Geochemical fingerprint of an Oligocene to Miocene arc segment in Eastern Mindanao (Philippines)

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The Oligocene to Miocene arc segment in central Eastern Mindanao (Philippines) is part of the Philippine Mobile Belt (PMB) and is related to the low sulfidation epithermal Co-O mine. The PMB constits of the Paleogene volcanic Philippine arc and accreted crustal framgents from the Eurasian plate [1]. This sudy of the Co-O magma suite addresses the geochemical fingerprint of this arc segment, inlcuding the nature of the mantle wedge, involement of subducted material such as sediment or crustal fragments (form the Eurasian plate) and relationships between geotectonic setting and ore forming processes.

The Co-O magma series displays typical island arc geochemical patterns highlighted by the conjunction of LREE-enrichment with depletion of Nb, Ta and Ti. The igneous rocks are dominantly calc-alkaline magma series (andesites and dacites), with some tholeiitic trends for basaltic rocks. There are no significant enrichment of LILE or LREE when compared to younger Pliocene magmas of the Philippines. Nb contents and Zr/Nb ratios (x-y) of the basalts are comparable to other primitive arc magmas in the Pacific (e.g. Marianas) signifying a MORB-like mantle wedge. Th/Ce values below 0.1, and Th/La ratios similar to the Marianas (that are close to mantle values), rule out sediment melting or seamounts on the slab. This magma series involved thin arc crust in an intraocenaic arc setting related to a potentially intermediate to steep dipping subduction zone in an extensional to neutral geochtectenic remige, without addition of rifted fragments or continental crust. The Co-O gold mine has relatively high base metal contents and is comparable to other low sulfidation deposits genereated in a neutral geochtectonic arc regime and is potentially in transition to a porphyry deposits, in contrast to bimodal volcanism in back-arc regimes [cf. 2]. However, the low to medium K Co-O magma series varies partly from other arc magma series related to low sulfidation epithermal systems due to its lack of 'crustal contamination'.

[1] Pubellier *et al*. (1991) *J Southeast Asian Earth Sci* **6**, 239–248. [2] John (2001) *Econ Geol* **96**, 1827–1853.

Origin of nepheline-normative primitive magmas in island arcs

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Here we address the question of the origin of Si-undersaturated arc magmas, although they are rarely emitted on Earth surface, through a systematic on major and trace elements in primitive olivine-hosted melt inclusions. Samples are Mg-rich basalt to ankaramite lavas and lapilli scoriae from different volcanic arcs (Vanuatu, Lesser Antilles, Indonesian, Luzon and Aeolian arcs).

Melt inclusions display trace element patterns typical of arc-related calk-alkaline basalts, with variable enrichments in LILE, Sc (20 to 90 ppm), and La/Yb or Nb/Y ratios ranging from 1 to 18, and from 0.1 to 0.3, respectively. In CMAS projections, the melt inclusions delineate a trend linking two well-defined end-members strongly or poorly enriched in diopside component.

As a whole, the melt inclusions provide snapshots of instantaneous melts recording a compositional diversity of primitive magma batches, which requires the multi-stage mixing between melts generated by partial melting of peridotite and amphibole-bearing clinopyroxene-rich lithologies. This hypothesis is also supported by trace element models including Sc and incompatible element ratios, where melt inclusions form mixing trend between the two lithologies. We conclude that amphibole-bearing clinopyroxenite, occuring as metasomatic segments in the upper mantle of island arcs [1, 2], could be a suitable source for Ne-normative, Di-rich melt inclusions found in arc environments [3-7]. The progressive melting of these lithologies and surrounding peridotite could account for the geochemical characteristics of the studied melt inclusions.

[1] Pilet *et al*. (2008) *Science* **320**, 916–919. [2] Pilet *et al*. (2009) *Contrib. Mineral. Petrol*. **5**, 621–643. [3] Gioncada *et al*. (1998) *Bull. Volcanol*. **60**, 286–306. [4] Métrich *et al*. (1999) *EPSL* **167**, 1–14. [5] Schiano *et al*. (2000) *G3* **1**, n°5, 1018. [6] Médard *et al*. (2006) *J. Petrol*. **47**, 481–504. [7] Elburg *et al*. (2007) *Chem. Geol*. **240**, 260–279.