Proc. NIPR Symp. Antarct. Geosci., 4, 245, 1990

CLASSIFICATION AND MODELING OF ANTARCTIC INLAND WATER BY PRINCIPAL COMPONENT ANALYSIS (ABSTRACT)

Shinya KAKUTA and Kunihiko WATANUKI

Department of Chemistry, College of Arts and Sciences, the University of Tokyo, 8-1, Komaba 3-chome, Meguro-ku, Tokyo 153

Dissolved major ionic components Na^+, K^+, Mg^{2+}, Ca^{2+}, Cl^- and SO_4^{2-} in waters of lakes, ponds and melt streams of the Syowa, Vestfold and McMurdo Oases are classified by principal component analysis and with modeling under an assumption of ions removed by fractional freezing. The result of the principal component analysis shows that the origin of dissolved salts in lake waters in the Syowa and Vestfold Oases (Lakes Midori, Nurume, Hunazoko, Ô-ike, Oyayubi, Skallen Ô-ike, Suribati, Zakuro, Ace, Deep and Oval) is sea water. In contrast, the result of the calculation of ions removed in the McMurdo Oasis suggests the origin of dissolved salts as follows: only sea water for the ponds in the south Fork and north Fork, Lake Vanda and Balham Lake: glacial melt water for the Onix River and Lake Bull; both sea water and glacial melt water for Lake Joice and Canopus.

This paper is also concerned with local characteristics of water in the Syowa Oasis and McMurdo Oasis. First, waters of the Syowa Oasis were analyzed by principal component analysis. This analysis indicated that salts dissolved in saline water of the Syowa Oasis are of marine origin and that $NaCl \cdot 2H_2O$ may have precipitated from or dissolved into the waters. Then, waters in the McMurdo Oasis were also analyzed. The scores of waters obtained by principal component analysis in the Labyrinth in the McMurdo Oasis are noticeably various as compared with those of the other waters in the McMurdo Oasis. Moreover, $[Mg^{2+}]/[Cl^-]$ ratios of saline waters in the Labyrinth are high as compared with those of the other waters in the Mcmurdo Oasis and sea water. Thus, it was concluded that waters in the Labryinth would not been much influenced by fractional freezing and that magnesium ion is separated from the water. Lastly, waters only in the Labyrinth were analyzed. The ratio of magnesium ion concentration to chloride ion concentration of waters in the Labyrinth is about three times as high as the ratio of sea water. This ratio is too high to be attributed to airborne salt.

(Received June 7, 1990; Revised manuscript received July 12, 1990)