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Numerical modeling of a sub Plinian eruption at La Soufrière de Guadeloupe: implications for pyroclastic density currents hazard assessment.

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We present three-dimensional numerical simulations of a sub-Plinian eruptive scenario at La Soufrière de Guadeloupe, aimed at assessing the capability of pyroclastic density currents to reach the inhabited regions on the volcano slopes, in case of the future resumption of the explosive activity.
The selected eruptive scenario is similar to that hypothesized for the 1530 a.D. eruption, but several eruptive conditions have been analyzed to account for different behaviours of the eruptive column and percentages of collapse. Numerical results describe, in 3D and in time, the formation, instability and partial collapse of the eruptive column, and the simultaneous formation of a convective plume and several branched pyroclastic density currents.
The proximal volcano morphology, characterized by the presence of ancient caldera rims and the remnants of the old edifice, controls the areal distribution of the collapsed material and the paths of channelized flows along the incised topography. The analysis of the 3D runs suggests that partial collapse scenarios produce steeply stratified pyroclastic density currents, which are strongly controlled by the topography and whose propagation is likely driven by the dynamics of the dense, basal layer.
Although vertical grid size still does not allow the resolution of the dynamics of such concentrated flows, preliminary georeferenced maps of pyroclastic density currents' hazardous actions (temperature and dynamic pressure) provide interesting and useful information which can serve as a basis for elaborating a quantitative framework for the assessment of their impact on vulnerable infrastructures, networks, and population.