IMPACT CRATER (I): TERRESTRIAL IMPACTS ON TWO TARGETS OF LAND AND OCEAN FLOOR.

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Introduction: Earth's impact craters are described on crater shapes with impact evidences on dry lands so far [1]. However, terrestrial surface reveals lands (ca.30 vol.%) and ocean water (ca.70vol.%), which indicates that impacts on ocean-water surface (non-solids as liquid) are disappeared after impacts for long Earth's history [2, 3]. In order to elucidate more effects on Earth changes (including life activity), different target rocks on water-planer Earth should be classified in this impact crater series as part 1 shown as the main purpose of the present paper.

Descriptive study of dynamic impact process: In general, dynamic process of active planet Earth with "different time and location of material state changes" factors are largely difficult to be described as static and stable evidences of chemistry and physics data shown by any defined terminology. This is mainly because solid materials of asteroids and target rocks are changed abruptly materials of solid-liquid-vapor (SLV) states to be quenched to solid-state (called as "post-shocked" solid). In this sense, remained solids of mineral and rocks in impact crater structure, show "limited descriptive data" of impact process which have less data of origin (before impact) and development (after previous impact). Therefore, impact process should be discussed all states of the SLV, especially liquid-and vapor-related processes during the impact process (including "ocean impact" in this study).

Characteristics of target rocks on Earth's lands: From previous material database, water-planet Earth shows clear and homogeneous "solid rocks on lands" through extreme condition (including magmatic melting) after the plate-tectonics on water and volatiles-included sea-bottom rocks. Therefore, Earth's land rocks are chemically and structurally separated volatiles to be evaporated (for atmosphere and ocean water systems) as shown in Fig.1.

Three types of target rocks of Earth's lands: Water-planet Earth has three types of impact evolved target rocks (originally from primordial mixed rocks) as follows:

1) Primordial dry land rocks: This is mixed with ion-atom and solid grains formed at primordial dry planet Earth originally, which is usually difficult to be observed at present evolved water-planet Earth.

2) Silicate-rich Earth rock: This is main representative land rocks of water- and air-planet Earth systems, which are separation from plate of sea-sediments and melted through interior magmatic heating to land crust after formation of less volatiles (except crystal structure sites of H. O, OH and H_2O states locally)

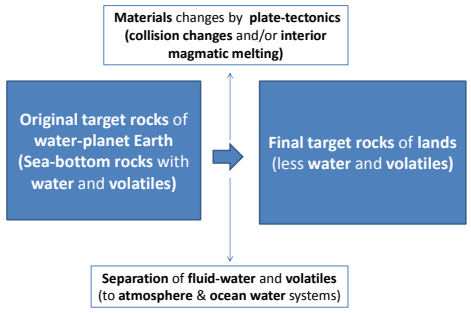

Fig.1. Schematic diagram of original and final target rocks of water-planet Earth to form dry lands (without volatiles and liquids during extreme impact process).

3) Volatile (including carbon)-rich Earth rock: This is also representative surface rocks of circulated water- and air-planet Earth evolved; which are formed to hydrate and carbonates of plate sea-sediments after formation of less volatiles (except crystal structure except crystal structure sites of H. O, OH and H_2O states widely).

4) Fluid-bearing Earth's rocks: This is mixed breccias of more evolved rocks (on water planet Earth), which include irregularly fluid with mixed liquid and micro-grains in solid grains aggregates. This type local interior fluids might be developed to

a) source of interior melting sources during continuous earthquakes-related processes, and

b) fluids with much more circulated volatiles (changed purified fluids to pure water liquid as significant effects to life activity later on active Earth) as shown in Fig.2.

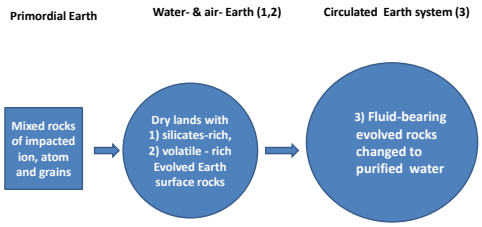

Fig.2. Schematic diagram of three types of target rocks evolved from primordial mixed rocks to dry silicates-rich, volatile-rich and fluids-rich rocks.

Target rocks of Earth's ocean-water impacts: After passing volatile-rich atmosphere and ocean water system of evolved planet Earth, larger meteorite and asteroids impacts with sea-sediment floor rock (with volatiles and fluids-rich thin layers), and larger asteroids penetrated to mantle rocks with dry land-type rocks will form impact crater-structure followed discarded by big tsunami-events [4], and/or into smaller fragment or remained interior-foreign rocks (obtained as in the West Africa, East Europe and Asia of China and Japan (including the Akiyoshi-dai limestone blocks). This type of Earth's impact crater structure are not dry-land impact crater, but remained impact blocks (mainly with carbonates) are scientifically significant to for metallic and diamond carbon (to coal formation) used in our human society (including formation for pure water for life activity), as shown in Fig.3 [5-8].

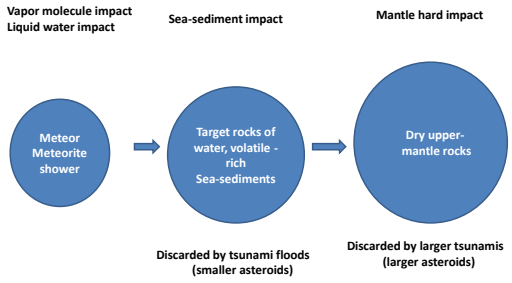

Fig.3. Schematic diagram of target rocks of Earth's ocean-water impacts from sea-sediments (crust) and upper mantle rocks (mantle) which are discarded by larger tsunami floods, which can be observed by remained impact limestone breccias globally at West Africa, East Europe and Asia of China and Japan (including the Akiyoshi limestone blocks).

Case by the Akiyoshi breccias of ocean impact:

The Akiyoshido (cave) and Akiyoshi-dai (plateau) are located at Mine-City, Yamaguchi Prefecture in Japan (Fig.4a). Age of Akiyoshi limestone is 350Ma to 250Ma in Paleozoic period formed Equator by fossil records. The size is about 130 km^2 (13,000ha) on plateau at altitude of 200m to 400m (similar central peaks). Among 450 limestone caves, main Akiyoshido Cave is huge as 420,000 m^3, long as 10km length, and took 300,000 years to form recently formed by dissolving of carbonate limestone or marble (Fig.4b). The Akiyoshi district shows “Karren" (a flock of sheep by impact breccias) shown in Fig.4c.The Akiyoshi limestones which have many fossils of Carboniferous to Permian Periods, were created in southern Equator about 350 million years ago (Fig.4d). As stopping sedimentation of Paleozoic limestone in shallow sea water, original Akiyoshi limestones were strongly broken to survive under crust ground (with old China blocks) by strong Paleozoic catastrophic event. After transporting to northern part of Asia with two China continents blocks (more than 5,000km), western part of Honshu island of Japan was separated from big China continent where the Akiyoshi limestone blocks are isolated to form the Sea of Japan by Takamatsu impact event about 15 million years ago recently, where ocean imapcts are proved by many metellic deposits of extraterrestrial elements (Au, Ag, Cu, Fe, Ni and Co) in Japan islands in breccias coral reef limestones finally [5-8].

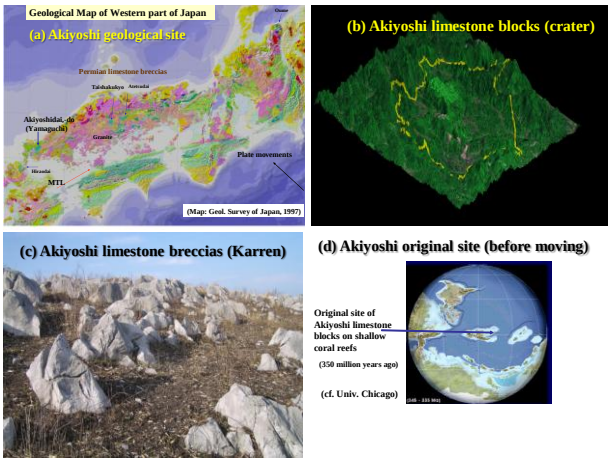

Fig.4. Case of ocean impact in Japan. (a) Geological site of the Akiyoshi blocks. (b) The Akiyoshi limestone block remained. (c) Akiyoshi breccias Karren. (d) Original site near Equator of the coral reefs.

Summary: Present summary is as follows. (1) Active water planet Earth has three type target rocks on dry lands, wet sea-sediments and dry mantle rocks. (2) Ocean impact of the Akiyoshi case is discussed topograhic data, geological data and extraterrestrial metallic enrichment of deposts in island uplfted after recent impact. (3) Liquid of fluids are purifdied at circulated system of active Earth for life activity finally.

References: [1] French B.M., Short N.M. (1968): *Shock Metamorphism of Natural Materials*, 644pp. [2] Ernst W.G. (1990): *The Dynamic Earth* (Col. Univ. Press), 280pp. [3] French B. (1998): *Traces of catastrophe* (LPI Contribution 954), 120 pp. [4] Kaiho Y.and Y. Miura et al. *Geology*, 29, 815-818. [5] Miura Y. *et al.* (2004): *LPI Contrib.*, 1197, #2150. [6] Miura Y. (2003): *J.Yamaguchi Earth Sci.*, 50, 13-18. [7] Miura Y. (2006): *Akiyoshi Cave Plat-eau Field Guide (English)*, 1-16 (ICEM2006).[8] Miura Y. et al. (2006): *LPS XXXVII*, abstract#1239