

Dynamics of the pyroclastic density current formed during the 1902 eruption of La Soufriere, St Vincent, West Indies from analysis of the photographic archive

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The excellent contemporary documentation of eruption 7 May 1902 at La Soufriere, St Vincent provides a rare opportunity to study the impact and analyse the dynamics of a lethal pyroclastic density current (PDC). The photographic archive combined with these contemporary accounts reveals that the PDC formed was essentially a single, radially distributed short lived paroxysmal current occurring over the space of the a few minutes, and was not the result of multiple events. The PDC directly resulted in the deaths of around 1500 people, nevertheless a number of people survived inside buildings. Dense high particle concentration basaltic andesite scoria-rich PDCs moved down the main valleys to the NW, W, SW and SE, while the low particle concentration currents were continuous between these valleys. Dilute PDCs also travelled for several km over the sea on the western side of the volcano, emanating from several of the deep valleys. In proximal areas, < 3km from source, tree felling was near total both in valley bottoms and on the top of narrow ridges. Such damage indicates high dynamic pressure (>20Kpa) and likely high velocities. Whereas a near absence of damage or charring of wooden buildings reveals almost negligible dynamic pressures and low temperatures of the PDCs and in distal regions (6 – 7 km from source). Numerous human casualties occurring at these locations confirms the passage of slow moving, dilute current in the final few km of runout. This analysis indicates that the PDC rapidly attenuated in velocity and dynamic pressure over the course of its run out. Dynamic pressures decreased from 20 to <1 Kpa over only a few km. From a hazard point of view it is worth noting that despite the low temperatures and dynamic pressures these currents were lethal to almost anyone outdoors.