Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

BPT28-01 Room:202 Time:May 21 16:15-16:30

80,000-60,000 BP aeolian sediments and raw materials for stone tools from A5-3 limestone cave at Arsanjan, South Iran

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Six layers were confirmed through the E5 trench survey (4 X 4 m square), Arsanjan, south Iran. Layers 1 to 3 yielded more than 6,000 pieces of chipped stone, whose majority are flint. They may belong to culture layers of Late Paleolithic to Proto-Neolithic periods. Addition to these, more than 1000 pieces of animal bones in smaller size were found. Layer 4 yielded more than 100 and several tens pieces of flint chipped stones and more than 300 and several tens pieces of animal bones. Among them, Middle Paleolithic artifacts including Levallois flakes were also discovered, and layer 4 belongs to Middle Paleolithic culture layer. Five hearths, nearly located each other, were excavated from layer 4, each hearth ranges from 0.3 m to 0.5 m in diameters. Middle Paleolithic flint chipped stones were found from layers 5 and 6. The 14C of five samples from layer 2 indicates approximate 26,000 BP. Samples from below layer 2 exceeds limit of 14C age determination and dated as earlier than 43,000 BP.

The results of B3 trench survey (4 X 4 m square) are now reviewing. The culture layers are divided into ten layers. Layers 1 to 3 correspond with layers 1 to 3 at E5 trench and belong to Late Paleolithic to Proto Neolithic. Six samples from layers 2 and 3 indicate approximate 36,000 BP. Layers 4 to 10 are included into Middle Paleolithic culture layers. It is noteworthy that structures 1 and 3 were discovered from layers 6 and 7, respectively. Structure 3 presents a circular form on plan, 1 m in long axis and 0.7 m in short axis. In profile, it is conical and depth is about 50 cm. Cave limestone bedrock is used as a bottom wall of the conical shape, and concrete-like harden wall with pebbles and clays is used as the other one. The concrete-like wall might be built after cutting soil surface. The filling of the conical shape structure is light orange color clay, 50 cm in thickness. This clay presents a bimodal pattern, 5 phai and 11 phai in grain size analysis, and consists of quarts, muscovite and hydroxylapatite. The color of the clay is characteristics (10YR7/6, 6/6 etc) and conspicuous from other soil. Based on the color and clay-seized sediments, it can be concluded that they are aeolian sediments. This sediments attain to approximate 30 cm in thickness in structure 3. The use aim is unsettled as far. This conical structure may be intended to be a water-reserved place keeping water oozed from the limestone wall. Thus, the clay might be deposited in this pit, 50 cm deep. This laying down at the pit seems to be prevented from erosion and transportation because the pit was full of water. On the other hand, structure 1 presents oval shape on plan, 1.25 m in long axis and 0.75 m in short axis, and 0.15 m in depth. The same clay, a few centimeters thick, was also found at the basal part in structure 1. This clay bed is similar to the grain size and color as those of structure 3, and is probably aeolian in origin. It, however, is unsolved whether this structure was used as a watering place or not. The ages for these layers 6 and 7 are inferred 60,000 to 80.000 BP based on the artifact study.

The major lithology of chipped stones from both trenches is radiolarite. It proves from our geological mapping that radiolarite is widely distributed in the Dalnesin valley where A5-3 cave is located. In addition, the outcrop presenting the similar lithology and color to an artifact from A5-3 site was confirmed in the Dalnesin valley. The distance between A5-3 cave and the outcrop is about 4 km. The radiolarite is making a gentle topography, and the access to there is so easy. Thus, the exposure of radiolarite could be an appropriate place for collecting raw materials for artifacts. In conclusion, Arsanjan is gifted with supply of excellent raw materials.

Keywords: Iran, artifact, radiolarite, watering place, aeolian, cave

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A geoarchaeological study of the persistence of Stone Age sites in the southeast Arabian Peninsula

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Recent discoveries of lithic industries of anatomically modern humans (AMHs) at Jebel Faya (United Arab Emirates)[1] and the Dhofar region (Sultanate of Oman)[2] suggested the ’Southern Route Out of Africa’ theory in which AMHs dispersed from East Africa to South and Central Asia through this region. The archaeological survey in the Al Wahrah and Wadi al Kabir districts of the interior of Omanin December 2012 and January 2013 identified a number of Stone Age sites with a variety of lithic industries belonging to the Middle and Upper Palaeolithic and Neolithic (Pre-Hafit) periods. These lithics were scattered on the marginal areas of alluvial fans at the foot of the hills and mountains on which good-quality chert sources for lithic production are located. A number of lithic concentrations were also found besides cairns built on the hill top. On-the-ground observation of geomorphological features and soundings revealed the following: (1) In the piedmont areas and on the remnant terraces, lithics remained due to deflation, i.e. eolian erosion of fine-grained surface sand to cause an accumulation of lag gravels on the ground surface. (2) On the piedmont fans, lithics were scattered out of context due to colluvial-fluvial activities. (3) On the lower terraces, the Pleistocene landforms were completely eroded by alluvial activities and therefore only Holocene sites remained. Using these observations as heuristic operator, we predicted the likelihood of presence of Stone Age sites and mapped it based on eco-cultural niche modelling[3].

[1] Armitage SJ et al. (2011) Science 331:453-456.
[2] Rose JI et al. (2011) PLoS ONE 6:e28239.
[3] Banks WE et al. (2006) PaleoAnthropology 2006:68-83.

Keywords: geoarchaeology, Arabian Peninsula, Oman, Stone Age, site formation process, deflation

BPT28-03 Room:202 Time:May 21 16:45-17:00

Cultural diffusion rate estimated from radiometric dates

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Date of culture diffusion has often been discussed in order to well understand the cultural transition and chronological secuence on archaeology and anthropology. In the case of almost Paleolithic studies, the date is based on radiometric dating, and various scenarios of cultural diffusion are drawn. However, the more we target the order period, the more reliability of the dates is decreased, resulting in rough scenarios.

In this paper, we focus on diffusion rate of several cultures, apart from the chronological studies. Research Team B02 "Reconstructing the Distribution of Neanderthals and Modern Humans in Time and Space in Relation to Past Climate Change", directed by Minoru Yoneda, is part of the project of "Replacement of Neanderthals by Modern Humans", and is collecting the information on radiometric dates in Levant, Europe and Africa between the Middle to Upper Paleolithic period. The collected data have been recorded in the B02 database "Neandat". Using this data, we attempted to reconstruct the Paleolithic chronology, and to simulate population dynamics so far.

Added to these, we try to estimate cultural diffusion rate with radiometric statistic analysis, and summarize the estimated rates of the specific culture groups (esp. lithic industries). The purpose is to reveal characteristic appearance of each cultural group, and find out the difference between the groups. Here, we will discuss the calculation of the cultural diffusion rate, and present summary of each cultural group.

Keywords: radiometric date, diffusion rate, paleolithic

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Conversion of GISP2-based sediment core age models to the North GRIP ice core chronology

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The early portion of the last glaciation is beyond the range of reliable radiocarbon dating. This is problematic for assigning ages to an important period in human history that includes the migration of modern humans out of Africa and their eventual replacement of Neanderthals. In addition to the assignment of absolute age, this also complicates understanding the relative deposition timing of stratigraphic layers from distant sites. While correlation to Greenland ice core records provides an alternate dating means, paleoclimate records generated over the past 15 years often have incompatible time scales due to significant revisions in the ice core chronologies.

Creation of a compatible chronology is required prior to quantitative analysis of spatial and temporal climate variability. Here we present an automated mathematical function that updates GISP2-based chronologies to the newer, NGRIP GICC05 age scale. This is done using the original author's own age tie points and does not effect relative phasing with Greenland stadial-interstadial variations. The script is modular in design, allowing substitution of our isotope matching for the more comprehensive volcanic matching, once available. Usage of this function highlights on the NGRIP chronology, for the first time, the series of global millennial events related to the large and rapid millennial climate events of the Last Glaciation.

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Modeling the climate of the Late Pleistocene: A general overview of results and comparisons with proxy-derived data

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The Late Pleistocene was a period which lasted from the Eemian interglacial period, about 130,000 years ago, to the start of the warm Holocene, about 11,700 years ago. Much of the Late Pleistocene was characterized by glaciation. It was also a period which saw modern humans spread throughout the world and other species of the same genus, like the Neanderthals, become extinct.

Climate models of various complexities are used to simulate both past and future climates. In our present study, we have used three variants of MIROC (The Model for Interdisciplinary Research on Climate), a global climate model, for timeslice experiments within the Late Pleistocene: two mid-resolution models (an atmosphere model and a coupled atmosphere-ocean model) and a high-resolution atmosphere model. We discuss the general features of the simulated climate.

Climate models are not capable of simulating climates perfectly since a theoretical understanding of climate is not complete and models include simplifying assumptions and parameterizations. Biases are therefore present in models. As it is not possible to verify the reliability of simulations of future climate changes with observational data, comparing simulations of past climates against proxy-derived data provides a valuable tool to evaluate the models and investigate the degree of confidence in model estimates. We compare our climate model results with some available proxy data to elucidate where simulations show good agreement and how higher model resolution can offer further improvements.

Keywords: paleoclimate, climate modeling, Late Pleistocene, glacial-interglacial cycle

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Replacement of Archaic humans by Modern humans in relation to climate change

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Homo sapiens is the only survived hominid living today, while several kinds of archaic humans including Neanderthals became extinct in the late Pleistocene. Drastic climate changes toward colder and dryer conditions is thought to be a crucial cause of their extinction but the biological and cultural difference between archaic and modern humans which was significance for their survival and extinction is not understand well. In this talk, we will review a series of viewing point regarding on the difference between archaic and modern humans and the impact of climate change, in order to extract the geoscientific information which is required for testing these archaeological scenarios. Any comments and suggestion from geoscientists are very welcome.

Keywords: human evolution, Neanderthals, Homo sapiens, marine isotope stage 3, Pleistocene, Paleolithic industry