Sintering fragmentation of a dust aggregate due to sublimation and condensation

Sin-iti Sirono[1]

[1] Earth and Planetary Sci., Nagoya Univ.

One of the most important unknown processes in planet formation is the formation of planete simals. If the dust surface density is increased by a factor of 10 from its standard value, gravitational instability takes place resulting in the planetesimal formation (Sekiya 1998).

The gas outside the snow line is saturated with H$_2$O vapor. Sublimation and condensation proceed on the surface of grains in an icy dust aggregate. Because the vapor pressure on a small grain is larger than that on a large grain, H$_2$O molecules sublime from small grain s and condensate on large grains. As a result, an icy grain aggregate breaks to small fragm ents. I will show the fragmentation by numerical simulations. By a numerical simulation tak ing account of the fragmentation, the dust surface density exceeds the critical value requi red for gravitational instability by the fragmentation.