Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.4178

Release of CO_2 from the hydrothermal organic carbon maturation during the late Paleoproterozoic to early Mesoproterozoic maximum in sediment-hosted massive sulfide mineralization

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The late Paleoproterozoic to early Mesoproterozoic era is the dominant period of Earth's history during which clastic-dominant (CD) massive sulfide deposits, traditionally referred to as sedimentary exhalative (sedex) type, formed [1]. Despite their abundance, the link between mid-Proterozoic CD-type deposits and the Earth's surface redox conditions remains poorly understood. It is well known that coeval seawater sulfate has a significant contribution to ore sulfide by hydrothermal sulfate reduction (HSR), during which sulfate is reduced by organic matters and/or hydrocarbons to H_2S and CO_2. The moderately negative $\delta^{13}C$ values of carbonate in sediment-hosted massive sulfide deposits may be explained by the interaction of the hydrothermal fluid with the host sediment. In view of its magnitude , an increased CO_2 flux from hydrothermal organic carbon maturation in the dominant period of Earth's history during which CD-type deposits formed may strengthen greenhouse forcing through transfer of CO_2 to the atmosphere. This strengthens the inextricable link between the emergence of significant CD Pb-Zn deposits [1] and the carbon cycle dynamics as well as the Earth's surface environment during the late Paleoproterozoic to early Mesoproterozoic era. The subsequent substantial rise in atmospheric CO_2 concentration would support enhanced continental weathering, with the potential to drive further reinforced nutrient delivery and therefore increase the primary productivity, together with the flux of nutrients and metals delivered to the ocean by hydrothermal fluids. , the release of CO_2 from the hydrothermal organic carbon maturation results in the transfer of sedimentary C into the ocean–atmosphere system as CO_2. This CO_2 source associated with Mid-proterozoic significant sulfide mineralization should be considered a potentially important but as yet generally unrecognized component of the long-term carbon cycle.

[1]Leach, Bradley, Huston, Pisarevsky, Taylor & Gardoll (2010), Economic Geology 105, 593–625.