Integrated Exploration Case Histories
Paper 139

The Cerattepe Massive Sulphide Property, Northeastern Turkey

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Cominco's Cerattepe property is located about 10 km southwest of the city of Artvin in northeastern Turkey. The initial discovery of the Cerattepe deposit was made in 1990 based on regional geochemistry and attractive showings. The deposit is one of several important Kuroko type, submarine arc environment, volcanogenic massive sulphide deposits within the 300 km long Pontides, a mountain belt along the Black sea coast of Turkey. Since the discovery, geophysical techniques including induced polarization, horizontal loop EM, and fixed-loop time-domain UTEM were applied. The latter resulted in the discovery of the small Kardelen massive sulphide deposit at depth, 600 m north of the Cerattepe deposit.

The deposit is hosted by a sequence of Cretaceous volcanics, sediments, and intrusives. It is preserved within a narrow but elongated northeast trending graben structure, and capped by a veneer of hanging wall rocks. The Cerattepe sulphide deposit consists of a deformed lensoidal pyritic breccia body with a strike length up to 440 m, locally up to 84 m thick, and up to 180 m in dip extent, with dip shallow to the west. 1996 ore reserve calculations give indicated and inferred reserves of 4.1 million tonnes grading 4.9% Cu, 1.0 g/t Au, and 21 g/t Ag. The sulphide body can be divided into a high-grade zone mainly at the base and a low-grade zone which overlies the high-grade zone and sometimes envelops it. Overlying this deposit and along trend to the northeast is a gossan gold indicated and inferred reserve of 7.3 million tonnes grading 4.1 g/t Au and 145 g/t Ag.

The Cerattepe deposit is indicated by a strong soil anomaly with high Cu, Pb, Zn, Ag, Au, Ba values over a 1500 m × 200 m area. The discovery hole was collared in a high lead soil anomaly within the larger geochem response. Soil geochemistry on line 0N over the deposit is shown in Figure 1 along with an approximate cross-section of the sulphide zone. Zinc and copper responses are subdued due to leaching in acidic soils.

Time domain pole-dipole induced polarization data shown in figure 2 indicate that the Cerattepe deposit has a moderate amplitude chargeability response up to 14 mV/V in a background of about 2–5 mV/V. Resistivity data show that the Cerattepe deposit displays only a weak apparent resistivity low down to 13 ohm-m. Silicified footwall rocks immediately east of the deposit show high resistivities up to 5000 ohm-m, whereas hanging wall rocks to the west have resistivities in the 40–150 ohm-m range. The simple metal factor calculation enhances the deposit's response.

Figure 3 shows horizontal loop EM data using 100 m coil spacing and 880 Hz frequency. The Cerattepe deposit produces a strong anomaly with high in-phase to out-of-phase ratio in generally noisy quadrature data due to low host rock resistivities.

Figure 4 shows fixed loop time domain UTEM data with a strong late time 20% channel 1 response over the Cerattepe deposit. The time decay shows the classic characteristics of anomaly blanking at early time, current channeling enhancement at middle time and slow decay induction response at late time. Anomaly shape varies from crossover style for the current channeling response to that of a saucer shape for the induction response. Figure 5 shows a 2000-siemen plate in a 200 ohm-m halfspace EMIGMA model calculation that reproduces the field data very well.

About 600 m north of the Cerattepe deposit, the weak current channeling style UTEM response shown in Figure 6 was observed within a block type response that is apparent on adjacent lines. This was interpreted as a possible conductive body at a depth of 150 m within a graben structure. The interpretation was essentially correct with the first hole intersecting 22.5 m of Kuroko-style massive sulphide mineralization at a depth to top of 153 m with an average grade of just under 3% Cu. Drilling has been limited but does suggest a small deposit within a small synvolcanic, fault-bounded basin or graben structure, with slump features evident in overlying sediments. Figure 7 shows an EMIGMA prism in a halfspace model calculation that reproduces the field data.

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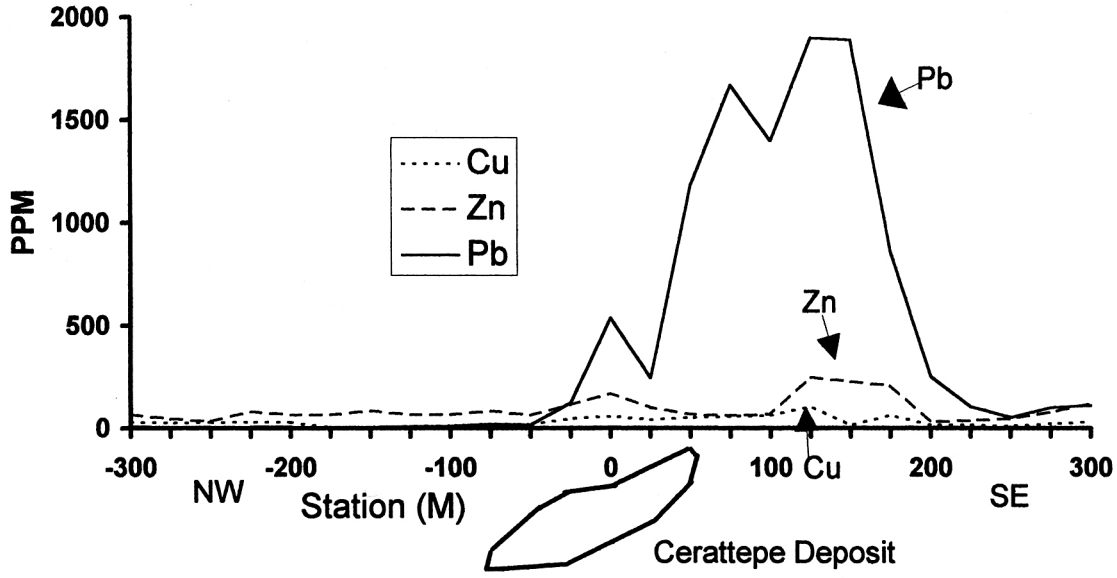

Figure 1: *Soil geochemistry on Line 0N over the deposit.*

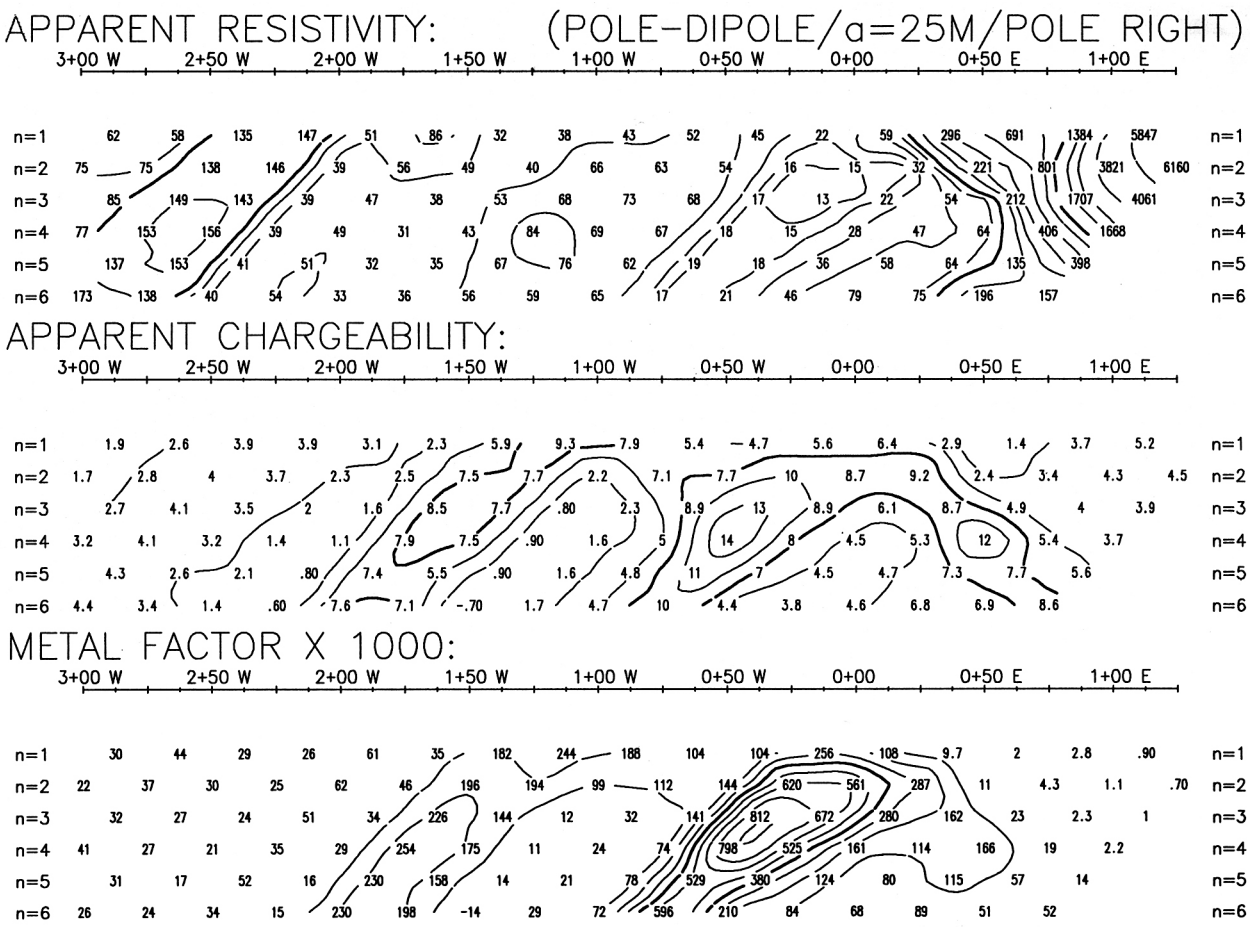

Figure 2: *Time-domain pole-dipole induce polarization data.*

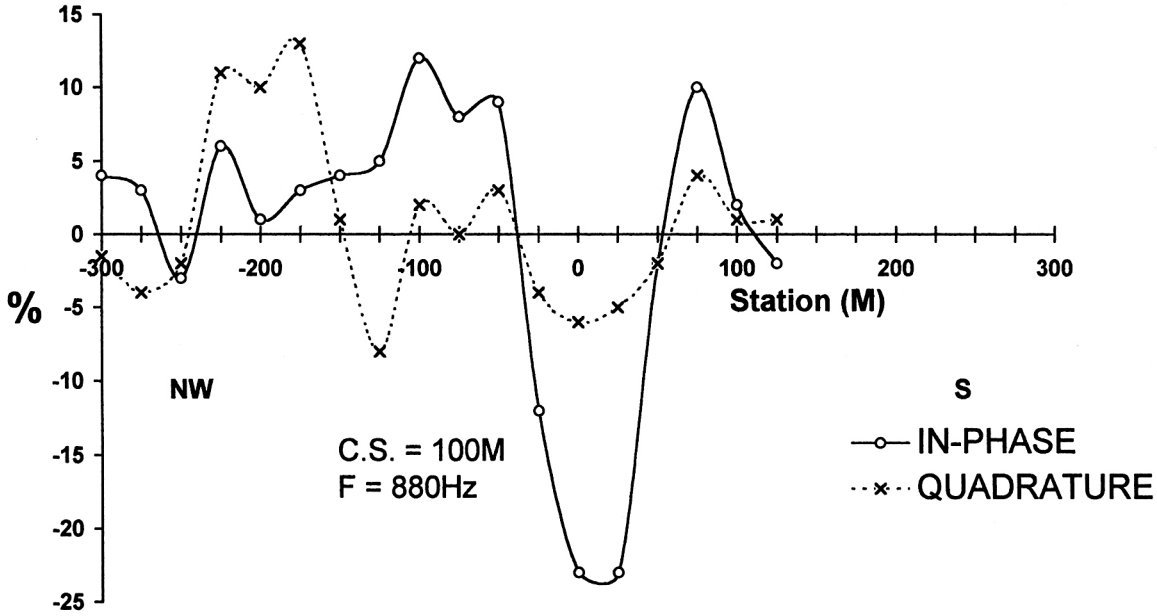

Figure 3: *Horizontal-loop EM data using a 100m coil spacing and a transmitter frequency of 880 Hz.*

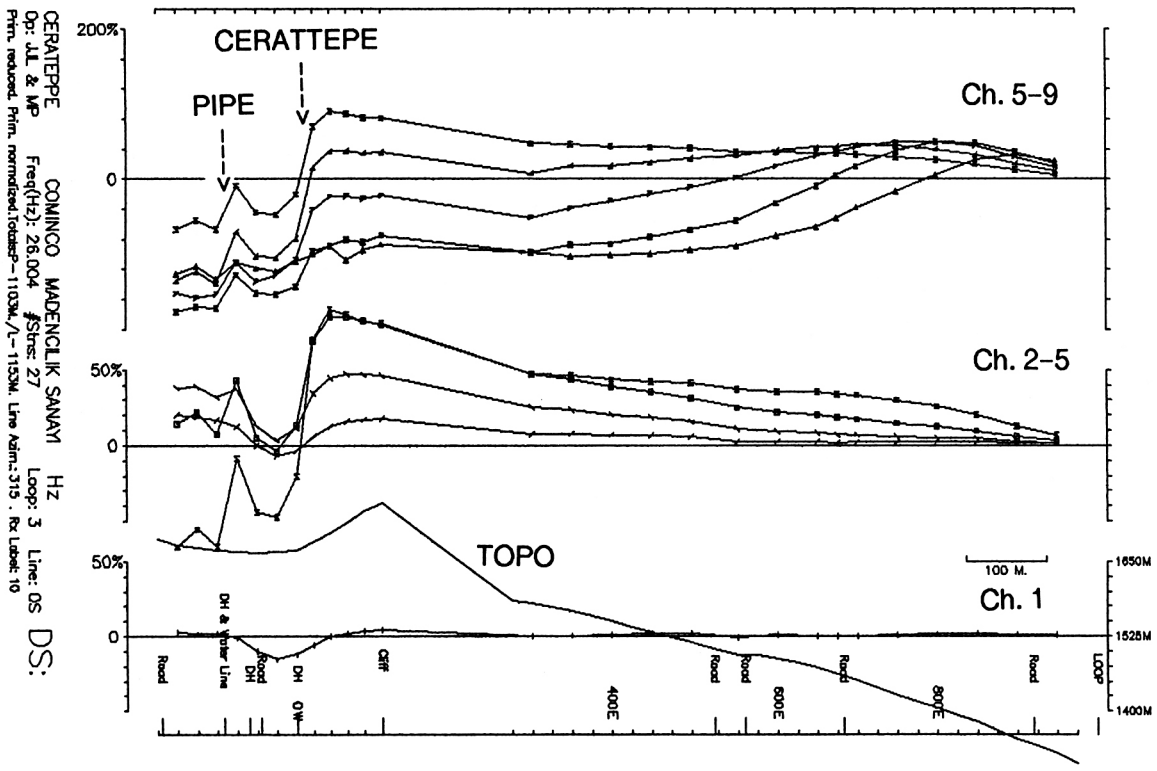

Figure 4: *Fixed-loop time-domain UTEM data. Note the strong late-time 20% CH. 1 response over the deposit with anomaly blanking at early-tme and current channeling at middle-time.*

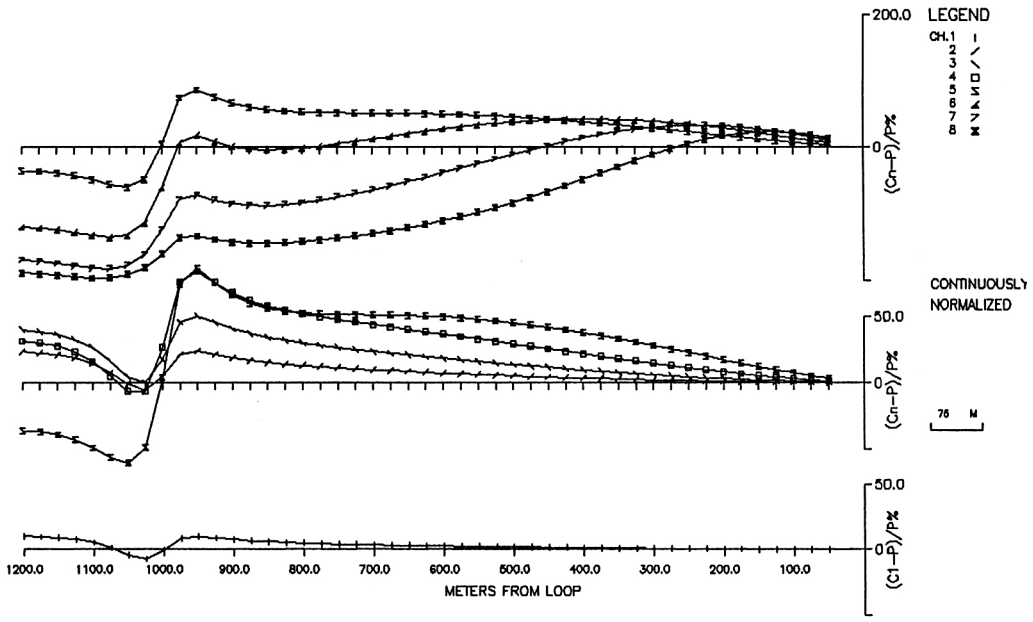

Figure 5: *An ENIGMA model using a 2000 siemen plate in a 200 ohm-m half-space.*

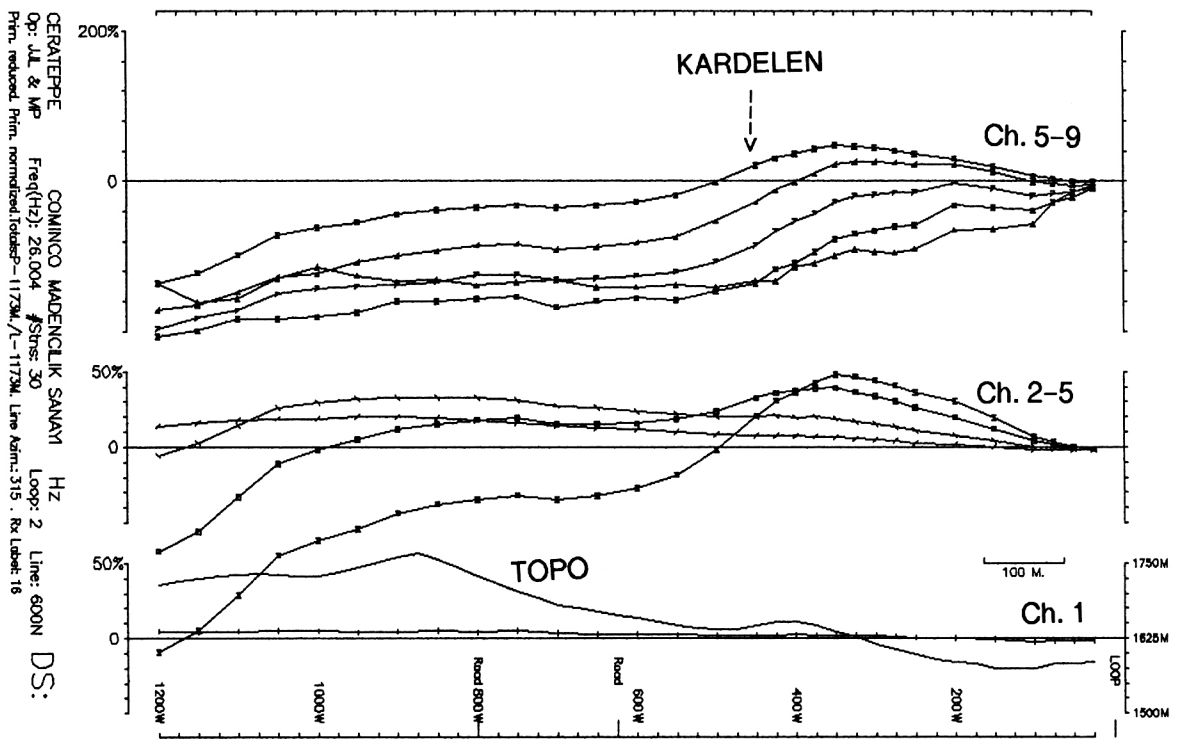

Figure 6: *UTEM response showing weak current channeling 600 m north of the deposit.*

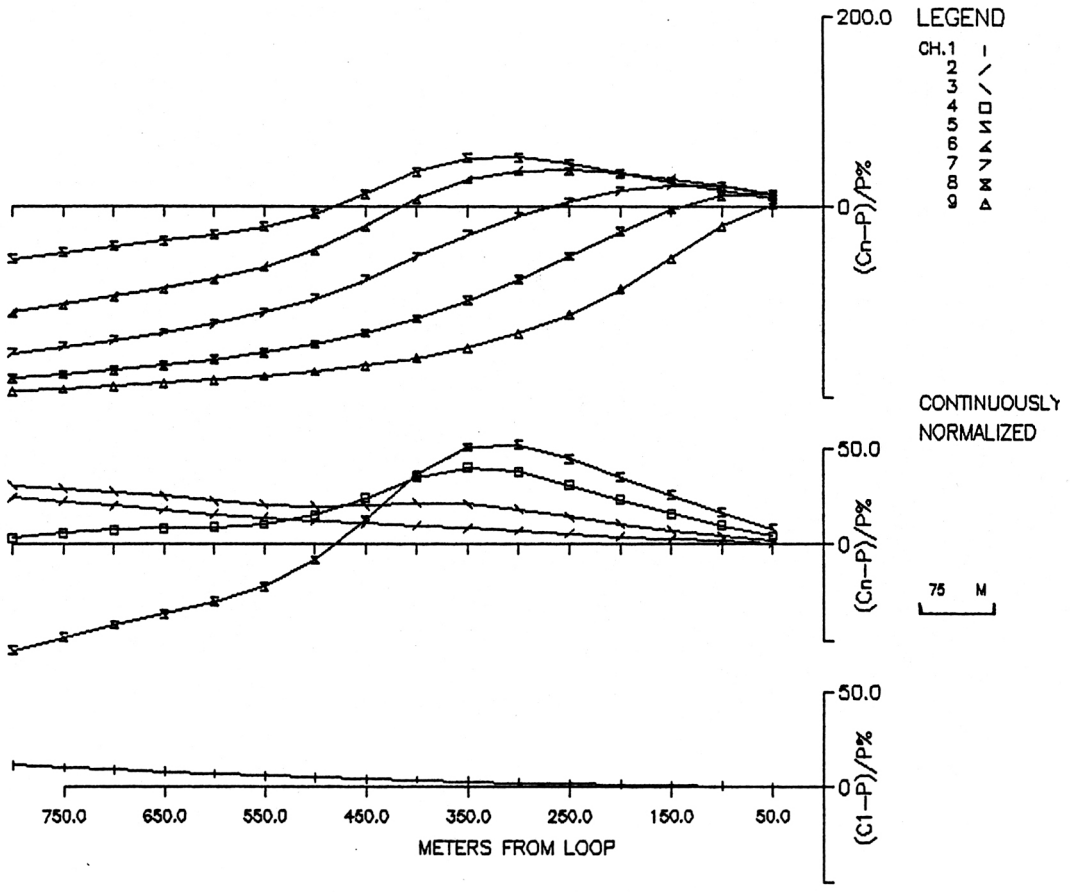

Figure 7: *An ENIGMA model using a prsim in a half-space that reproduces the field data.*