Submarine calderas on the Shichito-Iwojima Ridge, northern Izu-Ogasawara Arc

M Yuasa (Geological Survey of Japan, AIST, Tsukuba Central 7, 1-1Higashi 1-chome, Tsukuba, Ibaraki, 305-8567 Japan; ph 81-298-61-3687;fax81-298-61-3672; e-mail yuasa-m@aist.go.jp)

There are thiteen volcanic islands and fifteen major volcanic seamountsonthe Shichito-Iwojima Ridge, Izu-Ogasawara Arc. They lie parallel to theIzu-Ogasawara Trench to constitute the volcanic front of the Arc. Eightsubmarine calderas are recognized on the ridge. Seven of them are in thenorthern part of the ridge, and at least six calderas, Kurose,Higashi-aogashima, Myojin Knoll, Myojinsho, Sumisu and Minami-sumisu(Daisan-sumisu Knoll) calderas from north to south are accompanied withdacitic or rhyolitic pumice. Stratified layers are observed on theseismicprofiles of flanks of these calderas, and recent submercible survey hasdisclosed a thick pumiceous seuquence on the wall of Myojin Knollcaldera.The submarine calderas on the Shichito-Iwojima Ridge have a basaldiameterof 2-10 km with a caldera-floor diameter of 1-6 km and a height of0.8-1.8km. Compared with the subaerial calderas produced by a large-scalepyroclastic eruption of felsic magma, they are verysmall in basal andcaldera-floor diameters and large in height. The depth-to-daimeterratiosrange from 1:1 to 1:5, and the caldear floors are located almost at thesame levels of the surroundings 0.6-1.5 km deep, similar to maar-typevolcanoes. Pumiceous deposits recovered from ODP sites 788-791 close toMinami-sumisu caldera commonly contain not only pumice lapilli andblocksbut also blocky or platy variably vesicular glass shards ofphreatomagmaticorigin. Gravity anomalies of the submarine caldearas are not low, due tocentral lava domes or minor mass-loss by eruption. I thus propose thatthesubmarine caldera structures were produced by consecutive submarinephreatmagmatic explosions at the top of ascending vesicular magma, butnotby collapse of basement rocks upon catastrophic pyroclastic eruption.Theresulting structures are perhaps comparable to a funnel-shape caldera ormaar-type volcano.