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Complex proximal deposits and deposition from historical explosive eruptions.

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On plots of tephra thickness versus area$^{1/2}$, steep slopes of Hawaiian and Strombolian deposits distinguish them from subplinian or Plinian pumice sheets. However, several well-described historical pyroclastic deposits have two elements: a cone and an adjacent scoria or pumice sheet or blanket. The relationship between these two architectural elements is an intriguing and unresolved question- what features of the eruptions permit growth of two such disparate elements?

Here we examine the geometry for three such eruptions: the Hawaiian eruption of Kilauea Iki in 1959, the subplinian eruption of Ruapehu in 1996, and the Plinian eruptions of Tarawera in 1886 and Novarupta in 1912. Whilst the volumes of tephra apportioned to the two regimes are drastically different during these eruptions, it appears that both co-current (= tephra sheet) and concurrent (cone) transport of pyroclasts can characterize explosive eruptions over a wide range of eruptive intensity. The very proximal deposits are complex in their internal stratigraphy and sedimentation was episodic and fluctuating in intensity perhaps mirroring local fluctuations in discharge rate associated with the margins of the eruptive jets.