m). The lower sand member contained an array of intertidal flat molluscs, chiefly *Cyclina sinensis* and *Crassostrea gigas*; the middle mud member found in the inner bay mud bottom was defined by the following mollusc species: *Fulvia mutica*, *Musculista senhousia* and *Theora fragilis*; the upper sand member included inner bay sand bottom molluscs, such as *Batillaria multiformis*, *Umbonium moniliferum* and *Mactra veneriformis*. In order to know the formation age of the alluvial deposit, the ^{14}C radiometric dates were calculated from the base of the borehole core sediments and from the lowermost horizons of the lower sand member. The results of the ^{14}C ages are as follows: >54,080 yrs BP (*C. gigas* from 33.05m ～ 33.03m in depth); 11,020 ± 40 yrs BP (organic material from 33.07m in depth); 10,370 ± 30 yrs BP (plant fragments from 29.20m ～ 29.19m in depth). The two radiometric dates from the lowermost horizons of the lower sand member support a good correlation with the Natsushima shell mounds, although the radiometric dates from *C. gigas* from the base of the core sediment showed an extremely older date.

2-8) Kazuo Masubuchi: The Holocene Palaeoenvironment Of The Izu Myojin Pond

1. Radioactive carbon dating of the Myojin- Pond alluvium

The core we bored at the alluvium IDM-1 IDM-2, provided us with the suitable samples for radiocarbon dating. The boring took place both at the point No.1 (sea level altitude 2.23m), by the Myojin- Pond, Numazu-shi, and Shizuoka locations and at point No.2 (sea level altitude 4.49m), a fallow field on both sides of the Itaoo River. The dating was undertaken by the Institute of Accelerator Analysis Ltd. They used dedicated device ^{14}C-AMS based on accelerator (made by NEC) and measured ^{14}C tally, ^{13}C concentration （^{13}C/^{12}C） and ^{14}C concentration （^{14}C/^{12}C. The oxalic acid（HOxⅡ）provided from the American National Institute of Standard and Technology (NIST) was used as a standard sample.

The results showed that the age of the suprabasal alluvium was: IDM-1 at 24.02m depth (sea level -21.79m): 7,740±30 yrs BP and IDM2 at 27.13～27.15m depth (sea level -22.64～-22.66m): 7,770±30 yrs BP.

2. Fossil diatom assemblages

For the fossil diatom analysis as well as for the future analysis of microfossils, we collected samples 10cm from the boring core for both IDM-1 and IDM-2.

Since we have not yet finished preparing all the samples this will be a general overview of the IDM-1 fossil diatom assemblages.

We could not find a horizon dominated by marine fossil diatoms, even though we did find a definite marine stratum from the samples at the intervals of 1m each from the depth 24m-2m.

The dark-grey-brown clay coming from a depth between 24m and 18m, yielded fresh water assemblages such as *Aulacoseira spp.*, *Cymbella spp.*, *Diploneis spp.*, *Eunotia spp.*, *Gomponema spp.* Also fresh-brackish water yielded *Thalassiosira lacasutris*, *Cyclotella bondanica*, whereas the brackish form of *Masogloia elliptica* and *Cyclotella meneghiniana* appear mainly in estuarine regions.

The fresh water planktonic *Aulacoseira spp.* obviously appears in the depth 16m of dark brown clay. And from a 15m deep deposit of dark brown organic clay, we were able to see a blooming *Aulacoseira*.

After that, the fresh-brackish water form of *Thalassiosira lacasutris* appears continuously but it seems that fresh water species dominated. At 8m of depth into the grey-brown clay and at 6m depth into the blackish fiber clay, fresh water forms sucha as *Fragilaria construens*, *Fragilaria construens* (var.venter) seem to dominate the area. *Fragilaria construens* has massive blooms especially in standing water.

Cymbella spp., and *Diploneis spp.* dominate the area of the 5m deep dark brown clay. Lastly at 3m depth into the dark brown silt *Aulacoseira spp.*, *Cymbella spp.* were found to be dominant.

2-9) Takashi Sase and Mamoru Hosono: Phytolith Records From The Hiroppara Wetland Deposits And Soils Of The Adjacent Area

We carried out the phytolith analysis on deposits in the Hiroppara wetland and the soils of an adjacent location in the Nagawa town, Nagano prefecture, central Japan. On the basis of phytolith records, the wetland deposits can be divided into the following three periods: (1) the transitional moor (mire) period of the uppermost deposit of peat which is characterized by the dominant *Molinia* phytoliths, (2) the low moor (fen) period in the middle deposit of sandy peat, which is characterized by the continuous appearance of *Phragmites* phytoliths, and (3) the pre-moor period: the lowermost deposit consisting mostly of sand and dominated by *Pooideae* phytoliths. The clear evidence of *Sasa* phytoliths indicates that the advance of *Sasa* from the adjacent land into the moor occurred at least three times after the fen period. The soils from the adjacent location can be divided into the following three periods: (1) the semi-grassland period of the upper black soils dominated by a significant signal of non-Bambusoideae phytoliths, (2) the bare land period of the middle yellowish brown soils with very low quantities of phytoliths, and lastly (3) the sub-boreal vegetation period of the lower yellow brown soils, including Aira-Tn tephra (AT: 28-29ka), characterized by the continuous signal of *Pooideae* phytoliths. It is estimated that the shift from the pre-moor period to the fen period correlates with the shift from the bare land period to the semi-grassland period, and those shifts most likely occurred in the earlier Holocene period.

2-10) Takashi Chiba: Palaeoenvironmental History Of The Hiroppara Wetland During The Holocene

This presentation discusses the palaeoenvironmental history of wetlands during the Holocene in the Hiroppara wetland area. Our conclusions were reached through diatom analysis, TC/TN analysis, and 14C dating. Records of diatom assemblages as well as TC and TN changes infer changes in past moisture conditions and stability of depositional environment. Unlike the modern wetland, which is dominated by benthic and aeroterrestrial diatoms, the Late Holocene wetland indicates the growth of planktonic species instead. The relative abundance of benthic and aeroterrestrial diatoms suggests four main periods when the wetland was drier than today: at 200 cal. BP, 500 cal. BP, 700 cal. BP, and 900 cal. BP. These dates coincide chronologically with the Dalton, Spörer, Wolf and Oort Minimums. On the contrary, prior to 4000 cal. BP, TC and TN ratios of depositional environment seem to have been extremely low and the grain size of this sediment is mostly coarser than modern peat, and also mixed diatom assemblages formed at this time. All of the above seem to suggest that this wetland region was an unstable depositional environment during the middle Holocene.

2-11) Yuichiro Kudo: Radiocarbon Dating Calibration For Marine Samples: Demonstration Of Calibration By Using The Oxcal Program

For the purposes of estimating the sea level and environmental changes around the Japanese archipelago during the Holocene, a number of marine shells samples were collected from outcrops and drilling cores in order to be radiocarbon dated. In order to know the true calendric dates, it is necessary to calibrate these radiocarbon dates.

To accommodate local effects, the difference ΔR in reservoir age of the local region of interest should be determined. In the Kanto region, marine shell samples that were collected in the 19th and early 20th century were radiocarbon dated by Yoshida et al. (2010), who estimated ΔR values in this region. In this study, the mean values of ΔR for the Tokyo bay were estimated at 61±22 ^{14}C yrs; for the Miura peninsula and Sagami bay they were estimated at 89±22 ^{14}C yrs; and for the Boso peninsula 81±15 ^{14}C yrs.

In order to advance the calibration for marine samples that this project collected, I introduce an outline and some calibration issues common to marine samples using the Oxcal program.

2-12) Naoto Tomioka, Yuko Sato, Koki Morita, Satoshi Hatakeyama, Jin Ying xi, Jia Xiao Bing: Stable Oxygen And Carbon Isotopic Analysis Of Shells From An Archaeological Site.

Around the coastal area in the Eastern Asia, so many shells have been excavated from archaeological sites, including shell middens. These shells are very important materials from the viewpoint of archaeology, as they are able to reveal natural resource dynamics and environmental changes in the past, including prehistory.

In the laboratory of Environmental Archaeology, at the Okayama University of Science, we have been trying to analyze shell growth line, but have been facing some methodological issues and limitations. Since 2011 we have been working on stable oxygen and carbon isotopic analysis using MAT 253 (stable isotope ratio Mass Spectrometer System) in the laboratory of paleontology, at the National Museum of nature and Science, in Japan.

As a result, we have some data concerning the palaeoenvironment and seasonal shell collecting from the excavated shell assemblages at the Xiao zhu shan site, Da lian City, in China.