

MIS022-P04

Room:Convention Hall

Time:May 23 14:00-16:30

Quaternary tephrostratigraphy in IODP exp.323 cores (U1343 and U1344) collected from the Sea of Bering

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Tephra layers constitute valuable stratigraphic markers. In this study, we analyzed eighty-two tephra samples in IODP exp.323 cores (U1343 and U1344) collected from the Sea of Bering, describe their petrographic and geochemical characters, and reveal tephrostratigraphy.

Sediments cores U1343 (water depth 1956 m) and U1344 (water depth 3174 m) were collected from the center part of the Sea of Bering and near the Bering Self sloop. Sediment mainly constitutes of diatomaceous clay to silt. The core U1343 include total forty-eight tephra samples from four Hole cores, 13 samples in Hole U1343A (total length: 201.5 mbsf), 9 samples in Hole U1343C (total length: 234.2 mbsf), one sample in Hole U1343D (total length: 8.5mbsf), and 25 samples in Hole U1343E (total length: 744.3mbsf). Paleomagnetism suggests that sediments in the Hole U1343A and Hole U1343C are the continuous records during last 800 ka approximately, and the bottom of sediment in Hole U1343E reach at the 2.1Ma. The core U1344 include thirty-four tephra samples from three Hole cores, 27 samples in Hole U1344A (total length: 745.0 mbsf), 6 samples in Hole U1344D (total length: 286.5 mbsf), and one sample in Hole U1344E (total length: 202.8 mbsf). Paleomagnetism suggests that sediments in the Hole U1344D and Hole U1344E are the continuous records during last 600 ka approximately, and the bottom of sediment in Hole U1344A reach at the 1.9Ma.

Tephra samples were (1) washed by ultrasonic cleaner, (2) sieved by 63, 125 and 250 micrometer size and to recover the 63-125 micrometer size fraction, and (3) grains examined under a binocular/polarizing microscopes to describe their form, color and mineral assemblage. The chemical compositions of volcanic glass shards in the 63-125 micrometer size fraction were determined using a wavelength dispersive electron probe micro-analyzer operated at 15 kV and using a 10 nA beam current and a 10 micrometer beam diameter to minimize loss of Na and K.

Most of tephra samples include rounded rock fragments, rounded and weathered minerals, quartz and plagioclase. Furthermore, foraminiferal fossils and diatom fossils are contaminated in most samples. In every tephra sample, volcanic glass shards in the 63-125 micrometer size fraction are observed and also volcanic glass shards are concentrated under the 63micrometer size. On basis of major-element composition of glass shards in 82 samples, SiO₂ in glass shards is between ca.53 wt% to ca.78 wt%. Vitric tephra samples which are characterized by high-SiO₂ content (ca. 71wt% to 78 wt%) were found in five in the core U1343, and two in the core U1344. They are rich in clear and bubble-wall type volcanic glass shards and rarely heavy minerals. The size fraction of volcanic glass shards is concentrated under 63 micrometer.

Rock fragments and minerals are considered as to be transported by seasonal sea-ices and ice-bergs, not to fall out accompanying volcanic eruptions, because almost they are almost rounded. On basis of major-element composition of volcanic glass shards, eighty-two samples can be divided to two groups (Type 1: high CaO-MgO type, Type 2: low CaO-MgO type). Also, SiO₂ of Type 1 tephra is ca.58-63wt% and Type 2 is ca.65-78wt%. Such geochemical characters suggest that Quaternary tephra beds in the central of the Sea of Bering have been provided form at least two volcanic zones.

Five tephra beds in the core U1343 are divided to Type 2. Furthermore, three of them and two of them in different Hole are cor-relatives respectively: 93.825 mbsf in Hole U1343E (ca 0.37Ma; thickness is 3.5 cm), 97.835 mbsf in Hole U1343C (ca.0.29Ma: thickness is 2 cm), and 98.868 mbsf in Hole U1343A (ca.0.33Ma: thickness 4cm). SiO₂ contents in three samples are ca.75wt%. 190.850 mbsf in Hole U1343E (ca.0.78Ma: thickness is 1 cm) and 193.795 mbsf in U1343C (ca.0.78Ma: thickness 2 cm) are correlated each other. SiO₂ contents in two samples are ca.78wt%.

With collaboration of the IODP Exp.323 science party

Keywords: tephrostratigraphy, the Sea of Bering, Quaternary, EPMA