Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

MIS007-05 Room: 304 Time: May 24 14:45-15:00

Cyclic sedimentation and astronomical tuning of sedimentary record obtained by IODP 323 Bering Sea Expedition

Tatsuhiko Sakamoto[1*], Alan Mix[2], IODP Expediton 323 Scientific Party[3]

[1]JAMSTEC, [2]Oregon State Univ., [3]Integrated Ocean Drilling Program

IODP Expedition 323 in the Bering Sea is the first expedition to recover deep continuous sections of sediment, providing an opportunity to study paloceanography in time and space in the Bering Sea. The seven sites drilled during Expedition 323 provide a continuous high-resolution record of the evolution of marine sedimentation in the marginal Bering Sea. Drill sites explored in the Bowers Ridge region (Sites 1340, 1341, and 1342) represent the time spans between the Holocene to 5 Ma in the Pliocene. In the gateway region sites at the Bering slope, two deep drill sites (Sites U1343 and U1344) reached 2.1 and 1.9 Ma, respectively. At other drill sites, the bottom ages or the sedimentary sequences based on shipboard stratigraphy are as lows: Site U1339 (Umnak Plateau: 0.74 Ma), Site U1342 (Bowers Ridge: 1.2 Ma). Siliciclastics are a dominant component of all Bering slope sites and are less dominant at the Bowers Ridge sites. At all sites, because the sediments are primarily comprised of mixtures of siliciclastics and diatom frustules, the physical properties such like magnetic susceptibility (MS), gamma-ray attenuation (GRA) bulk density, and natural gamma ray (NGR) measurements made on the shipboard tracks and with the logging tools generally provide information on the relative proportions of clays/silts versus diatoms in time. The potassium concentrations (K%) measured by the logging tool are generally related to the terrigenous clay concentrations. Applying the shipboard age model to the K% record at Site U134 3 and performing spectral analyses on the record indicate that variability in K% dominantly occurs with 40 k.y. periodicity in periods older than 1 Ma. After 1 Ma the variability of the sediment composition changed, as reflected by logging K%. In the portion of the record younger than 1 Ma, the variance is dispersed among many frequencies; 40 k.y. periodicity does not dominate the spectrum. NGR core measurements that represents the amount of terrigenous material relative to biogenic material in this region occurred dominantly with 100 k.y. variability; rather, the pulses of sedimentation appear to occur with much higher frequency. Distinct variability with the same scale of 40 k.y. cycles suggests that the primary factor controlling the magnetic susceptibility records is related to the relative amount of terrigenous material. During the time period of large 100 k.y. ice volume cycles, GRA bulk density records vary across a spectrum of frequencies. It more clearly show long-period variance characteristic of the 100 k.y. ice age cycles than they do other physical parameter properties. This indicates that terrigenous deposition at the Bering slope sites in the late Pleistocene was likely a combination of many processes such as bottom water current deposition of fine-grained material, IRD from sea ice and icebergs, and mass sediment transfer from the shelf to the lower slope and abyss. These clear orbital cyclic variations are very useful not only reconstruction for paleoceanographyic changes in the Bering Sea but also for astronomical calibration in order to the first attempt to obtain fine age scale in the high latitude in the northern most Pacific region. Band-pass components of 100 and 40 kyrs in the non-destructive measurement data of physical properties extracted from distinct periodic sedimentary sequence and tuned to the target variation of astronomical parameters in order to construct age scale in the Bering Sea.

Keywords: IODP, Bering sea, Marine sediment, Astronomical calibration