A noteworthy conclusion based on the result of Fig. 4.3 is that the secular rate of water level rise would be lower in the bay than in the sea, on account of the decrease of bay superelevation. Hicks (1984) selected 19 pairs of gages, one inside the bay and the other at the closest location outside the entrance, for which long-term data were available. For each pair, the difference (outside minus inside) in the secular rate of change of mean water level (mm/yr) was calculated. In 12 cases, this difference was positive, which means a greater water level rise outside than inside the bay. With the exceptions of the Long Branch (NJ)/New York (NY) and Springmaid Pier/Charleston (SC) pairs, where the differences were large (13.1 and 13.6 mm/yr, respectively), the mean of the remaining 10 pairs was 2.6 mm/yr. If bay superelevation changes were the sole effect involved (which is not by any means certain, since the gage data were probably contaminated by any number of physical phenomena), this 2.6 mm/yr change would be indicative of the rate of decrease of superelevation.

Mann (1987) showed that the changes in bay response are greater in shallow inlets than in deep ones. He also found that considering, for example, the bay to have a gentle boundary slope as opposed to a vertical wall-like perimeter would reduce the changes in superelevation and tidal range compared with the vertical wall case (Fig. 4.3). In general, however, it was concluded that due to an increase in sea level, "additional coastal flooding may occur beyond that due merely to the changes in sea level." Observations by Führböter (1986) in the German Bight estuaries seem to corroborate such a trend.

4.5 RESEARCH NEEDS

Fast computers with large memory storage have made numerical modeling of tides rather sophisticated. In many cases, it seems, modeling capabilities have "outstripped" data quality such that inaccuracies in collected data limit the accuracy of mathematical prediction. Data limitations arise from many causes; it suffices to note two factors.

One pertains to a lack of physical understanding, on a micro-scale, of phenomena which ultimately affect water level prediction. An example is our understanding of bed forms, the manner in which they change with flow, and the precise relationship between their occurrence and the flow resistance they