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Controlling factors on vent distribution in volcanic cone fields

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Distribution of vents within a large-scale volcanic edifice is controlled by several factors leading to a local or regional extensional regime. Because several factors influence the vent spatial distribution at any one time, the distribution may at first appear complex and random. As part of a broader study exploring the controls on volcanic cone shape, size and vent distribution, we systematically revisited these aspects for the Mauna Kea volcanic cone field (MKCF). For the MKCF, we postulate that four main factors appear to control the vent distribution. First the direction of shield-stage rift zones whose development was eventually influenced by buttressing from other volcanic edifices (Mauna Loa, Hualalai, Kohala). Second, stress reorientation at major topographic breaks-in-slope appears to favour final magma ascent and vent opening there. Third, former caldera ring faults and, fourth a major arcuate fault related to volcano-scale spreading to the WNW under the buttressing limit, are also inferred to control the location of some vents. By gradually deconvoluting the 300 cones dataset, we assess to what extent each of these factors can account for the vent distribution. The generality of the MKCF findings is evaluated by comparison with other case studies.