More on Tidal Forces

The Sun also exerts a tide on the Earth.

Now, $F_T \propto \frac{M_P}{r^3}$ so $\frac{F_{T,\text{Sun}}}{F_{T,\text{Moon}}} = \frac{M_{\text{Sun}}}{M_{\text{Moon}}}\left(\frac{r_{\text{Moon}}}{r_{\text{Sun}}}\right)^3$

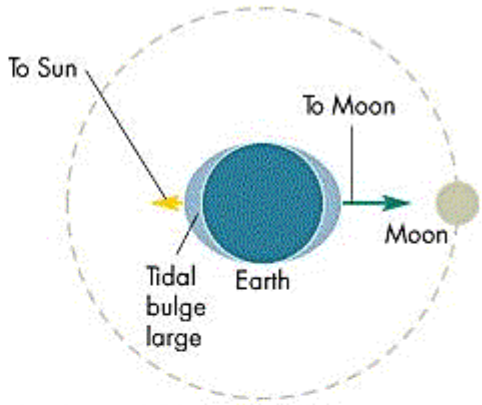
$M_{\text{Sun}} = 1.989\times10^{30}\,\text{kg}$ $\quad M_{\text{Moon}} = 7.35\times10^{22}\,\text{kg}$

$r_{\text{Sun}} = 1.496\times10^{11}\,\text{m}$ $\quad r_{\text{Moon}} = 3.844\times10^{8}\,\text{m}$

Hence $\frac{F_{T,\text{Sun}}}{F_{T,\text{Moon}}} = \frac{M_{\text{Sun}}}{M_{\text{Moon}}}\left(\frac{r_{\text{Moon}}}{r_{\text{Sun}}}\right)^3 \approx 0.5$

i.e. the tidal forces on the Earth due to the Sun and Moon are **comparable**.

Spring tides occur when the Sun, Moon and Earth are aligned (at Full Moon and New Moon). High tides are significantly higher at these times.



Neap tides occur when the Sun, Moon and Earth are at right angles (at First Quarter and Third Quarter). Low tides are significantly lower at these times.