



**TECHNICAL BULLETIN – THE APPLICATION OF
MMI GEOCHEMISTRY IN TROPICAL AND HIGH
RAINFALL ENVIRONMENTS**

AUGUST 1997

Introduction

A question often asked by explorationists and geologists using or considering the use of MMI and other geochemical exploration techniques is “does it (MMI geochemistry) work in tropical environments with very high rainfall?” Initial perceptions tended to be that surface soils anomalies would either be washed away and leached downward by the excessive rainfall or the high organic component of soils in these climates would inhibit metal movement and accumulation in surface material. This bulletin looks at some of the MMI surveys already conducted and investigates the movement and accumulation of mobile metal ions in these environments

Case Studies

The MMI Geochemical technique has been implemented at numerous case studies and orientation sites both in tropical and temperate rainforests climate areas. These areas are typically high in rainfall and have very high organic content in the soils. A number of the locations surveyed were in areas where topography was dominated by deep lateritic weathering. Three case studies, all from different regions but having high rainfall climates are presented below.

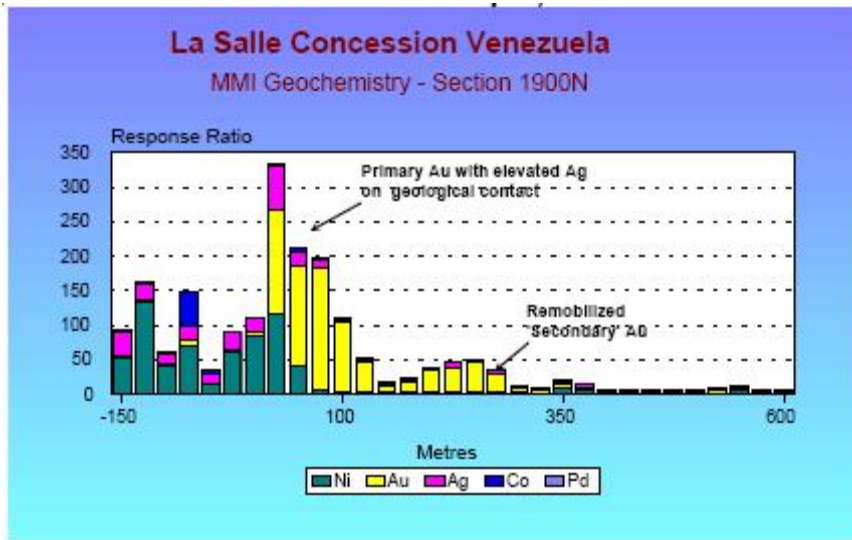
1) Tropical Climate: La Salle I Concession Gold Case Study, Venezuela, Sth America

Note: The La Salle case study has been written up as a complete report and is available from the MMI web site or MMI Technology.

The La Salle I Concession case study area is situated in a tropical equatorial jungle environment. The landform is very hilly with lower sheet wash plains. The area has soils that are typically high in organic matter. There is a deep lateritic weathering profile.

Figure 1 below is the MMI results across a traverse at La Salle, showing the high MMI Au and Ag responses over primary Au mineralization and the subdued Au response across the secondary or remobilized Au. The MMI technique has not only worked well in the tropical, deeply weathered lateritic environment but has been capable of distinguishing primary high grade Au from secondary low grade Au mineralization.

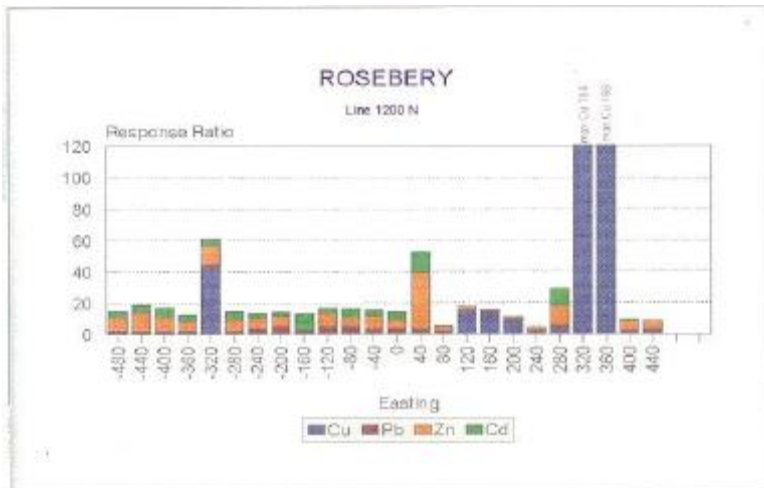
Figure 1. MMI traverse 1900N at La Salle Prospect, Venezuela.

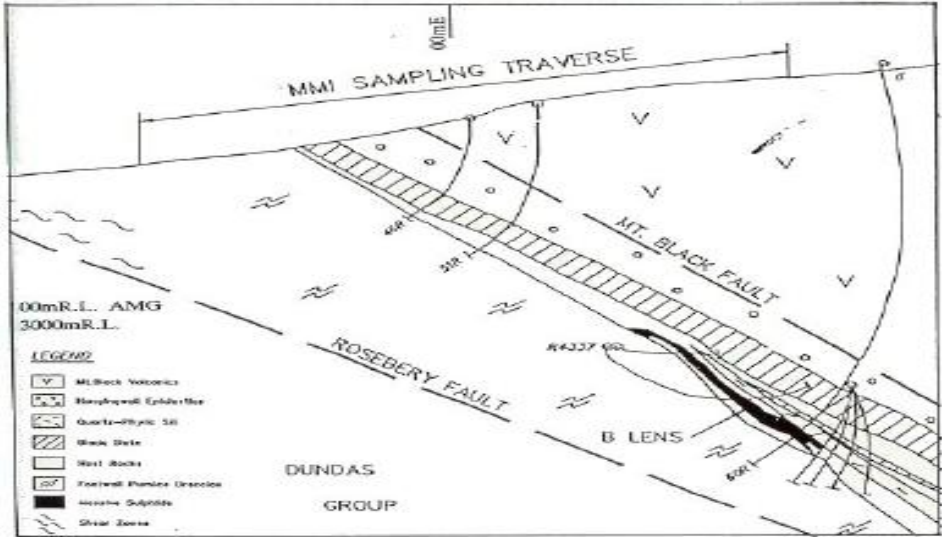


2) Temperate climate with high rainfall: Rosebery Base Metals Mine, Tasmania, Australia

The Rosebery base metal deposit is located on the west coast of Tasmania in an area of very high rainfall and dense temperate rainforests. Several MMI orientation lines were conducted across the Rosebery mineralization. Samples were collected from the A-horizon and contained a high proportion of organic material. The MMI results across one of the lines are shown in Figure 2.

Figure 2. MMI Sample traverse across the Rosebery orebody, Tasmania.





3) Alpine-Temperate Climate: Kilmelford Gold Copper Porphyry Case Study, Scotland

Note: The Kilmelford case study has been written up as a complete report and is available from the MMI web site or MMI Technology.

The Kilmelford case study area is situated on the west coast of Scotland. It is situated in alpine regions with steep topography and a very wet climate. The soil profile is dominated by a 1m thick humic layer. MMI Samples were collected from this organic rich layer and also from the glacial till A-horizon, which consisted of grits and clays.

The MMI worked well in both sample horizons. Figure 3 below is a traverse from one of the lines showing the strong MMI anomalies over two styles of mineralization at depth.

Figure 3. MMI Line 1 at Kilmelford, Scotland.

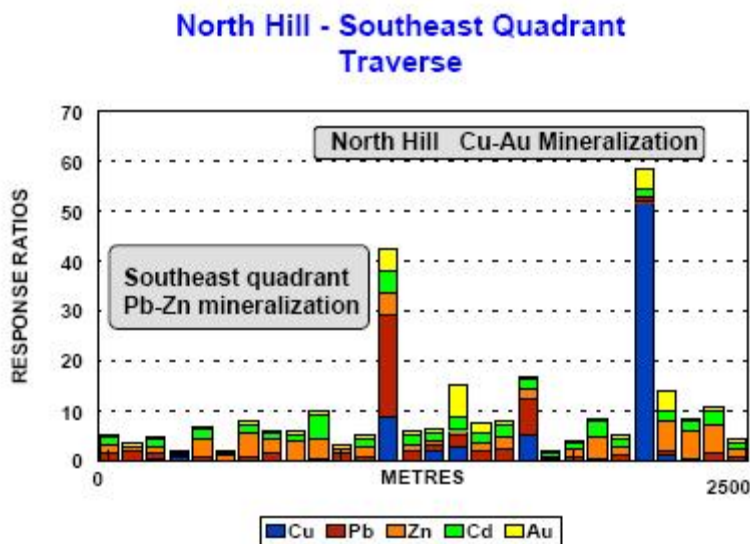


Figure 1 MMI Response Ratios for Line 1.

Discussion

Information from the orientation surveys that have been completed, indicate that MMI geochemistry is effective in tropical, temperate and alpine regions. This is despite the fact that these regions typically have high rainfall and the surface soils are dominated rich organic layers.

It is also apparent from case histories completed that climates with high rainfall and organically rich surface soil horizons provide an ideal environment for mobile ions to move and accumulate in the surface of the soil profile. This moist environment has a number of organic rich phases that facilitate the accumulation of mobile ions, but do not bind as strongly as normal pedogenic processes would. This environment near surface is even more conducive for migration and accumulation than that available in dryer climatic conditions. Within this environment, the ions migrate and accumulate at probably higher rates than in dryer climates, and these wet, climates probably represent an ideal environment to enhance the mobility of metal ions, and provide accumulation sites without strongly binding the ions within the soil components.

Interpretation of the geochemical responses is important, and from experience to date, element backgrounds from surveys in these environments may be higher than in arid environments. However, providing response ratios are used to interpret the data, the signal to noise, or anomaly to background, ratios are enhanced significantly.

Conclusion

The use of MMI geochemistry as a surface soil exploration technique in areas of high rainfall is an effective and cost saving technique for exploration companies. It has been shown that the surface material, often high in organic content, is capable of moving and accumulating metal ions migrating upward from depth despite very high rainfall in these areas. As opposed to “leaching” the metal ion from surface horizons, the movement of water and the ability of organics to adsorb mobile metal ions, appear to facilitate processes that create mobile metal anomalies.

However as with all surveys, sample collection should be done with care and it is always recommended that orientation samples over known mineralization are tested first to ensure correct sampling technique. Sampling depths should be kept consistent and from our experience and research the A-horizon, which may be rich in organic matter, is the optimum sampling horizon for MMI. The very top, loose layer of fresh material should obviously be removed and the sample taken below in a consolidated and “mature” part of the A-horizon.