8.1.5 Remarks on Gravity Reduction

Gravity reduction may be summarized as follows (for more details cf. (Heiskanen and Moritz, 1967, pp. 130–151)):

1. *Removal of topography.* Gravity g_P is measured at a surface point P (Fig. 8.8). The attraction A_T of the topographic masses above sea level is computed by a similar

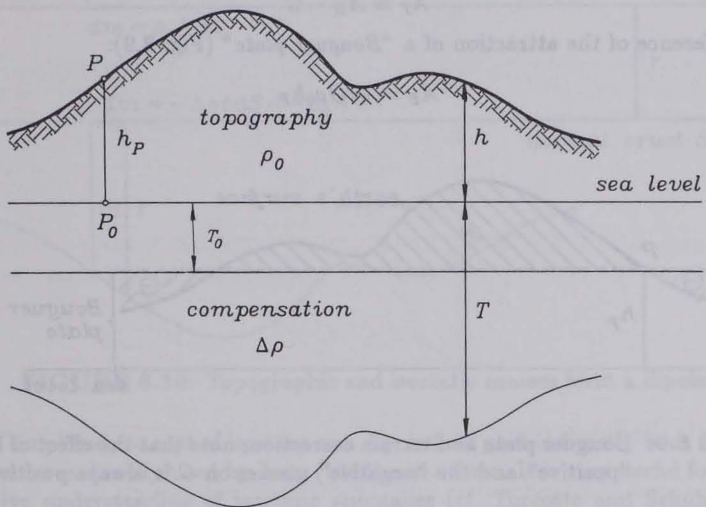

FIGURE 8.8: Topographic and compensating masses contribute to gravity reduction

formula as (8–31a), with ρ instead of $\Delta\rho$ and $z = -h$, and subtracted from g_P. The result is

$$g_P - A_T \quad . \tag{8–33}$$

However, $g_P - A_T$ continues to refer to P, therefore the next step is

2. *Free-air reduction to sea level.* This is done by adding the "free-air reduction"

$$F = -\frac{\partial\gamma}{\partial h} h_P \doteq 0.3086\, h_P \,\text{mgal} \quad , \tag{8–34}$$

with h_P in meters. (The *milligal*, abbreviated mgal, is the conventional unit for gravity differences: $1\text{mgal} = 10^{-5}\,\text{m}\,\text{s}^{-2}$.) The replacement of actual gravity g by normal gravity γ is only an approximation, and the numerical value given in (8–34) is conventional. The result is *Bouguer gravity*

$$g_B = g_P - A_T + F \quad . \tag{8–35}$$

Subtracting normal gravity γ we get the *Bouguer anomaly*

$$\Delta g_B = g_B - \gamma = g_P - A_T + F - \gamma \quad . \tag{8–36}$$