Study on silica-rich breccia of impact crater at Takamatsu-Kagawa district in Japan

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To compare with lunar Maria crater with basaltic intrusion along veins, impact crater structure of volcanic islands on the Earth is studied on Takamatsu-Kagawa buried structure, which is located in Busshozan-Cho, Takamatsu City, Kagawa Prefecture (in center site) to Kagawa-Gun, Kagawa Prefecture (in southern part). The main purposes of this paper are 1) to elucidate silica-rich breccias, 2) to elucidate shocked quartz with altered minerals, 3) to show X-ray CT (Computer tomography) images of the samples, 4) to indicates intrusion of andesitic vein to shocked melt rock, and 5) to compare with crater structure of lunar Maria.

1. Location of shocked quartz:

Shocked quartz with planar deformation features (PDFs) can be found in three localities as follows. 1) granitic basement rock S2 in surface of the rims, 2) drilled melted breccias D1 (450m to 1,120m in depth) and 3) melt breccias at surface around the andesitic intrusions.

Shocked quartz textures of the mixed with zeolitic minerals changed from feldspar grains by buried metamorphism and andesitic hydrothermal solution are found at the surface and drilled samples of melt breccias which is originally melted breccias of the crater sediments.

2. Bulk chemical change of drilled crater sediments:

Bulk XRF data of the drilled samples are changed from bottom to surface (on Al2O3 to SiO2) which are completely different with magmatic crystallization trend. There is sharp change of these bulk XRF compositions at 450m to 470m in depth to higher silica-rich composition, which suggests that original crater sediments are ca.470m in depth, and that there is thick volcanic flow from smaller andesitic intrusions, followed by transportation of flow-out impact sediments above the ca.460m in depth to cover the crater structure finally.

3. Geology of the surface:

There are three types rocks of impact-related breccias from the crater, buried metamorphosed breccias with zeolitic minerals formed by later volcanic intrusion, and andesitic rocks from crack as intrusion. Shocked data of glasses and Fe-Ni bearing grains can be found within 8km boundary of the rim.

4. X-ray CT images:

The surface and drilled sample are checked by X-ray CT images to found Fe,Ni bearing grains inside the samples. There are smaller grains inside the sample.

5. Similarity with structure of lunar Maria:

The present impact crater followed by volcanic vents is similar with impact crater of lunar Maria.

6. Summary:

The results are summarized as follows:

1) Three silica-rich rocks in Takamatsu-Kagawa district are found as original impact rocks, melt brecciate rocks with rocks.
2) Three types shocked quartz with PDFs are found in this district.
3) These rocks are related by broken structure from original ca.8km in diameter as impact structure at volcanic Islands of Japan.
4) X-ray CT images show smaller grains inside the sample.
5) Impact crater followed by volcanic vents
is similar with impact crater of lunar Maria.