



Kamchatka island arc: two modes of extension in the overriding plate

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Unlike the neighboring island arc of Japan, or the island rise of Sakhalin, which is farther inland of the subduction zone, the Kamchatka island arc is experiencing arc-normal extension. This extension is manifested by two types of fault-associated structures spatially separated and evolving thus likely independently. Firstly, this is the asymmetrical Central Kamchatka depression (CKD) bounded in the east by normal faults of the East Kamchatka fault zone, striking obliquely to the deep sea trench. Geomorphologic and trenching data suggest that the west-dipping planes of these faults likely flatten with depth, that is, may have listric morphology. None of these faults define location of any volcanic center in Kamchatka.

Secondly, this is a set of extensional faults confined to the volcanic zones of the east, the south and the north of Kamchatka and manifested by either surface scarps or fissures beneath linear rows of monogenic cones. Both the volcanic zones and their faults extend parallel to the deep sea trench and, in plan-view, concordant with the geometry of the upper part of the subducted oceanic plate. Two extensional features intersect in the north of central Kamchatka, the intersection marked by the Kizimen volcano sitting just on the faulted slope of the CKD east flank. There are no signs that two features influence each other. This suggests that each of the extensional structures in the leading edge of the overriding plate, one of them magmatic and another amagmatic, may have its own source. Volcanism-producing extension relates primarily to the subduction of the oceanic plate and affects the whole arc crust above a certain depth of the subduction zone. The Central Kamchatka depression is a purely tectonic extensional feature that has developed in upper crust evidencing that strong partitioning of relative movement between the oceanic plate and the arc occurs.