

Fig. 8.2 Coordinate system of line conductor and lightning stroke.

The total electric field associated with the charge and the current in the lightning stroke at any point in space is

$$\mathbf{E}_i = \mathbf{E}_{ei} + \mathbf{E}_{mi} = -\nabla\phi - \frac{\partial\mathbf{A}}{\partial t}, \quad (8.2)$$

where ϕ is the *inducing* scalar potential created by the residual charge in the return stroke, and \mathbf{A} is the *inducing* vector potential created by the return-stroke current. ϕ and \mathbf{A} can be easily computed by assuming the lightning channel to be a vertical line of charge and current (Fig. 8.3).

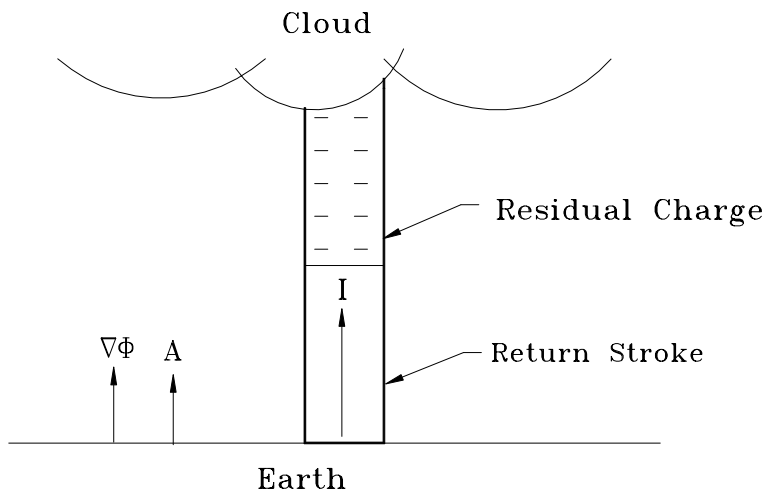


Fig. 8.3 Return stroke with the residual charge column.