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Deposits and dynamics of the 1951 pyroclastic density current of Mount Lamington, Papua New Guinea

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We present preliminary results of a detailed reinvestigation of deposits of the famous 1951 eruption of Mount Lamington, Papua New Guinea, which was originally studied by T. Taylor (1958). The climactic phase of the eruption produced a vertical explosive fountain which gravitationally collapsed and formed a powerful pyroclastic density current (PDC). This PDC completely devastated an area of 230 km2, travelling maximum distance of 15 km in N direction; 3500 people were killed by the eruption. The surge deposit, which is still well-preserved, was studied in 2 profiles, which are parallel to the longest axis of the surge propagation. The deposit consists of mostly juvenile rock fragments (80-85%) represented by poorly vesicular (4 – 40%) highly crystalline dacite; bombs with poorly developed bread crust surfaces are common in proximal areas. The deposit is in general normally graded and consists of lapilli and coarse ash fining upward into fine ash. The base of the deposit is mixed with soil in proximal areas. Stratigraphic characteristics of the deposit demonstrate strong local fluctuations, but have clear trends with distance from the volcano. At distances from 3 to 12 km from the volcano the maximum deposit thickness decreases from 55 to 5 cm, and the average size of the 10 largest clasts decreases from 4.5 cm to 0.5 cm; Md diameter decreases from -1.5 to 4.5 phi; sorting improves from 3 to 0.7 phi. The surge produced spectacular tree blow-down in the devastated area. Aerial photographs taken one month after eruption show that the PDC was strongly channelized even by small (tens meters) topographic features; the front of the moving PDC was frequently split into multiple small tongues which were variously deflected by topography. The deposit and the tree blow-down features demonstrate many similarities with those of blast-generated PDCs of Bezymianny in 1956 and Mount St. Helens in 1980. A notable difference however is that although some layering similar to the classic A, B, C stratigraphy is present in the proximal deposits of Lamington, the layers are not so clearly distinguished by grain size characteristics and lack the sharp contacts that are common in classic blast deposits. We attribute this difference to the fact that, unlike the St. Helens and Bezymianny examples, the Lamington blast cloud first ascended vertically before collapsing and producing a PDC. Consequently the Lamington PDC injested more air and was more dilute than those at St. Helens and Bezymianny.