# Geopotentielle Höhe



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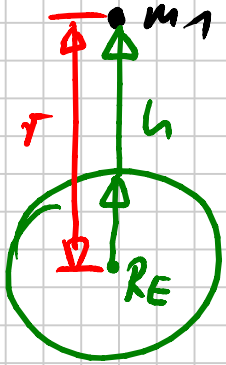
Gravitationsgesetz: $F = \gamma \frac{m_1 m_2}{r^2}$ $\quad m_2 = m_E$, $r = R_E$

$$F = \frac{\gamma \cdot m_E}{R_E^2} \cdot m_1 = g(r) \cdot m_1$$

$g_0$ $\quad F = g(R_E) \cdot m_1 = g_0 \cdot m_1$

$$\left.\begin{aligned} m_1 g_0 &= \gamma \frac{m_1 m_E}{R_E^2} \\ m_1 g(r) &= \gamma \frac{m_1 m_E}{r^2} \end{aligned}\right\} \quad \frac{g(r)}{g_0} = \frac{R_E^2}{r^2}$$




$$\frac{g(r)}{g_0} = \left(\frac{R_E}{R_E + h}\right)^2 = \frac{g(h)}{g_0} \qquad (1)$$

Def: $$U(h) = \int_0^h m_1 g(h)\, dh =: m_1 g_0 \cdot h_p$$

$$g(h)\, dh = g_0\, dh_p$$

$$dh_p = \frac{g(h)}{g_0}\, dh \qquad (2)$$

$$dh_p = \left(\frac{R_E}{R_E + h}\right)^2 dh$$

$$\int_0^{h_p} dh_p = \int_0^h \left(\frac{R_E}{R_E + h}\right)^2 dh$$

$$\boxed{h_p = \left(\frac{R_E}{R_E + h}\right) h} \qquad \boxed{h = \left(\frac{R_E}{R_E - h_p}\right) \cdot h_p}$$

Bsp.: $R_E = 6378\ km$, $h = 40\ km$

$$h_p = \frac{6378}{6418} \cdot 40\ km = 39{,}75\ km$$