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Eclogite in West Papua (Wandamen Peninsula), petrological and geochemical characterization : geodynamical implications

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The Lengguru accretionary wedge (West Papua) is located in a very active geodynamical context. It results from the oblique convergence between the Pacific plate and the Australian plate. All the wedge has been build between 11 and 2 Ma (Bailly et al., 09). Exceptional boulders of fresh eclogites were discovered in the internal part of the Lengguru wedge, in the so called Wandamen peninsula. The Wandamen peninsula displays an increasing metamorphic gradient from West to East. This metamorphic peninsula may also be regarded as the continuation of the inner part of the Central range of Papua New Guinea farther east. The eclogites area embedded in metasediments that present similarities with Mesozoic and Cenozoic sediments of the Australian margin in the continuation of Lengguru wedge.

According to geochemical analysis of major and traces elements on the two freshest eclogites, their protolith has a Fe-Ti gabbroic composition. The CIPW norm of these rocks suggest a protolith, with 32% of pyroxenes, 47% of anorthite, less than 3% of olivine, with 7% of ilmenite and 7% of magnetite.

Major elements show a tholeiitic characters. Traces elements suggest a T MORB signature with a high content of TiO2.

The eclogites are medium to coarse grained. The metamorphic paragenesis consists of clinopyroxenes, garnets, amphiboles, rutiles, quartz and accessory minerals like apatites.

Clinopyroxenes with omphacitic composition (XJd: 0.3-0.4) are poecilitic, rare textures of retrogression (symplectites) are observed. Symplectites are composed by diopside or Na-Ca-Fe pyroxene XJd (0.18) and albite, locally calcic amphiboles can replace the clinopyroxene.

Garnet of several millimeters (3-4 mm) result from the aggregation of smaller euhedral crystals (500-700 μm). Some of them display atoll microstructure and exhibit a core filled by omphacite, slightly green amphibole, or by quartz. They contain minute inclusions of omphacite, amphibole, apatite, quartz. Many rutiles exsolutions are observed within the garnets, suggesting high metamorphic conditions. Garnets have a mixed composition between almandine and grossular.

Inclusions of quartz in both garnet and omphacite are surrounded by fractures suggesting the previous occurrence of coesite.

The sodic calcic and calcic greenish amphiboles are also important minerals of these eclogites.

The PT conditions deduced from the eclogitic paragenesis are 14$\pm$3 kbar, 650$\pm$50°C.

The Lengguru accretionary wedge has been active during 8 millions years, (between 11 and 2 Ma). So far we do not know the age of eclogitisation. However it is probably related to the accretionary wedge. Miocene pebbles were found engulfed within unmetamorphozed conglomerate (no metamorphic or magmatic pebbles were in the conglomerate) that overlies the eastern flank of the Wandamen massif suggesting that exhumation of eclogite was active after Miocene. Most of blueschist and eclogitic rocks in the world require at least 15 Ma for their formation and exhumation. These eclogites require the exceptional rapid process.

Agard, P.,Yamato, P., Jolivet, L., Burov, E., (2009) Exhumation of oceanic blueschists and eclogites in subduction zones:Timing and mechanisms, EPSL, , 53–79

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