Alternating subaerial pyroclastic and marine reworking processes during eruption of a coastal tuff ring, Jeju Island, Korea: A high-resolution record of Holocene sea-level

Woo Seok Yoon[1], Gi Bom Kim[2], Seok Hoon Yoon[3], Young Kwan Sohn[4]

[1]Jeju National University, Korea, [2]Seoul National University, Korea, [3]Jeju National University, Korea, [4]Gyeosang National University, Korea

E-mail: yoonssul@naver.com

Explosive volcanic eruptions commonly result in rapid aggradation of pyroclastic materials in a very short period of time, allowing for the preservation of the details of the deposition history. The Songaksan mount, located near the southwestern coast of Jeju Island, Korea, is a typical tuff ring formed by phreatomagmatic activity in the middle Holocene when the sea level was almost identical to that at present. The purpose of this study is to unravel the depositional processes of the 120 cm-thick basal portion of the medial-distal rim beds of the tuff ring, which comprises seventeen units of alternating primary and reworked volcaniclastic deposits. Primary volcaniclastic units show pinching-and-swelling but laterally continuous bed geometry and a variety of deposit features such as migrating megaripple bedforms, accretionary lapilli, impact sags, and various grading patterns, suggesting deposition from pyroclastic surges and falls in a subaerial condition. On the other hand, reworked volcaniclastic units are ripple cross-laminated and better sorted (fines depleted) with intercalating mud drapes, indicative of reworking of volcanic debris and winnowing of fines by marine waves and currents. These two groups of facies alternate seven times and then pass upward into the wholly subaerial pyroclastic surge deposit with raindrop marks and footprints of birds on the bedding planes in between. This facies transition suggests repetitive marine reworking of pyroclastic material during the deposition of the lowermost rim beds of the tuff ring in an intertidal zone. Considering the short duration of monogenetic volcanic activity, it is inferred that the alternating deposition of the primary (subaerial) and reworked (submarine) units occurred within "several days", and that the daily fluctuations of the sea level due to tides were responsible for the alternation of the facies. This study implies that coastal tuff rings and tuff cones can provide high-resolution information of paleo-sea levels, which cannot be obtained by the study of nonvolcanic deposits.