I. INTRODUCTION

The climatological pattern of world precipitation and the general causes of aridity have been explained in chapter 3. The present chapter describes how local physiography modifies the general weather patterns and affects water supply, water need, and water use. Physiography, as used here, includes absolute and relative altitude, aspect, topography (especially as related to prevailing winds), drainage, water bodies, and other similar physical features.

Nichols (1924) showed that differences in climate which are common between areas quite distant from one another also exist between locations which are relatively adjacent. In high mountains, for example, marked differences in climate occur in short distances with changes in elevation, accompanied by corresponding differences in vegetation. Even within areas of generally uniform elevation, the climate is locally modified by small differences in topography and by relative positions of land and water bodies. The aspect of the terrain (i.e., north- or south-facing slopes) influences types of vegetation. Plants found in ravines differ from those on level or rounded uplands.

II. EFFECT OF LOCAL PHYSIOGRAPHY ON WATER SUPPLY

A. Altitude

Both absolute and relative altitude should be considered as they affect precipitation. It is difficult to generalize regarding the effect of absolute altitude because of other masking influences. In most areas there is a gradual increase in precipitation with altitude up to 1,000 m or so. The principal mechanism for producing rain involves the lifting and cooling of moisture-laden air. At higher elevations the air is normally cooler and drier, hence, many high plateaus are arid or semiarid. The effects of relative altitude on precipitation are easier to observe and will be discussed in greater detail in section B of this part.

Sternberg (1956) describes an area in Brazil which is a classical example of a regional precipitation pattern influenced by elevation. In this area, precipitation decreases rapidly from the east (the Atlantic coast) toward the west (about 950 km inland). He describes three zones: a low coastal humid forest zone; an eastward-sloping transitional zone of relatively stable agriculture; and a broader inland plateau with insufficient and highly variable precipitation. Island-like eminences rise above the general level of the inland plateau which are favored by other masking influences. In most areas there is a gradual increase in precipitation.