I212-016 **Room: 201A** **Time: May 28 9:45-10:00**

Numerical modeling of superplume and plate tectonics in the earliest earth

Kunihiro Fujita[1]; Masaki Ogawa[2]

[1] Earth & Planetary Science, Univ. of Tokyo; [2] Dept. of Earth Sci. & Astronomy, Univ. of Tokyo at Komaba

http://ea.c.u-tokyo.ac.jp/earth/fujita.htm

A series of numerical models of coupled magmatism-mantle convection system with moving plates have been developed to understand the dynamics of plates and superplumes in the strongly heated mantle of the earliest earth. The superplumes as broad piles of subducted oceanic crusts on the core-mantle boundary develop well and remain at depth in the lower mantle for geologic time in the present mantle. This is because the thermal buoyancy due to the internal heating in subducted oceanic crusts balances their compositionally induced negative buoyancy, and the superplumes are neutrally buoyant as a whole. In the mantle of early earth, however, the internal heating due to subducted oceanic crusts is too strong to keep the neutral buoyancy of superplumes for geologic time: superplumes, if developed, would become buoyant within a short period of time. The strong internal heating induces mantle overturn and lets a large amount of materials in hot regions at depth in the lower mantle ascend to the surface at a burst. This mantle-overturn causes vigorous magmatic activity and lets magma-ponds develop along the surface boundary. The vigorous magmatic activity severely damages plates, the plates disintegrate into smaller pieces, and many new subduction zones are frequently formed. The present style of plate tectonics as a tectonics induced by several large rigid plates that steadily move, therefore, does not occur any more, and the lithosphere behaves more chaotically. The mantle overturn and chaotic motion of lithosphere effectively stir the mantle, and the mantle becomes more homogeneous. Superplumes do not develop well in the early earth. The numerical model of mantle convection developed here suggests that mantle convection has changed its style in the earth's history from the one characterized by frequent mantle overturn, vigorous magmatism and chaotic plate motion to the one characterized by stable superplumes and rather steady plate motion. The style of mantle convection in the early earth modeled here is consistent with the picture of the mantle convection inferred from the geologic records of the Archean continents.