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The effect of giant flank collapses on magma pathways and location of volcanic vents

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Flank collapses have been identified at tall volcanoes and ocean islands worldwide. They are recurrent processes, significantly contributing to the morphological and structural evolution of volcanic edifices, and they often occur in interaction with magmatic activity. Moreover, it has been observed that the intrusion pathways and eruption's sites often differ before and after flank collapses. While it is understood that dyke intrusions might destabilise a volcano flank, and a moving flank might create the space needed for further intrusions, the effect of collapses on the magma pathways has been rarely addressed.
Here we use a boundary element model for dyke propagation to study the effect of the stress redistribution due to a flank collapse on the location of eruptive vents. We use our model to simulate the path of magmatic intrusion after the collapse of the eastern flank of Fogo Volcano, Cabe Verde. We find that the competition between loading stress due to the volcanic edifice and unloading due to the collapse of a flank favours magmatic activity to cluster within the collapse scar, displaced with respect to the pre-collapse volcanic centre. Our results are compared with geomorphological observations at Fogo Island and are discussed in the general context of the long-term evolution intraplate volcanic ocean islands worldwide.