**IMPACT DRILLED SAMPLES OF BURIED CRATER STRUCTURE AT TAKAMATSU-KAGAWA DISTRICT IN JAPAN.** Y. Miura, N.Koga and A.Nakamura, Institute of Earth & Planetary Sciences, Faculty of Science, Yamaguchi University, Yoshida 1677-1, Yamaguchi , Yamaguchi, 753-8512, Japan. E-mail: yasmi-ura@yamaguchi-u.ac.jp

**Introduction:** Surface shocked materials lifted from crater bottom with later andesitic intrusion along cracks are reported by previous papers at Takamatsu-Kagawa district from Busshozan-Cho, Takamatsu-City to Kagawa-cho, Kagawa Prefecture, Shikoku Islands, Japan [1-3]. Drilled samples to 1,750m in depth are collected every 10m intervals as slice grains are studied by separated preliminary reports [4-8]. Purpose of the present paper is to make drilled profile and to elucidate shocked materials of quartz and Fe-Ni particles from buried crater which is probably related with formation of Japanese islands and Sea of Japan in Miocene Tertiary.

**Drilled Samples:** Borehole project of 1,750m in depth has been carried out at the Hotel Kansui (with courtesy of manager Mr.T.Oka) of north inside within buried crater of Takamatsu-Kagawa district to make hot spa project, where there is no mountain of andesite intrusion with hydrothermal veins. Deep drilled samples stored in Y.Miura Laboratory of Yamaguchi University up to 1,750m indicate that there are many layers of flow-in rocks and sediments from outside which are completely different with volcanic intrusion district of "the Goshikidai drilled samples" from 20km West-North of Takamatsu-Kagawa district in the same Kagawa Prefecture. Drilled samples up to 1,750m in depth have been checked as follows (Fig.1):

1) Layer of 0m to 170m:Complete buried crater structure was formed by the Alluvium sediment for 45m and conglomerate and clay of the Mitoyo group layer with 125m in thickness, which was formed in the water (sea or lake) sediments.

2) Crater sediments I (upper part) of the crater (170m to 450m) are flow-in sediments (of "round" granite of basement rock, andesite as intrusion and crystalline minerals from these rocks) from outside the crater for 280m in thickness. This indicates typical impact cratering event to the sedimentation process (not large type of volcanic event) at the later stage during or after filled event to form the buried crater.

3) Crater sediment II ( lower part) of melt breccias brownish and black) for 675m in thickness(450m to 1,125m), which we can find only Fe-Ni-bearing grains (Fig.2) and spherules, together with shocked quartz grains in melted rocks.

4) Basement of granitic rock is found with recrystallized texture of quartz and feldspar from 1,125m to 1,750m in depth (i.e. 625m in thickness). There are a few percent of basaltic rock type in the drilled samples which indicate inrusion along cracks at later volcanic event during volcanic Goshikidai formation. However there no large volcanic rocks at granitic basements rocks of the buried crater.

**Fe-Ni-Co grains:** Fe-Ni rich grains (ca.10μm in size) are found at the crater sedimenst I of 230m and 420m, and the crater sediments II of 610m, 930m, 950m, 960m, 980m, 1,080m in depth (Fig.2). Spherules of polyhedral shapes (ca.50μm in size) are found at samples of 930m in depth. These Fe-Ni rich grains indicates that these Fe-Ni-Co rich grains are formed during mixture of Fe-Ni-Co grains from meteoritic impacts.

**Shocked quartz**: Shocked quartz of PDFs texture can be found at surface lifted from crater bottom and drilled crater sediments II (450m to 1,125m) of 460m, 690m , 960m and 1,120m in depth (Fig.2). This indicates that these shocked quartz minerals are formed at event of the sediment II as impact breccias. The main reason why we cannot find many shocked quartz minerals at this district is that a) basement rock of Rhyoke granite is so hard to make shocked feature (though it was crushed during the Koshikidai intrusion from North-West direction), and b) shocked quartz garins are found at brecciated glassy texture easily changed with feldspar grains with twinning from original texture.

**Water analysis:** Water analysis from the crater bottom of 1,750m indicates that temperature is 45 degree C, and rich in Na+, Cl□ and Fe(total) ions, and F ions, though there is no S ions (as in the volcanic hot spa in Japan) which was analysed by official hot-spa Laboratory of Kagawa Prefecture Laboratory. This indicates that water from buried crater bottom is not volcanic type, but non-vocanic,deep-layer grandwater and fossil sea-water type water which can be applied for hot-spa.

**Broken buried crater structure:** There is "no active and large volcanic rocks" at drilled samples under 450m of real crater sediment and crater bottom which suggest that there is "no large volcanic event" in the crater formation. Later volcanic intrusions along cracks are considered to be a) young volcanic rocks from small intrusion of andesite after crater formation, and b) rocks injected to the cracks of buried crater structure which were formed by later Goshiki-dai basaltic

intrusion. The latter broken process is considered to be formed at a) uplifts of Granitic basements, and b) basaltic intrusion of the Goshikidai plateau produces finally compression to South-East direction to against original crater structure to form crashed granitic rocks around the crater structure (Fig.4). This process can be found by negative gravity anomaly [9] of the crater to show ellipsoidal-shape on NE-SW direction against hard granitic blocks at the South direction. Sharp negative gravity anomaly with two types of ellipsoidal shape were formed by by later crustal event of small volcanic intrusions along the crack to form quasi-circular shape of 4km in size finally. These strong broken process are found from field outcrop observation that almost all Ryoke garnites found in and around the buried crater are broken to small blocks of granitic rocks.

**Summary:** Drilled samples to 1,750m in depth of buried crater of Takamatsu-Kagawa district of Japan show shocked quartz and Fe-Ni-Co grains mainly crater sediments. Water from the bottom indicates non-volcanic tyoe water. Compared with other drilled samples of the volcanic Goshikidai plateau, buried crater of Takamatsu-Kagawa district is not srong volcanic type but meteoritic impact type. Large basaltic intrusions of the Goshikidai plateau squeeze original shape of the meteoritic crater structure. Small andesitic intrusions after impact event form finally smaller quasi-circular crater of half size (4km in size) [2-7].

**References:** [1] Miura Y. et al. (2001): *LPS XXXII* , Abstract#1981. [2] Miura Y. (2001): *Meteoritics Planet. Sci.* 36S, 136-137. [3] Miura Y. et al. (2001): *Proc. 34th ISAS LPS* ,33,183-186. [4] Miura Y. (2002): *Geol. Soc. America (Denver,USA)*, Abstract 239-11, [5] Miura Y. (2002): *LPS XXXIII*, Abstract# 1231. [6] Miura Y. (2002): *Meteoritics Planet. Sci.* 37S, 101. [7] Miura Y.(2002): *Proc. 35th ISAS LPS* ,34,124-127. [8] Miura Y.(2002): NIPR 25th Antarctic Meteorites. [9] Furumoto M.,Y.Miura & Y.Kono (1996): *Proc. Int. Symp. Obs. Cont. Crust through Drilling*, 8, 172-177.

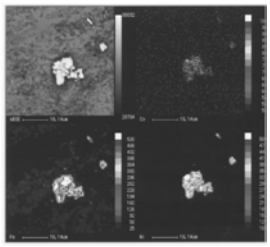

Fig.2. Electron color-mapping micrographs of Fe-Ni-Co-bearing particles with SEM image (upper left) at 610m drilled sample of buried crater in Takamatsu-Kagawa district in Japan [4-8]

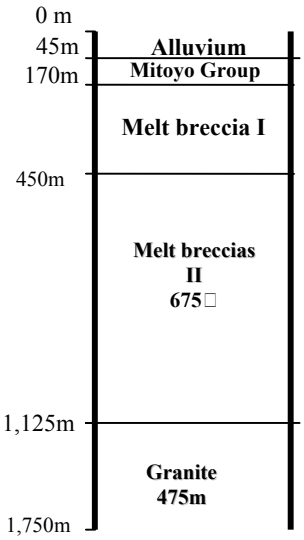


Fig.1. Drilled log of buried crater structure at the Takamatsu-Kagawa district in Japan [4-7].

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Fig.3. Optical polarized micrograph of shocked quartz
Multiple sets of the PDFs texture with three directions in breccias at buried crater in Takamatsu-Kagawa district , Japan [4-8].

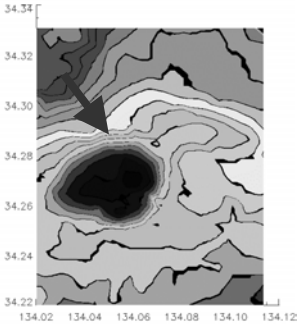


Fig.4. Gravity anomaly mapping of Takamatsu-Kagawa district (Center as dark area), together with volcanic Goshikidai compressuion from NW direction shown by arrowm [4-8].