THE APPLICATION OF MMI™ GEOCHEMISTRY IN DEEPLY WEATHERED LATERITIC ENVIRONMENTS

INTRODUCTION

A vast number of exploration areas particularly for Gold and Nickel, occur in landscape environments that are characterised by deeply weathered lateritic profiles. These lateritic environments can often be difficult to explore particularly when applying surface geochemistry. Low grade supergene mineralization formed from relocation and precipitation of weathered ore zones can create broad and displaced anomalies when using conventional geochemistry, which makes pin-pointing the primary ore zones very difficult.

Information from orientation surveys already completed has shown MMI™ geochemistry to be successful in landscapes dominated by deep lateritic weathering profiles. The case study sites have varied from areas characterised by hot, humid conditions with wet, organic surface soils through to areas with remnant duricrusts in arid environments. Some of the sites include areas in Australia, Venezuela, Surinam, Ecuador, Bolivia, Guyana, Cotê d'Ivor, Bukina Faso and Mali.

MMI™ RESPONSES

It is the ability of the MMI™ technique to selectively target mobile forms of metals in surface soils that enables the technique to define sources of metals at depth. It enables the MMI™ technique to discriminate between displaced conventional geochemical anomalies in lateritic environments, and anomalies associated with primary mineralization at depth. This is so because secondary mineralization, i.e. supergene blankets, are not an active source of metal ion (unless undergoing reweathering and re-mobilization) whereas primary sources will be releasing mobile ions at the weathering front which migrate to the surface.

Typical MMI™ anomaly patterns in deeply weathered lateritic terrain are shown in Figures 1 and 2. The expected response from primary gold mineralization, within a deep lateritic weathering profile with elevated supergene gold mineralization near surface, is shown in Figure 1. Although backgrounds can be elevated over supergene mineralization, the geochemical signal above the primary mineralization is clearly anomalous, and can provide a more precise drill target. There is often an elevated Ag response coincident with the Au anomaly over the primary source.

In variably dismantled landscapes that are usually characterised by a more complex surface regolith, (shown in Figure 2), displaced or false anomalies are common when applying conventional geochemistry.

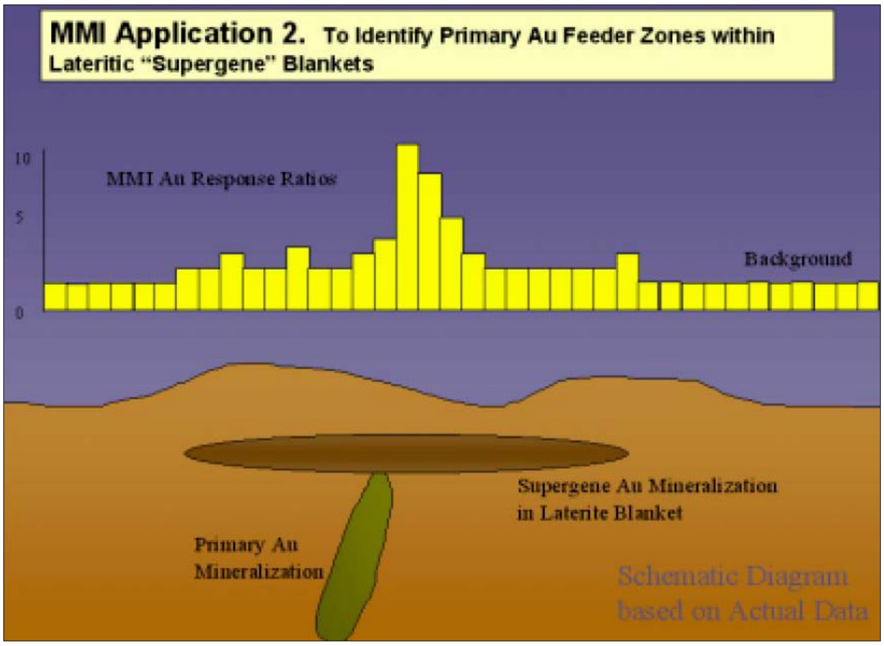

Figure 1: MMI™ Application 2

The ability of MMI™ geochemistry to assist in early drill targeting of primary sources in these more complex lateritic terrain has been demonstrated at the Golden Web Deposit (arid environment) and at the La Salle Concession, Venezuela (tropical environment). **

At Golden Web transported lateritic colluvium and alluvium as shown in Figure 3 obscured the position of the primary source. At La Salle (see Figure 4) MMI™ geochemistry not only discriminated primary from supergene Au mineralization using both Au and Ag responses, the Ni pattern defined a geological contact hosting the mineralization.

In both types of lateritic landscapes, tropical and arid, primary sources of metal ions can be detected through enriched surface and sub-surface supergene blankets using the MMI™ technique.

**The Golden Web case study (CS10) and the La Salle case study (CS02) reports can be obtained from the MMI™ web site or from MMI™ technology.

CONCLUSION

Applications in Lateritic Terrain

The prime application for MMI™ geochemistry in all types of lateritic terrain is more precise drill targeting of mineralization hidden beneath more extensive lateritic blankets with elevated Au, Ni or base-metal responses.

Often the more anomalous values defined by conventional or total element determinations are not directly linked to primary or source mineralization at depth. The development of false or displaced geochemical anomalies can be a function of;

1. local chemical conditions in a weathering profile that can influence hydromorphic mobilisation, dispersion and subsequent re-deposition of elements, and

2. The selective physical dismantling of a lateritic landscape exposing different components of a profile.

The most dramatic effect on a conventional geochemical pattern can occur when erosion exposes the deeper "depleted" zone leaving it adjacent to an Fe-rich duricrust with elevated backgrounds that can appear as an anomaly. In depositional regimes, element backgrounds can be

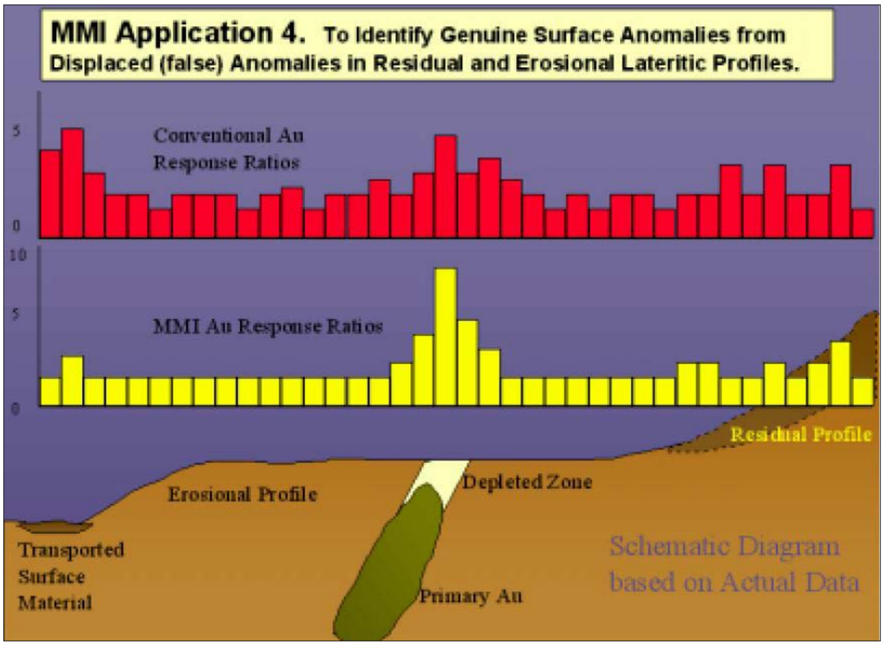

Figure 2: MMI™ Application 4

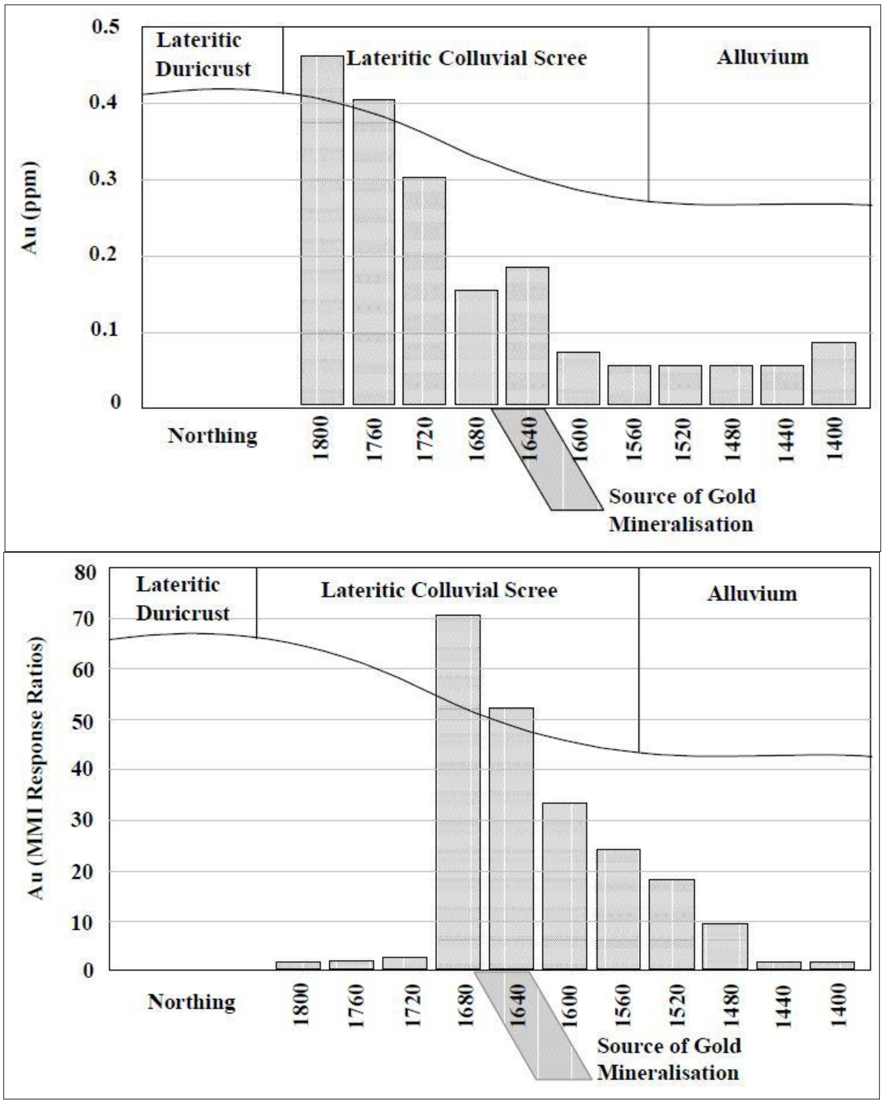

Figure 3: Conventional Geochemistry (Fire Assay) vs MMI™ Geochemistry

subdued leading to interpretation of false anomalies that merely represent background in adjacent relict and/or erosional landscape units.

MMI™ geochemistry has been specifically designed to respond to the strongest source of mobile metal ions, that is, the metal ions that are interstitial or very weakly attached to soil particles. By measuring the mobile component of metals in the soils, the technique pinpoints the largest source of metal ions, prior to the elements being transported any significant distance from source and becoming more strongly bound within the soil matrix by pedogenic processes. A function of pedogenic or soil forming processes in deeply weathered profiles can be re-precipitation and chemical concentration of commodity elements at sites remote from the original source, leading to often-confusing geochemical patterns that can be further complicated by subsequent landscape modification.

REGIONAL SCALE APPLICATIONS

At broader scales, composite sampling allows a cost-effective application of MMI™ geochemistry to assess regional areas. The low detection levels, no nugget effect, commodity element responses and the techniques ability to target primary sources, makes it a viable alternative in areas with reasonable access.

Soil surveys sampling at 100m intervals along lines and then composited to 500m on lines 1km apart have been successful. As anomalous areas are defined, individual 100m "archive samples" are retrieved off the shelf and analysed to provide the second phase of analytical work without returning to the field. As anomalies are confirmed, further defined and prioritised, infill lines can then be sampled on a more restricted basis to provide drill targets.

The sampling intervals and line spacing can be best determined from orientation data. However, if this information is not available, the mineralization styles and geological settings expected that are thought to constitute an economically viable target resource for the area, need to be considered. Orientation surveys are always strongly recommended and further advice and assistance can also be obtained from MMI™ technology.

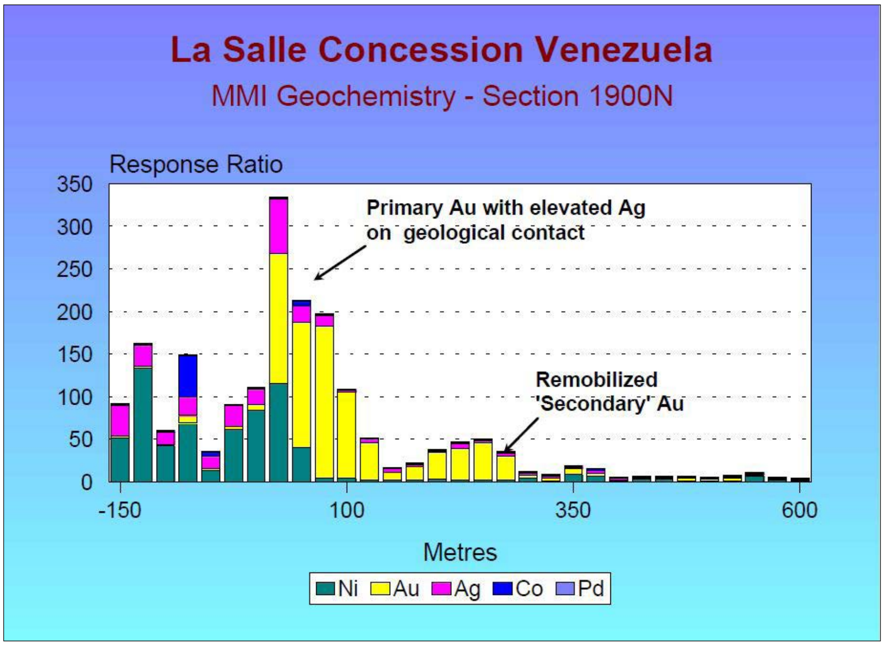

Figure 4a: MMI™ Geochemistry - Section 1900N

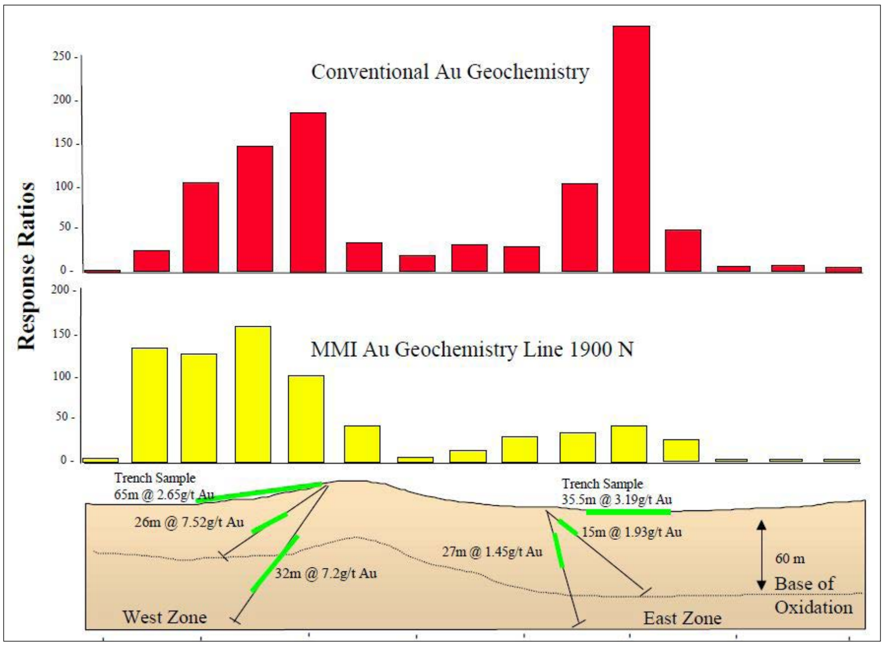

Figure 4b: Line 1900 N Conventional Au Geochemistry vs MMI™ Au Geochemistry

CONTACT INFORMATION

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