ST.229
Metal Earth in Chibougamau: Neoarchean Magmatism and Its Importance for Mineralizing Processes

Lucie Mathieu
Université du Québec à Chicoutimi - UQAC, Chicoutimi, QC, Canada

Magmatic fluids are an important carrier of precious and base metals in many mineralized systems (porphyry deposits, intrusion-related gold systems – IRGS, volcanogenic massive sulfides – VMS). The importance of fluids exsolved from magmas remains a source of much debate for some contexts, such as IRGS and orogenic gold deposits. Also poorly quantified is the importance of intermediate to felsic magmatism in the metal budget of Neoarchean greenstone belts. These issues are addressed using the Chibougamau area, NE corner of the Abitibi greenstone belt, as an example, which is characterised (1) by an abundance of Cu-Au and Au magmatic-hydrothermal mineralizing systems (porphyries and IRGS). The Chibougamau area also (2) displays several TTD (tonalite-trondhjemite-diorite) suites, while TTG (TT-granodiorite) are more abundant in the rest of the Abitibi greenstone belt, as shown by a recent interpretation of geochemical data compiled at the scale of the Abitibi belt (Mathieu et al., 2020; doi. 10.3390/min10030242). Understanding the importance of magmatism in mineralising processes requires a comprehension of magmatic systems and notably of the physicochemical parameters that favor metal uptake by magma. This contribution will highlight some of the first measurements of oxygen fugacity and volatile content of Neoarchean magmas located in the Abitibi greenstone belt, using zircon and apatite chemistry. Through the measurement of these parameters, comparison between TTG and TTD suites, as well as sanukitoïds and alkaline magmatism, becomes possible, and a discussion of the potential amount of metals that these ancient magmas can carried is proposed.

Fig. 1. Schematic geologic model showing the distribution of mineralizing systems of the synvolcanic period – volcanogenic massive sulfide (VMS), porphyry and epithermal systems – and of the syntectonic period – intrusion-related gold system (IRGS) and orogenic gold system (OGS). Three main stages of the evolution of the Abitibi greenstone belt are shown: (a) synvolcanic; (b) early syntectonic; and (c) late syntectonic periods. Figure from Mathieu (2021) - doi. 10.3390/min11030261