

# Morphologic features of tafoni and notch developed in Miocene tuffaceous rocks and rock fall due to seismic vibration

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Tafoni and notch are a small cavity appeared on steep rock slopes, and it is believed to have been formed due to mainly salt weathering. Piling up of rock blocks on the foot of such cliffs indicates that evolution of tafoni and notch may be closely related to rock fall from the cliffs. Tafoni and notch are well developed in the cliffs of tuffaceous rocks of the Miocene Setouchi volcanic rocks in Kagawa, Shikoku, Japan. They are found mountain area with altitude of about 300m.

Although size of tafoni and notch ranges 0.3 to 10 m in diameters, their profiles resemble one another in this area. Upper roof of tafoni and notch is usually concave, whereas lower floor is flat. And also they tend to develop on steep slopes characterized by massive fine-grained tuff.

Distribution of moisture content on rock surface shows that it takes highest value on concave roof portion, and this may be almost independent of degree of weathered condition. This supports that concave roofs have been formed due to high rate of salt weathering in high humid condition.

Formation processes of tafoni and notch are estimated; (1) inward infiltration of water from cliff surface of coarse volcanic breccia, (2) solution of rock materials in water, (3) concentration of water into roof of tafoni and notch, (4) occurrence of tensile failures due to salt precipitation in surface portion of rocks, (5) exfoliation and degradation of rocks on rock surface.

Development of tafoni and notch make a sort of canopies overhanging on steep cliff, and such unstable portions fall down as rock fall. In addition to development of tafoni and notch, cracks within volcanic breccia are also one of causes of rock fall. Such cracks occurred due to rotational moment of overhanging portion. Consequently, weathering rates of rocks due to salt weathering and spacing of these cracks may control the frequency of rock fall in these cliffs.