セール・ロンダーネ山地に産する氷河堆積物の物理・化学風化特性（II）

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Physical and chemical weathering properties of till deposits in the Sør Rondane Mountains, Dronning Maud Land (II)

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Degree of weathering can be useful tool to investigate timing of some geographical and geological event because it must depend on duration through rocks are on the earth's surface. Stain and fragility of surface of rocks are adopted in order to determine contemporary exposure events by deglaciation in Sør Rondane Mountains, Dronning Maud Land, East Antarctica (e.g. Moriwaki, 1994). However, what physical and chemical phenomena dominate for weathering in this region are not clarified. Then, the purpose of this study is making them clear by some scientific experiments. Rocks used for this study are glacial till deposits on various terrace plains on Sør Rondane Mountains. Whole-rock x-ray fluorescence major element chemistry (XRF), measurement of loss on ignition (LOI) and Fe^{3+}/Fe^{2+} ratio measurements by permanganate titration method were carried out for flesh core and weathered crust of the rocks in order to investigate chemical weathering degree. XRF analyses show no alkali and alkali earth elements displacement indicating feldsper alteration for weathered crust. LOI values of the weathered crusts show no significant difference from that of the flesh cores. Result of whole-rock chemistry and LOI measurement indicate that chemical weathering attribute to clay mineral formation from feldsper are not dominant in this area. Fe^{3+}/Fe^{2+} ratios are mostly higher in the weathered crusts compare to the flesh cores for each rock. Color of the powders used for XRF analyses are measured to estimate stain degree in L*a*b* color space in which the a* value denote reddish. The a* values are also higher for weathered crust than flesh core. According to the hardness tests with Equotip3 rebound hardness tester, hardness gradually declines from the flesh cores toward the weathered crusts in most case. Rocks that have strongly stained weathered crust tend to show large declination rate to the amount of nearly 40%. In addition, the hardness of the flesh cores and the a* values of weathered crusts have clear positive correlation. Under the microscope, the weathered crusts generally have cobweb-like stained microcracks and have hematite arising from alteration of opaque minerals. The stained microcracks show brownish or reddish. The brownish color and reddish color indicate existence of fine-grained Fe(III)hydroxide and hematite, respectively. Enrichment of Fe(III)hydroxide and hematite in the weathered crust are concordant with increment of Fe^{3+}/Fe^{2+} ratio in the weathered crust. Moreover, opaque mineral alterations are also found in the flesh cores with lower hardness. In these rocks, microcrack should extent deeply toward the flesh core because hardness weakening must attributes to formation of microcrack. Summery, fine-grained Fe(III)hydroxide in microcrack stands for that water-rock interaction certainly occur in these rocks. However, it is insufficiently functional to form clay minerals. Microcrack propagation and oxidation are dominant physical weathering process in this area. Oxidation is induced by microcrack formation.

References

Moriwaki, K, Iwata, S., Matuoka, M., Hasegawa, H. and Hirakawa, K., 1994, Weathering stage as a relative age of till in the central Sør-Rondane. Proceedings of the NIPR Symposium on Antarctic Geosciences, 7, 156-161.