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Highly siderophile element geochemistry of Phanerozoic komatiites and related mafic-ultramafic rocks in Gorgona island, Columbia.

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Gorgona Island, Columbia is recognized as an important site for understanding mantle evolution since it represents an exceptional occurrence of virtually unaltered lavas of Phanerozoic komatiite preserving spinifex-texture. However, relationships with other members of igneous complex present in Gorgona remain unclear. Here we present whole-rock Re-Os isotopic systematics and highly siderophile element (HSE) abundances of (1) Gorgona komatiites, (2) picrites, and (3) plutonic rocks with mafic-ultramafic compositions (dunite, wehrlite, and olivine gabbro) to investigate the origin of Gorgona Igneous Complex as a whole.

Our data demonstrate that initial $^{187}Os/^{188}Os$ ratios obtained from studied rocks are uniform within the range of the chondritic mantle evolution curves, while HSE abundances of the three groups follow individual fractionation trends. For instance, picrites tend to have lower S, Pt, Pd, and Re than those in komatiites and plutonic rocks at a given MgO content. Ru contents in all three groups exhibit positive correlations against Cr contents, but the slopes of correlation lines are systematically different between komatiites and plutonic rocks. From these data, we envisage that the plutonic rocks and komatiites are comagmatic, but the picrites formed by different melting stages.

Previous studies found that picrites are depleted in lithophile trace elements relative to those in komatiites, and a multistage melting model has been proposed to explain their distinct signatures [1, 2]. The model is that parental melt of picrites was formed by re-melting of an extremely depleted source that had exhausted a large volume of partial melts such as komatiite. S, Pt, Pd, and Re depletions observed in picrites can be accounted for by this model if the source of picrite were residue after sulfide exhaustion. On the other hand, no distinct variations in Ru contents between komatiites and picrites may infer that the bulk solid-liquid partition coefficient for Ru was close to unity during high degrees of partial melting.

[1] Arndt et al. (1997) *Earth and Planetary Science Letters*, 146, 289-301

[2] Robin-Popieul et al. (2012) *Journal of Petrology*, 53(11), 2191–2229.