

Assessing volcano flank instability in Dominica, Lesser Antilles arc

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A multidisciplinary geological and geophysical study is underway to assess newly recognised flank instability on the north slope of Morne aux Diabes volcano, the northernmost of nine volcanic centres on the island of Dominica. Bathymetric data suggests that offshore the slope is truncated by an active fault structure with a dip-slip component that causes uplift of the unstable flank. Onshore, field, remote sensing and VLF geophysical surveys reveal an unstable complex, occurring above inferred deep-seated rotational failure planes, that includes open water-filled fissures associated with spreading and toppling failures. Large-scale failures have the potential to generate devastating tsunami that would inundate coastal zones of Guadeloupe only 30 km to the north. A relatively small potential landslide block of ~1 M tonnes on the seaward margin of the instability complex that has large tension cracks on its upslope margin is particularly notable. Failure of this block could destabilise an even larger adjacent upslope block (~ 3 M tonnes), and preliminary modelling calculations indicate that landslides at these scales could trigger tsunami waves, locally reaching up to 4 m in height, which would cause significant inundation along the southern coast of Guadeloupe. Such failures might be expected to be triggered by earthquakes occurring at the subduction interface, or in the overlying upper plate. However, a ML 6.0 event in 2004 some 20 km NW of Dominica did not generate significant landsliding. It may be that a combination of large earthquakes occurring in the wet season is required to initiate renewed movement on deep-seated failure planes.