Corrigendum

Corrigendum to “Characterization of Geotomographic Studies with the EMRE System”

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Received 3 May 2017; Accepted 24 May 2017; Published 30 July 2017

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In the article titled “Characterization of Geotomographic Studies with the EMRE System” [1], there were errors in the “Theory” section.

Paragraph three should be corrected as follows:

“The field depends on the distance \( r \) from the source. Certain characteristics of an electromagnetic field dominate at one particular distance from the antenna, while a completely different behaviour can dominate at another location. The wave number \( k \) multiplied by the distance \( r \) defines the behavior [10, 11, 13]. When \(| k \cdot r | \ll 1 \) or at a distance much shorter than the wavelength, the electric field resembles the static dipole field, being proportional to \( r^{-3} \) (static term), and anything in this region that couples with the antenna will disturb the antenna severely (reactive near field). The EMRE system operates in the near-field domain due to the wavelengths of hundreds of meters when the low frequency of 312.5 kHz and short distances \( (r \ll 300 \text{ m}) \) are used with resistivities \( \sim 10000 \Omega \text{m} \). When \( |k \cdot r| \approx 1 \) or at a distance much shorter than the wavelength, the electric field resembles the static dipole field, being proportional to \( r^{-2} \) (induction term), and the static term \( (\sim r^{-3}) \) becomes negligible. The region is known as a radiating near-field or Fresnel zone. With the frequency of 2500 kHz and with resistivities 10000–10000 Ωm, the EMRE system operates in the Fresnel zone at distances of \( \sim 40–80 \text{ m} \). When \( |k \cdot r| \gg 1 \) or at a distance much greater than the wavelength, the electric field is inversely dependent on the distance \( r^{-1} \) (radiation term). The angular field distribution is independent of the distance from the antenna (far-field or Fraunhofer zone). When the frequencies \( f > 1250 \text{ kHz} \) and distances \( r \gg 200 \text{ m} \) are used with resistivities \( <10000 \Omega \text{m} \), the EMRE system operates in the far field. The inhomogeneous generalized time-domain wave equations for the time harmonic electric field \( E \) and magnetic field \( H \) (\( \varepsilon \text{re} \) dependence) can be written as [16–18].

Equation (4) should be corrected as follows:

\[
Q = \frac{\omega \varepsilon' + \sigma''}{\sigma' - \omega \varepsilon''} = \frac{\omega (\varepsilon' + \sigma''/\omega)}{\sigma' - \omega \varepsilon''} = \tan \Theta = \frac{\omega \varepsilon'}{\sigma'}.
\] (4)

Equation (9) for \( v_p \) should be corrected as follows:

\[
v_p = \frac{\omega}{\beta} = \frac{\omega}{\sqrt{\mu \varepsilon / 2} \left( \sqrt{1 + (\sigma/\omega \varepsilon)^2} + 1 \right)^{1/2}}
\] (9)

"Figures 2(a) and 2(b) present the cut-off frequencies (\( f = \sigma'/2\pi \omega \)) for different materials (\( \rho = 100, 1000, 10000 \Omega \text{m} \) and \( \varepsilon_r = 10, 20 \))" should be corrected to "Figures 2(a) and 2(b) present the cut-off frequencies (\( f = \sigma'/2\pi \varepsilon \)) for different materials (\( \rho = 100, 1000, \) and \( 10000 \Omega \text{m} \) and \( \varepsilon_r = 10, 20 \))."

"Increasing the relative permittivity of the medium, the cut-off frequencies decrease \( (\varepsilon_r = 20) \) and the quasi-static conditions are valid almost up to \( \sim 60 \text{ kHz} \)" should be corrected to "Increasing the relative permittivity of the medium, the cut-off frequencies decrease \( (\varepsilon_r = 20) \) and the quasi-static conditions are valid almost up to \( \sim 600 \text{ kHz} \)"

Figure 2(b) is corrected hereinafter.

In addition, in the “Rim Instrument” section, the legend of Figure 4 is corrected hereinafter.
Figure 2: (a) The attenuation ($\alpha$) and phase ($\beta$) constants in a dissipative medium with $\varepsilon_r = 10$ and $\rho = 100, 1000, \text{and} 10000 \Omega \text{m}$. (b) The phase and attenuation constants in a dissipative medium with $\varepsilon_r = 20$. $\alpha$ is the attenuation (red lines) as Nepers/m and $\beta$ is the phase constant (blue lines) as rad/m. The m-curve is valid when the attenuation constant equals the phase constant or $\alpha \approx \beta$ (black curves).

Figure 4: The electrical properties of a sulphide sample (a) and a granite sample (b) from Vogt [7].
References
