Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SVC070-P01 Room:Convention Hall Time:May 23 16:15-18:45

Progress in new theory of volcanism with 2011 eruption of Shinmoe-dake as a trigger: birth of caldera chain tectonics

Yoshimasa Iida[1*]

[1]non

This is a sequel to the presentation on the shock-wave fracturing pipe model in this meeting (S-VC47). According the model the crater is laterally located to the magma reservoir (MR) as the vent is formed by laterally discharged shock wave with dome crush. The Shinmoe-dake erupted on the next day of the abstract submission. A few days later GSI released MR was estimated 10 km WNW to the Shinmoe-dake, that is concordant with the model. Further 5 km NW quake swarms (1968 Ebino quake etc.) occurred in the past. The MR underlies the focal region. It supplied magma to the secondary MR in vent.

MR is suspected below the quake swarm. The swarms in Matsushiro and the off-shore of east Izu Pen. are underlain by MRs for Mt. Asama and Izu-Oshima.

Then I noticed the epicenter distribution before and after the Unzen-dake eruption (Ohta, 1993; Jour. Geol. Soc. Japan, Fig.28) is consistent with the vent-forming model. The MR is estimated 15 km below the Chijiwa caldera. The MR for the Shinmoe-dake is also estimated below a caldera (Kakuto). Is this accidental?

According to the model, as the load on shallower dome is lighter, the shallow MR tends to grow large without crush. Assuming the magma is generated in the deep, it is natural that the huge MR is formed in the shallow part that is plugged by cooled and solidified vent top. The shallow MR grows with succeeding magma supply without eruption into a silent gigantic MR.

The lateral eruption with dome crush of big MR forms a collapse caldera. The sudden fall of pressure generates new magma in the deep. The caldera chain (CC) is formed by the repetitive process; dome crush, vent forming, eruption, shallow MR grow, and collapse caldera. Plural MRs are usually generated; most of them form normal volcanoes surrounding the caldera.

The depression called volcanic graben is CC. The typical one is Kagoshima Bay; Ata-south, Ata-north, and Aira calderas form a northward CC. The next may be the gravity low to NW of Aira caldera. CC is estimated from the off-shore of western Satsuma Pen. to the Chijiwa caldera; the next may be the gravity low in east off-shore of Shimabara Pen. In Kirishima area the Kobayashi and Kakuto calderas make CC; the next may be the gravity low in Makizono-cho. In Ohita pref. a complex CC is estimated; a forecasted next caldera is the gravity low in Beppu Bay. Intensive observation to three of the indicated gravity lows is required.

The CCs are seen in the Ogasawara, Mariana, and Okinawa troughs, Philippine Sea, Japan Sea, and the graben in western side of Japan Trench. The CC in ocean is larger than that in land. The land caldera eruptes large pyroclastic flow; in contrast the ocean one flows vast basalt. The North-Yamato bank is a rare case; a large MR was solidified without eruption with radial dykes; the SE half was lost by another CC.

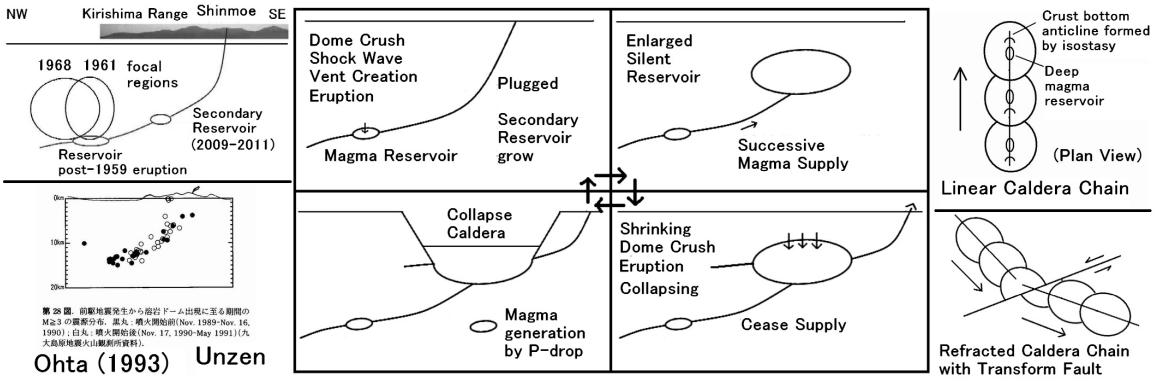
The CC has linearity. An anticline coincides with the center axis of calderas is formed in the crust bottom due to isostasy to make new MR place in same direction. The seamount chains are formed by CC. The uniform ocean crust keeps the high linearity. The CC is refracted by the transform fault.

The Columbia River plateau and the corridor to Yellowstone in the western US consist of CCs. The Basin and Range consists of many NS trending CCs.

The Rift Valley in the eastern Africa is CC. The Red Sea seems to spread after the CC passed. The CC is seen on the Atlantic Ocean coasts. As a continental cutter the CC migrated northward across the Pangaea. N-S trending CC seems common, but E-W may be dominant in equatorial region. This may be related to the tidal force and spin.

Surprisingly the Marineris canyon of Mars seems a CC. The North Polar Basin was formed by CC. The luna maria were formed by CC. The older is larger and the younger is smaller, as the MR deepened with moon cooling. NNW trending ray system of Tycho crater seems a CC; magma may be generated by meteorite impact.

I would like to express deep sympathy for victims of the disasters.



Keywords: volcanic graben, caldera chain, separation of continent, luna mare