Volcanogenic Massive sulfide (VMS) deposits from the Eastern Desert of Egypt: a comparative mineralogical and geochemical study

HASSAN M. HELMY

Geology Department, Faculty of Science, Minia University, Minia, Egypt

Volcanogenic massive sulfide (VMS) deposits are known in many localities in the Eastern Desert of Egypt, i.e., Um Samiuki, Helgate, Maaqal, Derhib and Abu Gurdi. Massive and disseminated sulfides are present in all localities, however many differences among these deposits do exist. The comparative geological, mineralogical and geochemical studies enabled the distinction of two groups:

1) The first group, Um Samiuki, Helgate and Maaqal are hosted in felsic volcanics and pyroclastics in a certain stratigraphic level in the Shadli Metavolcanics. Although massive sulfides of these deposits are located along fault zones, disseminated sulfides are encountered in the metavolcanics. Sphalerite, chalcopyrite, pyrite and galena are the major sulfides. Sphalerite is Mn-rich (up to 5.5 wt.%) and Cd-poor (<0.1%) and shows a wide range of Fe content (from 0.5 to 4.5 %). Galena is pure PbS, no Ag or Se was detected. Tellurides are represented by Ag-tellurides. Gangue minerals are Mn-minerals, barite, calcite, talc and Mn-chlorite. Geochemically, these deposits are Zn-dominated.

2) The second group is represented by Derhib and Abu Gurdi, the sulfides are located along major shear zones crossing ophiolite succession. No primary depositional features were observed, metamorphic and deformational features are dominant. Chalcopyrite, pyrite, sphalerite and galena are common. Sphalerite is enriched in Cd (up to 5.1 %) and depleted in Mn (<0.3%). It shows a bimodal distribution of FeS (2.1 and 9.3 mol.% FeS). Galena is generally enriched in Se (up to 7.2%). Ag, Pb and Bi tellurides are present. These deposits are Cu-dominated.

It is concluded that the first group is genetically related to the hosting island arc volcanics while the second group is connected to ophiolite succession and were later modified during tectonism and metamorphism. The differences in telluride mineralogy, trace element contents of sulfides and ore chemistry reflect the magmatic environments at which the ore-forming fluids were originated and the post-magmatic processes.

Northern Hemisphere Winds during Heinrich Events

SIDNEY R. HEMMING

Department of Earth and Environmental Sciences and Lamont Doherty Earth Observatory of Columbia University, Rt. 9W, Palisades, NY 10964 USA

High-resolution records around the globe show evidence for millennial-scale climate variability. A major question is what drives these changes and how they are correlated. Competing views of climate drivers of millennial-scale variability are forcing from northern latitudes via changes in the strength of North Atlantic overturning and forcing from the tropics.

A growing literature is emerging with credible evidence for correlation of Heinrich events with abrupt climate changes in diverse northern hemisphere sites. The North Atlantic's Heinrich events are layers of extremely high flux of ice-rafted detritus (Heinrich, 1988), most simply interpreted as armadas of icebergs launched from the Hudson Strait region. Most of the individual studies of sites, outside the North Atlantic ice-rafting zone, conclude that the Heinrich-correlated events are caused by changes in winds; stronger Trade winds in the tropics (e.g., Arz et al., 1998), stronger Monsoon winds in China (e.g., Porter and An, 1995) and the Arabian Sea (e.g., Schultz et al., 1998), stronger northerly winds in the western Mediterranean (e.g., Cacho et al., 1999). It is far less clear if there are truly correlatives to the Heinrich events in the southern hemisphere, although Chilean moraines appear to correspond to the youngest three (Lowell et al., 1995).

When compared to the ambient glacial conditions, there appears to be a general pattern of tendency of wetter (milder?) conditions along the western North Atlantic margin during Heinrich events. In contrast more extreme cold/dry glacial conditions prevailed during Heinrich intervals on the eastern North Atlantic margin and western Mediterranean. The pattern of difference compared to ambient glacial may provide important clues to the driving forces of these abrupt climate changes.

References

Arz, HW, Patzold, J, and Wefer, G, (1998) Quat. Res., 50, 157-166.

Cacho, I, Grimalt, JO, Pelejero, C, Canals, M., Sierro, FJ, Flores, JA, and Shackleton, N., (1999) Paleoceanography, 14, 698-705.

Heinrich, H, (1988) Quat. Res., 29, 142-152.

Lowell, TV, Heusser, CJ, Andersen, BG, Moreno, PI, Hauser, A., Heusser, LE, Schluchter, C., Marchant, DR, Denton, GH, (1995) Science, 269, 1541-1549.

Porter, SC, and An, Z, (1995) Nature, 375, 305-308.

Schultz, H, von Rad, U, Erlenkeuser, H, (1998) Nature, 393, 54-57.