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High grade metamorphic rocks from the Dibut Bay Meta-ophiolitic Complex, Philippine.

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This paper describes occurrences and petrography of amphibolite, garnet-amphibolites, and garnet-clinopyroxene metabasite from the Dibut Bay Meta-ophiloitic Complex (DBMC) of Cretaceous in age at Baler, Aurora Province (northeastern part of Luzon Island), Philippine.

Regional Geology

The Philippine Island Arc is divided into a relatively aseismic region, called the Stable Region and a seismically active Philippine Mobile Belt (PMB) (Gervasio, 1967). The PMB represents an orogenic belt that resulted from the accretion of several different terranes. On the eastern part of this belt lies the Northern Sierra Madre magmatic arc where the study area is located. The Northern Sierra Madre magmatic arc is generally described as a Middle Eocene to late Olgiocene volcano-sedimentary unit that is intruded by the gabbroic Coastal Batholith. The coastal area is predominantly underlain by peridotites, gabbros, basalts and minor pelagic sediments collectively referred as the Isabela-Aurora Ophiolite (Tamayo et al., 2001). The Dibut Bay Meta-ophiolitic Complex is one of the Isabela ? Aurora Ophiolite.

The Dibut Bay Meta-ophiolitic Complex (DBMC)

The dominant lithology of DBMC in the study area is variably serpentinized peridotites (dunite and lherzolite) that host pyroxenites (clinopyroxenite and olivine websterite) pods and veins. In the southern part of the study area, we newly found high-grade metamorphic rocks at Disgosip area. The contact with the ultramafic body was not observed, hampered by a steep coastal cliff. The metamorphic rocks consist mostly of amphibolite and garnet-amphibolite with small amounts of garnet ? quartz amphibolite and garnet ? clinopyroxene metabasite. Billedo et al.(1996) dated a garnet amphibolites from Alsanay, south of Dibut Bay, to be 92 Ma by Ar/Ar method for hornblende.

Petrography

The amphibolite is composed of green hornblende (pargasite), plagioclase and quartz. Plagioclase is completely decomposed into an aggregate of clinozoiste and albite. The garnet amphibolite has the same mineralogy as that of the amphibolite with only a difference in the presence of significant amount of garnet. Garnet ? quartz amphibolite is mainly composed of plagioclase and quartz with small amounts of garnet and pargasite. Garnet ? clinopyroxene metabasite consists mainly of garnet, clinopyroxene, brown hornblende, green actinolite, plagioclase, and quartz with small amounts of phengite, rutile, ilmenite and titanite. Garnet is homogeneous without a notable zoning in all rock types. The composition ranges from Prp15Alm60Grs23Sps2 in garnet amphibolite to Prp32Alm62Gr5Sps1 in garnet ? quartz amphibolite. Garnet from the garnet-clinopyroxene metabasite shows a composition of Prp18Alm57Grs24Sps1. Clinopyroxene from the same rock is augite (Wo32En38Fs30) with about 1 wt % of Na2O.

Discussion

The P-T condition of the garnet-clinopyroxene metabasite can be estimated to be about 880 C and 8.6 kbar by garnet-clinopyroxene thermometer and by garnet - phengite ? clinopyroxene barometer, respectively. The condition corresponds to the granulite facies very near to the transition from the amphibolite facies. This is also consistent with the occurrence of a

characteristic assemblage of orthopyroxene free garnet ? clinopyroxene ? plagioclase ? quartz as emphasized by Pattison (2003). The garnet ? hornblende geothermomter yields much lower temperatures ranging from 530 to 620 C for the garnet-amphibolite. The low temperature may represent re-equilibration under the amphibolites facies. The olivine ? spinel thermometry applied to the peridotites and pyroxenites gives temperatures between 550 and 620 C, which are consistent with those for the garnet amphibolites. Therefore the DBMC experienced two stages of metamorphism: the graulite facies followed by the amphibolite facies.

Keywords: high grade metamorphic rocks, garnet amphibolite, granulite, ophiolite