

Thermal structure and the genesis of large earthquakes under the Japan Trench inner slope, North-East Japan arc

Shozaburo Nagumo[1]

[1] OYO Co.

none

The gravitational shear flow was detected on the seismic reflection profiles under the Japan Trench inner slope. The slip zone of the shear flow develop under the Cretaceous unconformity, and above the oceanic plate. In and above the shear flow zone, the island arc rock mass is driven towards ocean by the horizontal gradient force of the self-weight pressure. The ductile nature of the shear flow zone seems to originate from the central volcanic island arc.

Considering the geological implication of such shear flow zone, we postulate a picture of the arc-trench dynamics as below. Under the volcanic arc, the heat in the upper mantle is transported into the lower to intermediate crust forming hot thermal regime in the lithosphere. The buoyancy of the hot asthenosphere and lithosphere uplifts the volcanic island arc, which drives gravitationally the rock masses towards ocean. The gravitational shear flow predominates in the ductile intermediate zone of the crust. By the progressive shear deformation in and above the shear flow zone, the gravitational potential energy of the rock masses migrates towards ocean, and is converted to the elastic strain energy leading the formation of the large earthquake provinces.