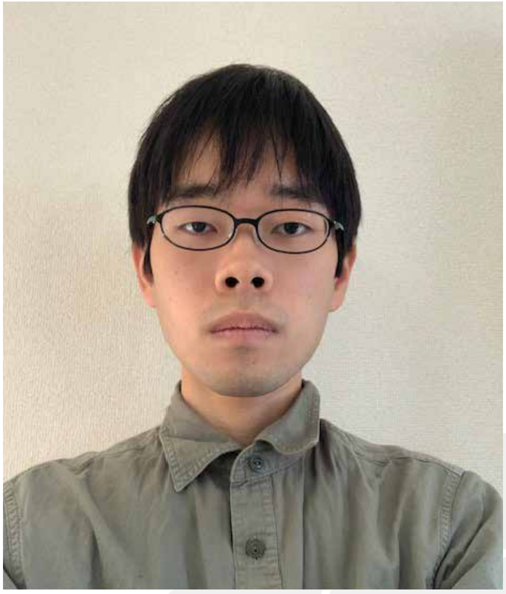
THE GEODYNAMICS SEMINAR

№ 643



Development of 3-D Numerical Models for Thermo-Mechanical States in Subduction Zones and Applications to the Along-Axis Variations in the Flow Structures in Mantle Wedges

Computational fluid dynamics approaches are important research tools to understand the thermal and flow structures in the mantles of subduction zones. Actual subduction zones exhibit 3-D characteristics, including the along-axis changes in the ages of subducting plates, oblique subduction, and non-planar shapes of the slab surfaces. In this study we are developing a 3-D numerical model of thermal and flow structures in subduction zones, by kinematically incorporating these 3-D characteristics of plate subduction. From the preliminary numerical experiments using this model we found that the non-planar shapes of the slab surface and trench axis significantly increase the three-dimensionality of the flow field above the subducting plates, while the effects of others are minor.
We also applied our numerical model to the thermal and flow structure in the mantle wedge beneath the Northeast Japan where the Pacific Plate is subducting. We demonstrated that in the cases with non-planar curved shapes of the slab surface and trench axis a 3-D small-scale convection (SSC) takes place within the mantle wedge, which are in good accordance with the "hot fingers" inferred from the distributions of active volcanoes in the region. We can therefore conclude that, in addition to the decrease in the viscosity of the mantle wedge (due to the dehydration), the non-planar shapes of the slab surface (and of the trench axis) play a crucial role in the generation of SSC within the mantle wedge.

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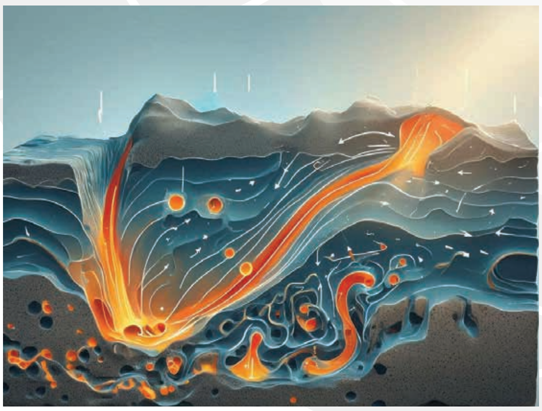
2025.11.21 (Fri.) 16:30 ~

Venue: Meeting Room #486
Science Research Bldg. 1, 4th floor.
Ehime Univ.

Keywords
1. 3-D numerical simulations
2. Mantle wedge
3. Small-scale convection (SSC)



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