

CRATER ANALYSES BY MULTIPLE MAPS OF EARTH AND ITS APPLICATION TO EXTRA-TERRESTRIAL SURFACES. Y. Miura, Inst. Earth Planet. Mat. Sci., Grad. School., Sci. & Eng., Fac. Yamaguchi University, Yoshida 1677-1, Yamaguchi, 753-8512, Japan. yasmiura@yamaguchi-u.ac.jp

Introduction: Crater analyses on the surface of planetary bodies are started by huge picture map analyses of the Apollo missions to the Moon which is airless and waterless satellites. Recently computer analyses of terrestrial and extraterrestrial surfaces have been applied to many extraterrestrial bodies. There are two types of crater analyses on this surface whether there are erosions by water-liquid process of sedimentation or not. Extreme characteristics of active Earth with water sedimentation (e.g. broken and buried crater analyses [1-11]) will be applied to unsolved surface of these extraterrestrial bodies. The purpose of this paper is to elucidate characteristics of crater analyses of these extraterrestrial bodies by using various data [6-10].

Crater analyses with water-liquid process: Standard model of crater formation has been used at active Earth with and without erosion process by water (lake) and ice (glacier) sedimentations with impact sediments, as listed in Fig. 1.

Fig.1. Classification of crater (without moving) by water-liquid process with impact sedimentation.

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- 1) Crater with clear feature with impact deposits:
(Almost all types of craters on & out of the Earth)
 - 2) Crater without clear feature and new deposits:
(On Earth , asteroids, Mars and some satellites)
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Crater analyses with vertical and horizontal erosions: Erosion and broken processes of crater by vertical and horizontal movements on active Earth are considered to be 1) vertical broken process by volcanic intrusion (found in volcanic islands in Japan [2-10]), and 2) horizontal moving by compression of continental drift or island formation by plate-tectonics or mantle convection ([6-10], Fig.2) .

Fig.2. Classification of crater with vertical and horizontal movements.

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- 1) Vertical moving of crater:
Intrusion by volcano (Earth, Venus?, Mars?, some Satellites?)
 - 2) Horizontal moving of crater:
Continental drift and island formations by plate-tectonics and/or mantle convection (Earth, Extraterrestrial bodies ?)
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Typical example of vertical and horizontal erosions is Takamatsu crater in Japan, which is new joined locality name of Takamatsu City [9-10]. The center of the structure is Latitude 34.3° and Longitude 134.05°. Takamatsu crater is formed after impact by 1) vertical erosions of small andesite intrusions, and 2) horizontal erosion by shifting from old China continents to present southern position during Japan island formation [6-10].

Application to crater analyses of extraterrestrial surfaces: Crater analyses of active Earth can be applied to unsolved features on extraterrestrial surfaces, by using multiple map analyses of topography, compositions (by optical and wavelengths), and gravity anomaly (for underground information) [10] , as listed in Fig.3.

Fig. 3. Crater analyses of extraterrestrial surfaces by multiple map analyses [10].

| Surface map | Characteristics |
|--------------------|-------------------------|
| 1) Topography | Used for final feature |
| 2) Gravity anomaly | Used for buried crater |
| 3) Composition | Used for final deposits |

Summary: The present results are summarized as follows: 1) Craters (without moving) can be analyzed by topography with compositions of impact or new deposits. 2) Craters erode by vertical and horizontal movements are analyzed by example of Takamatsu crater on active Earth. 3) Present crater analyses can be applied to extraterrestrial surfaces, by using multiple maps of topography, composition and gravity anomaly.

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