

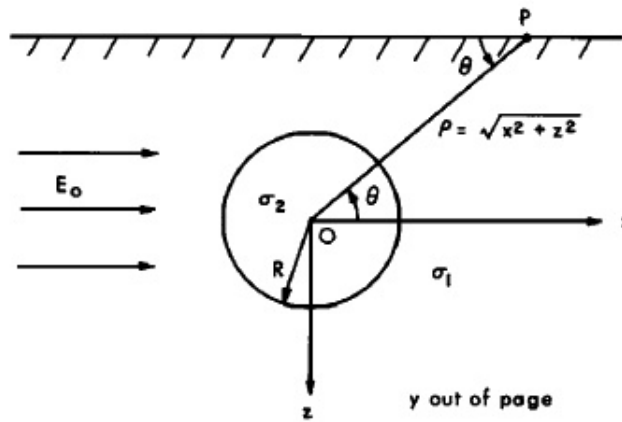
ANALYTICAL RESULTS AND PHYSICAL UNDERSTANDING

TEAM C

Uniform electric field illuminating a sphere in a uniform earth (analytic solution, reference)

Let consider a resistive uniform half-space, of conductivity σ_1 enclosing a conductive sphere σ_2 . Let assume a uniform, unidirectional static electric field E_0 going through this half-space.

FIGURE 1. Uniform electric field illuminating a sphere in a uniform earth



Maxwell equations

In this case, we need:

$$\nabla \times E = 0, \text{ so } E = -\nabla V$$

$$J = \sigma E$$

The primary field E_0 can then be expressed by:

$$E_0^p = -\frac{dV^p}{dx}$$

Assuming a primary potential null at the origin:

$$V^p = E_0 x = E_0 r \cos \theta$$

As [...], the anomalous or secondary field is expressed as:

$$V^s = (Ar + Br^{-2}) \cos \theta$$

Continuity of current and charge accumulation.

Charges, Coulomb's law and potentials.

Anomalous currents and electric fields

DC app for looking at currents, charges etc with a current source at the surface.

Analytic solution for a buried sphere in a uniform space