

Dolerite sill body inferred from bore hole investigation in the Yufutsu Oil and Gas Field, Hokkaido, North Japan

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Petrographic study of the dolerite intrusions in the Yufutsu well, drilled over 5 km depth revealed that the dolerite multiple sills up to 1 km in total thickness intruded into the Mid Eocene coal-bearing Formations of the Ishikari Group and the Late Eocene fine-grained marine strata of the Poronai Formation. The thickness of each sill ranges from several m to over 30 m. The dolerite rocks are characterized by variable textures ranging from typical coarse-grained dolerite texture to porphyritic texture with fine-grained crystal and /or glassy groundmass. Plagioclase size distribution indicates small and needle form at the levels of the Poronai Formation and bottom of the Ishikari Group, and large and square form at the middle of the Ishikari Group. The dolerite rocks have basaltic andesite to andesite compositions (54-59 SiO₂ wt percentage). Main mineral assemblages of the dolerite rocks are divided into plagioclase (SiO₂ rich rocks) and plagioclase + clinopyroxene (SiO₂ poor rocks). Upper most and bottom part of sills consist of mafic rocks, middle part of sills repeated layers of felsic and mafic rocks. These features suggest that the multiple sills body may indicate marginal facies of the cross section of magma chamber characterized by layering in gabbro plutons.

Among the igneous rocks in the Yufutsu Oil and Gas Field, a subset of the Oligocene volcanic rocks in the Minami-Naganuma Formation underlain by the Late Eocene Poronai Formation is distinctive on the basis of markedly high incompatible element abundances. The dolerite rocks also show an enrichment in incompatible elements. The similarity of geochemical signature in the Oligocene volcanic rocks and the dolerite sills suggests that the former exhibits effusive facies and the latter has played the role of parent magma chamber emplacing in the Poronai Formation and the Ishikari Group.