The 74th GRC & The 19th MEXT Shin-Gakujutsu "Core-Mantle Coevolution"
International Frontier Seminar

On the role of dislocation climb for the convection of planetary interiors

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2018.11.5 (Mon.)
17:00-18:00
Meeting Room #486, Science Research Bldg. 1, Ehime Univ.

Planetary interiors are characterized by high confining pressures. Evacuating heat by convection needs activation of creep mechanisms which are efficient enough under high pressures and small deviatoric stresses. In case of a silicate like bridgmanite, dislocation modeling demonstrates that glide is strongly inhibited by pressure. Standard dislocation creep mechanisms are thus inefficients. Since diffusion is also slower under high pressure, activation of diffusion creep places very strong constraints on grain sizes which are questionnable.

In this presentation, we discuss an alternative where plastic strain is produced by pure climb creep. Dislocations in climb configurations act as sources and sinks of point defects which are exchanged between (at least) two dislocation families. The resulting rheology is non linear (stress exponent 3), but it does not produce crystal preferred orientations which is in agreement with the absence of strong seismic anisotropy in the lower mantle.

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