"Beds rather than regular veins or lodes": VMS deposits, plate tectonics and the emergence of metallogeny in central Newfoundland

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Alexander Murray's recognition of the sedimentary nature of VMS deposits in Newfoundland may have been the first important metallogenic insight from the study of these deposits. But it was certainly not the last.

The Appalachian Orogen in Newfoundland provides exceptional exposure and preservation of the tectonic elements of a Paleozoic orogenic belt. The Cambrian and Ordovician volcanic sequences of central Newfoundland are abundantly endowed with VMS deposits that exhibit a wide variety of geological characteristics and settings. They provide a world-class laboratory for the study of VMS deposits in their tectonic context. Given the prominence of Newfoundland in early plate tectonic interpretations of orogenic belts, it is not surprising that Newfoundland VMS deposits have played a prominent role in global metallogenic analysis since the early 1970's. VMS metallogeny has both benefited from, and made significant contributions to, our evolving understanding of the tectonic history of the orogen.

Metallogenic analysis of Newfoundland's VMS deposits originally focused on data that was readily available; the geological character of the host rock sequences, the stratigraphic setting of the deposits, and their relative metal contents. Deposit level studies and detailed mapping of the volcanic sequences, particularly by MUN graduate studies in the early 1970's, were critical in documenting the nature and volcanic affiliation of the various deposits. Early metallogenic analyses used these data to postulate tectonic settings for the various deposits, using modern island arcs, back arc basins and oceanic ridges as models.

Lead isotope studies of the ores and early lithogeochemical studies of the host rocks provided some of the first indications that simplistic, single-stage models of the development of Iapetus and its associated metallogeny were untenable. For example, the recognition of a first order break in lead isotope compositions in VMS deposits between the eastern and western parts of the central mobile belt played a key role in the recognition of the Notre Dame and Exploits Subzones. This led to the realization that some volcanic sequences had apparently formed in widely disparate parts of Iapetus. However, it was precise U-Pb dating and detailed trace element and isotope petrochemical studies beginning in the 1980's that clearly demonstrated the temporal, geological and tectonic complexity of the volcanism and its associated VMS deposits and provided precision and improved resolution to the tectonic and metallogenic interpretations.

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