In addition, different inflow directions will lead to different orographic rain values, so inflow winds must be analysed to find a reasonable major inflow wind direction. The method requires that rainfall data distributed along the elevation be available in the inflow direction.

Both R_{Ad} and R_{Bd} can be determined through the difference between average rainfalls of plains and orographic regions covered by the same weather system, or comparison between orographic profiles and rainfall profiles, or theoretical calculation approaches (Gao and Xiong, 1983).

For a comprehensive orographic correction method, calculations can also be based on grid points.

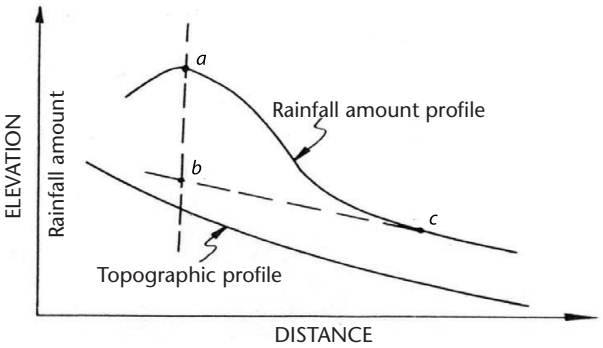

Figure 7.5. Diagram of topographic and rainfall profiles

7.4.6 Example calculations

The Yahekou Reservoir is located on the south-eastern slope of Funiu Mountains in the upper reaches of the Baihe River, Henan Province, China. It features a control area of 3 035 km^2. To ensure the safety of the dam, PMP/PMF needs to be estimated. According to the analysis of data observed, surveyed and recorded in the literature, the PMP/PMF in the watershed should be caused by the penetration of typhoons from the West Pacific Ocean into the watershed under stable longitudinal circulation types. The critical precipitation duration is 3 days. For this example, the transposition model method needs to be used to determine PMP. Steps of analysis and calculation are as follows (CJWRC, 1995).

(a) Selecting the transposed storm:
A study of rainfall data observed over the past decades shows that in the upper reaches of the Huaihe River, more than 100 km east of the design watershed, a historically rare extraordinary storm occurred on 5–7 August 1975. The maximum 3-day rainfall reached 1 605 mm in Linzhuang, the storm centre, where the maximum 24-hour, 12-hour, 6-hour and 1-hour rainfalls were 1 060 mm, 954 mm, 830 mm and 173 mm, respectively. The storm was caused by a typhoon, which turned into a depression after landing. That storm was selected as the transposed storm.

(b) Transposition possibility analysis:
(i) Comparison of geographical and climatic conditions:
The Baihe River basin is near the region where the August 1975 storm occurred. At the same latitude, both regions fall into the northern subtropical monsoon climate zone. They are similar to each other in terms of the annual rainfall, the annual number of days of precipitation and the annual number of days of storms. The main storm season is July and August. Both have a maximum absolute humidity of above 40 hPa, which means that they are both high-humidity regions. Therefore, the two regions are similar in terms of geographical location and share the same climatic background.

(ii) Comparison of weather systems:
The August 1975 storm was primarily caused by typhoon no. 7503 turning into a stable thermal low. A study of typhoon path maps since 1884 showed that two typhoon paths passed Henan Province, in 1943 and 1944, both of which were more westerly than the path of the August 1975 typhoon, suggesting that typhoons are likely to reach the Baihe River basin. The basin and the August 1975 storm area are at the same latitude, where circulations are stable. Possible transposition relies on whether the storm can be successfully transposed 100 km west. According to experience in weather analysis, it is probable that the circulation of the August 1975 storm could have moved 100 km westward. In other words, if extraordinary storms occur in the Baihe River basin, their circulations can remain stable.

(iii) Comparison of orographic conditions:
The August 1975 storm area was between plains and orographic regions. Linzhuang, the storm centre, is in an orographic belt that is surrounded by shallow mountains on three sides with an opening east to north-east. Such an orographic belt helps to draw in east to north-east air currents.