

How do ring systems form?

e.g. for **Saturn**, from the Table of planetary data:-

$$\bar{\rho}_p \approx 700 \text{ kg m}^{-3}$$

Take a mean density typical of the other moons:-

$$\bar{\rho}_m \approx 1200 \text{ kg m}^{-3}$$

This implies
$$r_{RL} = 2.456 \times \left(\frac{700}{1200} \right)^{1/3} \times R_p = 2.05 R_p$$

Most of Saturn's ring system *does* lie within this Roche stability limit, and *all* of its moons lie further out!

More on Tidal Forces

Of course, tidal forces also have an effect (albeit less destructive) *outside* the Roche stability limit.

Consider the effect of the Moon's tide on the Earth (and vice versa).

The tidal force produces an oval bulge in the shape of the Earth (and the Moon)

There are, therefore, **two** high and low tides every ~25 hours.

(Note: not every 24 hours, as the Moon has moved a little way along its orbit by the time the Earth has completed one rotation. Thus high and low tides are not at the same time each day)

