



Reconstructing paleo-eruption characteristics from tuff rings in Batoke, Cameroon

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In subtropical volcanic environments, there are often few accessible outcrops. These are often highly weathered and of very poor quality. Soil development is rapid (1cm/y) and small eruptions are unlikely to be preserved in the geological record. Reconstructing past eruptions and assessing hazards is therefore a challenge around the Mt Cameroon region. This is made more difficult because there has been no opportunity to effect real-time observations of large explosive eruptions in this region. Information therefore has to be collected from deposits of past eruptions. This can be achieved by the study and observation of tuff outcrops. We studied a tuff ring outcropping only along one road (very poor, incomplete section) and one beach cliff (up to ca. 5-10m high) at Batoke, to the SW of Mt Cameroon volcano. Quantitative data was extracted from a detailed study of outcrops' external surfaces. Mt Cameroon has a few tuff rings, currently of unknown ages, near the SW coast of Cameroon. In Batoke, the sequence is dominated by gently dipping tuff beds varying in the proportion of lithics, juvenile clasts, and accretionary lapilli (acc-laps). Several beds are close-packed with acc-laps of up to 10-15mm diameter. Part of the section is gullied by mud flow deposits. There is an empirical correlation between maximum acc-lap size in the thickest outcrop and eruption column height. This and the deposit features suggest that the Batoke eruption was pulsating but dominated by fallout (ash), with a water and ice-rich eruption column reaching 10-15km high. Recycling of water-drops and ice-coated fine ash oc-

curred during the eruption. At switch off, wholesale gravitational collapse of this material produced the mud flows which gullied the previously-laid down deposits. Such mud flows can represent a substantial hazard. They can gully down through towns and roads and cut evacuation routes, e.g. as happened during the 1937 and 1994 Rabaul eruptions (30m deep gullies). This study illustrates how, at subtropical tuff rings, it is possible to extract key data needed for hazard assessment from only 1-2 poor outcrops. Also it underscores the importance of ash fall as a non-negligible volcanic hazard in the Mt Cameroon region.