P140-003 **Room: 304** **Time: May 18 11:15-11:30**

Silicate atmosphere after a giant impact

Junya Miki[1]; Yutaka Abe[1]

[1] Earth Planetary Sci., Univ. Tokyo

According to the recent works on the planetary formation, several tens of Mars-sized protoplanets are formed through a successive accretion of planetesimals in the terrestrial planet region (e.g., Kokubo & Ida, 1998). Then, these protoplanets collide and accrete each other. Such collisions are called giant impacts. It is generally thought that several giant impacts of Mars-sized protoplanets occur at the late stage of the terrestrial planet formation and Earth and Venus are formed by this mechanism (e.g., Chambers & Wetherill, 1998).

A protoplanet after a giant impact is very hot (predicted temperature is about 4000 - 10000 K (e.g., Canup, 2004)) and partially vaporized by the high impact energy. Thus, the giant impact would have produced an impact-induced silicate atmosphere (a mixture of silicate vapor, dust (condensed components) and other components contained in protoplanets). We estimated the structure of the silicate atmosphere and its loss rate by calculating the chemical equilibrium. We use the PHEQ program (Wood & Hashimoto, 1993) that includes 12 elements (H, O, C, Mg, Si, Fe, S, Ca, Al, Na, Ti, N) and 276 components (including ionic compounds).

The partially vaporized silicate atmosphere would optically thick because dusts float in the atmosphere. Dusts would block radiative heat transfer and convection would develop. So, the silicate atmosphere would have adiabatic temperature gradient. Estimates from the chemical equilibrium calculation show three layers in the silicate atmosphere. (1) High temperature region (lower atmosphere): Over silicate condensation temperature, few dusts, and optically thin. (2) Silicate condensation temperature region (middle atmosphere): The layer in which major silicate condenses. The adiabat is close to isothermal due to the very large latent heat for condensation of silicate vapor. (3) Low temperature region (upper atmosphere): Low pressure and density, optically thin, radiatively equilibrated. Upper atmosphere is likely close to isothermal. Estimates of atmospheric radiations show that cooling time of high temperature silicate atmosphere itself is about from a few to 10 years.

We computed the escape fluxes of silicate vapor from the isothermal upper atmosphere. Escape from a Mars-sized body is 10^{15} kg/yr at the maximum. An Earth-sized body hardly loses its atmosphere because of its large gravity. Hydrogen, most light elements, also hardly lose, for heavy gases in the upper atmosphere suppress the escape flux of hydrogen. Taking account of escape from disks, the difference in the amount of alkali metal between Earth and Mars may come about. But the differences in the amount of water and alkali metal between meteorites and terrestrial planets never be brought. To explain these differences, we need some other ideas.