# Facies and geomorphic analyses of resedimented volcaniclastic deposits: post-eruptive volcanogenic floods and hazards

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Volcanic activities provide cataclysmic hazards to surrounding environments and human life by various eruptive and hydrologic processes, e.g., lava flows, pyroclastic flows, pyroclastic fallout, debris avalanches, debris flows, and flood flows. Although there are many studies dealing with the prevention and mitigation of volcanic hazards, these are mostly concentrated on primary (actual) eruptive processes related to proximal area to active volcanoes. Hydrological resedimentation would delete or confuse information on primary eruption, and hence, most of 'resedimented' volcaniclastic deposits have been less focused in earlier studies. However, some studies addressed to volcaniclastic resedimentation have shown that hydrological resedimentation can enforce severe hazards to far-distant downstream areas when large-scale eruptions occur (e.g., Manville, 2002; Kataoka and Nakajo, 2002).

Numazawa volcano, northeast Japan, has a small caldera (~2 km in diameter) at an elevation of approximately 475 m A.S.L., and most recent eruption was at about BC 3,400 emplacing large volume of ignimbrite (Numazawako eruption: Yamamoto, 2003). Facies and geomorphic analyses on resedimented volcaniclastic deposits (post Numazawako eruption) have revealed that the catastrophic breakout flood occurred in the eruption aftermath. The voluminous ignimbrite dammed a major river course and made huge impoundment of water behind the ignimbrite that finally caused the catastrophic outburst of the dam-up lake. Post-eruptive remobilised and resedimented pyroclastic material is widely distributed along the Tadami River and the Agano River with 10s of meters in thickness. The remobilised and resedimented volcaniclastic deposits finally reached to the Niigata Plain, more than 100 km downstream the eruptive centre. Fine-grained dam-lake deposits, 10 to 15 m thick hyperconcentrated flow deposits, slackwater deposits at tributary rivers, large flood boulders, and high water marks, all support the flood event.

Burials of archeological sites by the flood deposits imply that catastrophic volcano-hydrologic hazards occurred and impacted human life of the time. Most of the buried archeological sites were unaffected by actual ignimbrite eruption and/or pyroclastic fall directly. This indicates, the volcaniclastic resedimentation prevailed far beyond primary pyroclastic distribution, and subsequent hazards by hydrologic processes can give more impacts than actual volcanic eruptions. Therefore sedimentology of resedimented volcaniclastic deposits will give clues for further understanding, prevention and mitigation of various post-eruptive volcanic hazards.