GEOCHEMICAL CHARACTERISTICS OF VOLCANIC GLASSES FROM THE LIMNOPOLAR LAKE, BYERS PENINSULA, LIVINGSTON ISLAND, ANTARCTICA: APPLICATION AS AGE INDICATOR

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Several primary and reworked tephra layers are present in core sediments collected from Limnopolar Lake on Livingston Island, maritime sub-Antarctica (Fig. 1). Some of these tephra layers were used as a stratigraphic marker to construct the composite core (2.34 m long) by correlating overlapping two cores (Toro et al., 2013). This study intends to test the values of those tephra layers for establishing regional tephrochronology for the lake in ice-covered landscape in the vicinity of volcano. This study uses volcanic glass samples from nine tephra layers of Limnopolar Lake. By visual observation using optical microscope, two distinct types of tephra are identified on the basis of color, vesicularity and morphology. Most common are brown, vesicular and bubble-wall fragments of andesitic clasts. Some microcrystals, mainly lath-shaped plagioclases as well as euhedral opaque minerals, are present and common in the brown glass shards (Figure 2). The second type consists of black blocky shards. Both types of glasses are isotropic under cross-polarized light. Major element analyses of glass shards reveal that the majority of glass fragments belong to basic glass (< 60 wt.% of SiO2), compositionally ranging from basalt to andesite, probably sourced from both Deception and King George islands. This result agrees with the previous studies that show Deception Island to be the major source of Quaternary tephra horizons in the northern Anatarctic Peninsula region. However, it may suggest that they were the mixture of reworked tephras from eruption events of Deception and King George Islands (Figure 3). Based on geochemical similarity results, most tephra samples in two overlapping cores of Limnopolar Lake are not similar enough to be correlated each other. Therefore, most tephra layers of Limnopolar Lake are interpreted not ashfall deposits but reworked and redeposited pyroclasts. They are probably derived from the catchment transported by surface runoff during snow pack melt and the permafrost thaw periods. In this case, reworked tephras from the catchment and primary ashfall deposited on the lake ice cover would be trapped together in different ratios in the

same horizon of lake sediments. The result of this study implies that geochemical study in addition to sedimentological information is necessary to study tephrochronology and regional correlation and to understand paleoenvironmental changes using tephra in lacustrine environment in Antarctica.

References

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