



Samatosum
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MINISTRY OF ENERGY, MINES
AND PETROLEUM RESOURCES

Geological Survey Branch
200-756 Fort Street
Victoria, B.C.
V8V 1X4

FAX: (604) 356-8153

Date: June 18/90

Time: 3:20 PM

Please deliver the following message :

FAX TO # 681-3360

Ian Pirie

Minnova Inc

FROM: Paul Schwarz

Telephone: 356-2831

G513, 200-756 Fort St. Victoria

COMMENTS: I've already distributed this memo to your staff in Barrise & the brass here in Victoria. Ron Smyth & Vic Oreta want me to re-write it into a short article for "Exploration in B.C." (due to go to press in about a week!). I will

Number of pages 9 including cover sheet.

send you a copy of the "Final" article before submitting it; but do you have any comments/objections before I start.

MEMO

To: W.J. McMillan, V.A. Preto,
T. Hoy, W.R. Smyth,
R. Meyers (BCMEMP)

From: P. Schiarizza
June 14, 1990

D. Heberlein, J. Bradford,
J.K. Glover, I. Pirie (Minnova)

re: Visit to Minnova's Samatosum Mine, May 29-30, 1990

Over the past several years I have written, talked and argued about the stratigraphic/structural setting of the recently discovered (1983-1985) Rea Gold and Samatosum deposits. On May 29-30 I finally got the opportunity to visit the deposits, courtesy of Minnova Inc. Following is a brief summary of my impressions, particularly as they pertain to the stratigraphic framework for the area established by Schiarizza and Preto (1987).

Background

The Rea and Samatosum deposits occur within a metasedimentary/metavolcanic package loosely referred to as the Mine Series (Friesen, 1990, see Figure). These rocks were not exposed during our regional mapping program, but occur roughly along what we inferred to be a major thrust fault separating Cambrian rocks from structurally underlying Devono-Mississippian rocks (Schiarizza and Preto, 1987). Attempts to fit the lithologic units subsequently recognized within the Mine Series (mainly from diamond drill holes) into our regional stratigraphic framework has led to much controversy over which package(s) the Samatosum and Rea best fit into, and whether or not there is actually a major structural break corresponding to our inferred Haggard Creek thrust fault.

Structurally beneath the Mine Series is a heterogeneous succession of intercalated and structurally imbricated

felsic to intermediate metavolcanics and clastic metasediments that is regionally persistent and is dated as Devono-Mississippian (Devonian U-Pb on zircons from felsic volcanics and intrusives; and Mississippian conodonts from rare limestone lenses within the sediments). This Devono-Mississippian package hosts a number of VMS-style occurrences within the region, including the Homestake deposit in the immediate vicinity of Rea-Samatosum. Lead isotopes from the Homestake and other occurrences of this type define a cluster with a Late Devonian model age on the "pericratonic" growth curve established by Goutier (1986).

Structurally above the Mine Series is a thick succession of generally calcareous chloritic schists (derived from mafic volcanic flows, pillowed flows and breccias) with local intercalations of cherty and calcareous metasediments, and light grey limestone beds, including the very thick, regionally conspicuous Tshinakin limestone member. This succession is also regionally persistent, and is distinct from the Devono-Mississippian succession in both the nature of the volcanics (mafic rather than felsic and intermediate) and the sediments (in particular the presence of thin to very thick accumulations of light grey limestone). This succession has not been dated in the Rea-Samatosum area, but is correlated with a very similar succession that outcrops in the Vavenby area, 50 kilometres to the north, where a thick limestone unit correlated with the Tshinakin (and enclosed within mafic metavolcanic rocks identical to those above and below the Tshinakin) has yielded Early Cambrian archaeocyathids.

Observations Concerning the Mine Series

The Mine Series comprises a structurally complex interval of mainly cherty, argillaceous (locally dolomitic and tuffaceous) metasediments. It locally includes

feldspathic, intermediate tuffaceous rocks, and structurally above the Rea horizon includes a thick interval of mafic metavolcanic rocks (the Rea mafics). The metasedimentary intervals at Rea and Samatosum are very similar, suggesting that they are part of the same package. The Rea deposit is an overturned VMS, while the Samatosum is a quartz vein system, speculated by some to be part of a veined stockwork system related to a VMS. Lead isotopes from the two deposits are identical, and fall in the Late Devonian (VMS) cluster of Goutier (1986).

Although not exactly typical, and despite much severe alteration and deformation, observations made during my brief visit (as well as discussions with Minnova staff and consultants) suggest that most of the rocks within the Mine Series belong to the Devono-Mississippian part of the Eagle Bay package (specifically units EBF and EBP of Schiarizza and Preto, 1987). This is consistent with the VMS nature of the Rea mineralization and the lead isotope data from both Rea and Samatosum. The Rea mafics, however, are in large part lithologically identical to the thick package of mafic metavolcanic rocks structurally above the the Mine Series (referred to as the Sam mafics by Minnova geologists) which Schiarizza and Preto (1987) assign a Cambrian age. (I felt, however, that some rocks assigned to the Rea Mafics, and also the lowest part of the Sam mafics, more resembled feldspathic Devono-Mississippian volcanics. These distinctions might be important when defining contacts as in hypotheses 1 and 2 below).

Implications

While acknowledging that the Rea mafics are lithologically identical to the Sam mafics, I remain very confident that the bulk of the succession structurally above the Samatosum deposit (Tshinakin limestone and enclosing

mafic metavolcanic rocks) is correlative with the Lower Cambrian succession near Vavenby. I stress that this correlation is not just between the two thick limestone units, but rather is based on the lithologic similarity of the entire packages - in particular the association of mafic volcanic rocks and light grey limestone. The intimate nature of this association is apparent in the Rea-Samatosum area because: (1) The Tshinakin limestone is both underlain and overlain by Sam-type mafic metavolcanics; (2) at the one place where I actually saw it, the basal Tshinakin contact is gradational, comprising intercalated limestone and mafic volcanics for several tens of metres beneath the main limestone contact; and (3) thin beds of light grey Tshinakin-type limestone occur locally within the mafic metavolcanics for several hundred metres beneath the Tshinakin limestone.

The Cambrian age thus assigned to the mafic volcanic succession suggests that it is unrelated stratigraphically to the underlying Mine Series, the bulk of which (metasedimentary rocks, intermediate feldspathic metatuffs, Rea VMS mineralization, and presumably Samatosum vein mineralization) is inferred to be Devonian-Mississippian in age. This conflicts with interpretations derived from detailed work on the Mine Series itself, where the lithologic similarity between Rea and Sam mafics has led some (most?, all?) Minnova geologists to regard the entire succession, from the clastics in the footwall of Rea into the Sam mafics as a single (albeit heterogeneous and strongly deformed) package, presumably of Devonian-Mississippian age on the basis of the lead isotopes.

Following are three hypotheses that might be entertained regarding the structural/stratigraphic relationships in the Rea-Samatosum area. They all start from the premise that the Tshinakin limestone and enclosing mafic metavolcanic rocks are Cambrian in age, while the bulk of the Mine

Series, including VMS and related mineralization, is Devonian-Mississippian. These assumptions reflect my strong convictions regarding the ages of these packages; if one or the other of these age assignments is invalid then much simpler scenarios are possible.

Hypothesis #1: All mafic metavolcanic rocks that are lithologically similar to the Lower Cambrian volcanics are, in fact, Lower Cambrian - thrust imbrication version. The basis of this interpretation is the strong lithologic similarity of the Rea and Sam mafics to known Lower Cambrian metavolcanics in the region, and absence of proven Devonian-Mississippian volcanics of that lithologic nature. This suggests that there is a major thrust fault between the Sam mafics (which are part of the Cambrian Tshinakin package) and the underlying Mine Series, as well as important footwall imbricates that bound the Rea mafics (also Cambrian) and separate them from Devonian-Mississippian Mine Series rocks. Such structural imbrication is conceptually reasonable since the Mine Series appears to be a lense along what, in this interpretation, is a major thrust fault, and is clearly strongly deformed by overturned folds and thrusts (J.K. Glover's interpretation of diamond drill core). Such imbrication is problematic, however, because extensive diamond drilling does not provide evidence for major structural breaks between the Rea mafics (or the Sam mafics for that matter) and other rocks of the Mine Series (Hoy and Goutier, 1986; J.K. Glover, pers. comm., 1990).

Hypothesis #2: All mafic metavolcanic rocks that are lithologically similar to the Lower Cambrian volcanics are, in fact, Lower Cambrian - unconformity version. If, as in hypothesis #1, we allow that Cambrian metavolcanic rocks can be distinguished lithologically from the Devonian-Mississippian volcanics, but do not believe that there are any major thrust faults in the Mine Series, then perhaps the

Devono-Mississippian succession sat unconformably above the Cambrian package (including Rea mafics). This scenario is not entirely contrived because farther north, between the Barriere River fault and Clearwater, Devono-Mississippian Eagle Bay rocks do sit directly above metasedimentary and metavolcanic rocks that are correlated lithologically with the Lower Cambrian package (Schiarizza and Preto, 1987). It requires that the VMS mineralization developed in a predominantly sedimentary package with a relatively minor volcanic component, above a basement of distinctly older and genetically unrelated mafic volcanics. In this scenario a fairly major thrust fault might separate the Mine Series (and underlying turbidites?) from the thick Devono-Mississippian volcanic succession structurally lower in the section.

Hypothesis #3: The entire Mine Series, Including Rea Mafics, is Devono-Mississippian. This scenario would allow the entire Rea-Samosum succession, including the Rea mafics, to be part of a single (imbricated and folded) volcanic-sedimentary package. It requires that the Rea Mafics (Devono-Mississippian) are unrelated to lithologically identical mafic metavolcanic rocks intercalated with the Tshinakin limestone (Cambrian). This would still require a major thrust fault somewhere higher in the section. This thrust could be directly above the Mine Series (Sam mafics are Cambrian), or it could be still higher in the section, such that the Sam mafics are equivalent to the Devono-Mississippian Rea mafics, but are structurally overlain by lithologically similar Cambrian metavolcanics (and intercalated metasediments - including the Tshinakin and related limestones) across a cryptic thrust fault.

References

Friesen, R.G. (1990): Geology of the Samatosum Deposit; in Mineral Deposits of the Southern Canadian Cordillera, Notes to Accompany Field Trip B2, GAC-MAC Joint Annual Meeting, Vancouver, 1990.

Goutier, F.G. (1986): Galena Lead Isotope Study of Mineral Deposits in the Eagle Bay Formation, southeastern British Columbia; unpublished M.Sc. thesis, the University of British Columbia, 152 p.

Hoy, T. and Goutier, F.G. (1986): Rea Gold (Hilton) and Homestake Volcanogenic Sulphide-Barite Deposits, southeastern British Columbia; British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork 1985, Paper 1986-1, p. 59-68.

Schiarizza, P. and Preto, V.A. (1987): Geology of the Adams Plateau-Clearwater-Vavenby area; British Columbia Ministry of Energy, Mines and Petroleum Resources, Paper 1987-2, 88 p.

SW

NE

P. 9

Very schematic (i definitely not to scale) section through Rea-Samatosum extending from above Tshinakin 1st (NE) to felsic schists that host Homestake deposit (sw)

