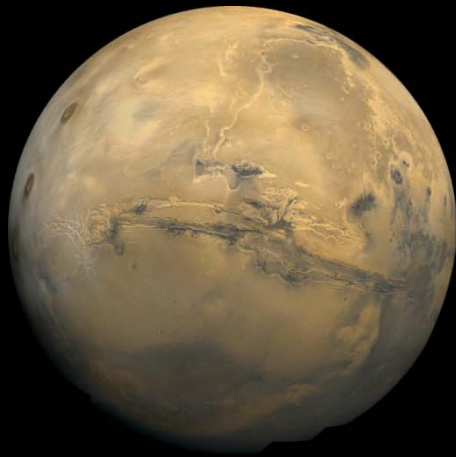


Martian moons from an accretion disc

Based on Rosenblatt and Charnoz 2012



Phobos



Deimos

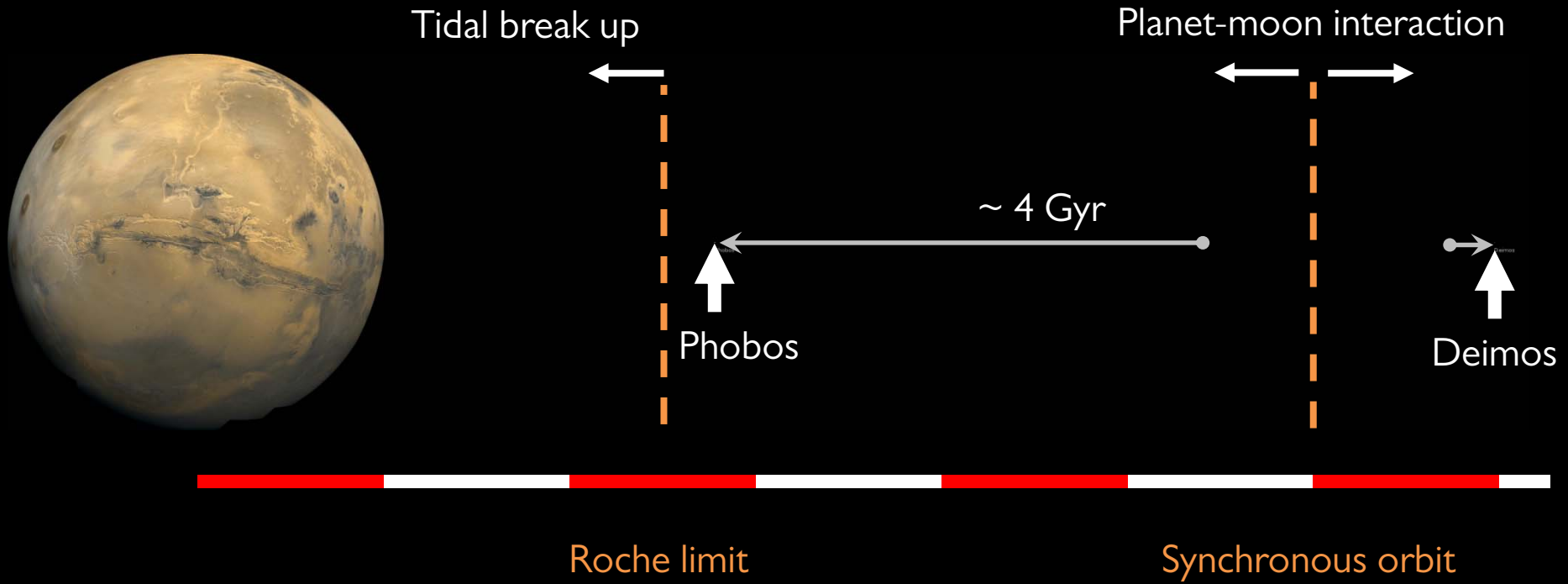


Roche limit

Synchronous orbit

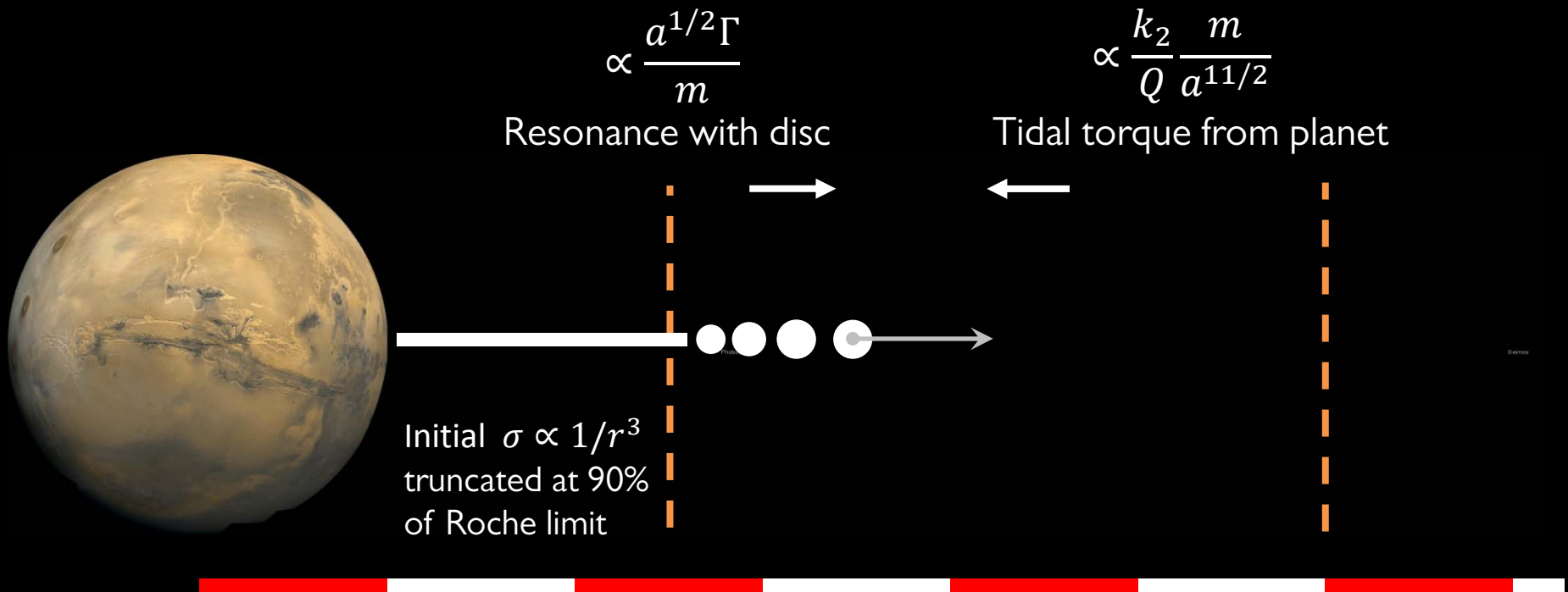
Orbit evolution post formation

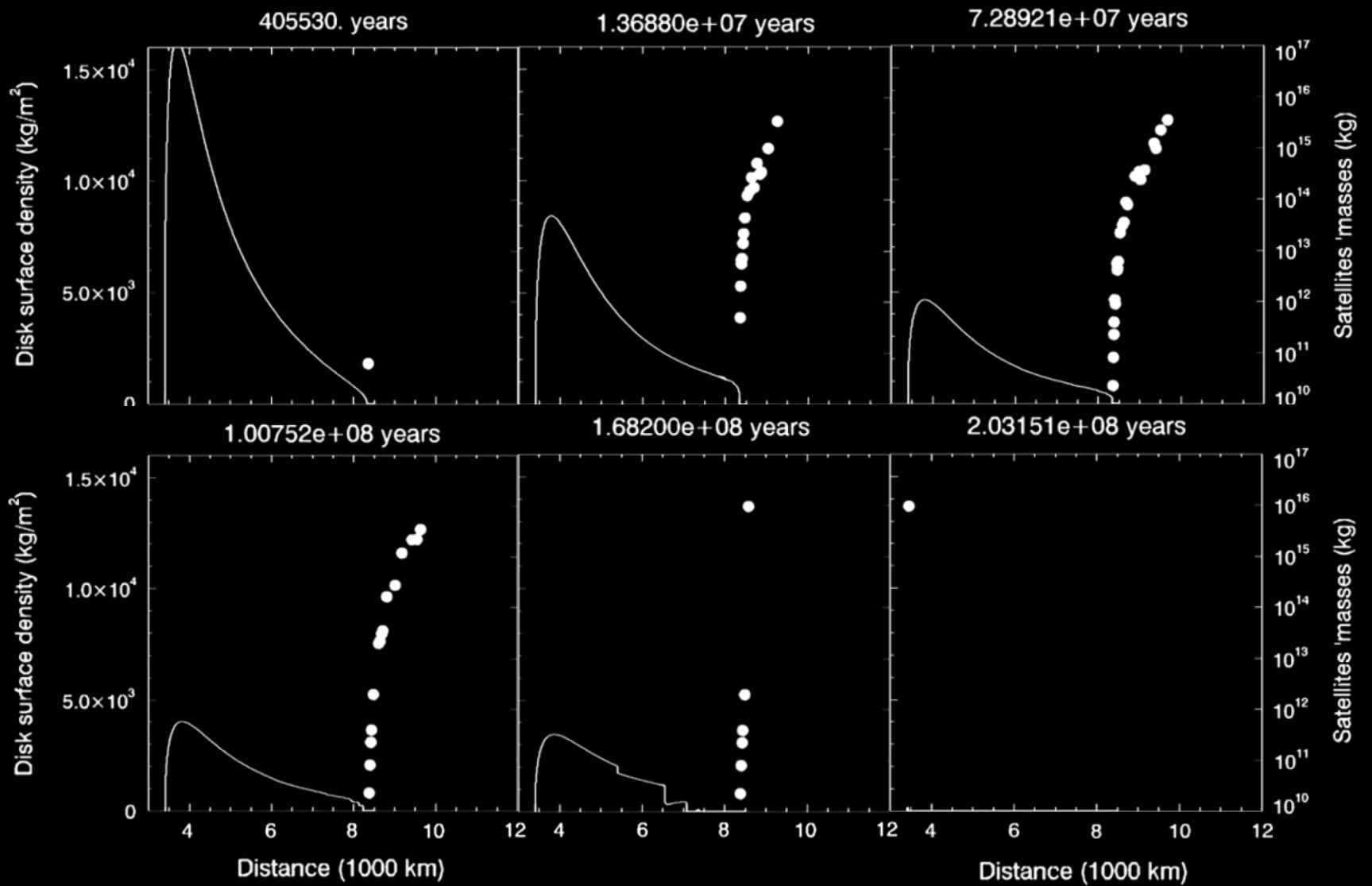
$$\frac{da}{dt} = 3 \frac{k_2}{Q} \frac{G^{1/2} R_p^{1/2}}{M_p^{1/2}} \frac{m}{a^{11/2}}$$



Cold debris disc – ‘strong tidal limit’

As a disc initially inside the Roche limit extends across it, objects form and grow by mutual accretion



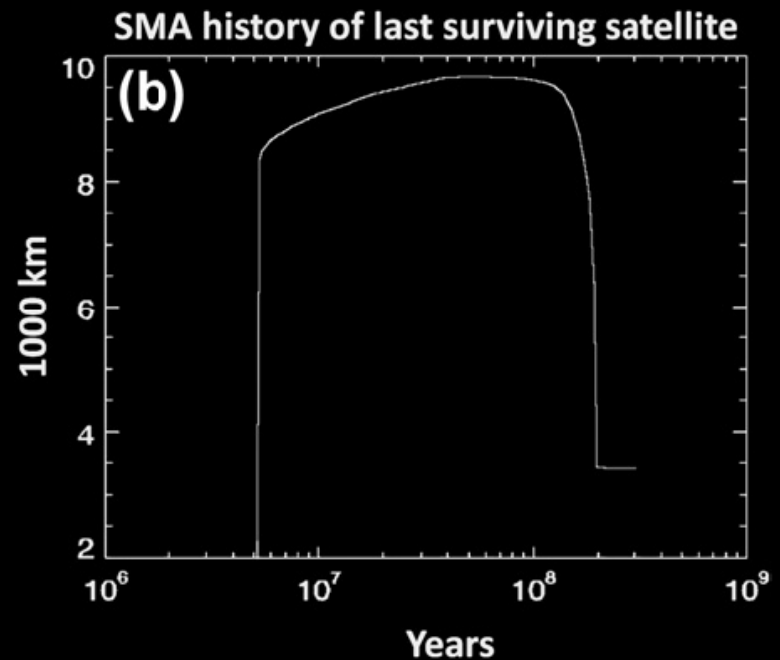


Rosenblatt and Charnoz 2012

Martian moons from an accretion disc – Qian Wang

Cold debris disc – ‘strong tidal limit’

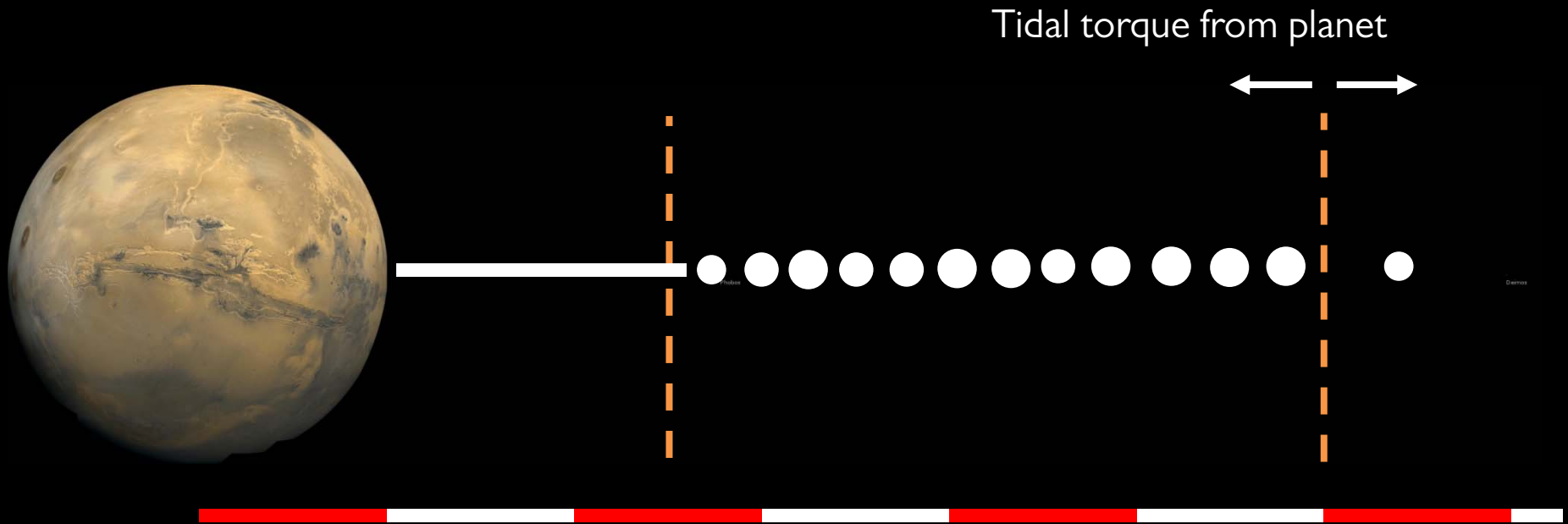
- Tidal decay of orbit trumps resonance with disc, net torque reigns moonlets in
- Simulations found that moonlets cannot migrate far enough out (3 – 4 Mars radii)
- Everything falls after 200 Myr, incompatible with Martian surface age ~ 1 Gyr



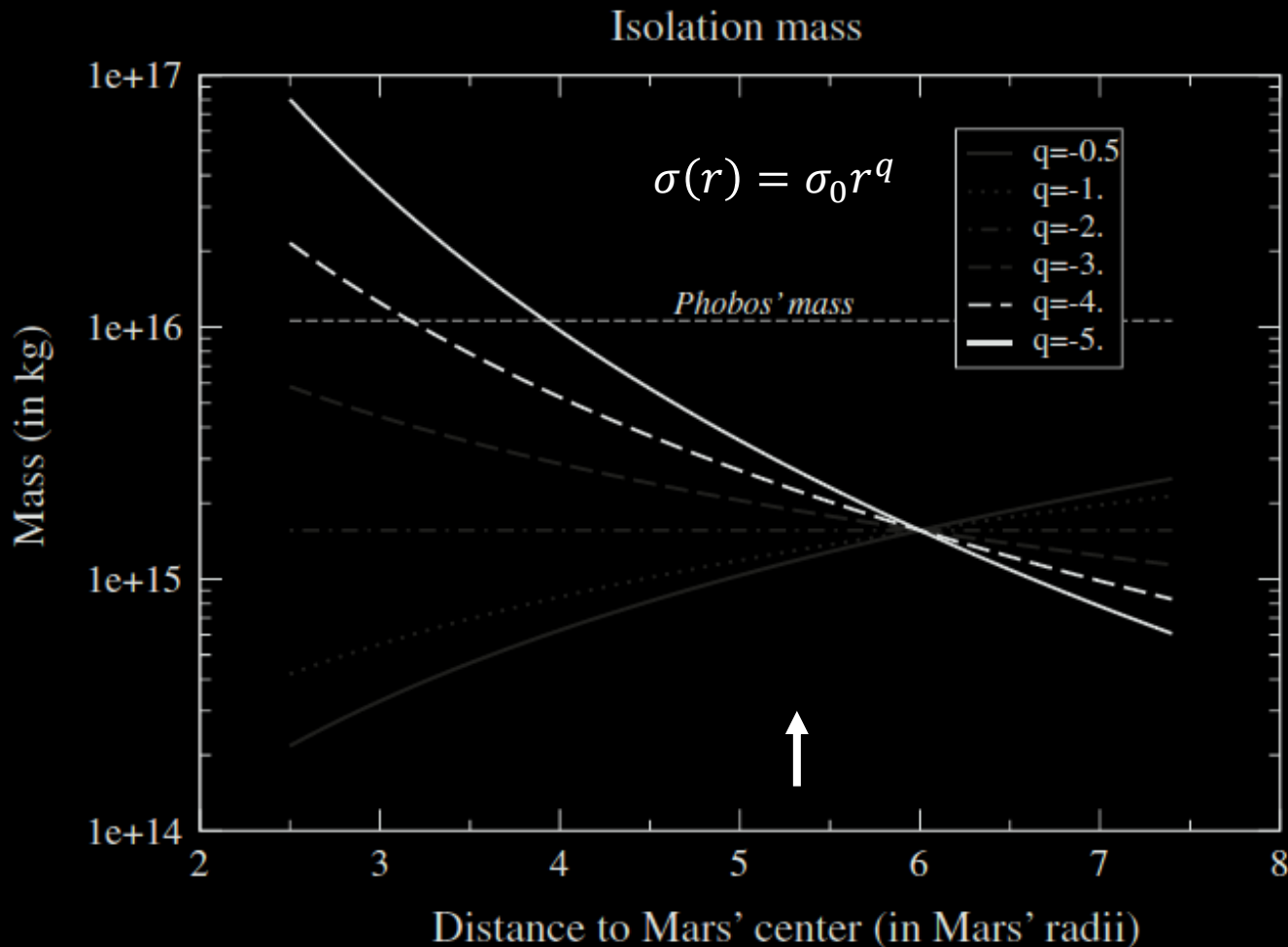
Rosenblatt and Charnoz 2012

Hot debris disc – ‘weak tidal limit’

Moon embryos form by runaway growth similar to planet formation



Hot debris disc – ‘weak tidal limit’



Rosenblatt and Charnoz 2012