Let us now consider B'', given by (8–70). As the integrand is easily seen to decrease very rapidly to zero with increasing distance l, it is sufficient to consider a neighborhood of, say, 50 km around the computation point P. Thus it is admissible to replace the sphere by its tangential plane at P, which is taken as the xy-plane; see Fig. 8.12. Then

$$R^2 d\sigma = dx dy \quad ,$$

$$l = \sqrt{x^2 + y^2 + (\eta - h_P)^2} \quad ,$$

and (8–70) becomes

$$B'' = -G\rho \iint_{-\infty}^{\infty} \int_{h_P}^{h} \frac{\eta - h_P}{[x^2 + y^2 + (\eta - h_P)^2]^{3/2}} \, dx dy d\eta \quad . \tag{8–74}$$

Since the integral is extended over the region that is crosshatched in Fig. 8.12,

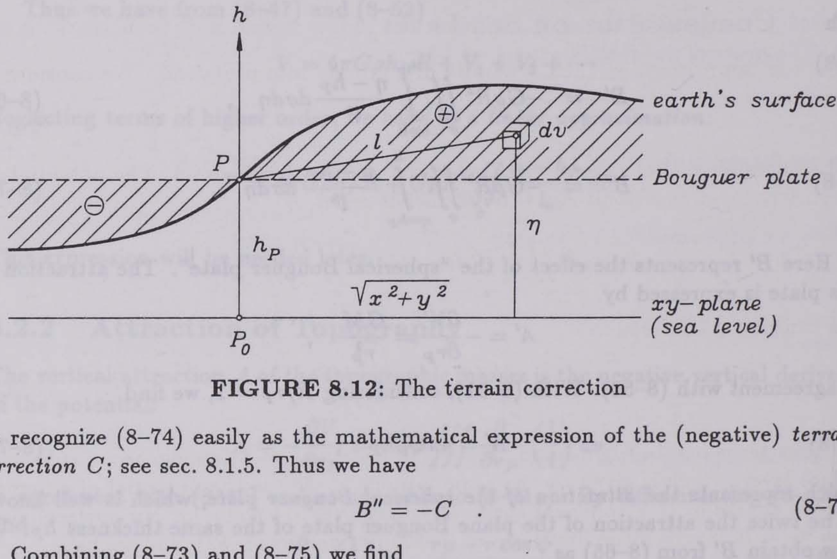

FIGURE 8.12: The terrain correction

we recognize (8–74) easily as the mathematical expression of the (negative) *terrain correction* C; see sec. 8.1.5. Thus we have

$$B'' = -C \quad . \tag{8–75}$$

Combining (8–73) and (8–75) we find

$$B = 2\pi G \rho h_P - C \quad . \tag{8–76}$$

The conventional Bouguer reduction is based on (8–38), which is formally identical with the right-hand side of (8–76); this again indicates the fact that the auxiliary quantity B has some connection with Bouguer reduction; see sec. 8.2.5.

The planar approximation of (8–70) is obtained by replacing l by $l_0 = 2R \sin \frac{\psi}{2}$. Now we can readily integrate with respect to η to get B'' or C, by (8–75). The result is

$$C = \frac{1}{2} G\rho R^2 \iint_{\sigma} \frac{(h - h_P)^2}{l_0^3} \, d\sigma \quad . \tag{8–77}$$