The Sibuyan Ultramafic Complex, Romblon (Central Philippines):A fresh perspective on abyssal peridotites

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Residual mantle rocks are often difficult to study because most of these are pervasively serpentinized due to exhumation related processes. Most fresh peridotites thought to be representative of the deep interiors of the Earth exist as mantle xenoliths carried to the surface by erupted host lavas. However, outcrops of ultramafic rocks in Sibuyan Island, Romblon, Central Philippines are recently discovered to be comprised of remarkably fresh spinel lherzolites and clinopyroxene-bearing harzburgites. Both lithologies occur in equal abundance. Spinel lherzolites are coarse-grained showing protogranular to porphyroclastic and at times, foliated textures. They consist of olivine, orthopyroxene, clinopyroxene and chromian spinel. Olivine crystals show undulose extinction and kink banding. Clinopyroxenes are large anhedral grains showing deformed and bent lamellae. Some of these grains are rimmed by smaller aggregates of olivine and orthopyroxene. Orthopyroxene porphyroclasts showing deformed lamellae reach up to 3 mm across. Smaller grains of spinel and olivine are noted as inclusions within these large orthopyroxene. Spinels are pale green in color and are vermicular in shape. Clinopyroxene-bearing harzburgites have protogranular to cataclastic textures. Olivine is clear and typically crisscrossed by serpentine veins and exhibits wavy extinction. Large porphyroclasts are dominantly orthopyroxene (˜2mm) with small olivine inclusions. Some of these are already altered and with bent lamellae. Clinopyroxene is rare and occurs as small (0.01mm) and dusty-looking anhedral grains. Spinel is also anhedral and usually seen as pale reddish brown blebs.

Preliminary major element data of the Sibuyan Ultramafics reveal characteristics typical of abyssal peridotites. The Cr# (=(Cr/Cr+Al)) of spinels in the spinel lherzolite plot at the low (0.2-0.3) end of the abyssal peridotite field. Spinels in the harzburgites show moderate Cr# ranging from 0.4-0.5 thus falling within the abyssal and forearc peridotite fields. Trace-element compositions of clinopyroxenes in the spinel lherzolites and clinopyroxene-bearing harzburgites are characterized by a steeply plunging LREE with humped MREE to flat HREE patterns (YbN/SmN=6.27-6.85 in lherzolite; LaN/SmN=0.14, YbN/SmN=5.03-6.58 in clinopyroxene-bearing harzburgite) typical of abyssal peridotites from mid-oceanic ridge environments.