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# Ultramafic-hosted volcanogenic massive sulfide deposits: an overlooked sub-class of VMS deposits forming in complex tectonic environments?

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Ongoing seafloor exploration highlights that ultramafic-hosted volcanogenic massive sulfide deposits (VMS) are ubiquitous along slow to ultra-slow spreading ridges. These deposits are closely linked to oceanic core complexes, are hosted in variably altered ultramafic rocks and are enriched in precious (Au-Ag) critical (Co) and base metals (Cu-Zn-Ni). Ultramafic-hosted VMS deposits, however, are commonly thought to be scarce on land, which contrasts with the results of a detailed literature review showing that more than thirty deposits exist. These deposits occur in complex tectonic settings often referred to as "tectonic mélange", and their origin is often disputed (e.g. hydrothermally overprinted magmatic Ni-Cu massive sulfide) due to a late orogenic overprint that partly erase and/or overprint earlier seafloor-related features. Their uncommon host rocks and ore mineralogy for VMS deposits and the limited awareness of scientific and industrial community make them difficult to interpret. Furthermore, although seafloor exploration greatly improved our understanding of these deposits, it also induced a strong bias by focusing almost exclusively on mid-ocean ridge (MOR) environments. Ultramafic-hosted VMS deposits on land, however, mostly occur in settings more recently interpreted as ocean-continent transitions (OCT) and/or supra-subduction zones, which, ultimately, are more easily obducted and susceptible to preserve the deposits. In this study we review more than thirty ultramafic-hosted massive sulfide deposits present worldwide in the geological record and discuss the key features which enable to unambiguously classify them as ultramafic-hosted VMS deposits. Differences in metal endowment is observed between tectonic environments and deposits from supra-subduction environments tend to be more enriched in Ni-Co than the ones from MOR and OCT settings. Because of their unique nature and metal endowment, the ultramafic-hosted VMS deposits should be considered as a self-standing sub-group of VMS deposits, which represent untapped mineral resource with high future potential. Finally preliminary results from deposits on land highlight that hydrothermal system on the seafloor in an ultramafic substrate can occur in very diverse environments and should drive further seafloor exploration in less well explored tectonic environments such as ocean-continent transition and supra-subduction zone (e.g. hyperextended forearc).