
Clay Aerosols and Arctic Ice Algae

Kazue Tazaki¹, William S. Fyfe², Shigeru Iizumi³, Yoshikazu Sampei³, Hiroaki Watanabe³, Masatoshi Goto⁴,
Yasuyuki Miyake⁵ and Shuji Noda⁶

¹ Department of Earth Sciences, Kanazawa University, Kanazawa 920-11, Japan

² Department of Earth Sciences, The University of Western Ontario London, Ontario, Canada N6A 5B7

³ Department of Geology, Shimane University, Matsue 690, Japan

⁴ Department of Anatomy, Tsurumi University, Yokohama 230, Japan

⁵ Department of Geology, Shinshu University, Matsumoto 390, Japan

⁶ Institute of Industrial Science and Technology, Shimane 699-01, Japan

Abstract: The red snow algae species found in snow at Resolute, Canadian Arctic, is a unicellular *Chlamydomonas nivalis*. Investigations by SEM-EDX, TEM, FF-IR, GC and GC-MS suggest that clay aerosols may provide nutrients for these unique systems. The clays provide P, S, K, Si, Ca, and Mg. Soot is also present and halite is very common. This salt probably plays a significant role in lowering the freezing temperature. The red snow algae is coated by a sticky thin film composed of both organic membrane material and inorganics consisting of mica and smectite. Green algae rich in Ca are involved in active photosynthesis while red algae are in a resting stage. Protamine, stearic acid, and decanoic acid were found at Ca-rich green cells while carminic acid and nopalcol BR-13 were found at Ca-poor red cells. The cell wall of red algae is composed of protein with cellulose. The major fatty acids in cells are all of even-carbon species with maximum concentrations of palmitic acid, stearic acid, and behenic acid, suggesting normal chemistry of algae species without C22. High concentration of n-alkanes with n-C24 is a characteristic component in this red snow algae, suggesting the presence of hydrocarbons that could be derived from the Arctic cold desert and/or organic debris of wind-transported bacteria. It is likely that such organic and inorganic matter provide the nutrient sources for the red snow algae in ice.

Key Words: *Chlamydomonas nivalis* • Clayey aerosols • Electron microscopy • Fourier transform infrared • Gas chromatograph mass spectrometer • Red snow algae

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