

## The Bentengawara pyroclastic flow deposit, Nantai volcano: a pyroclastic flow generated by scoria cone collapse

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Nantai volcano (2486 m asl), a near-conical stratovolcano with a ca. 1-km-wide summit crater, is located on the volcanic front of NE Japan. The 11-12 cal. ka BP Bentengawara pyroclastic flow deposit (BPF; Miyake et al., 2006) occurs at the northern slope and northeastern foot of the volcano, and it consists of a single block-and-ash flow deposit unit. We describe the petrological features of the juvenile pyroclasts, identify the source, and establish the origin of the BPF. The BPF consists of a mixture of finely pulverized rock ash, lapilli, and volcanic blocks. The volcanic blocks are texturally and morphologically diverse, including vesicular scoria blocks, poorly to moderately vesicular cauliflower bombs, and none to poorly vesicular bread-crust, densely-welded, lava-like blocks. The lava-like blocks commonly have curvilinear non-vesicular surfaces and prismatic joints extending inward from the surfaces to the poorly vesicular interior, which imply quenching, post-depositional vesiculation, and the resultant fracturing of hot welded materials. The coexistence of vesicular pyroclasts and densely welded blocks suggests that the BPF was generated by the collapse of a pre-existing, partly welded, high-temperature volcanic edifice. On the basis of rock types, and modal and whole-rock compositions of the juvenile pyroclasts, we identified the partly collapsed scoria cone within the summit crater as the source for the BPF. The scoria cone comprises a thick scoria and bomb fall deposits and a densely welded part occur at the base. Lithological characteristics of the BPF and the source scoria cone suggest that the first phase of the eruption occurred within the summit crater and produced a scoria cone on the steep inner slope of the summit crater. During this phase, hot pyroclasts rapidly accumulated in the proximal zone as fallout, creating the variably welded source scoria cone. This phase was followed by the gravitational collapse of the scoria cone, thereby generating the BPF.

Keywords: Nantai volcano, pyroclastic flow deposit, scoria cone