The sodium sulfate gravel discovered on the bottom of a lake and the transparent lamina, found from two saline lakes in Antarctica

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1. Introduction

The sediment cores were taken from two hyper saline lakes, Lake Oyayubi and Lake Hunazoko, along the Soya Coast, Antarctica. Precipitated minerals found out in the sediments are reported.

2. The gravels discovered on the bottom of Lake Oyayubi

Lake Oyayubi locate around intertidal zone, and the water depth is about 5 m. The altitude of the surface of the lake is about 50 cm-1 m. The outflow of a lake was recognized slightly early in November. The water temperature in January, 2005 was 15 degrees C in the depth of water of 1.5m, and -3 degrees C on the bottom of the lake, and the salinity was 127 psu on the bottom. There were a lot of pebbles of several mm - several cm which consist of a transparent and colorless precipitated mineral in the topmost 5-10 cm of all three cores taken from the lake. The phenomenon in which the pebbles of a precipitated mineral were found out from the bottom of such a lake near an intertidal zone was not reported until now. The pebbles of the core surface part were sealed, frozen and brought home, and sample preparation and powder X-rays diffraction measurement were performed at room temperature (20-25 degrees C). The X ray diffraction analysis showed a clear pattern of thenardite (Na_2SO_4). Since a big change was recognized in repetition measurement of the X ray diffraction pattern at room temperature after sample preparation in the refrigeration state, a possibility that mirabilite (Na_2SO_4 $10H_2O$) changed is high. The sediment of lamina structure was observed at the lower part any core. Furthermore, the fossils of a sea urchin (*Sterechinus neumayeri*) were found at even the lower part in two cores.

3. The transparent lamina found in the Lake Hunazoko sediments

Lake Hunazoko is separated from the sea in the saddle part with an altitude of several m. The present surface of the lake is 23 m below sea level. The major axis of the lake is 675 m, the minor axis is 250 m and the water depth is 9.2 m. The water temperature in January, 2005 was 15 degrees C in the depth of water of 2.0 m, and -9 degrees C or less (below a measurement limit) on the bottom of the lake, and the salinity was 190 psu on the bottom. The water temperature in the spring (2005. 10) was almost uniform at about -14 degrees C. There is a report in which water temperature was -17 degrees C. In full length of all four cores, a lot of transparent laminas were observed. The transparent needlelike crystals were also found in the sediment and the surface of some needlelike crystals became cloudy when they touched the open air at room temperature. The sediments also have deliquescence, so they were sealed, frozen and brought home.

4. Discussion

Though Lake Oyayubi was a lake near an intertidal zone, it became a hyper saline lake. This may be caused by accumulation of brine produced when sea water freezes over and concentration by evaporation joined this. It is known that in the course of cooling of sea water, mirabilite (Na_2SO_4 $10H_2O$) will deposit at -8.2 degrees C, and hydrohalite (NaCl $2H_2O$) will deposit at -22.9 degree C (Donald E.Garrett and 2001). It is also known that only sodium sulfate have large temperature dependability of solubility among minerals which may deposit from sea water. It may be related to only sodium sulfate having deposited. On the other hand, since the chemistry composition of the dissolved matter in Lake Hunazoko is not different from sea water very much, the crystals considered to deposit from sea water at low temperature are considered to be these candidates. Therefore, the needle crystal with which the part became cloudy has the possibility of mirabilite and thenardite. The water might become -22.9 degrees C or less at the severe winter term, and hydrohalite may have deposited.

Reference:

Donald E. Garrett:'Sodium Sulfate: Handbook of Deposits, Processing, & Use', pp. 384., 2001, Elsevier