

## Gravity Formulae

INTERNATIONAL GRAVITY FORMULA (revised occasionally):

$$\gamma = 9.78 (1 + 0.0053 \sin^2\lambda - 0.0000058 \sin^2 2\lambda)$$

where  $\gamma$  is theoretical gravity and  $\lambda$  is latitude

### Units

Earth's gravity  $\sim 9.81 \text{ ms}^{-2}$

Useful units are the milliGal =  $10^{-5} \text{ ms}^{-2} = 0.00001 \text{ ms}^{-2}$

and the gravity unit =  $10^{-6} \text{ ms}^{-2}$  (this is the SI unit)

### Gravity corrections

'Free air' effect (height above geoid):

$g \downarrow 0.3086$  milliGals/metre

Bouguer mass effect (additional rock attraction):

$g \uparrow 0.0419 \rho$  milliGals/metre ( $\rho$  = density)

Gives a **Bouguer Gravity Anomaly**  $\Delta g_B$

$$\Delta g_B = g - \gamma + 0.3086h - 0.0419\rho h$$

where  $g$  = measured gravity

$\gamma$  = theoretical gravity at the latitude of the measurement

$h$  = height above mean sea level

which is interpretable geologically

### Variations in $g$ with latitude (at sea level)

Latitude (degrees)	$g$ ( $\text{ms}^{-2}$ )
0	9.78032
15	9.78394
30	9.79388
45	9.80629
60	9.81924
75	9.82873
90	9.83221

### Variations in $g$ with elevation (at equator)

Height (m)	$g$ ( $\text{ms}^{-2}$ )
0 (sea level)	9.78032
1500	9.77579
3000	9.77108
4500	9.76639
6000	9.76169