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Integrated Interpretation of Airborne Geophysical Data for Gold Exploration in the Asankrangwa Gold Belt, Ghana

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The Asankrangwa Gold Belt in central Ghana is one of the world's premier gold provinces, comparable in scale and significance to the Abitibi Belt of Canada and the Yilgarn Craton of Western Australia. Geotech airborne survey flown over the Mpatasie Gold Belt area in 2011 collected VTEM electromagnetic and TMI magnetic data. These data are interpreted using an advanced inversion approach to AEM data that incorporates induced polarization effects, allowing the recovery of 3D distributions of conductivity and chargeability that reflect realistic rock and mineral assemblages. In parallel, the magnetic data are inverted to recover both the induced and remanent magnetization carried by magnetite altered during paleomagnetic events.

The resulting 3D models highlight zones where elevated chargeability coincides with depressed magnetization. Geologically, these patterns align with shear zone–hosted hydrothermal alteration systems in which sulfide introduction increases chargeability while magnetite destruction reduces magnetic susceptibility. The anomalies spatially overlap mapped structural corridors, surface geochemical gold anomalies, and drillhole MP95 03, which intersected 1 m at roughly 5.3 g/t Au—supporting their interpretation as mineralized or alteration-related features.

The magnetic inversion also clarifies that several apparent highs in the total magnetic intensity data are not true susceptibility highs; once remanence is accounted for, they resolve into magnetization lows consistent with magnetite destructive alteration. This distinction is critical in Archean and Paleoproterozoic belts, where remanence can obscure the true distribution of magnetic minerals.

Taken together, the integrated interpretation shows that gold mineralization is structurally controlled and marked by a geophysical signature of high chargeability from disseminated sulfides and low magnetization from hydrothermal removal of magnetite. Combining 3D AEM inversion with IP sensitivity and vector magnetic inversion provides a clearer picture of alteration footprints and structural controls, thereby improving targeting in geologically complex, magnetically heterogeneous terranes.