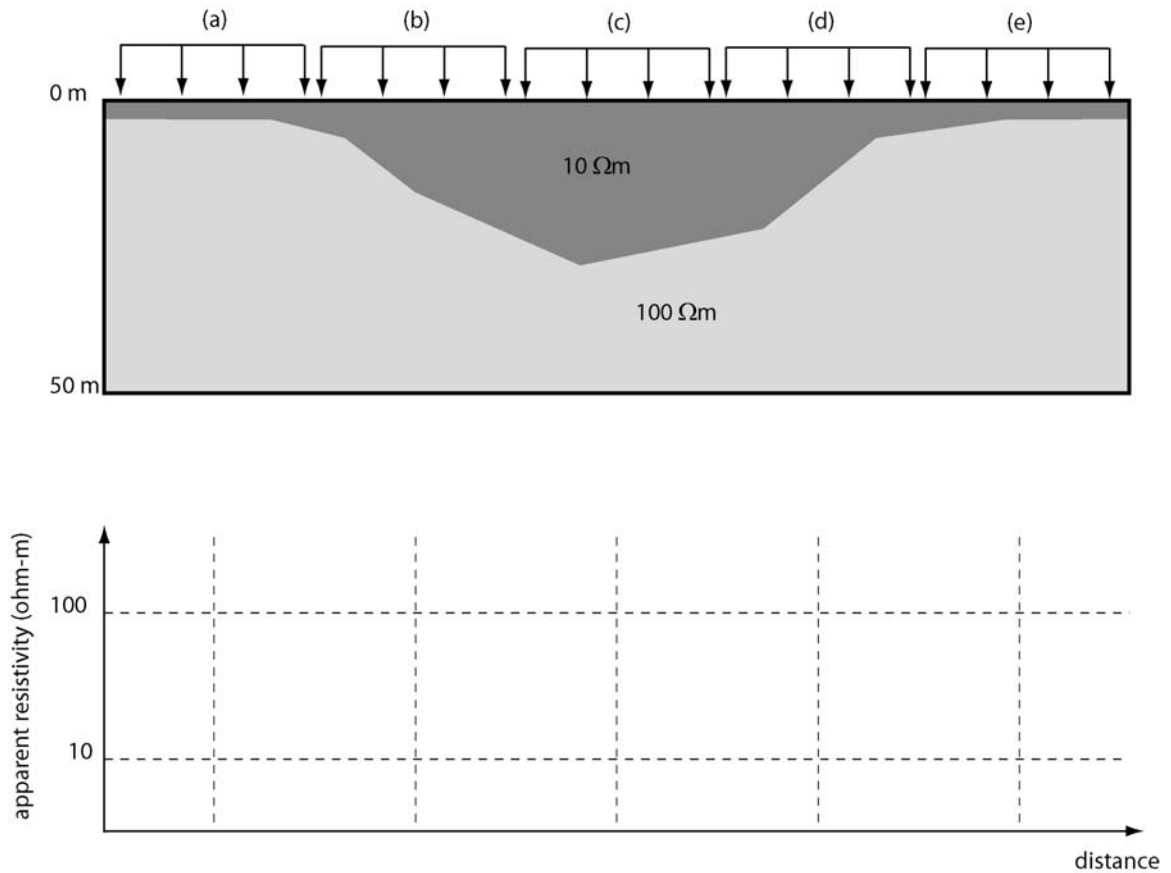


223 B4 profiling with DC resistivity

- In the previous section we assumed that the resistivity of the Earth varied only with depth. In this case we can use an expanding spread array (Wenner or Schlumberger) to measure the variation of resistivity with depth.
- If the area being studied has significant horizontal variations in resistivity, then an alternate surveying technique can be used.
- This technique is termed **profiling** or **constant-spread traverses**.
- A Wenner array is set up with a fixed a-spacing. The whole array (all 4 electrodes) and then moved for each measurement.
- The a-spacing should be chosen to reflect the depth of investigation.
- Consider the following simple example



Example of a fault

- If there is a horizontal change in resistivity at the surface then sharper variations can occur in apparent resistivity. e.g. Burger Figure 5-23

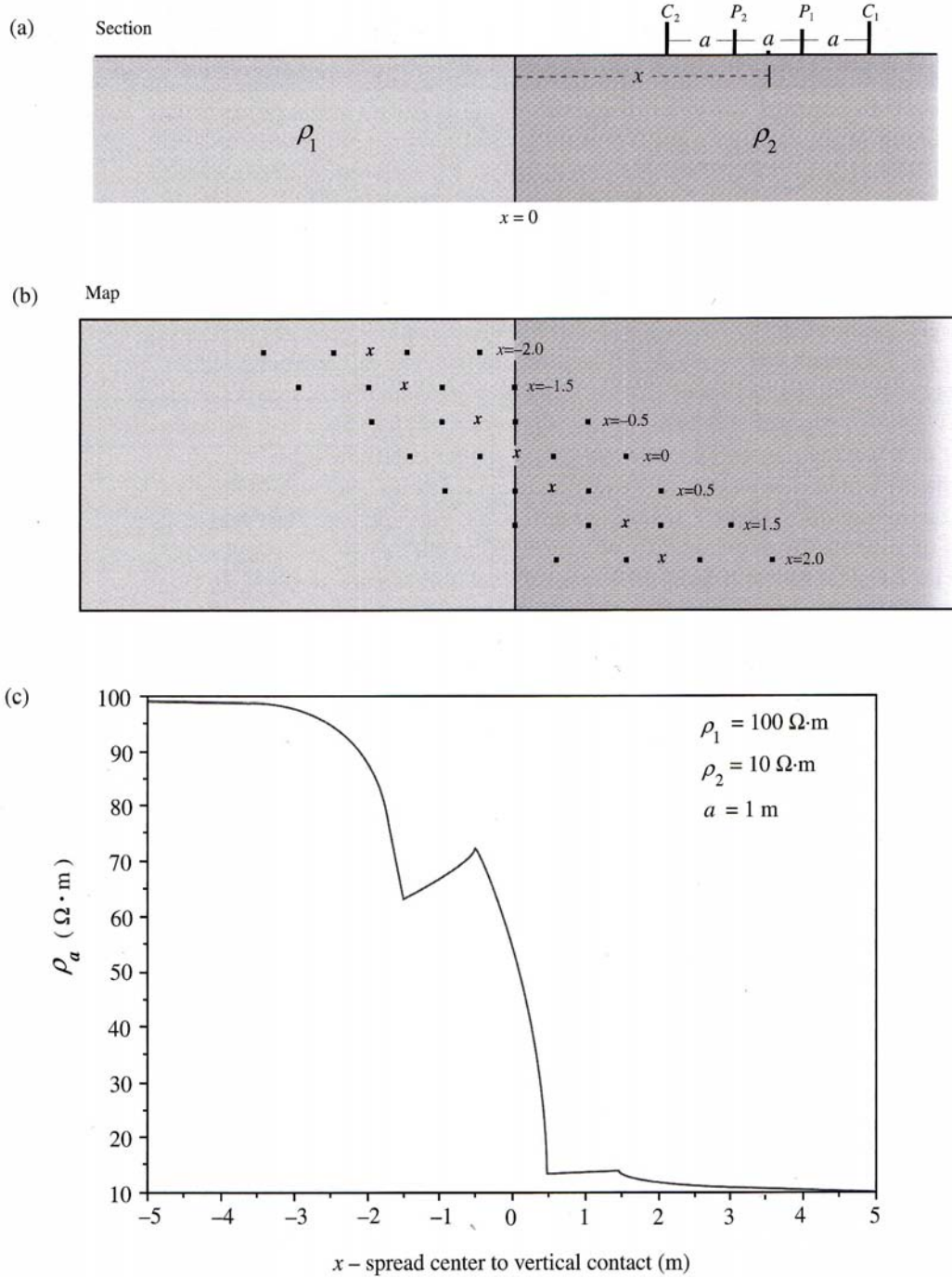


FIGURE 5.23 Apparent resistivity for a constant-spread traverse oriented perpendicular to a vertical contact. (a) Section view illustrating parameters used in Table 5.5. (b) Map view designating critical positions of electrode spreads. (c) Graph of values in Table 5.5.

Examples of profiling data

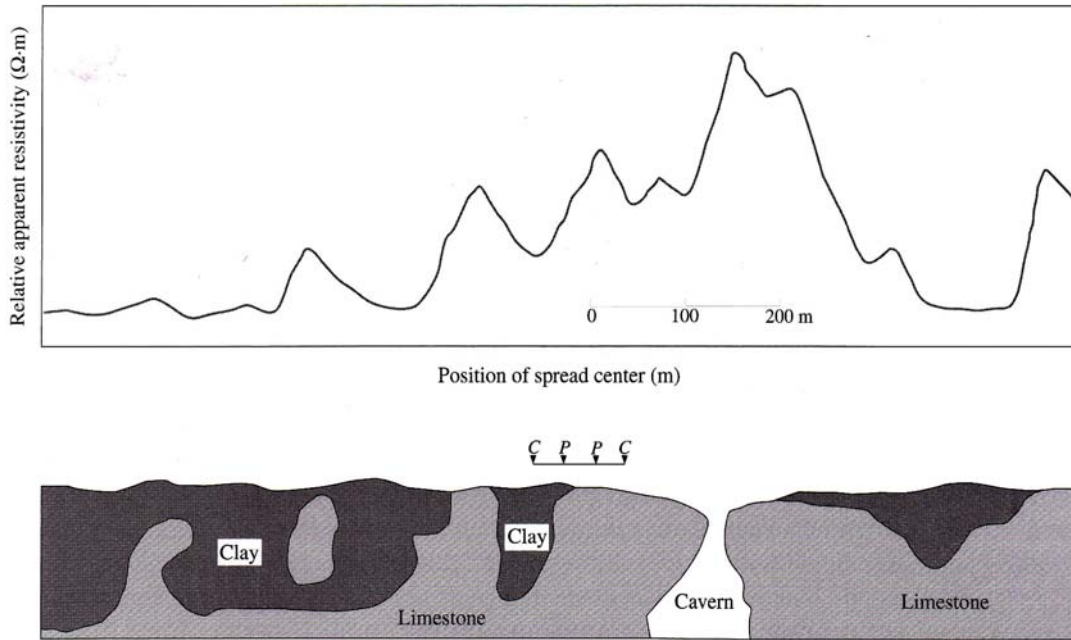
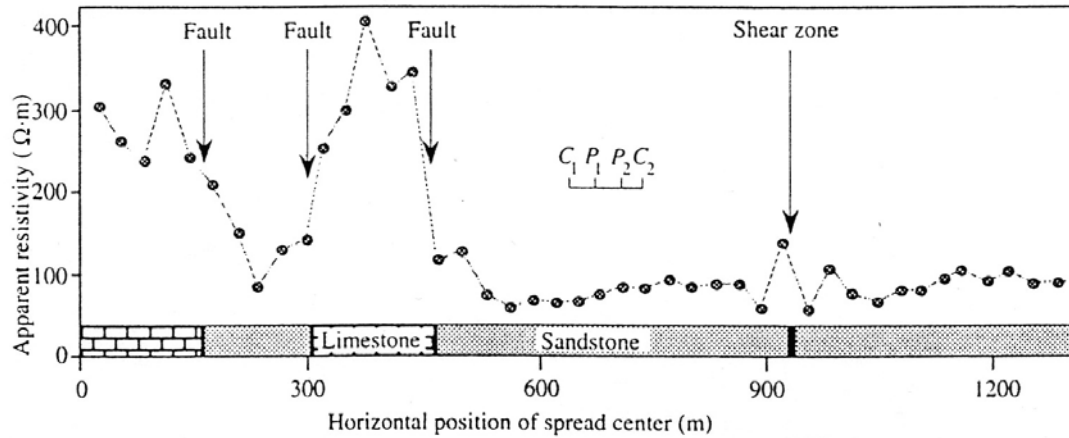


FIGURE 5.38 Apparent resistivity curve for a constant-spread traverse over karst topography, Hardin County, Illinois. Wenner array, a -spacing = 30.48 m, spread-center spacing = 30.48 m. Apparent resistivity highs correspond to limestone and voids; apparent resistivity lows correlate with clays. (Modified from M.K. Hubbert, 1944. An exploratory study of faults in the cave in Rock and Rosiclare districts by the earth resistivity method. In *Geological and geophysical survey of fluorspar areas in Hardin County, Illinois*. United States Geological Survey Bulletin 942, Part 2, 73–147.)



Burger et al., Figure 5-39

Profiling on a grid

- Profiling can easily be extended with the array being moved over a grid of points on the surface. This allows structures to be mapped in two dimensions.
- We will see later on that this can be time consuming and surveys with EM31 and EM34 instruments can be more time (and cost) effective. These EM surveys have the advantage that direct contact with the ground is not needed.
- If the survey is repeated with different a-spacing, then the variation of resistivity with depth can be investigated. e.g. Burger 5-37 shows a low resistivity contaminant plume that is leaking from a landfill.

